

CONCUSSION ACADEMIC EFFECTS, PREVENTATIVE MEASURES, AND POSITION
AT RISK IN FOOTBALL

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ACADEMIC CONCUSSION EFFECTS, PREVENTATIVE MEASURES, AND POSITION
AT RISK IN FOOTBALL

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Since 2013 concussions and related brain damage had become recognized as a significant problem and, due to this, had pushed the game of football into the public spotlight. What were needed besides developing concussion protocols were preventative measures to help identify potential problems an athlete might encounter before sustaining a concussion. In addition, proper understanding and protocol for return-to-play needed to be put into place if a student athlete were to sustain a concussion. The purpose of this study was to provide a basis of research and analysis to better understand concussions, as well as to further the goal of reducing or eliminating instances of when or where a concussion could occur, as well as to draw conclusions and make recommendations that might assist future research. The five major issues addressed in this review of literature were concussion protocol effectiveness, classroom effects of concussions, technology changes, the effects of rule changes, and position at risk. Findings indicated that steps had been taken to understand the long- and short-term effects, as well as to introduce preventative measures and return-to-play protocols. Classroom behavior changes were noted but few solutions were offered. Proactive steps had been taken to reduce the number of hits to the head that an athlete received while playing football through rule changes. Modern technology provided equipment adaptations to further decrease concussions in the game of football. Positions most at risk were identified. In all cases follow-up research was recommended. The Appendices provided original surveys developed by this researcher that could be used in future studies to address prevention and management of this serious problem.

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Chapter 1: Introduction

By 2016 the game of football had been thrust into the spotlight of the mainstream media as many had begun to view the sport as a danger to collegiate and high school athletes. In particular the short-term and long-term risk of concussions and related head impact had researchers scrambling for ways to identify potential precautions and safety measures. This research focused on four issues as related to the sport of football and concussions suffered as a result of playing the game. The five major issues addressed were concussion protocol effectiveness, classroom effects of concussion, effectiveness of technology changes on decreasing concussions, effectiveness of rule changes, and position at risk. . In order to conduct this research, related studies that addressed this serious issue were identified and reviewed.

While many researchers had studied the long-term effects of suffering a concussion and the effects of multiple concussions, few had looked into the academic effects specifically on collegiate football players. Further, a limited number of studies had examined the preventative and diagnostic measures, as well as which football position was the highest at risk for a concussion. One of these limited studies done by Mannix, Iverson, Maxwell, Atkins, Zafonte, and Berkner (2011) explored if there were lingering effects as a result of multiple concussions that would show up on a preseason baseline evaluation. This research determined there was a significant effect on the verbal memory composite score, and the results suggested that athletes who suffered multiple concussions had lingering memory dysfunction.

Wasserman, Bazarian, Mapstone, Block, and Wijngaarden (2016) further investigated if concussions led to academic dysfunction for high school and college athletes. They found that student athletes with concussions self-reported increased academic struggles within one week of receiving a concussion, with 83% of the participants who sustained a concussion reporting

problems in the classroom. At one month, 61% of the participants documented struggles to maintain focus and with poor performance. Abreu, Edwards, and Spradley (2016) discussed the major developments of helmet safety by companies such as Riddell, which came up with the InSite Impact Response System as an improved concussion detection unit. Their research concluded that the risk of a concussion could never be eliminated from the game of football, but rule changes and new product advancements would help decrease the risk.

Statement of the Problem

Since 2013 concussions and related brain damage had become recognized as a significant problem and, due to this, had pushed the game of football into the public spotlight. PBS Frontline's *Concussion Watch* project monitored the concussions suffered in the National Football League (NFL) over the course of two seasons. The data provided from the research showed that 323 concussions were suffered, and this data was proof that concussions were a national problem in the sport of football.

What was needed besides developing protocols were preventative measures to help identify potential problems an athlete might encounter before sustaining a concussion. In addition, proper understanding and protocol needed to be put into place if a student athlete were to sustain a concussion. These issues needed to be addressed in the game of football in order to eliminate head contact, or the game of football might cease to exist altogether.

Purpose of the Study

The purpose of this study was to provide a basis of research and analysis, as well as to draw some conclusions and recommendations that might assist in further research of the proposed problem. In the Appendix is an example of an original survey that could be used in further research of this problem. The available instrument could be used in the prevention and

management of the current problem. This study was done in hopes of establishing a better understanding of concussions, as well as to further the goal of reducing or eliminating instances of when or where a concussion could occur.

Assumptions

The research that was conducted was based on a couple of assumptions. The first assumption was that through a careful literature review conclusions could be reached that this was a major issue not only in just the game of football, but in all athletic events in which high school, college, and professional athletes participated. The second assumption was that this was a relatively new subject area that became relevant in the early 2000s, and research was limited. However, recommendations could still be made, and new studies could be proposed.

Delimitations of the Research

Two delimitations directly affected this research. The first delimitation was that the topic of this study was relatively new; and despite its importance, only a small number of published research studies could be found related to playing football and concussions. Accordingly, other sources that might not include information that was as reliable as scholarly research studies were included in this research. Such sources included *The New York Times*, ESPN, and *Sports Illustrated*. The second delimitation of this research study was strictly limited to professional players in the National Football League (NFL), collegiate student athletes, and high school football players. Not included in this study was research conducted on youth football leagues (Pop Warner), semi-professional football teams, or club football organizations.

Method of Approach

This research was conducted using reference materials from the Karrmann Library at the University of Wisconsin-Platteville. Search engines that were used from the Karrmann Library databases included: EBSCO Host, ABI/Inform Complete, Annual Reviews, Education Full Text, Education Research Complete, and ERIC. In addition, the research also covered searches of various Internet websites and related major newspaper articles that pertained to the research topic. Search terms that were used in the study from these databases included: *Concussions*, *Concussions and Academics*, *NFL Concussions*, *Concussion Protocol*, *Return-to-play Guidelines*, *Concussions High School*, *Concussions College*, and *Head Trauma in Football*.

After research was reviewed a summary was developed and presented, followed by conclusions and recommendations for further research. Provided in the recommendations and based on the prior research were options describing when a student athlete who had suffered a concussion might be able to return to pre-concussion classroom performance. Furthermore, this researcher proposed and showed evidence of what could be done to help decrease concussions in the game of football. Using evidence from this review of literature, identification was made of a position on the football field that was deemed most at risk for concussions. Recommendations were included to make that position safer in the game of football.

In the Appendix an example of a survey that might be used as a component in a research study involving concussions and its effects was included. This study would be used to collect data on a collegiate football team involving concussions experienced, academic effects, position played, and type of helmet worn by each player.

Definition of Terms

Concussion: Traumatically induced disturbance of brain function that is the result of a mild traumatic brain injury (Harmon, et al., 2012).

ImPACT: A computer-administrated test that athletes undergo at the beginning of the season. It provides a baseline for medical staff of the athletes cognitive functioning, focuses on such areas as attention, memory, reaction time, and processing speed (Iverson, Enchemendia, LaMarre, Brooks, & Gaetz, 2012).

InSite Impact Response System: Developed by the Riddell helmet company, monitors and records head impacts sustained by a football player during play. The wireless sensors in the helmet alert coaches and healthcare providers when a player has suffered a significant blow to the head (Abreu et al., 2016).

Return-to-Play (RTP): Proper amount of rest and time given to an athlete that has suffered a concussion, before the athlete can resume normal activities (McKeon et al., 2013).

Chapter 2: Review of the Literature

Introduction

A careful review of previous research was done to review the concussion protocols at the professional, college, and high school levels. The purpose was to identify the current standards and procedures in place at each level, and to research what was being done to combat concussions. After reviewing protocol, research on the academic effects of a concussion on high school and collegiate student athletes was done. Since these two populations were younger in age this research involved what most tended to ignore when a student-athlete had suffered a concussion. The next part of the research involved the improvements in equipment and up-to-date rule changes that had impacted the game of football due to the concussion problem. Research was also done to determine which specific football position was most at risk to suffer from a concussion and if rule changes benefited these specific positions. First steps to reduce football-related head injuries and their impact included research to identify and treat concussions and establish guidelines to resume play.

Concussion Protocol and Return-to-play

When an athlete suffers a concussion both the athlete and coaches focus on when that player could return-to-play (RTP). A variety of protocols and procedures were in place as a result of recommendations made by athletic trainers and team doctors. However, these protocols varied depending on the age and level of competition. The National Federation of State High School Association (NFHS) and the Sports Medicine Advisory Committee (SMAC) suggested guidelines on how high schools should handle student athletes who had suffered a concussion. One of the most meaningful guidelines the NFHS and SMAC provided was rest for the concussed athlete both physically and mentally. Regarding a return to the sport, the NFHS

and SMAC recommend a slow and gradual return to activities. Athletes needed to be completely symptom free where no concussion behavior was present. Once symptoms were no longer evident the RTP should be a gradual and constantly progressing process.

The National Football League (NFL) shared similar RTP guidelines as those the NFHS and SMAC recommended for high school players. The NFL's Head, Neck, and Spine Committee had created protocols in order for professional athletes to RTP after suffering a concussion. NFL athletes had to recover physically and mentally, and athletes would be forced to rest by keeping concussed athletes away from team activities. The player could not move on to the next stage of the RTP process until the baseline level of signs that were present prior to suffering the concussion was regained. The second and third step of the protocol set up by the NFL Head, Neck, and Spine Committee involved going from light to moderate exercise. Athletes were also allowed back into film and team meetings. The progression then included non-contact football-related activities and eventually game play. The protocols and guidelines from the NFHS, SMAC, and NFL Head, Spine, and Neck Committee were put into place as a result of prior research and experience handling players with concussions.

When examining past RTP guidelines, Enchemendia, Giza, and Kutcher did research to find the evolution and progression of the RTP protocols. The basis of research was to highlight the pros and cons of past RTP policies. Enchemendia et al. looked to establish recommendations that would help to continuously improve and advance RTP guidelines for doctors and athletic trainers. Enchemendia et al. researched the position statement put forth by the Concussions in Sport Group (CISG). The CISG recommended that athletes suffering from concussions should have physical and mental rest until their symptoms were resolved. Once the athlete was symptom free, then a gradual return to exercise was carried through. The Enchemendia, et al.

(2014) research paved the way for future research and future guidelines and allowed for other groups to propose further guidelines.

Harmon, et al. (2012) conducted research to build a statement regarding the best practices to assist athletic medical staffs in the proper evaluation and management of sports-related concussions. Furthermore, Harmon, et al. wanted to determine the knowledge gaps and areas involving concussion that needed further medical research. One of the key findings of Harmon, et al. was that a history of prior concussions led to a 2 to 5.8% higher risk of suffering another concussion. This research pointed to a question of finding when was the safest time for an athlete to RTP.

When looking to find the safest RTP policy for athletes, McKeon, et al. (2013) conducted research with the goal of developing an estimate for proper time frame. McKeon et al. specifically focused this research on high school athletes who played at the varsity, junior varsity and freshman levels. McKeon, et al was in agreement that RTP within the first two days after suffering a concussion was unlikely. However, the probability of return rose at least 71% if an athlete waited until after a week of suffering a concussion before returning to play. The study done by McKeon et al. gave an estimated RTP for high school athletes that was relevant with clinicians. A seven- to nine-day rest allowed for the resolution of post concussion symptoms and the return of normal balanced and cognitive function. With most football games occurring once a week, that meant an athlete suffering a concussion would probably miss one game.

When an athlete was held out of competition, another need was to research the medical personnel that were involved in the decision. Kroshus, et al. (2015) conducted research on the pressure faced by clinicians or trainers from athletic personnel and coaches. The purpose was to quantify the extent to which sports medicine personnel felt pressured to prematurely return

collegiate athletes to play after a concussion. Kroshus, et al. evaluated a total of 789 athletic trainers and 111 team physicians from 530 institutions and determined more than half of the personnel had experienced pressure. The research was conducted using three populations (other clinicians, coaches, and athletes) to examine if pressure was used to prematurely return athletes to participation. The results of Kroshus et al. found that 64% of respondents determined pressure from athletes and 53.7% from coaches. Also uncovered in the study was that 6.6% of medical personnel or athletic trainers experienced pressure from other physicians. If these players were cleared prematurely, not only did it violate protocol but also could lead to further damage.

With frustrations and pressure put on medical personnel, it was important to evaluate the effectiveness of RTP policies. Johnson (2011) wrote a research article on the effects of football-related concussions and the effectiveness of RTP policy. As a result of a literature review, Johnson stated that student athletes were more vulnerable to concussions and that these concussions could cause serious effects on academic and athletic performance. Johnson concluded that more effective concussion prevention was needed. Because of the literature review, Johnson believed that RTP guidelines did little to address the problem of sport-related concussions or damage done as a result of concussions. Growing concerns about serious head injuries due to football led to recent studies about academic effects for players with such injuries.

Academic Effects

When looking into the academic effects of a concussion, it was important to examine what effect multiple concussions would have on a student athlete. Mannix, et al. (2014) explored whether a history of multiple concussions had an impact on baseline neurocognitive testing. The study proposed that there would be a frequency-dependent effect of the number of prior concussions and the test results for high school athletes. Prior to the baseline neurocognitive

testing, health history surveys were given to all participants, which asked such questions as concussion history and dates. Participants were then tested neurologically for their baseline with the Insite Impact Response System (ImPACT). The ImPACT system covered a variety of neurological tests such as attention, memory, reaction time, and processing speed. Mannix, et al. believed that this research could be of importance when evaluating the risk factor of multiple concussions and, with over 279 participants documenting a history of multiple concussions, was one of the largest studies at the time regarding concussion effects. At the conclusion of the study, Mannix et al. confirmed that a prior history of concussions was directly related to a decrease in baseline scores, specifically in verbal memory. Mannix, et al. found there was some variance in total symptom scores, and additional research was needed to quantify how the diverse range of factors could influence reporting in student athletes.

Mannix, et al. (2014) researched in-depth about the effects of multiple concussions; and prior to that study, Iverson, Enchemendia, LaMarre, Brooks, and Gaetz (2012) found that athletes with a concussion history were more at risk for future concussions and possibly long-term damage to the brain structure and function. In this research Iverson, et al. explored the relationship between athletes with multiple concussions and their performance on the neurophysiological baseline testing. Iverson, et al. proposed that an athlete who had a history of three or more concussions would perform more poorly on the baseline neurocognitive testing. With over 786 participants, 26 matched the requirements of having reported a history of three or more concussions. These participants then went through testing using the ImPACT preseason testing system. Iverson, et al. also matched these groups with demographic and academic information (e.g., special education), as well as athletic variables. Athletes who had a history of more than three diagnosed concussions were found to perform more poorly on verbal memory,

and showed much evidence of a lingering deficit in memory. Iverson, et al. conducted a study on the relationship between multiple concussions and sizeable differences for visual memory and post-concussion symptoms. As in Mannix, et al., Iverson et al. measured the effects of multiple concussions using the ImPACT system. Both of these studies clearly stated that there was a correlation between multiple concussions and poor performance on the pre-season testing. If athletes were showing visible signs of a deficit in memory and visual memory, then this had to carry over to an effect on the academic work of these student athletes.

When looking at academic effects, Wasserman, Bazarian, Mapstone, Block, and van Wijngaarden (2016) was one of the first studies to investigate if concussions led to academic dysfunction for high school and college athletes. Hypothesizing that student athletes with concussions would experience more academic dysfunction than students who sustained other injuries, they conducted interviews focusing on academic dysfunctions such as sleep disturbance, mood disturbance, and impaired cognition. Wasserman, et al. conducted interviews with these participants at one week (five - nine days) and one month (25-35 days) after injury. They found that student athletes with concussions self-reported an increase in academic struggles within one week of receiving a concussion, with 83% of the participants who sustained a concussion reporting problems in the classroom. At one month, 61% of the participants documented academic struggles with performance and focus. The data showed major effects after one month, but Wasserman et al. believed it should be interpreted very cautiously.

Arcia and Gualtieri (1993), as cited in Wasserman et al., stated that concussed individuals underreported their pre-injury symptoms. Athletes underreporting their academic problems meant that concussed individuals perhaps were suffering more in the classroom than what was commonly recognized. More research was needed to determine how long the academic

dysfunction remained after suffering a concussion, and when exactly would an athlete who was concussed feel back to pre-concussion standards academically. It was also important to examine if there were certain criteria in place already for student athletes who had suffered a concussion playing sports.

Olympia, Ritter, Brady, and Bramley (2016) conducted research to determine the compliance of schools with national recommendations for rest for students who had sustained a concussion. The purpose was to determine if school nurses and schools complied with the recommendations for the management of post-concussion students. Using the data, Olympia, et al. discovered that 53% of schools had guidelines in place to assist students who returned to school after sustaining a concussion. Such guidelines included rest periods during the school day, a reduced workload, and noise or light accommodations. Out of all the school nurses involved in the study only 66% of nurses had training in the recognition and management of concussions. The results of Olympia, et al. showed that there was too much of a range within schools and with training of nurses in regard to compliance with national recommendations for rest for a concussed student. More research needed to be done to ensure that student athletes were put in a proper place to succeed in the classroom. The research clearly stated that interventions for challenges faced by concussed athletes in the classroom and use of technology improvements could help reduce the effects of concussions faced by young athletes.

Technology Changes

When concussions in the game of football were examined, the first focus was the protection that the athletes wore. Daneshvar, et al. (2011) reported on the role of helmet and mouth guard equipment. Specifically discussed was that helmet manufacturers had begun to design helmets with the intent of protecting against concussions. This included updated helmet

styles, the installment of air turbulence and shock absorbers into the helmet, and focus on impact levels. The biggest issue Daneshvar, et al. faced when evaluating the effectiveness of helmet designs was that few studies had been nonrandomized and selection biased. More importantly and directly related to concussions in football, Daneshvar et al. also reviewed literature on the type of mouth guard. Using past research that stated better-designed mouth guards were able to eliminate some of the force of impact, Daneshvar, et al. concluded that custom-fit mouth guards were a more effective, measurable means of absorbing force and impact.

To further examine the effectiveness of helmets and mouth guards, McGuine, Brooks, Hetzel, Rasmussen, and McCrea (2012), collected data to determine if mouth guards and specific types of football helmets affected the number of sports-related concussions (SRC) in high school football. They collected data from 36 high schools across the state of Wisconsin during the 2012 football season. The focus was on three specific helmet manufacturers: Riddell, Schutt, and Xenith. All the helmets involved in the research were purchased between the years of 2002 and 2012. The research of McGuine, et al. even examined custom-fit mouth guards against generic school-issued ones. Of 1,332 participants, 116 experienced a SRC throughout the course of the 2012 season. At the conclusion of the research, McGuine et al. believed that, despite what helmet manufacturers stated, no lower risk of concussions was linked to a specific brand of helmet. There was also no difference between players wearing newer models of helmets as opposed to those with older models. Even more interesting was that players who had worn the generic mouth guards provided by the school had a lower risk of concussions compared with players who had expensive mouth guards to reduce SRC.

Abreu, Edwards, and Spradley (2016) discussed the major developments of helmet safety by companies such as Riddell. Riddell invented the Insite Impact Response System as an

improved concussion detection unit. The Impact Response System had enabled sensors in the helmet to measure and detect powerful forces to the head so that the medical personnel could examine the athlete. Throughout the study Abreu et al. further discussed the evaluation process for when a concussion occurred, return-to-play scenarios, preventative measures, and advancements in concussion detections. Abreu et al. finalized the research by stating that the game was becoming more dangerous at the higher levels due to athletes who were getting bigger, faster, and stronger. They believed that the risk of a concussion would never truly be eliminated from the game of football, but rule changes and new product advancements could help decrease the risk.

Rule Changes

In an effort to make the game safer, the NFL in 2011 decided to change the rules to push kickoffs up from the 30-yard line to the 35-yard line. It was believed that kickoffs were one of the most impactful plays during the course of a football game. When examining the new rule change, Gay Mihoces of *USA Today* reviewed the data on the new rule. Since the kickoff rule was implemented, the total number of kickoffs that were returned dropped 32%. In the 2012 season, concussions on all plays dropped 12.5%. In the 2010 football season, there were .679 concussions a game. This meant that in 321 pre-season and regular season games, there were 218 concussions. In 2011 with the addition of the kickoff rule, there were 190 concussions with about .594 concussions a game. The kickoff rule was a drastic change at the NFL level, and the NCAA had made rule changes of its own to make the game safer.

In 2013 a targeting rule change was implemented by the NCAA to reduce the amount of head-to-head contact. According to the American Football Coaches Association, targeting was a penalty that resulted when a player initiated contact with the crown of the helmet on a

defenseless player. When an official called a targeting penalty, it resulted in a 15-yard penalty and possible ejection. Tim Rucker of *The Atlantic Journal-Constitution* analyzed the targeting penalty at the Division I level throughout the 2013 season. The research stated that 50 collegiate players were called for targeting in 2013. However, Rucker found that 30% of those players called for targeting were allowed to stay in the game after video review. Rucker concluded that the targeting rule was instituted with the idea of increasing awareness of concussions and eliminating dangerous players from the game. The targeting rule had achieved the goal of trying to eliminate head-to-head contact in the game of football. However, as head-to-head injuries had decreased, injuries to other body extremities increased.

As the NFL, collegiate, and high school organizations focused on concussions there was perhaps an unintended consequence. Westermann, Wehr, and Amendola (2016) conducted research to examine the NCAA rule changes that tried to limit concussions. The purpose was to assess if lower extremity injury rates were increasing as a result of concussion rule changes. Westermann et al. (2016) researched the NCAA Injury Surveillance System (NCAA ISS) database and were able to see all in-game injuries from 2009 to 2014. Data provided from this research found that lower extremity injuries increased at 9.45 injuries per 1000 athletes in the 2009-2010 season. This number rose again in the 2013-2014 season to 12.63 out of every 1000 athletes. Interestingly enough, the rate of concussions suffered did not significantly change in college football players. At the conclusion of the study Westermann et al. found that lower extremity injuries were constantly increasing due to players trying to avoid head-to-head contact. This could lead to further cases of arthritis and disabilities as these players aged. At different levels of football, rule changes had helped improve player safety. As rules had been evolved, there needed to be a focus on which position on the football field needed the most protection.

Position At Risk

Research was needed on which position on the football field was most at risk to suffer a concussion. Once that was determined it would help provide and adapt rules to protect that position. Harmon, et al. conducted research on which football position was most at risk for concussions. The research looked at studies on professional athletes and found that skilled players on offense (quarterbacks, wide receivers, running backs) had a three-times greater risk of concussions. Research on specific position also was conducted through the high school level in which it was found that linebackers were the most concussed players on defense, and running backs the most concussed on offense.

Having looked further into position at risk, Nathanson, et al. (2016) calculated the rates of concussions as well as position specific information. In the study Nathanson, et al. used data from the 2012-2013 football season and the 2013-2014 season. The purpose was to examine the concussion incidents as related to the position type. They divided groups into offensive skill players and linemen, then defensive skill players and linemen, and then by position. The research found that offensive skill players had a significantly greater rate of concussions than offensive lineman, defensive skill players, and defensive lineman.

When collegiate football players were examined, Crisco, et al. (2011) conducted research to put a quantity on exposures to head impacts. Crisco, et al. studied the frequency, location, and magnitude for collegiate football players. Of the 314 participants, a total of 286,636 head impacts were recorded over three seasons. The frequency of impacts was varied by position. In this research, Crisco et al. (2011) found that running backs and quarterbacks experienced the greatest magnitude of head impacts, while lineman and linebackers received the most frequent head impacts.

Continuing to examine head impacts, Crisco, et al. (2010) researched the frequency and location of head impacts with collegiate athletes in one season among three collegiate teams. Participants in this study included 188 players from three NCAA teams. It was discovered that the number of impacts players received was non-normally distributed and varied by team and position type. The maximum number of head impacts for a single player on each team was between 4.8 and 12.1 per practice and per game. Offensive lineman had a higher percentage of impacts to the front as oppose to the back of the helmet, and quarterbacks had a higher percentage to the back of the helmet than the front. The data was extremely helpful in determining the impacts and how to prevent so much head-to-head contact.

Summary

In this review of literature, clear concussion protocols for football players were being used at all levels of play in the programs that were researched. All athletes and medical personnel in the research were expected to abide by return-to-play guidelines. However, these protocols varied dependent on levels and needed to be more consistent. It was clear that concussions could lead to academic dysfunction in student athletes, and the review of literature showed student athletes needed to be protected. It was widely known that a football helmet could not be made to protect a student athlete from all concussions however, with further advancement and research, helmets might be made to better protect athletes. Rule changes in the game of football also needed further research to extend to the research of head-to-head blows and concussions. Harmon, et al. stated that at the professional level, skilled positions were most at risk for suffering a concussion; and at the high school level, it was the linebackers. The review of literature yielded information regarding the issue of concussions in the game of football. In Chapter 3, conclusions and recommendations were recorded.

Chapter 3: Summary, Conclusions, and Recommendations

Summary

By 2016 the game of football was thrust into the spotlight of the mainstream media as many began to view the sport as a danger to collegiate and high school athletes. As early as 2013, concussions and related brain damage had become recognized as a significant problem and, due to his, had pushed the game of football into the public spotlight. In particular the short-term and long-term risk of concussions and related head impact had researchers scrambling for ways to identify potential precautions and safety measures. The five major issues addressed in this research were concussion protocol effectiveness, classroom effects of concussions, technology changes, the effects of rule changes, and position at risk. If these issues were not addressed, the game of football might need to be changed drastically to eliminate head contact; or the game might cease to exist altogether. While many researchers studied the long-term effects of suffering a concussion and the effects of multiple concussions, few had looked into the academic effects specifically on collegiate football players. The purpose of this study was to provide a basis of research and analysis, as well as to draw conclusions and recommendations that might assist in further research of the proposed problem.

Conclusions

Throughout this research it has been uncovered that concussions in the game of football had become a national problem. More importantly, steps had been taken and are currently being taken to help further understand the long-term effects, short-term effects, as well as to introduce preventative measures. Proactive steps had been taken to reduce the amount of hits to the head that an athlete receives while playing football. However, as previously stated, concussions are a relatively new subject area that has been thrust with great speed into the national spotlight. As

modern technology adapts and more research is conducted, it is with positive hope that concussions in the game of football can be drastically decreased.

This research uncovered a variety of concussion protocols at different levels of play. All protocols that were researched involved mental and physical rest for an athlete after suffering a concussion. Athletes could not return-to-play until all baseline signs that were present before the concussion returned. All the protocols covered in this research also emphasized a slow and gradual return to activities. This means that athletes would start with light exercise and progress until they are able to resume full contact.

Although much is being done to improve RTP policy, this research found that there is an ignorance of the academic effects of concussions on student athletes. A majority of athletes that partake in football do so at the high school and college level. These are students who play football as an extracurricular activity, and still have an academic workload to complete. Research has shown that student athletes who suffer a concussion experience academic struggles ranging up to a month after the concussion. It was also found that only 53% of high schools involved in this research complied with the national recommendations for the management of post-concussion students. Furthermore, 66% of nurses involved in the study conducted by Olympia, et al. had specific training in regard to compliance with national recommendations for rest for concussed students.

As concussions were pushed to the national spotlight, technology has been continuing to adapt to best protect the student-athlete. It was found throughout this research that no lower risk of concussions was linked to a specific brand of helmet. There was also no difference with newer models of helmets as opposed to older models of helmets. However, what can be found beneficial to the game of football is the cutting edge technology and research that is being poured

into helmets and design. This research found that there is no helmet that can stop every concussion, but helmet companies had been designing helmets with shock absorbers and sensors that detect the force of impact. The Insite Impact Response System developed by Riddell, is a huge benefit to medical personnel, and helped monitor and prevent a player from continuing play with a concussion.

This research targeted two rules that have been adapted to try to eliminate the risk of concussions in the game of football. The targeting rule punishes a player for a direct blow to a defenseless receiver with a penalty and possible ejection. The NFL has also tried to take out one of the game's dangerous plays, the kickoff, in an effort to reduce injuries. The kickoff change has help drastically decrease injuries in the game. Through the careful examination of these two rules, it is evident to see that rule changes or adaptations to the game can make it much safer.

In order to adapt a rule to make the game safer, it is important to examine which position on the football field is most at risk for a concussion. As this research has uncovered, the position most at risk is dependent on the level of play. At the high school level it was found that linebackers were the most concussed players on defense, and offensively it was the running backs. However, at the professional and college level, skilled players on offense had a three-times greater risk to suffer a concussion than any other position on the field.

Recommendations

Concussion protocols and RTP policies are being enforced to ensure that an athlete does not prematurely come back, increasing the risk for further damage. Further research needs to be emphasized to uncover the safest time frame for athletes to return-to-play, and if this time frame varies, dependent on concussion history. As concussions are a relatively new subject, it is important that research continues to evolve when discussing proper time frame for athletes.

When having had examined RTP policies, what was uncovered that is particularly concerning is the pressure being placed on medical personnel and team doctors to return an athlete prematurely. This directly stems to the popularity of football in American culture. At the college and professional level especially, football has become a business. Coaches are evaluated by win and loss records. When jobs are on the line, coaches need the best players; so it is not particularly surprising to see pressure put on medical personnel. However, for the safety of the players, football organizations like the NCAA and NFL need to ensure that coaches are prohibited from doing this. Efforts to solve this may involve enforcing fines or suspensions on coaches that have done this. Player safety, long-term health, or lives should not be held to be more important than a game.

More assistance needs to be placed on the high school and college level to ensure a student athlete's success not only with RTP, but also academics. This research shows that not all high schools and colleges are prepared nor trained to help a student athlete who has suffered a concussion with the academic workload. All high schools and colleges need to have guidelines in place to assist students who have suffered a concussion. Such guidelines would include complete mental rest and extended time on classwork and tests. Furthermore, there needs to be medical personnel such as athletic trainers or school nurses who have undergone concussion management training. There needs to be someone in the school who has been trained in the proper management of concussions.

Along with the proper management of concussions, technology has to continue to evolve so that the most up-to-date research can be installed in football programs throughout the nation. The Riddell Insite System has changed the way medical personnel look at the blunt head force that is used in the game of football. Medical personnel and team doctors need to continue to

research and chart the hits that appear in the system. A further breakdown of data can be used including the position played, mouth guard type, and whether it was a run or pass play. The more the medical personnel and doctors can understand when and where the hits are coming and coming from, the more football can adapt the rules.

As marked evidence; for example, the kickoff change in the NFL clearly shows that rule changes can help enforce safety. Kickoffs at the college and high school levels perhaps need to be evaluated and found to be removed or pushed forward like in the NFL. More research also needs to go into what other types of plays are found to be dangerous. Committees need to be formed at all levels of football in order to further examine how certain types of plays on the football field can be changed or removed to generate safer game play. This research found that at the college level the NCAA tried to strictly enforce dangerous hits with the targeting rule. This rule should stretch across all levels of football, as its whole purpose is to reduce shots to the head on defenseless players. When examining rule changes, it is important to note which position is most at risk to receive a concussion. As this research uncovered, it mostly involves a skilled position on offense. Further medical research needs to go into why these positions are specifically at risk. When results are discovered as to why the skilled positions are more at risk, then that data could help uncover rule changes or modifications to reduce that risk.

In the Appendices are examples of documents that might be used as part of a research project that would involve a collegiate or high school sports team. These documents are directly related to such future research, and the purpose would be to further understand the effects of a concussion, as well as to gather information about the position in which the concussion occurred.

The Pre-season Questionnaire (see Appendix A) would be distributed to a high school or collegiate football team. This pre-season survey would be part of a season-long research project

that could be conducted on multiple teams at the same time. The survey asks participants to record their helmet type, mouth guard type, and position played. Furthermore, this survey asks players to rate the amount of contact that they receive in practice and in a game. After answering these questions, the participant will be asked about concussion history. If participants have a history of concussions, there will be further questions for them to answer. These questions will ask participants to recall the effects of the concussion/s that were experienced. Questions are generated especially to recall symptoms from concussions that directly affected academics. These appendices were developed based on this research and the experience of the author, having played high school and university level football and having two years of experience as a defensive coach at the University of Wisconsin-Platteville, WI.

The data received from the questionnaire in Appendix A would be filed and stored by the researcher. If a player were to suffer a concussion during the season, then the Post-concussion Questionnaire, (see Appendix B) would be distributed. The Post-concussion Questionnaire would be distributed to concussed athletes at one-week, one-month, and three-month intervals. This questionnaire asks athletes to evaluate short-term concussion effects, and how the effects have impacted academics. Athletes are asked to self-monitor their academic behavior; and if an athlete suffers from disorders that were present prior to the concussion, these are taken into account. For concussed athletes, the answers on the two questionnaires would be compiled and compared.

Application of the surveys found in the Appendices could be the basis of a follow-up research project that would directly relate to the research that was conducted for this study. Resulting data would be provided from such a future research project that would supplement the topics that were addressed in this paper. Additional data would be gathered on helmet type,

position played, and mouth guard worn. In addition, a broader approach would be taken to fully understand the academic effects that are experienced after suffering a concussion. The proposed follow-up research project would be very simple to implement with a variety of football teams. As long as regular monitoring at one-week, one-month, and three-month intervals was done, ample data would become available for further study.

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Appendix A: Project Materials

Pre-Season Questionnaire

Appendix A

Pre-Season Questionnaire

1. Are you over the age of 18?

_____ Yes

_____ No

2. What position do you play on defense, and how long have you been playing that position at the University of Wisconsin-Platteville?

Position

Length of Time

_____ Defensive Line

_____ 1 Season

_____ Linebacker

_____ 2 Seasons

_____ Defensive Back

_____ 3 Seasons or More

3. What grade level are you on the NCAA eligibility?

_____ Freshman

_____ Sophomore

_____ Junior

_____ Senior

_____ 5th Year Senior

4. During practice how would you rate the amount of contact that you receive on every play?

_____ Never

_____ Most Plays

_____ Occasionally

_____ Every Play

5. During games how would you rate the amount of contact that you receive on every play?

_____ Never

_____ Most Plays

_____ Occasionally

_____ Every Play

6. What is your current GPA and major that you are pursuing academically?

GPA _____

Major _____

7. What helmet (company, type, and size) will you be wearing during the 2016 football season?

Company _____

Type _____

Size _____

8. Has an athletic trainer or team doctor checked or evaluated the helmet for you?

_____ Yes

_____ No

9. Do you wear a mouth guard? If so, could you list the mouth guard type?

_____ Yes

_____ No

Type _____

10. Have you experienced a documented concussion? If yes, please give the number of diagnosed concussions?

_____ Yes

If yes, how many (lifetime) _____

_____ No

For those that have answered yes to question 10, please complete Questions 11-15 on the back of the questionnaire.

If you have not had a previous diagnosed concussion, please turn in the survey.

11. If you answered yes to Question 10, was the concussion or were these concussions a result of an impact on the football field?

_____ Yes

_____ No

12. How long ago was (were) your concussion(s)?

_____ Within a Year

_____ Within the last three years

_____ Within the last two years

_____ 5 or more years ago

13. If you have a concussion history, how long do you feel it took to recover academically from the concussion(s)?

_____ a couple of weeks

_____ a couple of months

_____ at least a year

_____ don't know

14. Can you explain any academic effects of the concussion(s) that you experienced during the first week of the concussion? Please rate a 1 if you experienced one of the below effects, and 2 if you did not.

_____ Reaction Time

_____ Focus/Attention Span in Classroom

_____ Verbal Skills

_____ Processing Time (Responding to Teacher)

_____ Memorization

_____ Sleep Deprived

_____ Turning in Assignments

_____ Focus

15. Can you explain any academic effects of the concussion(s) that you experienced after the first three months? Please rate a 1 if you experienced one of the below effects, and 2 if you did not.

_____ Reaction Time

_____ Focus/Attention Span in Classroom

_____ Verbal Skills

_____ Processing Time (Responding to Teacher)

_____ Memorization

_____ Sleeping at Night

_____ Turning in Assignments

_____ Focus

Appendix B: Project Materials
Post-concussion Questionnaire

Appendix B

Post-Concussion Questionnaire

1. Are you still experiencing symptoms as a result of the concussion? (dizziness, headaches, etc.)
 - No
 - Yes

2. Are you having difficulty sleeping?
 - No
 - Yes

3. Have you missed any classes as a result of your concussions? If yes, can you list the number of classes missed over the given time period?
 - No
 - Yes # of classes missed

4. Do you feel that your symptoms have worsened since suffering your concussion?
 - No
 - Yes

5. Can you explain any academic effects of the concussion(s) that you experienced during the first week of the concussion? Please rate a 1 if you experienced one of the below effects, and 2 if you did not.

<input type="checkbox"/> Reaction Time	<input type="checkbox"/> Focus/Attention Span in Classroom
<input type="checkbox"/> Verbal Skills	<input type="checkbox"/> Processing Time (Responding to Teacher)
<input type="checkbox"/> Memorization	<input type="checkbox"/> Sleep Deprived
<input type="checkbox"/> Turning in Assignments	<input type="checkbox"/> Focus

6. Can you explain any academic effects of the concussion(s) that you experienced during the first month of the concussion? Please rate a 1 if you experienced one of the below effects, and 2 if you did not.

<input type="checkbox"/> Reaction Time	<input type="checkbox"/> Focus/Attention Span in Classroom
<input type="checkbox"/> Verbal Skills	<input type="checkbox"/> Processing Time (Responding to Teacher)
<input type="checkbox"/> Memorization	<input type="checkbox"/> Sleep Deprived
<input type="checkbox"/> Turning in Assignments	<input type="checkbox"/> Focus

7. Can you explain any academic effects of the concussion(s) that you experienced over the last 3 months? Please rate a 1 if you experienced one of the below effects, and 2 if you did not.

<input type="checkbox"/> Reaction Time	<input type="checkbox"/> Focus/Attention Span in Classroom
<input type="checkbox"/> Verbal Skills	<input type="checkbox"/> Processing Time (Responding to Teacher)
<input type="checkbox"/> Memorization	<input type="checkbox"/> Sleep Deprived
<input type="checkbox"/> Turning in Assignments	<input type="checkbox"/> Focus

8. Do you suffer from any of the below:

<input type="checkbox"/> ADHD	<input type="checkbox"/> Had a IEP
<input type="checkbox"/> Verbal Skills	<input type="checkbox"/> Processing Time (Responding to Teacher)
<input type="checkbox"/> Memorization	<input type="checkbox"/> Sleeping at Night
<input type="checkbox"/> Turning in Assignments	<input type="checkbox"/> Focus