IMPACT OF CONCUSSIONS IN FOOTBALL

Approved: ___________________________________ Date: _05-23-2014____

IMPACT OF CONCUSSIONS IN FOOTBALL

A Seminar Paper

Presented to

The Graduate Faculty

University of Wisconsin-Platteville

In Partial Fulfillment of the

Requirement for the Degree

Masters of Science

in

Education

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by

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2013

Abstract

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The paper reviewed research literature regarding the frequency of concussions in the sport of football. The paper found the causes of concussions in football along with several symptoms that occur. The paper describes the proper biomechanical technique to tackle and provides strategies for lessening the frequency of concussions. These strategies include using improved helmet technology and new rules and regulations for the game. The paper found that the biggest increase for the apparent frequency of concussions was the increase of knowledge about concussions, along with increased testing and improved record keeping.

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CHAPTER 1

INTRODUCTION

Athletes in the U.S. suffer from 3.8 million sports related concussions every year (Foster, 2013). The concussions within the National Football League has increased at more than 20 percent within 2008 through 2011, and the rate of concussions in high school and college football has also increased (Casson, Pellman, & Viano, 2008). Specific rules, regulations, and coaching methods have been developed to help reduce the frequency of concussion related injuries. However despite these new rules, equipment, and coaching methods, the frequency of such injuries is still increasing. By taking a closer look into these improvements to the game to ensure the safety of all individuals willing to participate in the game of football, it can be determined what type of impact they have on decreasing the frequency of concussions. Further examination is required to determine the reasons behind the higher frequency of head injuries.

Purpose of the Study

The purpose of the study is to provide a review of the literature related to the increase of head injuries in the game of football to inform and improve practice in the area of football coaching techniques and high impact sport equipment design.

Significance of the Study

The study of high impact sport-related head injuries is important to the practice of any and all persons who professionally or voluntarily work with individuals in the sport of football at any skill level. This work will make an impact on the proper coaching techniques and treatment regarding head injuries in the sport of football and should be of importance to others seeking information related to these best practices.

Statement of the Problem

Why is the frequency of concussions increasing in the sport of football, with the increased attention to preventing such from happening?

Definition of Terms

Brain Trauma- Traumatic brain injury occurs when an external mechanical force causes brain dysfunction. (Mayo Clinic Staff, 2013).

Biomechanics- The mechanics of biological and especially muscular activity; also: the study of the principles and relations involved (Merriam-Webster, 2013).

High impact collision sport- A sport in which the athletes purposely hit or collide with each other or inanimate objects, including the ground, with great force, and have a higher risk of transmitting blood-borne infections (Segen's Medical Dictionary, 2012).

Concussion- A traumatically induced transient disturbance of brain function and involves a complex pathophysiological process. (American Medical Society, 2013)

Delimitations of Research

The majority of the research was conducted through technological means including; EBSCO Host and ERIC. Another major source of resources was the UW-System search tool, utilizing the services of the Karrmann Library in Platteville, Wisconsin. Some information came from the resources of current and former coaches and players involved with the game of football. The main search topics include, “Concussions in high collision sports,” “Biomechanics of athletic movements,” “Effects of Concussions,” and “Business/technological aspects associated with concussions.”

Method of Approach

A review of what causes concussions along with a brief review of the effects of concussions was conducted. A review of safety, rules, and regulations regarding concussion awareness and prevention in football was conducted. A review of the impact of equipment technology, and individual techniques of tackling was conducted as well.   A review of current and past treatment options for concussions was researched through experiences of former football players and football coaches.

Chapter Two: Review of Related Literature

This chapter reviews relevant literature on determining what a concussion is, what actions in football can cause a concussion, and possible health risks that can occur with a concussion.

Relevance of Concussions in the Sport of Football

The game of football is a high impact sport. This means that athletes are moving at a high velocity and create an impact with every play. Considering the physicality of the game, injury is unavoidable. The severity of the injury can mean the difference between missing out on a couple of plays, and missing out on a normal life. One of those life-threatening injuries involves the brain.

The brain is certainly considered one of the more important organs in the human body. One of the most common injuries in football is a brain injury called concussion. A concussion is reported happening nearly 4 million times in a given year during the course of a football season. (Broglio, Sosnoff, Shin, He, Alcaraz, and Zimmerman, 2009). There are many symptoms that persist following a concussion and the post-concussion symptoms mostly depend on the severity of the injury. Not only are there different degrees of a concussion injury, but there are also several different ways to receive a concussion. The most basic is direct contact to the head, however based on certain techniques involved with the game, some athletes are more prone to a concussion because of the way they perform a specific football movement (Higgins, Masamitsu, & Coburn, 2007). Studies have also shown that the type of equipment can help or hurt athletes, especially considering the helmet which protects the head (Foster, 2013; Boriboon, 2013)

Another way of protecting athletes is to include new rules that point out especially harsh penalties to flagrant fouls when an individual targets another's head. With all of the ongoing studies and research that has been done to help understand the process of a concussion and what measures can be applied to prevent concussions as much as possible, the biggest question then is why are concussions happening more frequently?

Concussion Definition and Causes

A concussion is an injury that is sustained by the head that causes abnormal function of the brain (Mayo Clinic Staff, 2012). The severity of the hit can lead to more and harsh symptoms. Symptoms of a concussion can include short and long-term symptoms, again depending not only the severity of the hit, but also the frequency of the injury and the amount of time in between each injury (Boriboon, 2013). Short-term symptoms include headache, temporary loss of consciousness, confusion, amnesia, dizziness, nausea and vomiting, and slurred speech. Some of the symptoms may not immediately occur (Mayo Clinic Staff 2012). They could potentially be delayed. Typical delayed symptoms are trouble sleeping, sensitivity to light and noise, taste and smell disorders, irritability, and personality differences. Some of the long-term effects include: abnormal brain wave activity, deteriorating motor skills similar to Parkinson’s disease, depression, and, worst of all, swelling of the brain that leads to death (Dean, O’Neil, & Sterr, 2012). These symptoms show that it is important to avoid concussions.

Each person who receives a concussion experiences it differently. Some may find the strongest symptoms include trouble sleeping and sensitivity to light. Others might find memory loss and nausea as the most prevalent to them (Dean, et al., 2012). Because symptoms like nausea and vomiting are commonly seen in other disorders, it can be hard to determine if an individual actually has a concussion, especially considering that the symptoms can be delayed.

One of the many reasons concussions can become so serious is because they are difficult to test for. During a football contest and practice there are several trainers on the field. At higher levels of play (e.g., in the National Football League) not only will there be more trainers, but the trainers will be more qualified and experienced (McKinley, 2007). Players at the lower levels will have fewer, less-qualified athletic trainers. For example, a youth tackle football team will have a handful of parents around, but no certified athletic trainers. The role of an athletic trainer is to be the first one on the scene when an injury occurs (McKinley, 2007). When a broken bone happens it is easy for the athletic trainer to diagnose and send that individual to the right place to be treated. With a concussion it becomes much harder to determine. The athletes themselves must cooperate. Many times players' egos can get in the way because they may not want to come off the field of play even though they may have experienced a concussion (McKinley, 2007).

It is important for the trainer to look for the signs of a concussion. Many times an athletic trainer will be able to spot the injury during the play. Other times the athletic trainer will hear of the injury by word of mouth from other coaches or players. Once a concussion is a possibility and the athletic trainer is aware of the diagnosis, decision-making then falls into the hands of that athlete and that athletic trainer (McKinley, 2007). The athletic trainer will then evaluate the player by asking the individual specific questions regarding how they are feeling. Most of the questions asked are to see if any of the symptoms that come with a concussion are present. If the athlete does not admit to having any symptoms then a series of physical tests will be administered. For example some of the tests include a balance test, a vision test, and a memory test (Dean, et al., 2012). If the trainer feels that the athlete passed all of the tests then they will be able to continue to play and will be watched closely throughout the rest of the contest to see if there are symptoms that can be physically seen. If there are any red flags at all that the athlete has experienced a concussion, the athlete will be immediately taken out of the contest and will have several follow-up tests administered (McKinley, 2007). Once a player has been diagnosed as having a concussion, treatment of the injury is the next step of the process.

Treatment of Concussions

Treating a concussion can be easy in some aspects, but hard in others. A concussion does not call for placing ice on the head. The best treatment is simply rest and letting the symptoms run their course. The short-term symptoms will not be permanent beyond a few days to a week. For example, vomiting and troubles sleeping will eventually stop. However, the duration of the symptoms is the biggest key to determine when the concussion is through running its course (Johnson, 2012).

Each institution follows a specific protocol when determining when an athlete is able to continue playing. The most common protocol requires each individual to take a baseline test at the beginning of every season. The baseline test is administered to every student athlete whether or not they have ever experienced a concussion. The test is recorded and saved in a file that will last throughout the player's career at the institution. Anytime an athlete has been suspected of or diagnosed with a concussion, the athlete must score as high as their baseline test before the athlete is cleared to play. Another factor is that the athlete will not be cleared to play until all symptoms have been cleared for at least one week. This helps ensure that the concussion has been given plenty of time to heal properly. If an athlete experiences a concussion within the next contest the same protocol will have taken place with another week added to the length of time to play since the last symptom, equaling two weeks symptom-free. If a third concussion has been diagnosed within the same season it is likely that the athlete will be done for the year, with possible examination by a specialist along with a meeting determining whether or not the athlete should continue playing in high impact sports. Since concussions can be so severely disabling, determining what causes has caused a concussion is looked at thoroughly.

Tackling Mechanics to Avoid Injury

Performing the correct tackling biomechanics is a large part of avoiding injury. It is not only important for the tackler but also important for the athlete who is getting tackled. Performing a tackle the wrong way can lead to several injuries for both parties. One of the most common injuries that occur when an athlete performs a tackle the wrong way is a concussion (Higgins, Masamitsu, & Coburn, 2007). One of the reasons an athlete performs a tackle incorrectly stems from their previous teaching or coaching, all the way back to their youth playing days. Many bad habits can form on the youth football playing fields. For example, leading with the head down with a straight back before performing a tackle places a player at risk. Luckily several programs have been developed, and there has been increased attention on concussions in youth football. The National Football League has developed a youth football program specifically designed for youth football coaches to become certified coaches for tackling (Mihoces, 2013). Former NFL players and coaches show the proper way to tackle. The coaches in the program go through the training and must pass a test to ensure they will be able to teach youth football players the best way to tackle.

There are several steps to be coached to ensure a proper tackle. The first biomechanical advantage that helps ensure the rest of the body will be safe for the ensuing tackler is having the head tilted up. The neck will be slightly hyperextended, meaning the head will be looking upwards. The next series of movement that will help put the tackler in the correct position involve the ankles, knees, and hips. The ankles will be in dorsiflextion, the knees will be in flexion, and the hips will be in flexion. This will look similar to an individual performing a squat, or similar to what humans do before they sit in a chair. These four movements are the core essentials for getting into a proper tackling stance (Higgins, et al., 2007). The reason for this stance is because the head will not be the first point of contact for either the tackler or the individual being tackled. Since the tackler is in a lower position than the one being tackled, that will rule out a head-to-head collision. Because the head is tilted up, the first point of contact will either be the chest or the shoulder of the tackler. The tackler will be making contact with the other individual's mid-section. This can include the chest, abdomen, or hips. This method enables the player to tackle without making contact anywhere near the head. Contact presumes the tackler will the go through a motion called triple extension, which refers to extension of the ankle, knee, and hip joints (Higgins, et al., 2007). This motion is similar to what humans do when standing up from a chair. The triple extension motion helps ensure the tackler is keeping his head up, supported by a sturdy spinal column. The triple extension motion will also help tacklers avoid diving at the opponent they are attempting to tackle. The arms and shoulders also play a part in the tackling process; however they are involved with the process of securing a tackle and have little to do preventing a head injury. Performing a tackle the right way can be beneficial to preventing injury, but an improper tackle can lead to a head injury.

In an improper tackle, the athlete will approach the opponent without having ankle, knee, and hip flexion. This would look similar to an individual with straight legs. Making contact with straight legs will take away the possibility of performing the triple extension movement since the ankles, knees, and hips will, for the most part are already be extended. This would also suggest that the tackler will be bent over with a flat back. The tackler will then have his head exposed as the first point of contact. Regardless whether the neck has slight hyperextension, or looking upward, the athlete who is performing the tackle is bracing for impact using his head. Because it has already been stated that a direct blow to the head presents a serious risk for having a concussion it can be presumed the player performing the movement would be displaying an improper tackle and unsafe to the tackler. Safe tackles protect the head, unsafe tackles put it at risk. Head placement can have a huge impact on whether or not the athlete is safe. The equipment protecting the head can have an impact on the safety of the athletes as well.

Equipment Issues

There are many pieces of equipment that are required for playing football. The most important piece of equipment when preventing a concussion is the football helmet (Foster, 2013). The helmet is never just given out, but is fitted to each athlete before use during the season. The helmet must fit tight to the head with no wiggle room. If there is wiggle room this can cause the head to have yet another item to contact, increasing the risk of a concussion.

There are many brands of helmets. All helmet companies' main priority is the safety of the athlete wearing the helmet; however it is still a business (Barret, 2013). Every helmet company competes with one another to sell their product. The best way for a helmet company to sell their product, especially with the added attention of concussion injuries, is to claim their helmets will prevent concussions the best. This cannot be true as there can only be one brand that truly protects the head the best. The National Operating Committee on Standards for Athletic Equipment (NOCSAE) conducts tests on several different helmets to determine if the helmet meets the criteria to be considered a safe piece of equipment (Foster, 2013). Helmets are tested by being placed into a model that fits into the helmet, similar to how a head would fit inside. The model is then is rammed into a firm ground base. The helmet is rotated around the model to test different areas of the helmet. Each helmet is given a different rating. The best brand also receives the best rating.

The helmet and evolution of the design of the helmet from leather to a polycarbonate shell with padding placed in designated areas is certainly a huge benefit to lessening the chances of a concussion (Foster, 2013). However for over 30 years the NOCSAE has placed a warning on all helmets that meet the recommended safety measurements. Part of those warnings states that a helmet cannot prevent all head injuries, and should not be used as a weapon. Unfortunately accidental or flagrant misuses of the helmet have occurred, resulting in serious injury and death. Harsher penalties have been instilled specifically at the National Collegiate Athletic Association (NCAA) and high school levels to remind the athletes leading with the helmet is not a viable option (Broglio, et al., 2009).

Another factor in determining the safety of a helmet is the environmental conditions such as the weather. The main source of materials that make up a football helmet is a polycarbonate shell. The polycarbonate shell is similar to a very hard plastic. This means the helmet can be susceptible to extreme conditions, for example heat. If the heat allows more wiggle room this would mean increased chances of a concussion. (Rowson & Duma, 2012) A study conducted through the years between 2006 and 2010 measured the amount of heat presented on the helmet along with the acceleration of the head. The study showed that the temperature did have some influence on the acceleration of the head, however it was only a 10% change. This is not a large enough change to cause a concussion (Rowson & Duma, 2012).

Rules and Regulations to Avoid Violent Hits

In 2013 a new rule was implemented in all of the NCAA football levels. The rule enhanced the penalties for violent hits. The previous penalty was that if a hit was obvious and flagrant, the athlete who performed the flagrant hit would receive only a penalty resulting in loss of yardage for the athlete’s own team. The new penalty included the loss of yardage as well as an ejection from the game and a four quarter suspension of play for the specific athlete who triggered the foul. The new rule has helped coaches pay more specific attention to the correct tackling technique. It also lets the athletes know that they would not only hurt themselves and the opponent, but also the team, because of missing playing time. The new rule marks a transition into less contact in general throughout the year during practice.

Number of Practices and Contact Days

Direct contact to the head is an obvious way to trigger more concussions. A coach can teach each individual athlete exactly the best way to tackle, however athletes may unavoidably and unintentionally place their own heads in danger. During the course of a week an individual will endure more repetitions in practice than in the game. This would be the point of practice, to help prepare the athletes for the competition. That also triggers more opportunities for high impact contact and in turn increases the chance of a concussion happening. At the high school levels there have been fewer contact days allowed during any given week (Broglio, Sosnoff, Shin, He, Alcaraz, Zimmerman 2009). This trend is newly implemented at the younger levels of the game; however more NCAA teams along with National Football League teams already lessen contact days throughout the course of the year.

Summary

A concussion is an extremely common injury that happens within the sport of football. The reason is that football is a high impact sport. A sport that calls for high impacts can cause injury to the head. High impact contact to the head is the leading cause of a concussion. A concussion can lead to a large list of health problems and can turn from short term problems into long term problems if not handled properly. An athletic trainer who is present at the time of the injury will take every precaution to ensure that the health of the athlete is not at risk. The coach teaches every athlete the proper way to tackle to ensure the athletes are not putting themselves in danger. The helmet companies generate the best possible helmets to their capability to help decrease the chance of a concussion happening. New rules place harsher penalties on targeting another athlete's head. Fewer contact days are permitted by high school, college, and professional levels, to lessen the opportunity for a concussion to take place. Yet the frequency of concussions has increased throughout the past decade. The reason for the increase of the frequency is that the number of individuals playing the sport makes it difficult to have enough coaches at the youth level to teach proper fundamentals. Further, the increased knowledge of the concussion injury is causing trainers to better test and accurately report when a concussion has occurred.

Chapter Three: Conclusions and Recommendations

In summary, this paper has shown the impact of concussions on the sport of football. It is known what causes a concussion, and in the sport of football a concussion is more than capable of happening due to the nature of the game. It becomes obvious that a concussion is certainly an injury every athlete wants to avoid. No person would wish to have a sleepless night along with a headache and vomiting. No person would wish to see long term issues that resemble Parkinson's disease and depression encounter their lives as well. Knowing the possibilities of these health concerns many would wonder if the sport of football is currently a safe sport to play. This is why athletic trainers and other personnel are so involved with the football team.

The athletic trainer's main concern is to ensure the safety of all individuals playing. Athletic trainers take every precaution to ensure this. They will administer every test that needs be administered, to meet not only the protocol of the institution, but to ensure the general well-being of the athlete. Because concussions have been researched and studied more thoroughly, more is being found out to diagnose the concussion. An athlete even 10 years ago would never have had to undergo a baseline test for a concussion-like injury. An athlete 20 years ago who suffered a concussion would have been told they "had their bell rung" and would continue playing. The injury would not be treated as thoroughly and would not even be labeled as an injury. That statistic would not even show up unless the athlete was completely knocked unconscious and unable to move or perform simple motor skills. Today if an athlete shows any sign or symptom of a concussion they will be tested, and, if any red flags appear at all, will not be able to return to play immediately. Further tests will be done and symptoms will be checked daily. Until the athlete shows no signs or symptoms for a given period of time they will not be allowed to play.

This of course shows up in the statistics as a concussion. This in turn leads to the increase of the number of reported concussions within the past decade, simply because the knowledge of a concussion was not as prevalent in the past.   A concussion was not taken as seriously as it is in today's game. This continuing research is great for continuing development of the game of football. If football is not a safe sport to play then it should not be played with the same rules. However, although these injuries being assessed early and treated properly certainly helps the safety of all players, it does not completely solve the problem. The new rule change is also another step in the right direction. Some people may believe that the game loses the excitement if a player cannot physically harm the other player. However it is much better to lose some of the excitement then to lose the game of football altogether. There will always be exciting games that come down to much more than to see an athlete get carried off the field. The player, coach, and fan of the game of football should look forward to seeing new development of rules to help athletes understand the importance of playing the game, and being able to walk away from the game without having serious injury.

Many blame concussions on the helmet. However, the helmet is not going to completely prevent a concussion. It even states that, on every helmet that can be used in competition. Fortunately, business is as competitive as football. The competition within the helmet industry is great for the development of new and improved pieces of equipment. All the helmet industries will continue to push each other to have the best helmet to lessen the chances of a concussion. They must do this to improve their own business and continue to make a profit.

Finally there are the coaches. Every coach should have one common goal, besides winning. The safety of all their athletes and opponents should be the priority. One of the best ways to ensure their athletes can avoid as much head contact as possible is to lessen the amount of contact throughout the season. A coach wants to know who the best athletes are and who they want to have represent their team out on the field. However if the athletes are not healthy due to so much contact throughout practice, then the coaches will not have their best players representing the team out on the field. The coach should teach every player on the team how to tackle the right way to avoid injury. This should be done in a controlled manner. A great series of a progression drills to avoid high impact hitting can teach the athletes step by step how they should tackle.

It then comes down to the athletes to use the best technique possible to not only make a great play, but to stand up after the play and continue playing healthily. The sport of football is a great team sport. Some consider the sport of football as the ultimate team sport. This of course is biased by those who have played the game. However, football is many fans will be best served by striving to find ways to make the sport safe to play for every individual who wants to play the game.

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