

The Effects of Sports Related Concussions on Retired Professional Football Players

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The Effects of Sports Related Concussions on Retired Professional Football Players

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Abstract

Concussions in the NFL have become extremely important over the last decade. As new information regarding these brain injuries is discovered, there is an increase in awareness on and off the field. Former athletes Junior Seau and Percy Harvin suffered from concussions during their playing careers and there have been lasting impacts when they retired from the NFL. Seau committed suicide while being diagnosed with CTE and Harvin was diagnosed with depression and anxiety. Researchers on the topic have found there are significant signs of future mental illness and impairments associated with concussions for retired professional football athletes. For example, there's an increased risk of depression. It has been suggested by researchers to further the investigation on these brain injuries and come up with new innovative ways to report concussions to help these athletes ease their symptoms. The purpose of this synthesis was to review the literature on the effects of sports-related concussions on the cognitive and mental health of retired professional football athletes.

Chapter 1: Introduction

The rate at which concussions are occurring is alarming and player safety has become the topic of conversation among the sports community (Abreu, 2016). For professional football athletes, concussions are becoming quite common as 645 concussions were diagnosed in the National Football League from 2012-2015 (Thomson, Carabello, Mansell, & Russ, 2019). Boriboon (2013) states, “concussions occur when the brain repeatedly collides with the skull, most often due to a blow to the head.” There are plenty of symptoms associated with concussions, including the loss of consciousness, confusion, nausea, and headaches (Boriboon, 2013). One of the main reasons sports communities originally assumed that concussion injuries weren’t serious were because the signs and symptoms of concussions didn’t always appear immediately, they were often mild (Abreu, Edwards, & Spradley, 2016). But now, with new advancements in technology and literature the research tells us that while acute symptoms are transient, there are long-term deleterious effects of concussions (Thomson et al. 2019). Furthermore, Thomson et al. (2019) states that NFL players sustain many concussions throughout their playing careers, but many do not consider the mental health outcomes when they retire from football.

Long-term effects of concussions include cognitive impairment, depression, and anxiety (Roberts, Pascual-Leone, & Speizer, 2019). These effects can have lasting impacts on the quality of life of NFL players (Roberts et al. 2019). Multiple researchers believe that because there is a lack of published evidence surrounding the lasting impacts of concussions is the result of why professional football players report less and play through these brain injuries (Thomson et al. 2019). As a result, only ten percent of football players believe they will suffer long-term

detrimental effects of concussions (Thomson et al. 2019). Thomson et al. (2019) also found that NFL players with at least three concussions are three times more likely to be diagnosed with depression compared to players that do not report any concussions during their playing career. With new knowledge on concussions, the NFL has made some changes to their rules. For example, The Madden Rule, which states that if a player is diagnosed with a concussion he must be removed from the game and escorted to the locker room for evaluation (Boriboon, 2013). It's unfortunate that while NFL teams have taken a proactive approach to concussion assessment and management, many of the changes have come too late for players who already retired professionally. Retired players are now experiencing the consequences (Boriboon, 2013).

The rate of depression diagnosis in retired NFL players that sustained a concussion range from 7 percent to 24 percent (Thomson et al. 2019). Meanwhile, "an NFL study released in 2012 showed six percent of retired players above the age of 50 reported diagnoses of dementia, Alzheimer's, and other memory-related diseases compared with 1.2 percent of men the same aged in the United States" (Boriboon, 2013). This means that there is evidence to support the relationship between concussion history, depression, and cognitive impairment in professional retired football athletes (Thomson et al. 2019). Furthermore, Thomson et al. (2019) states, that the prevalence of depression in the general population in the United States is seven percent, suggesting that depression is potentially higher in NFL players compared to the general population. Roberts et al. (2019) study included postmortem brains that provided evidence that former players with neuropsychiatric symptoms had abnormalities in brain structure. Thus, it would be beneficial to educate NFL players about the possible link between their concussion history and mental health following their playing careers (Thomson et al. 2019). It's important because depression holds a risk of significant functional decline by affecting one's ability to

maintain relationships, productivity at work, and self-care (Kerr, Marshall, Harding, & Guskiewicz, 2012). With appropriate screening of NFL players for mental illness or cognitive impairment this would allow them to be referred to the correct services to improve their quality of life (Thomson et al. 2019). Furthermore, the field should explore the best practices to monitor for mental health issues for example, assessment tools, personnel, and how often individuals should be examined (Thomson et al. 2019).

Statement of Problem

Concussions in the NFL, along with the literature surrounding these brain injuries, show evidence of long-term cognitive and mental health problems for retired NFL players. The quality of life for professional football athletes are affected in various ways because of concussions. The issue is what cognitive and mental health problems arise in retired professional football athletes because of concussion injuries during competition.

There have been a handful of professional football athletes that have suffered from sports-related concussions that now have lasting implications on their mental health. Athlete Junior Seau for example, committed suicide due to CTE and mental health problems (Trotter, 2015). While Percy Harvin, an NFL wide receiver suffered from concussions during his playing career that resulted in numerous migraines and anxiety once he retired from football (McKnight, 2018). It is now that a growing body of research has linked sports concussions with serious long-term effects like depression (Abreu, 2016). According to Boriboon (2013), The American Academy of Neurology discovered that athletes are at the greatest risk of repeat injury in the first ten days post-concussion and suggest that the more head injuries a person suffers the more likely they are to face complications later in life. It is time to investigate the relationship between sports- related concussions and the mental and cognitive health of retired professional football

athletes. Boriboon (2013) states, retired football players are three to four times more likely to die from diseases of the brain compared to the general population. Lastly, while no one can change how sports-related concussions were managed in the past, physical therapists can play a vital role in helping athletes manage concussion symptoms (Boriboon, 2013).

Purpose of Synthesis

The purpose of this synthesis project is to review the literature on the effects of sports-related concussions on the mental and cognitive of retired professional football players.

Operational Definitions

1. Concussions- “When the brain repeatedly collides with the skull, most often due to a blow to the head” (Boriboon, 2013).
2. Mental Health- A person’s condition regarding their psychological and emotional well-being (Oxford Languages).
3. Cognitive Impairment- Stage between the expected cognitive decline of normal aging and the more serious decline of dementia. Characterized by problems with memory, language, thinking or judgement (Mayo Clinic).
4. Depression- Feelings of severe despondency and dejection (Oxford Languages).
5. Anxiety- A feeling of worry, nervousness, or unease, typically about an imminent event or something with an uncertain outcome (Oxford Languages).

Research Questions

The following research questions will be the primary focus explored for this literature review:

1. What are the mental health problems associated with retired professional football athletes due to concussions?
2. What are the cognitive impairments associated with retired professional football athletes due to concussions?
3. What treatments are available to remedy mental health problems and cognitive impairments associated with retired professional football athletes?
4. What are, if any, the programs, or services available for retired professional football athletes to seek help with regards to mental health and cognitive health problems?

Delimitations

1. The articles used in the literature review of the synthesis were both peer reviewed and full text.
2. The review included articles between 2010-2021.
3. Peer reviewed scholarly articles focused on the effects of concussion injuries on the mental health and cognitive impacts of retired professional football athletes and whether they can be treated.

Chapter 2: Methods

The purpose of this chapter is to review the methods and procedures used to determine the effects of sports-related concussions on the mental health and cognitive health of retired professional football players. A second purpose is to determine the cognitive and mental health effects that affect the quality of life of these retired professional football athletes. An extensive search for past research was conducted to gather information necessary to complete this synthesis project. This chapter details the methods used in obtaining the appropriate information for the synthesis.

Literature gathered for this project began with searches using the EBSCO database from SUNY Brockport Drake Memorial Library website. The research guide that was used was Kinesiology, Sport studies & Phys. Ed. Following that process, the databases within the research guide subject were SportsDiscus, Academic Search Complete, and Education Source. Searches of these three databases resulted in thousands of articles depending on the number of keywords used.

Keywords for the search were determined to focus on the research. These keywords included *concussions, brain, sports, football, professional athletes, health, sports concussions, concussions in sports, professional football players, sport injuries, NFL concussions, mental health, mental illness, NFL, and anxiety*. These keywords were selected based on the relevance to the research question with *NFL concussions, mental health, and professional football players* being the most important keywords that returned results and served as my starting point for the research.

The first combined search within the SportsDiscus database used the keywords *concussion in sports*. This resulted in 4,479 articles. A limiter was applied to produce only

results with academic journals and a publication date range from 2010-2021. This reduced the number of articles to 3,405. I then used the keyword *football* and that decreased my critical mass to 628 articles. Then I furthered the process using keywords, *effects (185 articles)* and *mental health (46 articles)*. 46 articles were found, and five articles fit the criteria for use in this synthesis.

The second search conducted within the KSSPE database used the same limiters of full text, peer reviewed journals, and a publication date of 2010-2021. The keywords that were used were *concussion, effects, brain, sports, football, and professional*. The search resulted in 21 articles. Out of the 21 articles, one article was used for this synthesis literature review.

The third search completed within the KSSPE database used the same limiters of full text, peer reviewed journals, and a publication date between 2010-2021. The keywords used in the search were *concussions in sport, effects, and professional football players*. The search revealed 70 articles. Out of the 70 articles, three were used in this synthesis literature review.

A fourth search was completed using the KSSPE database with the same limiters of full text, peer reviewed journals, and a publication date between 2010-2021. The keywords used in the search were *concussion, sport injuries, professional athletes, and football*. The search resulted in 57 articles. From the 57 articles, one article was chosen for this synthesis literature review.

A fifth search was completed using the KSSPE database with the same limiters of full text, peer reviewed journals, and a publication date between 2010-2021. The keywords used in the search was *retired football athletes and concussions*. That resulted in 29 articles produced. Out of the 29 articles, two were used for this literature review.

A total of 12 articles were selected through the search process. For the articles to be included in the research process it was important that the articles met certain requirements. The articles must have studied the effects of concussions on retired professional football players and what those effects were, mental health and cognitive impairments, for example. Some of the articles selected also offered ideas on how to help these individuals who are experiencing these problems.

The articles selected were produced from journals such as, *International Journal of Athletic Therapy and Training*, *Oxford Journals*, *The American Journal of Sports Medicine*, *Journal of Athletic Training*, *Sports Med*, and *the physician and Sportsmedicine Journal*. The articles selected for use included a mix of qualitative and quantitative approaches. These studies collected information using a variety of methods including data collection from different works of literature, article reviews, surveys, and questionnaires. Specific surveys were sent out to NFL athletes to better understand their health post retirement and to gather information of the prevalence of mental health problems and cognitive impairment. These articles also collected data about what can be done to help prevent mental and cognitive impairment among these retired athletes. Devising more efficient ways to report and diagnose concussions.

The primary challenge that was faced while conducting the research was the concept of narrowing down the literature because concussions in sports especially football is at the forefront of every discussion. However, when exploring the relationship between concussions and mental health along with cognitive impairment, I was able to find literature that makes the case on the effects of concussions on the cognitive and mental health of professional football athletes, thus gaining a trustworthy study.

Chapter 3: Review of Literature

The focus of this chapter is to present a review of literature regarding the effects of sports-related concussions on the mental health and cognitive health of retired professional football players. In particular, the following topics will be reviewed: the effects of sports-related concussions on the mental health of retired professional football players, the effects of sports-related concussions on the cognitive health of retired professional football athletes, nondisclosure, and the programs, services, or treatments offered to remedy the effect of sports-related concussions on retired professional football athletes. An analysis of literature found that these four themes emerged as being essential to the effects of sports related concussions on professional football athletes.

When football athletes sustain concussions during a game, they are sent to the sidelines to be evaluated. Some players may miss the rest of the game and be sidelined for about a week. But what happens to retired professional football players who had multiple concussions during their playing career and are now suffering from mental and cognitive health problems. In many cases they go unrecognized and are left battling these health problems on their own. The first component of this review of literature is the effects of sports related concussions on the mental health of retired professional football players

The Effects of Concussions on the Mental Health of Professional Football Athletes

What are the mental health problems for retired professional football players that sustain one or more concussions during their playing career? Thomson et al. (2019) states that there are long term deleterious effects of concussions. For example, higher rates of depression and anxiety. Furthermore, in a sample of retired NFL players the average number of concussions experienced in their lifetime was about four (Thomson et al. 2019). The researchers used a

STROBE method to show the relationship between retired professional football players and depression diagnosis. The authors researched PubMed databases in search of articles to back their claim. Following an exclusion of articles that didn't meet the criteria they were able to find 11 articles that support retired NFL players and the prevalence of depression after sustaining the concussions. Thus, after reviewing the articles Thomson et al. (2019) states there is emerging evidence to support the clinical question that retired NFL players, with a history of concussions, may in fact be diagnosed with depression with rates ranging from six percent to twenty-four percent. During this review of literature, Thomson et al. (2019) also found that authors used different methods to evaluate depression. One author used health questionnaires and forms to gain a clinical diagnosis of depression while another author used self-reported history of receiving treatment for depression.

Similarly, the Didehbani et al. (2013) study examined the relationship between a remote history of concussions with current symptoms of depression in retired professional football players. Using 42 subjects from a gathering of retired NFL players in North Texas. Each player received a neurologic and neuropsychologic evaluation. They were given independent t-test to compare demographic factors between NFL players and controls. Correlations were conducted to assess the relationship between the number of concussions and depressive symptoms shown. Didehbani et al. (2013) found a significant correlation between the number of lifetime concussions and depressive symptoms in these athletes and that the number of self-reported concussions may be related to later depressive symptomatology. The interest in this topic has gained national attention according to Didehbani et al. (2013) because multiple retired NFL players committed suicide and the autopsies of their brains show significant signs of CTE, chronic traumatic encephalopathy. CTE involves behavioral and personality changes that

includes depression, irritability, and suicidality. Lastly, Didehbani et al. (2013) states concussion athletes were more likely to experience depression, 16 percent more compared to the overall population of males in the United States. In other words, there is a correlation between retired professional football players and mental health problems.

Qualitative research, like surveys and questionnaires, have proven successful in understanding mental health problems in retired professional football players showing us that there is an association between the two. In addition, a cohort study by Kerr et al. (2012) explored the effects of recurrent concussions and the clinical diagnosis of depression in a group of retired NFL players, using health surveys from over one thousand retired NFL players. The players were asked information about their demographics, number of concussions sustained during their professional career, mental and physical health, and their medical conditions. The researchers used short forms for functional assessment of health and well-being and used categories (0-10) to rank the history of the players concussions. The percentage of players that were clinically diagnosed with depression was low, only ten percent. Kerr et al. (2012) concluded that professional football players self-reporting concussions are at a greater risk of having depressive episodes later in life.

Rice et al. (2017) conducted a systematic review which states that athletes can experience a diverse range of symptoms after sustaining a concussion. The purpose of the authors' study was to explore the evidence regarding the association between sports-related concussions and mental health outcomes in professional football players. While conducting a systematic search of PubMed, EMBASE, and SportDiscus databases a total of 27 studies were pulled for review. Throughout all the studies, depression is the most studied mental health problem associated with concussions for retired professional football players. Furthermore, reviews between concussions

and mental health outcomes were conducted and found that concussion exposure is a risk factor for mental health problems in some but not all individuals. “Media reporting of high-profile athlete suicides or significant mood and behavioral disturbance has drawn public attention to the link between repeated concussive injuries and poor psychological outcomes later in life” (Rice et al., 2017). The research concludes that concussion and impaired mental health, mainly depression, are associated together. In addition, it is important that procedures are developed to screen and detect such impairments on the mental health of these athletes to increase their quality of life.

The Effects of Concussions on Cognitive Health of Professional Football Athletes

Roberts et al. (2019) made a claim that football players have a higher prevalence of cognitive impairment than the US general population. This study’s purpose was to examine professional football players’ experiences with concussions and cognitive impairment that affects a player’s quality of life. The researchers used a cross sectional survey conducted in 2015- 2017 to better understand a player’s cognitive health and their quality of life. In addition, studies showed deficits in neuropsychiatric function, brain abnormalities, and CTE in the postmortem brains of former NFL players (Roberts et al. 2019). The study targeted former NFL players who played in the NFL since 1960 when the league transitioned to helmets with hard plastic shells. Over 14,000 players were sent surveys with 3,000 players responding back. The results from the Roberts et al. (2019) study showed that for each five seasons of play there was a nine percent increased risk of cognitive impairment along with symptoms being associated with poor quality of life. This suggested that the more seasons you play in the NFL, the lasting neuropsychiatric health deficits are present, Alzheimer’s disease, for example.

Furthermore, Baker et al. (2019) wanted to test if mild cognitive impairment rates are higher among retired professional football players. The authors tested 21 retired NFL players using surveys and questionnaires at the University of Concussion Management Clinic. Multiple tests were performed on these retired football players that included the Wisconsin Card Sorting Test, Beck Depression Inventory II, and the Delis-Kaplan Executive Function System to understand the onset of cognitive impairment of these players. The tests concluded that players with a history of playing professional contact sports had a higher risk of depression and mild cognitive impairment rates were somewhat higher. Without question, CTE is gaining media attention with a worry that football players will experience the onset of dementia because of cognitive impairment. Understanding ways and gaining knowledge will help these athletes who are going through these impairments.

Concussion injuries that were once viewed as short lived impairments of neurologic function, according to Cunningham et al. (2020), are now implicated in several long-term neurologic sequelae. The purpose of the study was to investigate the literature on the long-term cognitive health status of retired professional football players. The authors used systematic reviews and meta-analysis to support the purpose of this study, using databases like PsycINFO and MEDLINE to gather information that show the long-term cognitive effects from sports-related concussions. Based on the findings, certain areas of cognition may be affected by sports-related concussions. Cunningham et al. (2020) was able to conclude that there is evidence of poorer cognitive health among the retired players with a history of concussions. The authors made a claim that sports-related concussions may greatly affect the cognitive domains of memory, function, and psychomotor function. "Retired athletes appeared to have increased self-reported cognitive difficulties" (Cunningham et al., 2020).

One of the main cognitive impairments due to concussions is the ability to do multiple tasks at once. Manor et al. (2020) study's purpose was to explain how American style football concussion injuries would predict a worse gait performance when conducting dual task conditions. During the study, Manor et al. (2020) gathered 66 retired professional NFL players from ages 29 to 75. The researchers had them complete health and wellness questionnaires. In addition, the participants also completed a smartphone-based assessment that monitored them while they were doing tasks in their own homes to monitor their cognitions of multitasking. When the study concluded, participants who had head trauma exhibited a greater dual task cost, meaning that their cognitive functions decreased due to concussions during their playing career.

Nondisclosure

Even though concussion injuries have been a problem for the NFL and its players when they retire, when athletes are playing and sustain concussions there have been many cases where athletes don't report it. Not reporting could end up being fatal in the long-term. Kerr et al. (2018) set out to examine the incidence of concussions in the NFL, and nondisclosure (not reporting the concussion to the medical staff and organization), of sports-related concussions among NFL players. The purpose of the study was to examine the presence and factors associated with nondisclosure of concussions in retired NFL players. The NFL doesn't report on the information to cover themselves and the risk factors associated with it. This cross-sectional study took a sample of 829 retired NFL players that completed health surveys. The authors examined how many concussions these players had, the number of years they played, their positions, their concussion history, and the era in which they played in the NFL. The Kerr et al. (2018) research showed that 50 percent of respondents reported that they sustained concussions and did not inform any medical staff at least once during their playing career. Also, a large portion of former

NFL players did not report disclosing their sports-related concussions to medical staff. “Future research on concussion nondisclosure needs to identify mechanisms to improve football players intentions to disclose concussion-related symptoms to health care providers and to equip health care providers with more effective strategies for timely identification of concussions” (Kerr et al. 2018).

Programs, Services, and Treatments

Treatment for retired professional football players is scarce when it comes to health-related problems because of concussions. This occurs because they have retired from the game and are no longer provided health care through the NFL. The purpose of the Boriboon (2013) study on concussions was to show that the effects of sports-related concussions can last for decades and that physical therapists can play an important role in detection and intervention. Sometimes talking to someone about the issue can help players who are going through mental and cognitive health problems. “Six percent of retired players above the age of 50 reported diagnosis of dementia, Alzheimer’s and other memory-related diseases compared to the one percent of comparable men in the United States” (Boriboon, 2013). Physical therapist can play an important role in helping retired professional football players. Boriboon (2013) states that they can provide individualized exercise and training plans to reduce dizziness and headaches along with reducing pain and increase mobility. Furthermore, the researcher states these steps can help improve memory loss and can delay dementia and Alzheimer’s disease.

According to the Abreu et al. (2016) study on the War Against Concussions, the purpose was to qualitatively research and examine the advancements in concussion detection and prevention to provide league officials with recommendations that can help a player reduce the risk of concussions. By using a systematic review of literature approach, Abreu et al. (2016) was

able to formulate recommendations to help improve retired NFL players' quality of life. Abreu et al. (2016) concluded that league officials need to implement solutions that will help decrease the risk of concussions and educate players on the topic so they are informed about how it can affect them later in life. For example, the study explained increasing the focus on concussion awareness around the league by providing workshops and seminars to organizations. In addition, developing products like concussion detection helmets could serve as a basis in protecting a player's future.

Summary

Research has shown that there is a relationship between concussions and mental/cognitive health of retired professional football players. These health issues affect the players emotional and cognitive well-being causing them to have depression and anxiety. Furthermore, as retired professional football players age, the more risk they have for dementia and Alzheimer's disease. With current information and knowledge about the impacts of concussions long-term, researchers are trying to find ways to resolve the issues of CTE and help these athletes improve their quality of life. To achieve this, it is imperative that we study and gain information while they are playing and help educate players on the topic. Reporting concussions is the first step. Many players don't like reporting their injuries because they would rather play through the injury thinking the effects will go away, but that is false. Long-term, the implications can be fatal.

Chapter 4

Results, Discussion, and Recommendations for Future Research

The purpose of this chapter is to present the results of the review of literature on the effects of sports-related concussions on the mental health and cognitive health of retired professional football players, and how these results align with the purported research questions which guide this synthesis project. In addition, recommendations for future research as it relates to the effects of concussions on mental health and cognitive impairment as presented.

The results of this review of literature revealed that there are significant mental health and cognitive health problems associated with concussions in professional football players. Retired professional football players are more at risk of being diagnosed with depression while also showing increased signs and risk of Alzheimer's disease and dementia. Research has also indicated the NFL has no plans in place to aid the health of their past players leaving them vulnerable to these health problems in their post playing careers. With research on concussion effects on professional football players on the rise, there is now direct evidence of having one or more concussions in the NFL to the increased risk of CTE and mental instability causing athletes to be angry, have anxiety, be depressed, and have suicidal thoughts.

The literature review has also displayed those players who are going through mental health problems and cognitive impairment should seek help when the first signs of symptoms associated with the disease occur. Making sure former players talk with doctors and get evaluated can go a long way in the process of dealing with mental and cognitive health problems.

Discussion

Interpretations

As part of this literature review, several research questions were posed. The first question synthesized was, what are the mental health problems associated with retired professional football players because of concussions? The results as it relates to this research question showed that there are mental health problems associated with concussions for retired professional football athletes, mainly depression and anxiety. For example, in Thomson et al. (2019) the research showed that symptoms of concussions, although are acute at first, have the risk of long-term deleterious effects for example, higher rates of depression and mild cognitive impairment. This is much more prevalent in athletes that sustained two or more concussions over their career and play positions of running back, linebacker, offense, and defensive line. Expanding on the results, Didehbani et al. (2013) concluded that as the number of concussions increases, the more likely the athlete will be reporting on symptoms of depression. Changes in former players concentration, loss of sleep, loss of energy, angeriness all play a factor in the mental health problems of these professional football players. These mental health problems also tend to go unnoticed in players until it is too late to go and seek help. These results did meet my expectations, I understand as a former player that concussions do have lasting impacts on your health. Furthermore, retired athletes that sustained multiple concussions are at a higher risk of mental health problems because of the inability or struggle to do everyday motor functions and abilities.

The second question that was examined was, what are the cognitive impairments associated with professional football players because of concussions? The results shown throughout several studies displayed that the brain structure of former athletes showed significant

signs of CTE and cognitive impairment problems in many retired pro football athletes. For example, a cross-sectional study from Cunningham et al. (2020) showed that athletes that suffered from cognitive impairment displayed declines in memory, executive function, language, psychomotor function, and cognitive functioning. This increases an athlete's risk of Alzheimer's disease and dementia. Expanding on Cunningham et al. (2020) study, retired athletes performed worse than the control participants when being evaluated for cognitive domains of memory, executive functioning, and language showing that multiple cognitive difficulties have emerged in the retired players. These results met my expectations because of prior knowledge and examples of players like Junior Seau, who committing suicide due to CTE. This has struck the nation and made aware to us the struggles these retired players go through.

The final research question that was examined was, what are the treatments, programs, or services available to these football athletes trying to seek help about their mental and cognitive health problems? The biggest problem for retired athletes now is that when they were playing football, they under reported their concussions to healthcare professionals. This played a significant role in receiving and getting help for any future problems that may arise due to concussions. If players had reported concussions while they were playing, there could have been more knowledge on the risk of future health problems. The results of this literature review show that although retired athletes are not fully compensated, there are programs and services accessible to athletes dealing with mental and cognitive problems. Furthermore, Boriboon (2013) revealed that it is imperative to ensure these players obtain physical therapy to aid in dealing with these impairments. Therapy can play a significant role in helping these athletes by providing individualized exercise and training plans to reduce the risk of mental and cognitive health problems. By getting athletes back to everyday life by helping them reduce pain,

increasing their mobility and motion that would eventually lead them to getting back to everyday activities. The results from Boriboon (2013) show that if these retired athletes follow these steps, it can eventually improve memory and perhaps delay the onset of dementia and even Alzheimer's disease. Although the NFL doesn't offer any programs to its retired players, it is the players responsibility to understand that they have a problem and to seek help, opposed to seeking help from the NFL, their former employer. These results do meet my expectations, in most cases your former employer is not obligated to provide you with healthcare, so I understand it is not up to the NFL to reach out and aid these players. I find it real interesting that physical therapist can play a vital role in helping these players delay early signs of dementia and Alzheimer's disease.

Implications

Previous research on the effects of concussions on the mental and cognitive health of retired professional football players shows that a variety of aspects are in agreeance. Knowing that multiple concussions for these athletes can later affect their quality of life was present in many pieces of literature. Many of the results from the research were similar and showed that reporting concussions play an important role in understanding and furthering research on the implications of concussions on the players future. Unfortunately, the results of this synthesis don't offer many programs or services that can help these retired athletes, but it gives a better understanding of what some retired professional football players will go through if they don't start reporting concussions and taking the necessary steps to protect their mental and cognitive health.

Limitations & Recommendations for Future Research

In reviewing the data based on the effects of concussions on the mental and cognitive health of retired professional football players the following limitations were noted regarding the studies under review. The studies were limited to information gathered over a certain period. As more knowledge comes out about these brain injuries, more programs and services may be available in the future. The studies were also limited to the number of retired players who reported concussions during their playing career. Some players who are going through these experiences never reported concussions, making it difficult to correlate their mental health problems with concussions when they played football. Limitations can also occur when the NFL and its teams make sure that nondisclosure agreements are in place so that medical staffs can't report to the public or have knowledge of how many concussions a player has sustained over the course of their career. Therefore, there is no possible way to understand how concussions effects ones mental and cognitive health in the NFL.

Based on these limitations, future research should consider the following recommendations:

1. Future research should collaborate with the NFL and develop groups or programs that specialize in brain injuries for retired players so they can receive the help that they need.
2. Future research should investigate and revise NFL protocols on concussions, not just protecting current players, but extend protocols to retired players as well.
3. Future research should investigate new and innovative ways to detect concussions, concussion detection helmets, for example.
4. Future research should conduct workshops to educate players on concussions and brain health, so that players current or retired know the risk associated with these brain injuries.

Summary

The purpose of this literature review was to determine the effects of sports-related concussions on the mental health and cognitive health of retired professional football players. Delimiting variables were used to do an exhaustive data-based search which yielded 12 articles for this synthesis. These articles were then systematically used to determine the effects of sports-related concussions on the mental health and cognitive health of retired professional football athletes.

Research revealed that retired NFL players who sustained two or more concussions during their playing career are at risk of mental and cognitive health problems affecting their quality of life. A player's mood, memory, motor functions and cognitive functions are affected, often ending up as cases of depression and a player being diagnosed with dementia or Alzheimer's disease.

Furthermore, having a physical therapist can aid retired professional football players who are having these problems by helping them regain their abilities to function mentally and physically as well as slowing down the onset of diseases like dementia and Alzheimer's. Further research on the topic will only aid health care physicians to find better ways to treat these players and offer better solutions to deal with the problems associated with the effects of concussions on the mental health and cognitive health of retired professional football players.

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Thomson, R., Carabello, D., Mansell, J., & Russ, A. (2020). Depression following concussion in retired professional football players. *International Journal of Athletic Therapy and Training*, 25(2), 54–56. <https://doi.org/10.1123/ijatt.2019-0028>

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Appendix A

Synthesis Article grid

Author	Title	Source	Purpose	Methods & Procedures	Analysis	Findings
Abreu, M. A., Edwards, W., & Spradley, B. D. (2016)	The War Against Concussions	Abreu, M. A., Edwards, W., & Spradley, B. D. (2016). <i>The War Against Concussions. The Sport Journal.</i>	The purpose of this study is to examine the advancements in concussion detection and prevention, ultimately providing league officials with recommendations that could help reduce a player's risk of a concussion.	A review of literature to help solidify the purpose.	To reduce the risk of concussions league officials should focus on increasing concussion awareness and gain better knowledge to help athletes better recognize the signs and symptoms of concussions. Help athletes understand the consequences of not reporting the concussions as well.	The safety of today's football players will depend on league officials and their ability to implement solutions that help decrease the risk of a player suffering a concussion.
Baker, J. G., Leddy, J. J., Hinds, A. L., Haider,	An Exploratory Study of Mild Cognitive Impairment	Baker, J. G., Leddy, J. J., Hinds, A. L., Haider,	To test the hypothesis that mild cognitive impairment rates are	21 NFL retired football players take part in	When the test results came back, the retired football players all	Athletes with a history of playing professional contact sports had more of a

<p>M. N., Shucard, J., Sharma, T., Hernandez, S., Durinka, J., Zivadinov, R., & Willer, B. S. (2018).</p>	<p>of Retired Professional Contact Sport Athletes</p>	<p>M. N., Shucard, J., Sharma, T., Hernandez, S., Durinka, J., Zivadinov, R., & Willer, B. S. (2018). An exploratory study of mild cognitive impairment of retired professional contact sport athletes. <i>Journal of Head Trauma Rehabilitation</i>, 33(5). https://doi.org/10.1097/htr.0000000000000420</p>	<p>higher among retired professional contact sports athletes.</p>	<p>neurocognitive test.</p>	<p>showed symptoms of depression.</p>	<p>risk factor for higher depression.</p>
<p>Cunningham, J., Broglio, S. P., O'Grady, M., & Wilson, F. (2020).</p>	<p>History of Sport Related Concussions and Long Term Clinical Cognitive</p>	<p>Cunningham, J., Broglio, S. P., O'Grady, M., & Wilson, F. (2020).</p>	<p>To investigate the evidence regarding cognitive health in athletes</p>	<p>Cross sectional studies of living male or female athletes in which at least 1</p>	<p>Qualitative study. 46 cross sectional observations that included</p>	<p>Evidence of poorer cognitive health among retired athletes with a history of concussion is evolving.</p>

	Health Outcomes in Retired Athletes	History of sport-related concussion and long-term clinical cognitive health outcomes in retired athletes: A systematic review. <i>Journal of Athletic Training</i> , 55(2), 132–158. https://doi.org/10.4085/1062-6050-297-18	with a history of SRC.	cognitive test were used as an outcome and screened.	retired NFL athletes.	Results suggest that a history of SRC may more greatly affect the cognitive domains of memory, function, and psychomotor function.
Didehbani, N., Munro Cullum, C., Mansinghani, S., Conover, H., & Hart, J. (2013).	Depressive symptoms and Concussions in Aging Retired NFL Players	Didehbani, N., Munro Cullum, C., Mansinghani, S., Conover, H., & Hart, J. (2013). Depressive symptoms and concussions in aging retired	This study examined the relationship between a remote history of concussions with current symptoms of depression in retired professional football athletes.	42 subjects from a gathering of retired NFL players in North Texas, each player received a neurologic and neuropsychologic evaluation.	Independent t-test were conducted to compare demographic factors between NFL players and controls. Correlations were conducted to assess the relationship between the number of concussions and	Found a significant correlation between the number of lifetime concussion and depressive symptom severity using the Beck Depression Inventory II. Upon investigating they found the cognitive factor was the only factor that was

		NFL players. <i>Archives of Clinical Neuropsychology</i> , 28(5), 418–424. https://doi.org/10.1093/arclin/act028			depressive symptoms.	significantly related to concussion. The number of self-reported concussion may be related to later depressive symptomatology.
Kerr, Z. Y., Marshall, S. W., Harding, H. P., & Guskiewicz, K. M. (2012).	Nine- Year Risk of Depression Diagnosis Increases with Increasing Self-Reported Concussions in Retired Professional Football Players	Kerr, Z. Y., Marshall, S. W., Harding, H. P., & Guskiewicz, K. M. (2012). Nine-year risk of depression diagnosis increases with increasing self-reported concussions in retired professional football players. <i>The American Journal of Sports Medicine</i> , 40(10),	To determine the effects of recurrent concussions on the clinical diagnosis of depression in a group of retired football players.	Members of the NFL retired players association baseline health survey. 1044 respondents.	Out of the 1044 participants 10 percent reported clinically diagnosed with depression.	The association between concussion and depression was independent of the relationship between decreased physical health and depression.

		2206–2212. https://doi.org/10.1177/0363546512456193				
Kerr, Z. Y., Register-Mihalik, J. K., Kay, M. C., DeFreese, J. D., Marshall, S. W., & Guskiewicz, K. M. (2017).	Concussion Nondisclosure During Professional Career Among a Cohort of Former National League Athletes	Kerr, Z. Y., Register-Mihalik, J. K., Kay, M. C., DeFreese, J. D., Marshall, S. W., & Guskiewicz, K. M. (2017). Concussion nondisclosure during professional career among a cohort of former National Football League athletes. <i>The American Journal of Sports Medicine</i> , 46(1), 22–29. https://doi.org/10.11	To Examine the prevalence of and factors associated with nondisclosure of sports related concussions in former NFL athletes.	A sample of 829 former NFL players completed health surveys. This included players that played before WW2 to 2001.	The prevalence of nondisclosure among retired NFL players during their career overall in relation to race/ethnicity, professional career playing, primary position played.	50 percent reported they had a concussion at some point and did not report it. Former NFL players in this study reported at least one instance of not disclosing a sport related concussion to medical staff. Further research needs to identify mechanism to improve football players intentions to disclose concussion symptoms to health care providers and equip them with more effective strategies for identification of concussion.

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Kia Boriboon	Concussion Management in Football: Don't Shake it Off	Scribd. (n.d.). <i>Concussions in football</i> . Scribd. Retrieved October 21, 2021, from https://www.scribd.com/presentation/188848062/Concussions-in-Football .	To show the effects of sports related concussions can last for decades.	The use of health questionnaires and surveys of current and former NFL players.	Concussions will affect players health long term and the onset of CTE can affect a player's quality of life.	No one can change how concussions were managed in the past, but PT can play an important role in helping athletes manage concussion symptoms.
Manor, B., Zhou, J., Lo, O. Y., Zhu, H., Gouskova, N. A., Yu, W., Zafonte, R., Lipsitz, L. A., Trivison, T. G., & Pascual-Leone, A. (2019).	Self-Reported Head Trauma Predicts Poor Dual Task Gait in Retired National Football League Players	Manor, B., Zhou, J., Lo, O. Y., Zhu, H., Gouskova, N. A., Yu, W., Zafonte, R., Lipsitz, L. A., Trivison, T. G., & Pascual-Leone, A. (2019). Self-reported head trauma	What are the long-term effects of such trauma on cognitive functions?	66 retired Professional football players aged 29-75 completed health wellness questionnaires.	Participants who reported more symptomatic head trauma defined as the total number of impacts to the head or neck followed by concussions symptoms exhibited greater dual task cost.	Symptomatic head trauma was not correlated with average stride times in either walking conditions.

		<p>predicts poor dual task gait in retired National Football League players. <i>Annals of Neurology</i>, 87(1), 75–83. https://doi.org/10.1002/ana.25638</p>				
<p>Rice, S. M., Parker, A. G., Rosenbaum, S., Bailey, A., Mawren, D., & Purcell, R. (2017).</p>	<p>Sport-Related Concussion and Mental Health Outcomes in Elite Athletes</p>	<p>Rice, S. M., Parker, A. G., Rosenbaum, S., Bailey, A., Mawren, D., & Purcell, R. (2017). Sport-related concussion and mental health outcomes in Elite Athletes: A Systematic Review. <i>Sports Medicine</i>, 48(2), 447–465.</p>	<p>The purpose of this research was to appraise the evidence base regarding association between sport related concussions and mental health outcomes in professional athletes.</p>	<p>A systematic search of PubMed and other databases were conducted.</p>	<p>Through the review of literature, the authors found a relationship between concussions and mental health problems for these retired NFL players.</p>	<p>The evidence suggests that there is a link between SRC and depression symptoms.</p>

		https://doi.org/10.1007/s40279-017-0810-3				
Roberts, A. L., Pascual-Leone, A., Speizer, F. E., Zafonte, R. D., Baggish, A. L., Taylor, H., Nadler, L. M., Courtney, T. K., Connor, A., Grashow, R., Stillman, A. M., Marengi, D. A., & Weisskopf, M. G. (2019).	Exposure to American Football and Neuropsychiatric Health in Former National Football League Players	Roberts, A. L., Pascual-Leone, A., Speizer, F. E., Zafonte, R. D., Baggish, A. L., Taylor, H., Nadler, L. M., Courtney, T. K., Connor, A., Grashow, R., Stillman, A. M., Marengi, D. A., & Weisskopf, M. G. (2019). Exposure to American football and Neuropsychiatric Health in former National Football	Professional football, playing position, and experience of concussions were associated with cognition related quality of life and indicators of depression and anxiety.	The authors examined professional football positions, and experience of concussions as measured by self-report of 10 symptoms, were associated with QOL and depression and anxiety. Survey conducted 2015-2017. Patients' health questionnaires measured depression and anxiety symptoms.	Each 5 seasons of play associated with a 9% increased risk of indicators of depression and anxiety.	The data suggested that seasons of playing, and the positions associated with professional football are associated with lasting neuropsychiatric health deficits. Poor QOL, depression, and anxiety appear to be associated with concussions in the long term.

		<p>League players: Findings from the Football Players Health Study. <i>The American Journal of Sports Medicine</i>, 47(12), 2871–2880. https://doi.org/10.1177/0363546519868989</p>				
<p>Solomon, G., & Sills, A. K. (2015).</p>	<p>A Retrospective View of Concussion in American Football, 1900-1959: What Was Suggested Then We Now Know</p>	<p>Solomon, G., & Sills, A. K. (2015). A retrospective view of concussion in American football, 1900–1959: What was suggested then we now know. <i>The Physician and Sportsme</i></p>	<p>To review the literature of concussions in the NFL from 1900-1959 to now.</p>	<p>A review of the MEDLINE PubMed database.</p>	<p>Throughout the history of the NFL the authors found that players under reported concussions and some didn't report it at all.</p>	<p>Players under reported concussion then and likely will continue to do so.</p>

		<p><i>dicine</i>, 43(3), 247–252. https://doi.org/10.1080/00913847.2015.1024582</p>				
<p>Thomson, R., Carabello, D., Mansell, J., & Russ, A. (2020).</p>	<p>Depression Following Concussion in Retired Professional Football Players</p>	<p>Thomson, R., Carabello, D., Mansell, J., & Russ, A. (2020). Depression following concussion in retired professional football players. <i>International Journal of Athletic Therapy and Training</i>, 25(2), 54–56. https://doi.org/10.1123/ijatt.2019-0028</p>	<p>What is the prevalence of depression after sustaining a concussion ?</p>	<p>The Strobe method was used (Strengthening the reporting of observational studies in epidemiology) for cross sectional and case control studies were used to assess internal and external validity.</p> <p>Scores ranged from 0-22 and are graded on different components within the article.</p>	<p>After the authors reviewed the articles there is emerging evidence to support the question that retired NFL players with a history of concussions may be diagnosed with depression. The rates of depression diagnosis in retired NFL players that sustained a concussion range from 6.67% to 24%.</p>	<p>There is evidence that suggest that NFL players that have sustained concussions are more likely to be diagnosed with depression compared to the general population. However, the number of retired NFL players with depression may be higher than reported.</p>

				<p>Didehbani -30 retired NFL players number of concussion s range from 1-11 Self-report vs non- self-report.</p> <p>Prevalence of depression 6.67 %.</p> <p>Guskiewic z 2552 retired NFL players 60% reported concussion</p> <p>Health questionnai re and short form 11% depression was found.</p> <p>Hart 34 retired NFL players used Beck depression inventory 24% depression prevalent.</p>		
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