

Post-Concussion Experiences of Collegiate Student-Athletes

A Dissertation Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

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December 2016

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Dedication

To all the student-athletes that have or will experience a concussion.

Especially, to the seven former student-athletes that honored me and those that read this
with their stories.

Acknowledgements

I would like to sincerely thank my advisor, Dr. Patrick Biddix, for providing me with the flexibility, opportunity, and support to pursue a topic I was interested in. Thank you Dr. B for continually providing new challenges and diverse experiences as your Graduate Research Assistant. I would also like to thank my committee members Dr. McCoy, Dr. Derrington, and Dr. Hardin. Their questions, feedback, and guidance enhanced my understanding of the research, as well as, improved my skills as an independent scholar.

I am very grateful for the HEA faculty for not only accepting a geologist into their doctoral program but for opening my eyes to the world of research involving human-subjects through quantitative and qualitative research. I have learned so much from my committee members, Dr. Mertz, Dr. Ishitani, Dr. Boyd, Dr. Carver, and Dr. Cuevas. I would also like to thank the HEA staff, Vikki, Wade, Constance, and Janie, for their kindness and assistance throughout my four years in the department.

Thank you to my colleagues and classmates who have taught me so much about the wide range of issues and opportunities in education. Specifically, I would like to thank Dr. Brian Hester for introducing me to institutional research.

I sincerely thank Dr. Dennis Hengstler for his mentorship and providing an excellent internship opportunity for experientially learning about institutional research. I would also like to acknowledge Lucy Kniseley, N.P. and Rebecca Morgan, M.D. from the University of Tennessee Student Health for their help and guidance during the initial development of this study.

I was fortunate to meet Dr. Sarah Helm who introduced me to the field of higher education administration. I am grateful to Dr. Ron Fodor and Dr. Larry McKay for supporting my change from planetary geology to academic leadership. I owe my sincere gratitude to Dr. Ron Fodor, my first mentor, for shaping me into a scientist and showing me how to conduct research, teach, and be a scholar.

I want to thank my friends and family who provided support and inspiration. I have an immensely thoughtful and caring support network. Thank you for always supporting me either by showing interest in my work or respite when I needed. Special thanks to Charlie Pierce, J.D. for proofreading my dissertation and Flavius Dragila, M.D. for reviewing the medical content for accuracy and completeness. I cannot thank Dr. Stephen Kelley enough for countless hours of listening to my thoughts and frustrations. Our discussions challenged and enriched my ideas. Thank you Stephen for always knowing what to say and how best to support me through the dissertation process. I also would like to thank my grandmother, Nonnie, for keeping me company while I would read my draft or needed to brainstorm out-loud. Thank you for your unconditional love and support.

I would especially like to thank my siblings and parents. I will always be grateful to Petey, Rob, and Laurie for continuous support, inspiration, and help in understanding the life of a student-athlete. I am so thankful for my mom's expertise; particularly, translating difficult medical concepts for a geochemist. I am blessed to have your help, support, and love. Thank you Mom and Dad for the unparalleled encouragement and constant support during my academic career and throughout my life.

Most of all, I am truly grateful for the gatekeepers and participants that made this study possible. While I cannot name the wonderful individuals to protect their privacy, I want them to know they have changed my life for the better. Thank you for opening your hearts and trusting me to tell your story. It was an honor.

Abstract

Sports-related concussions are a major public health concern affecting a significant number of collegiate student-athletes. Medical and public health research has addressed every aspect of concussion management processes including concussion education, medical diagnosis, recovery, and returning to sport and classroom. This research has led to several best-practices for concussion management. Since 2010, the NCAA has mandated that its member institutions maintain concussion management policies and procedures. However, the current recommendations, based primarily on medical research, have been found in quantitative studies of the behaviors and practices of athletic trainers, coaches, and student-athletes to be ineffective. To date, no studies have explored the perceptions and experiences of student-athletes post-concussion. The purpose of this study was to understand student-athletes' experiences post-concussion and how their experiences compared to concussion management policy. A qualitative research design was utilized to allow for an in-depth understanding of the student-athlete's perspective on concussion management. Data were collected from interviews with seven current and former NCAA student-athletes from five member institutions representing Division I football, lacrosse, men's soccer, women's soccer, Division II football, and Division III football; and from publicly obtained concussion management documents. The data were analyzed using Tesch's (2013) organizing system and Love's (2003) methods for document analysis. Eight major findings emerged from the data: 1) Symptomology and its effects, 2) Pressure to return, 3) Lack of Knowledge, 4) Inadequate support, 5) No rest, 6) No policy, 7) Double-injury, and 8) Inconsistent

alignment between student-athletes' experiences and their institution's concussion policies. None of the student-athletes' experiences aligned with the current best-practices in concussion management. Recommendations for cultural change, NCAA practices, and higher education practices include using warning messaging and PSAs, applying effective preseason education, enforcing implementation of concussion management guidelines, leveraging media partnerships, investing in concussion specialists, and creating a team of support.

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Chapter 1. Introduction

Shane Morris and Kosta Karageorge surprised the nation and higher education in 2014 with high-profile incidents involving concussions sustained as student-athletes (Murphy, 2014; Terlep, 2014). University of Michigan quarterback, Shane Morris, sustained a helmet-to-helmet hit in September 2014 which knocked him to the ground and caused him to stagger on the field while being held up by teammates. Then head coach Brady Hoke sent him back into the game to play (Dienhart, 2014; Murphy, 2014). An already beleaguered Hoke could not withstand the negative implications concerning his leadership so he was eventually fired, and athletic director Dave Brandon then resigned in December 2014 amidst protests by University of Michigan students. Michigan president Mark Schlissel and the Board of Regents expressed regret with promises to shore up concussion management within the athletic department (Dienhart, 2014; Schlissel, 2014).

Ohio State's Kosta Karageorge, a wrestler and football player with a history of multiple concussions, was found dead in a dumpster from an apparent suicide after sending his mother a text message indicating that his concussions had contributed to his depressive state (Conti, 2014; Salant, 2014). The tragic death of Karageorge garnered attention from Congress as Rep. Bill Pascrell Jr., the founder of the Congressional Brain Injury Task Force, sent a letter of complaint to the National Collegiate Athletic Association (NCAA) and Rep. Joyce Beatty proposed a bill to protect student-athletes (Salant, 2014; Wehrman, 2014). The increased attention comes at a time when concussions are being reported throughout all of collegiate sports (Grasgreen, 2013).

Football has been where most of the attention concerning concussions has been focused, and this has been true since the 1890s (Stone, Patel, & Bailes, 2014).

Football in its purest form was a game played by the Greeks, Romans, Chinese, Arctic Eskimos, Egyptians, and many more; including the 16th century British who played “footeball” on a field that was several miles long and included broken necks, backs, legs, arms, and violence. The colonists of Virginia and New England found the Native Americans playing football with a pig bladder in a violent game they called *Pasuckqualkohwog* which meant “they gather to play football.” The extreme violence of the game caused the early Puritans to banish the sport but 200 years later students at Princeton began playing a modified version, and in the 1840s Harvard students initiated football melees strictly forbidden by faculty. After the Civil War, university-fielded football teams became the national pastime with professional athletes representing the schools and becoming rich on private endorsements and special treatment by the universities and alumni while also experiencing severe and brutal injuries. By the 1890s the faculties of the institutions began to insist on reforms and to demand that football be discontinued; the Intercollegiate Football Association (IFA) was formed and briefly modified safety rules, followed by the American Football Rules Committee to eliminate abusive acts; eventually the sport of football remained in college athletics but the athletes were forced to become student-athletes and the faculties were allowed more input on defining the role of “student-athlete.” Faculty and university administration officials mostly in the form of university presidents wanted an academic structure sanctioned to

reform college athletics and protect the now student-athlete from the violent and debilitating injuries occurring on the field (Crowley, 2006).

In 1893, President Theodore Roosevelt, a supporter of American football, declared the game was too brutal and needed a resolution which would lessen the danger. He formally invited college coaches to the White House in 1906 to collaborate on how to solve the problem of the 18 deaths and 159 serious injuries which had occurred that year (Stone et al., 2014). This group proposed assessing the use of the leather football helmet and other rule changes focused on safety, and proposed the formation of an oversight group charged with protecting the student-athlete; the National Collegiate Athletics Association (NCAA) (Ganim, 2014). Catastrophic deaths from closed head injuries in sport decreased with the formation of the NCAA and the implementation of safety rules and the leather football helmet; however concussions continued to occur and still present major challenges to the health of the student-athlete (Stone et al., 2014).

The Centers for Disease Control and Prevention (CDC) reported in 2003 that sports-related concussions and closed head injuries, including mild traumatic brain injury (mTBI), and sports-related traumatic brain injury (TBI) accounts for 20% all TBIs; and currently TBI is a contributing factor in one-third of all injury-related deaths (CDC, 2014; Williamson et al., 2014). In addition, 3.8 million sports-related TBIs are estimated to occur each year with 300,000 sports-related concussions with loss of consciousness (Langlois, Rutland-Brown, & Wald, 2006). Concussions have a higher occurrence rate per athletic exposure in field hockey, wrestling, ice hockey and lacrosse; however, football has the highest number of reported concussions (NRC, 2013). The attention

surrounding concussions primarily focuses on football because of the higher student population involved and an even larger audience (Grasgreen, 2013). A research study by Guskiewicz et al. (2003) of football players from 25 separate universities across all three divisions found that 6.3% had experienced a concussion; McGrath (2010) suggested up to 10% reporting concussive events, while the NCAA (2014g) reported 9.5% of football players admitted to concussion based on a self-reports.

TBIs and concussions which are sport-related frequently occur on a continuum which can be attributed to biomechanical forces on the brain resulting from a direct collision with another player or object; further they can be classified as focal due to a blow which causes disruption of brain matter and vessels and acceleration-deceleration injury when the student-athlete is stopped suddenly but the brain continues to rebound inside the skull (Morris, Jones, Proctor, & Day, 2014). In addition, an angular force can cause diffuse damage such as shearing of multiple axons in the central nervous system resulting in cerebral swelling and vessel engorgement (Morris et al., 2014). The National Research Council (NRC, 2013) defines concussions as injuries caused by a blow or jolt to the head which can cause a disruption in the functioning of the brain, and McCrory et al. (2009) further qualified that a concussion can also be caused by a hit to the face, neck or anywhere on the body which results in an “impulsive” force being transmitted to the brain. McCrory et al. (2009) also noted “concussion is a complex pathophysiological process affecting the brain, induced by traumatic biomechanical force” (p. 37), and includes the involvement of the following clinical domains for diagnosis: “a) Symptoms-somatic (e.g. headache), cognitive (e.g. feeling like in a fog), and/or emotional symptoms

(e.g. lability) b) Physical signs (e.g. loss of consciousness, amnesia) c) Behavioral changes (e.g. irritability) d) Cognitive impairment (e.g. slowed reaction times), and e) Sleep disturbance (e.g. drowsiness)” (p.37).

Concussions can result in short-term (7-10 days) or long-term effects (14 days to months or even years) and is individualized based on how it presents in each student-athlete (McCrory et al., 2009; NRC, 2013). Many experts now recommend a simplified listing of symptoms (headache, dizziness, nausea/vomiting, ringing in ears, disorientation, balance problems, inability to remember the play, sensitivity to light or noise, vision changes, personality changes, loss of consciousness) because they can be readily recognized by the student-athletes, coaches, trainers, and even parents in hopes that reporting of these dangerous injuries can be done more quickly (McCrory et al., 2009; NRC, 2013; Wake Forest Sports Medicine, 2010). This is necessary since long-term effects of concussion can result in a longer recovery following a subsequent concussion (Guskiewicz et al., 2003), late-life cognitive impairment (NRC, 2013), and chronic traumatic encephalopathy “a progressive, degenerative disease of the brain found in athletes with a history of repetitive brain trauma” (McKee et.al, 2009, p. 710). In addition, Kroshus, Baugh, Hawrilenko, and Daneshvar (2014) warned that even more severe and long-term neurological repercussions exist for student-athletes who receive second-impact concussions, or an additional concussion before the previous concussion has fully healed. Finally, post-concussion syndrome encompasses all of the symptoms of concussion such as headache, vomiting, light sensitivity, fatigue, sleep disturbances, and

cognitive impairment, and 50% of student-athletes can experience the symptoms for up to one year (Saigel & Berger, 2014).

The occurrence and danger of concussions in athletes competing on all levels and in many different sports has been publicized and explored on television, radio, internet, and social media (NRC, 2013). To further illustrate the challenges these student-athletes face concerning concussion, both the NCAA and university athletic departments have been impugned for the way university football players are inconsistently protected and treated pre- and post-concussive events, based on NCAA guidelines and university concussion management plans (Rhim, 1996; Vaughan, 2013; Wolverson, 2013a).

The NCAA has come under severe criticism for their lack of involvement in concussions in student-athletes. Individual states (regulating high-schools), the federal government (i.e., CDC, 1997; NRC, 2013), and the NFL recommended and adopted conservative treatment and protocols for the treatment of concussed athletes, but the NCAA ignored data and research from researchers such as Kevin Guskiewicz from the University of North Carolina until 2010 (Wolverson, 2013a). Several lawsuits have been filed asserting the NCAA was negligent in not adopting a formal concussion policy before 2010; and then only with minimal standards which are unenforceable, while charging each university with developing and being responsible for their own policy (Vaughan, 2013). The NCAA has defended itself by stating it is in existence to protect young people from dangerous and exploitive athletic practices; but it is known that they also make billions from their lucrative television contracts (Rhim, 1996). One hundred years ago the NCAA was formed to protect the health and safety of college athletes, but

CNN reporter Sarah Ganim (2014) wrote that CNN received emails from the NCAA professing that their role is to monitor rules on amateurism and academics only, while denying that their mission concerns the protection of the health and safety of student-athletes.

A class-action lawsuit of \$75 million in support of thousands of current and former athletes from both contact and non-contact sports is pending (Solomon, 2014c). As a result of the 2010 lawsuit filings, the NCAA (2011) urged universities to have concussion management plans and recommended that “student-athletes should not return to games, practices or other contests when symptoms persist, and under no circumstances should a student-athlete diagnosed with a concussion return to a sports activity in the same day” (p. 1). In 2014, there was no mention of the student-athletes well-being outside return-to-play protocols, and no mention of academic treatment plans post-concussion in documents provided to the coaches (NCAA, 2014d). The NCAA sent basic guidelines to the individual schools and programs and directed the schools to self-determine what protocols the schools would follow after an observed or self-reported concussion (Ganim, 2014). With the responsibility placed on the universities by the NCAA for implementing and enforcing concussion management, university administrators need to be aware of the inadequate support student-athletes receive post-concussion in order to develop effective policy (Pretty, 2014).

University athletic departments are also being criticized for not supporting and protecting their student-athletes. In 2010, Representative Steve Cohen, a member of the House Judiciary Committee, stated that university athletic departments “seemed to care

only about money and winning,” and that “it’s money, money, money, and health care ought to be considered, when you hear that no college conference has any standards different from the NCAA, that’s minimalism-that’s doing the least we can do to get along, and that’s wrong” (Associated Press, 2010). In terms of health protection, Rhim (1996) argued that it is not equitable and undue enrichment for the largest universities to reap huge monetary benefits without providing reasonable care for the student. Skorton (2011), the president of Cornell University, headed an Ivy League committee which re-configured concussion policy and protocol for all Ivy League schools to proactively prevent concussions and treat them effectively, and called on other universities to do the same.

Statement of the Problem

Based on medical, legal, political, and cultural data sources, there is mounting evidence that universities need to change the way they support and manage student-athletes suffering from concussion. Universities need to explore and confront the concussion vulnerabilities within their own athletic departments. While there is a growing consensus on the management and safe return-to-play for athletes following a concussion, primarily consisting of a plan of complete rest for the athletes until they are no longer exhibiting concussion symptoms; research has shown there is a significant lack of understanding concerning the concept of rest by those who have the primary responsibility of managing the recovery of concussed student-athletes (Chinn & Porter, 2013; McGrath, 2010; Sullivan et al., 2012), as well as a resistance to change from previously ineffective approaches (NRC, 2013). An NCAA fact sheet given to student-

athletes advises them not to hide a possible concussion and to pursue an evaluation, as well as counsels them to get their injury checked out by the team physician, and athletic trainer or other health professional before returning to the court or field of play.

Therefore, student-athletes are supplied the needed information to facilitate seeking help with the desired end result of returning to play, but this help is subject to the student-athlete's concern over playing or losing his scholarship, and the coach's desire to win (Wolverton, 2013b). Pretty (2014) observed that coaches, medical staff, and athletic trainers are ultimately concerned for their jobs, and so a conflict of interest exists which does not favor the student-athlete receiving appropriate concussion management.

Wolverton (2013a) noted that a 2010 NCAA internal survey of constituent institutions revealed half of the respondents admitted to returning diagnosed or suspected concussed football players back to play in the same game. Wolverton (2013b) also pointed out that in a survey conducted by *The Chronicle of Higher Education*, 53% of college football athletic trainers responded that the coaching staff influenced the hiring and firing of their positions, and 42% had been pressured to return a player to the game after being diagnosed with a concussion.

Carson et al. (2014) found that premature Return to Play (RTP) and Return to Learn (RTL) resulted in half of the concussed students experiencing a return of symptoms despite protocols which revolve around the absence of concussion symptoms and a step-wise progression prior to returning. In addition, student-athletes are usually counseled by medical, academic, and athletic staff to rest physically, but may not be counseled to rest mentally before returning to class, reading, studying, watching TV,

playing video games, using the internet, and text-messaging, as all of these activities can prolong the student-athlete's recovery (McGrath, 2010; Sullivan et al., 2012).

Without a change to the current condition of support and treatment of student-athletes post-concussion, players will continue to have an increased risk of permanent mental and physical health issues (McCrory et al., 2009), and an increased difficulty in being successful academically (Healy, 2013). For these reasons, higher education institutions may face increasing financial risk in the form of liability lawsuits brought on by former or current student-athletes (Rhim, 1996). However, these issues can be prevented with adequate support for the student-athlete after suffering a concussion. Much is known about the best practices of concussion management and the various influences exerted on concussed athletes; in addition, researchers have informed us about concussions from the perspective of coaches, athletic trainers, neuropsychologists, neurologists, and primary care medical personnel. However, little is known about the student-athletes' perspective after concussion including: his/her prior knowledge of concussion, symptoms experienced initially and afterwards, the search for care, the psychological, emotional, academic, and athletic after-effects of not playing or continuing to play, and the support or lack of support from coaches, teammates, athletic department, and medical care.

Purpose of the Study

The purpose of this qualitative study was to understand student-athletes' experiences post-concussion and how their experiences compared to concussion

management policy. This study specifically sought to determine alignment between student-athletes' post-concussion experiences and concussion management policy.

Research Questions

1. What are student-athletes' experiences post-concussion?
2. How are concussions managed at the student-athletes' institutions?
3. What is the alignment between student-athletes' post-concussion experiences and concussion management policy?

Theoretical Framework

In 2010, following an influx of concern regarding management of sport-related mild traumatic brain injuries, Dr. Neal McGrath, an expert neuropsychologist and Clinical Director of Sports Concussion New England, presented a framework for supporting student-athletes' health and academic needs following a concussion. His model provides athletic trainers, or those whose primary responsibility is the health and safety of the student-athletes, with guidance on management and advising institutional colleagues about concussion recovery. The model consists of a 5-step process: (1) concussion education, (2) preseason baseline testing, (3) post-injury testing, (4) academic support during recovery, and (5) return-to-play decision; and a team of support to implement each step (Fig. 1). His model built upon expert consensus on RTP (e.g., McCrory et al., 2009) by including academic support with a detailed review of reasonable accommodations specific to addressing post-concussion symptoms and a system of professional support within the school setting.

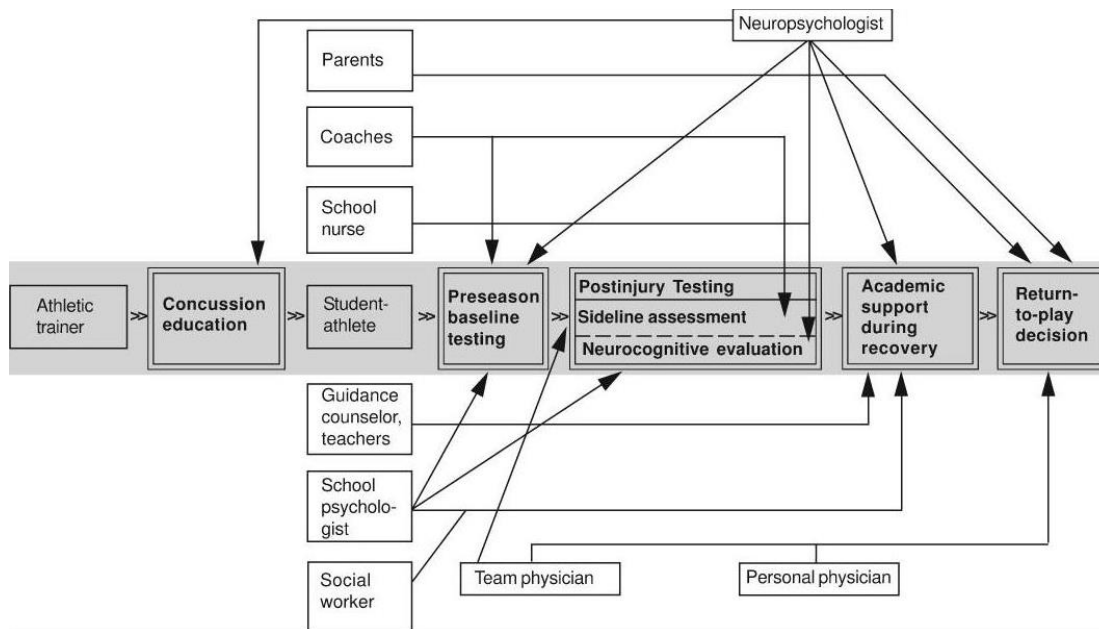


Figure 1. McGrath's framework for management of the student-athlete with a concussion. This figure illustrates a model for school athletic trainers to use in advising athletic programs about the health and academic needs of student-athletes who experience concussions. Reprinted from McGrath (2010).

This framework has since been used to look at the perceptions, attitudes, and practices of school nurses (Weber, Welch, Parsons, & McLeod, 2014), educators (Katz-DeLong, 2014), and principals (Heyer, Weber, Rose, Perkins, & Schmittauer, 2014) in secondary education; as well as in a study on athletic trainers in postsecondary education (Chinn & Porter, 2013) and in consensus statements from other clinical research fields (Harmon et al., 2013; McCrory et al., 2013).

This study used McGrath's (2010) student-athlete concussion management model to guide the research process in the development of the research design and methodology, identification of relevant literature, and in the analysis and interpretation of the findings (Merriam, 2009). Specifically, McGrath's framework informed data collection strategies such as providing questions to be included in the interview protocol, and also provided a broader context for understanding the study's findings. Since this study drew upon concepts and terms from the fields of sports medicine, athletic training, and neuropsychology, this approach fits well within the practices of "qualitative health science research in which investigators begin with a theoretical model, such as the adoption of health practices..." (Creswell, 2009, p. 62).

Significance

Previous research on the post-concussion experiences of intercollegiate student-athletes has been present in the form of anecdotal stories found in news reports or other forms of media. This research sought to obtain and analyze first-person accounts from the concussed student-athletes in order to advance the body of knowledge concerning post-concussion experiences of the student-athletes and uncover how their experiences

compare to the current concussion management policies of university athletic and academic departments. Effective existing policies provide new information which could inform and enhance policies and protect the short- and long-term physical, mental, and emotional health and safety of pre- and post- concussed student-athletes. The research also sought to identify relevant practices for supporting these injured student-athletes academically post-concussion.

While a plethora of literature exists in the fields of medicine and psychology on the topic of concussions, there is very limited research in the field of higher education administration. This study addresses two major gaps in the literature; a deficiency of research in higher education despite representing the student-athlete population, and a lack of research from the concussed student-athletes' unique perspectives. Findings from the student-athlete's individual experiences provide rich and thick descriptions attained through a qualitative design which should help shed light on the culture of resistant university departments, and ultimately, a framework for change.

Terminology

The following definitions are provided to ensure uniformity and understanding of these terms throughout the document.

Concussion: Injuries caused by a blow or jolt to the head, which can cause a disruption in the functioning of the brain (NRC, 2013).

CTE: Chronic Traumatic Encephalopathy is a progressive degenerative brain disease found in individuals with a history of repetitive brain trauma, including both symptomatic concussions and asymptomatic subconcussive hits to the head (Boston

University, n.d., p. 1). A potential long-term effect of repetitive brain injuries in student-athletes.

Illness behavior: “The ways in which given symptoms may be differentially perceived, evaluated, and acted (or not acted) upon by different kinds of persons” (Mechanic, 1961, p. 189).

Institution: For this study institution refers to all aspects of a university or college, including the academic, athletic, and student affairs.

mTBI: Mild traumatic brain injury is a concussion which exhibits minimal signs of central nervous system disruption and standard imaging will be normal (Morris et al., 2014).

Pseudotumor cerebri: Is a condition in which the pressure inside the skull is increased. The brain is affected in a way that the condition appears to be, but is not, a tumor (MedlinePlus, 2015).

Subconcussive event: Repeated sub-symptomatic brain trauma that occurs before the development of clinical manifestations (McKee et al., 2009)

Student-athlete: A college student that participates in at least one varsity-level sport recognized by the NCAA and is counted towards the roster limits. A student-athlete will not be referring to the scholastic (high school) level students unless specified.

Suspected concussion: When a student-athlete incurs an injury that is suspected by the athletic training staff to be a potential concussive injury. It is also considered a suspected concussion if a teammate, coach, and/or student-athlete themselves reports a potential head injury to the athletic training staff or any personnel with concussion

management duties. In essence, it is considered a suspected concussion if the student-athlete is identified with a concussive injury and undergoes any assessments or discussion with athletic training staff following injury. It is not dependent on diagnosis of a head injury. Specifically, in this study, suspected concussions are those that the participants shared with the researcher and met the above criteria.

Symptomology: The set of symptoms characteristic of a medical condition or exhibited by a patient (Oxford Dictionaries, 2016)

TBI: Traumatic brain injury is either a local injury from a direct blow to the head causing mechanical disruption of vessels or other brain substance, or a diffuse injury caused by a rotational force (Morris et al., 2014).

Chapter 2. Literature Review

To understand the experiences of student-athletes post-concussion, a review of relevant literature is presented in the following chapter. While there are numerous accounts and anecdotal stories of student-athletes' experiences with concussions in the media, there is an absence of qualitative research looking at this subpopulation of student-athletes. Almost every day there is a news story regarding sports concussion; and research on sports-related concussion has increased significantly in the last decade (Carroll & Rosner, 2011). Despite the concept of concussion being introduced in A.D. 900, it was not until very recently that scientists started to recognize that this mild traumatic brain injury was an emerging silent epidemic in sports that could cause "life-altering deficits as a result of something that didn't even show up on a brain scan" (Carroll & Rosner, 2011, p.xii). In less than five years, the "concussion crisis" has gone from a "silent epidemic" to the front page, with more than 97% of the total coverage by the mainstream sports media occurring since 2009 (Webb, 2014). However, there is much research left to do. According to researchers at the 3rd Matthew Gfeller Sport-Related Neurotrauma Symposium in March 2015, clinicians still know very little about CTE and are half-way there to fully understanding concussion. Therefore, this literature review will provide a snapshot of the current understanding of sport-related concussion as well as cover aspects pertinent to the student-athletes' post-concussion experience from literature in a wide range of fields including medicine, policy, and sports due to limited research on this subpopulation. Specifically, this chapter will address the short- and

long-term effects of concussion, the concussion management guidelines and policies, and additional factors influencing the student-athletes' experience.

Short- and Long-Term Effects of Concussions

A key to understanding the experiences of student-athletes, once they have incurred a concussion, must include the current medical knowledge on the short- and long-term effects of concussion. The literature on concussion and related conditions evolved slowly for the first 1,000 years, and it was not until after WWI that the subfield of sports medicine was born with the involvement of physicians and neurosurgeons in the care of athletic injuries (Stone et al., 2014). The research on mTBI has spanned all ages; however, this review will focus on studies involving college-level student-athletes.

Definitions. Over the decades an evolving view of concussions and concomitant increase in research has been driven by the escalating numbers of individuals diagnosed with injured brains from a jolt to the head, especially in sports (Carroll & Rosner, 2011, p. xii). A frequently cited incidence for concussion in sports-related activities is 300,000 concussions per year with loss of consciousness (LOC) and between 1.6 to 3.8 million concussions annually (Carroll & Rosner, 2011; Halstead & Walter, 2010; Langlois et al., 2006). Several researchers have proposed these numbers to be much higher as the CDC does not document individuals not seeking treatment, or who are seen in an outpatient setting or doctor's office for what they consider to be only "dings" or "head bumps" (Halstead & Walter, 2010; Langlois et al., 2006). The highest rate of concussion occurrence in student-athletes, during practices and competition, can be found in high collision/contact sports such as football, soccer, lacrosse, ice hockey, and wrestling

(NCAA, 2013). Collegiate student-athletes are subject to concussions and the potential severe sequelae of those concussions. Defining concussion, including how concussions occur, the incidence of concussion in student-athletes, the short- and long-term effects, and the management of post-concussed athletes will assist in preventing or ameliorating negative outcomes which can be found in both the short- and long-term recovery of these students.

Concussions are mild traumatic brain injuries (mTBI) (Bailes & Hudson, 2001; Gardner & Yaffe, 2015) which range from mild to severe on a spectrum (Bailes & Hudson, 2001). The terms concussion and mTBI are commonly used interchangeably, although some disagreement exists in this practice with some researchers classifying concussion as a subset or type of mTBI (Broglio et al., 2014; Gardner & Yaffe, 2015; Harmon et al., 2013). A sports-related TBI involves a head injury sustained by a player colliding with an object or another player resulting in either focal (localized) or diffuse injury (Morris et al., 2014). A TBI which results from forces being applied directly to the brain can be due to a direct hit to the head which disrupts the vessels or brain substance, or indirectly from an acceleration-deceleration injury where an athlete is suddenly stopped creating a shearing effect within the brain which can then lead to cellular changes (Broglio et al., 2014; Morris et al., 2014). The mechanical trauma the brain is subjected to can cause a primary brain injury which involves immediate and primary physical changes in the brain, or a secondary brain injury which evolves over hours to days later and can involve brain swelling (cerebral edema) or cellular changes (CDC, 2014).

Professional organizations as well as different clinicians and researchers have formulated their own definitions of sport-related concussion. The American Medical Society for Sports Medicine (AMSSM) defined concussions in sport as a traumatically induced transient disturbance of brain function involving a complex pathophysiological process with concussion existing as a subset of mTBI, which is generally self-limited and at the less-severe end of the brain injury spectrum (Harmon et al., 2013; West & Marion, 2014). According to the American Academy of Neurology (AAN) sports concussions are pathophysiological disturbances in neurologic function characterized by clinical systems induced by biomechanical forces, occurring with or without loss of consciousness where standard structural neuroimaging is normal, and symptom resolution usually resolves over time (Barr, 2014; Giza et al., 2013; West & Marion, 2014). The Zurich Consensus statement on sports-related head injury (McCrory et al., 2013) reported that a concussion is a brain injury that is a complex pathophysiological process affecting the brain and induced by biomechanical forces, and the NCAA used the same definition (NCAA, 2013). According to West and Marion (2014) of the above extensively used definitions, the Zurich Consensus statement (McCrory et al., 2013) is becoming the representative definition for management of sports-induced concussion in college athletes as the more meticulous definitions seem to be used primarily by the medical community. A more detailed definition in the Zurich Consensus statement includes criteria which allows for the inclusive management of concussion and mTBI in the student-athlete.

Most people recognize the term concussion rather than mTBI because it facilitates communication and is more easily understood by student-athletes, parents, coaches, and

the public (Kaut, DePompei, Kerr, & Congeni, 2003). However, Halstead and Walter (2010) suggested this could be risky as some may perceive the word “concussion” as being mild and less severe than a TBI, which can result in the student-athlete returning to school or play prematurely. Carroll and Rosner (2011) further noted that the appearance and disappearance of fleeting symptoms from a jolt to the head does not translate into an absence of injury to the brain; but rather becomes silent and is now thought to be cumulative leading to a greater possibility of more severe injury (Guskiewicz et al., 2003). The hidden nature of a concussion has over time influenced individuals into ignoring the management of their injury which could unfortunately give a student-athlete or coach an incorrectly perceived rational basis for prematurely returning to play. This has historically been problematic in concussion/mTBI management and continues to today; in A.D. 900 the alchemist Rhazes described the original concept of concussion, defining it as a transient, mild, and short-lived impairment in mental status resulting from a blow to the head (Carroll & Rosner, 2011). Stressing that a concussion is a form of TBI could lend gravity to the injury and elicit the necessary attention for responsive action. A lack of knowledge by stakeholders including the athletic coaches, student-athletes, parents, and public concerning the definition and symptoms of a concussion, as well as the paradigm of misperception regarding the seriousness of a concussion, could result in consequences leading to a dangerous lack of accurately reporting concussion, precluding concussion management interventions for the student-athlete (e.g., Robbins et al., 2014; Weber, 2010).

The student-athlete's perception of what a concussion is then becomes critical in identifying and reporting the injury and continues throughout the line of care in order to appropriately respond to returning the student-athlete to a healthy baseline. A study conducted by Robbins et al. (2014) found that student-athletes and the athletic community have not kept pace with the evolving medical definitions of concussion which include more mild and transitory symptoms and therefore present a challenge in self-identifying harmful brain injuries, as well as cumulative smaller injuries; and as a result this group contends that the inaccurate self-reporting of an athlete's concussion history can lead to negative health consequences as the number of concussions add up per individual athlete. The study asked the student-athletes to self-report their baseline history of concussion; after this the student-athletes were supplied with a medically accepted definition of concussion and asked to document their concussion history once more; a significant difference was found with 73% of the participants increasing their baseline reporting of concussion, 25% maintaining the same, and 2% decreasing their baseline reporting of concussion (Robbins et al., 2014). One important implication from this study highlighted the need for an accurate, standardized and succinct concussion definition which student-athletes, coaches, and parents can immediately recognize in order to improve concussion management.

Signs and symptoms. The signs and symptoms of concussion include short-term (7-10 days) or long-term effects (14 days to months or even years) and are individualized based on how they present in each athlete (McCrory et al., 2009; NRC, 2013) and help to demarcate where the injured athlete falls in the spectrum of concussion/mTBI (Fig. 2).

Spectrum of Traumatic Brain Injury

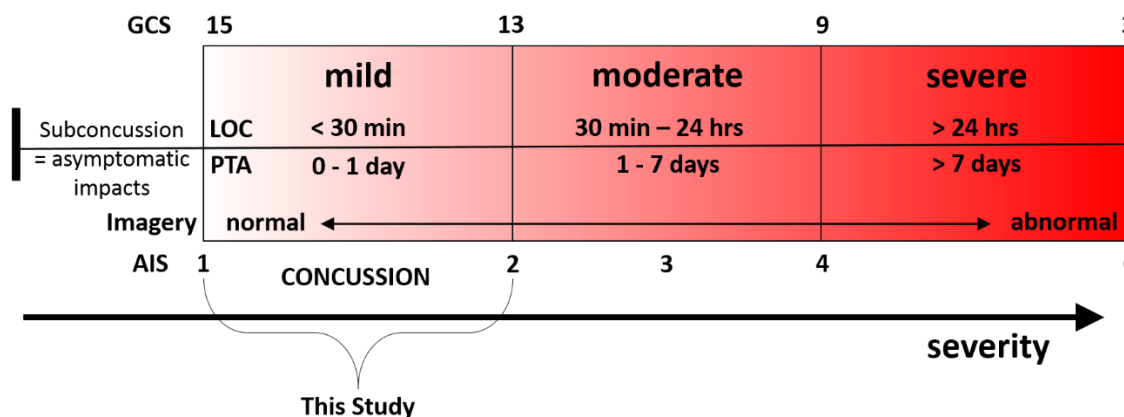


Figure 2. Spectrum of Traumatic Brain Injury (TBI). This figure illustrates the criteria used to classify TBI severity as mild, moderate, or severe. Concussion, the focus of this study, is a subset of mild TBI (mTBI). The five criteria located from top to bottom are 1) Glasgow Coma Scale (GCS), 2) Loss of consciousness (LOC), 3) Post-traumatic amnesia (PTA), 4) Imagery, such as CT scans, to identify structural brain damage, and the 5) Abbreviated Injury Scale (AIS), which ranks mortality risk of injuries. All five measures are used to classify TBI severity but no one criteria should be used alone. The figure was created based on (Brasure et al., 2012; Centers for Disease Control and Prevention, 2014).

Previously, concussions were diagnosed by utilizing one of the 25 grading systems which usually included the presence or absence of LOC, amnesia, and confusion (Halstead & Walter, 2010). Recently, the grading systems provided by the American Academy of Neurology, the Colorado Medical Society and the Cantu system (Cantu, 1996) have each been used to assess the presence and severity of concussion and the RTP competence of athletes with head injuries; however many groups and providers are currently recommending symptom-based checklists for a more objective model for diagnosis (Barr, 2014; Cantu, 1996; Halstead & Walter, 2010; Harmon et al., 2013). Four major sign and symptom domains are now being used by researchers and caregivers to diagnose concussion or mTBI: physical or somatic, behavioral or emotional, cognitive, and sleep (CDC, 2014; Harmon et al., 2013; NCAA, 2013; West & Marion, 2014).

The following symptoms of concussion organized by domain represent the most effective way of activating care for the concussed athlete, and include an important clarification that one or more signs or symptoms warrant a work-up for concussion, as well as being aware that the first symptoms may be evident immediately (LOC) or appear hours later in an acutely evolving suite (McCrory et al., 2013). *Somatic* symptoms of concussion include headache, nausea and/or vomiting, balance problems, fatigue, sensitivity to light and/or noise, numbness and/or tingling, and being dazed or stunned; *cognitive* symptoms are feeling foggy or slow, trouble concentrating or remembering, forgetting recent information and conversations, confusion about recent events, answering questions slowly and repeating questions; *emotional* symptoms comprise irritability and sadness; and finally, *sleep* symptoms are drowsiness, sleeping more or less

than usual, and difficulty falling asleep (Harmon et al., 2013; West & Marion, 2014). Two additional and specific signs of concussion in the student-athlete are LOC and/or amnesia. These signs are rare compared to the symptoms suite, with LOC occurring in just 10% of concussions (CDC, 2014; McCrory et al., 2009). Barr (2014) pointed out that at one time both the public and professionals thought LOC had to be present in order for an mTBI/concussion to have occurred, but today years of investigation have shown this to be incorrect; and is an example of the historical evolution of diagnosing concussion.

Most healthcare providers and researchers agree that the presence or absence of LOC appears to be one of the symptoms collegiate student-athletes under-report and do not recognize as a concussion symptom (e.g., Delaney, Lacroix, Leclerc, & Johnston, 2002). Inaccurate perceptions about concussion symptoms and management will prevent student-athletes from reporting and create critical delays in appropriate intervention. For instance, the use of terms “ding” or “bell-ringer” should never be used as this implies a normal state of brain health experiencing a slight hit (Broglia et al., 2014).

Agreement on the long-term effects of concussion by clinicians and researchers is inconsistent and in some cases does not exist. The American Academy of Neurology (AAN), the American Medical Society for Sports Medicine (AMSSM), and the Consensus Statement on Concussion (McCrory et al., 2013) have varying treatment and recommendation guidelines concerning the long-term sequelae of concussion (West & Marion, 2014). The AMSSM designates recurrent concussion and repetitive head impacts as contributing toward chronic neurologic impairment, and further states concern over

recurrent concussions causing chronic cognitive dysfunction (West & Marion, 2014). The AAN agrees with the AMSSM concerning the dangers of multiple concussions leading to neurocognitive and neurobehavioral pathology; McCrory et al. merely noted all athletes could develop problems and stated that healthcare providers should be aware of the potential for long-term issues (West & Marion, 2014). Post-concussion syndrome, chronic neurological impairment, chronic traumatic encephalopathy (CTE), mental health issues, and second-impact syndrome are long-term effects which can occur beyond the 7-10 days attributed to the acute phase of a concussion.

Post-concussion syndrome. Post-concussion syndrome can be defined as cognitive, physical, and emotional symptoms of concussion which are prolonged one to six weeks post-concussion (Halstead et al., 2013). Post-concussion syndrome is also defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* as three or more symptoms of fatigue, disordered sleep, headache, vertigo/dizziness, irritability, depression, and personality changes which last for three or more months (as cited in Halstead & Walter, 2010). However, the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* has complicated the understanding for clinicians, and the differences amongst researchers, by not including post-concussion disorder as a syndrome (as cited in Tator & Davis, 2014). Tator and Davis (2014) also stated that while most athletes will recover from concussion within a 10 day period, (disagreeing on the three month threshold) some athletes will continue to experience symptoms for months and even years, and commented that some never recover. In fact, evolving evidence gleaned from current research now supports sports-related concussions acquired

during collision sports as the persistence of concussion symptoms beyond one month (Montenigro, Bernick, & Cantu, 2015).

The incidence of post-concussion syndrome varies from 5%-58% of concussed athletes with the most common incidence reported between 10%-20% (Tator & Davis, 2014; Weeks & Tsao, 2012). Saigal and Berger (2014) found that resolution of the post-concussive symptoms occurred in a range from 10% of athletes at one week to 50% at one year post-concussion. Historically, Cantu (1996) first described the post-concussion syndrome, which he considered uncommon, to be from neurotransmitter functioning. Cantu also believed that the time period for symptoms was related to the length of any post-traumatic amnesia; today most experts believe post-concussion syndrome to be related to recurrent concussions particularly three or more concussions (Halstead et al., 2013; NCAA, 2013; Tator & Davis, 2014). Pre-existing conditions in student-athletes such as previous multiple concussions, concussions that have occurred within a short time period, and double-hit concussions (e.g., impact to head then hitting ground causing secondary impact) increase risk; but the greatest risk occurs when an student-athlete is concussed during a practice or competition, and then returns to play in that same event (Montenigro et al., 2015). Montenigro et al. (2015) conducted a retrospective cohort study to investigate the clinical characteristics and demographics of post-concussion syndrome in student-athletes; the study found that 80% had a history of previous concussion and averaged 3.4 concussions per athlete, each experienced 7.6 symptoms, 21% had a previous condition(s) (psychiatric, ADHD, LD, migraine headaches), and the median duration was six months. Identification of factors leading to post-concussion

syndrome in student-athletes by Montenigro and others currently being conducted will help researchers and clinicians continue to resolve the causes of this syndrome and what role it has in the development of serious neurodegenerative conditions including mental health issues, and chronic traumatic encephalopathy (CTE).

Mental health effects. Concussion in the student-athlete affects all aspects of what the brain controls, essentially every part of the human body and human experience. The standard for assessing the presence of a concussion is a mental status change, even though LOC occurs in only 10% of concussions/TBI and post-injury amnesia occurs in an estimated 25% of concussions (Guskiewicz et al., 2003). Mental status must still be assessed by using testing tools such as the Standardized Assessment of Concussion (SAC) which provides a 5-minute evaluation of orientation, short-term memory, concentration, and delayed recall (Broglia & Guskiewicz, 2009). Broglia et al. (2014) recommended a concussion management plan for each student-athlete which includes a baseline assessment encompassing a neurologic history. Once a concussion occurs in a student-athlete, it is important to establish the neurocognitive condition early and compare the results to the previous baseline testing. The comparison will help the clinicians and trainers individually manage the course of the concussion for the student-athlete.

As previously noted, in the United States it is estimated that 1.6 to 3.8 million sports-related TBIs occur yearly, and of that number 300,000 of these individuals experience LOC (Langlois et al., 2006). As has been documented throughout this dissertation, mTBI in the student-athlete usually resolves in seven to ten days; however;

Collins, Lovell, Iverson, Ide, and Maroon (2006) found that one in five athletes have a protracted recovery course of 3 weeks or more which means that 320,000 to 760,000 per year need additional management. Kontos, Marchetti, Henry, Elbin, and Collins (2015) agreed with this time period, noting that student-athlete recovery averaged three to four weeks. Given the full spectrum of signs and symptoms of concussion/TBI, the cognitive impairment category (attention, learning and memory, executive functioning, reaction time, reasoning and judgment, language and communication) is considered to be a benchmark of all TBIs (CDC, 2014); and depression after TBI with varying degrees of seriousness, is the predominant behavioral/emotional disturbance after concussion and is considered by researchers to be a major public health challenge (Roiger, Weidauer, & Kern, 2015). Since the signs and symptoms of concussion emulate behavioral and cognitive areas such as depression, attention-deficit disorders, learning disabilities and cognitive delays; then the student-athletes who have one or more of these mental health disorders preexisting the concussion can have these conditions worsen (Halstead et al., 2013). Mental health concerns for student-athletes pre- and post-concussion such as depression, learning disabilities (LD), attention deficit/hyperactivity disorder (ADHD), and mood disorders can be monitored by neuropsychological and neurocognitive testing (Reynolds, Collins, Mucha, & Troutman-Ensecki, 2014).

Experts agree that a prior history of concussion increases the possibility of more concussions and the dangerous second impact syndrome; but other risk factors such as LD (a disorder of the central nervous system), causes difficulty in understanding and using spoken or written language and can result in decreased ability to listen, think,

speaking, reading, writing, spelling or doing math, as well as ADHD which causes difficulties in attention and concentration, impulse control, executive functioning (organization, planning, time awareness, multi-step tasks) and interpersonal relationships (Etzel, Watson, Vissek, & Maniar, 2006). Reynolds et al. (2014) agreed that pre-morbid factors are critical to determining the correct concussion management for individuals with challenges such as history of migraines, LD, ADHD, depression, sex, and age. Harmon et al. (2013) considers LD and ADHD as having similar symptoms to concussion; the authors contended that the existence of these disabilities pre-concussion is additive to increased cognitive dysfunction and prolonged recovery, and should have pre-season baseline neurocognitive testing.

Collins et al. (1999) conducted a study with 393 athletes (LD incidence 13.5%) from four different universities using clinical interview, eight neuropsychological measures, and a concussion symptom scale pre- and post-concussion; they found that athletes with both LD and previous concussions performed more poorly than the athlete with only LD or the athlete with only prior concussions. In fact, they determined that pre-existing LD and concussion in student-athletes exerted a cumulative effect on the student-athlete resulting in compromised academic functioning; including decreased executive functioning and information processing, therefore presenting extreme academic challenges for these students (Collins et al., 1999).

Another pre-morbid disability which can be exacerbated due to concussion is depression. The mechanism for depression post-injury is thought to be from diffuse axonal injury causing changes to the white matter of the brain; and has been noted in

patients with depression with no concussion, and individuals with concussion post-TBI (Strain et al., 2013). Researchers used Diffusion Tensor Imaging (DTI) with fractional anisotropy maps (FA) to demonstrate that individuals with/without depression could be differentiated from each other based on damage shown on FA maps specific for depression (Strain et al., 2013). A study by Kerr et al. (2014) found that recurrent concussions in a group of former Division I student-athletes demonstrated a much greater risk for severe depression, as well as higher impulsivity and aggression. Kerr et al. corroborated several studies that have proposed a link between concussion/TBI and depression and other mood disorders (Broglia et al., 2014; Feddermann-Demont, Straumann, & Dvořák, 2014; Guskiewicz, Ross, & Marshall, 2001; Harmon et al., 2013; Roiger et al., 2015; Vargas, Rabinowitz, Meyer, & Arnett, 2015).

The psychological and cognitive challenges student-athletes face are overwhelming, but a student-athlete with a pre-existing disability has even more to overcome (Ferrante & Etzel, 2009). These student-athletes are struggling to handle the demands of being an athlete as well as meeting their responsibilities concerning academics. A student with depression and/or disability will struggle with the academics more than their non-disabled counterparts and will be challenged by additionally acquiring a concussion (Maniar & Sommers-Flanagan, 2009). In addition, a student-athlete with no pre-existing disability or depression could experience a concussion/TBI resulting in a new diagnosis of these disorders further challenging their academics and physical health (Trudeau et al., 1998).

Pre-intervention with intake interviews and testing establish a baseline for all student-athletes in contact sports. Kerr et al. (2014) recommended pre-neurocognitive and neuropsychological baseline testing for all student-athletes in a contact sport, and then repetition of the testing post-concussion to determine the severity, management, RTP, and RTL. A review of the literature on this tenet varies widely (see Concussion Management Guidelines and Policies section). For example, the NCAA (2014a) recommended a pre-participation, one-time baseline concussion history, assessment of cognition, balance evaluation, and symptom evaluation. However, these are only recommendations to the constituent schools and not enforced. In addition, a gap exists in the call for baseline neurocognitive and pre-concussion testing; the 4th Consensus Statement from Zurich (McCrory et al., 2013) pointed out that baseline neuropsychological testing has critical value for the student-athlete and notes that the panel considered this a recommendation but did not feel it needed to be a mandatory item for assessment. Broglio et al. (2014), the National Athletic Trainers Association Position Statement, stated that an individual's baseline measurements are the best approach to concussion management but it could prove to be unreasonable in light of administrative costs, time use, and effort.

The well-known University of Pittsburgh Sports Concussion Program recommends baseline neurocognitive testing using the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) computerized assessment (22-item post-concussive scale, 8 neurocognitive components, and 4 clinical composite scores) in order to assess the student-athlete after concussion in a more individualized manner by

comparing to the pre-participation assessment (Reynolds et al., 2014). These authors suggested that student-athletes frequently focus on the somatic symptoms such as headache, dizziness, nausea, vomiting, but rarely pay attention to changes they may have in concentration, focus, and executive functions. The student-athletes sometimes are not truthful about these lingering effects and do not consider the impact such symptoms have on academic performance. The student-athletes may not understand or recognize these effects as signs of concussion leading to protracted recovery. The use of ImPACT testing has been suggested for determining neurocognitive deficits when there is a lack of truthfulness concerning student-athlete symptoms and has been found to be sensitive to neurocognitive deficits with 95% accuracy (Reynolds et al., 2014). These results could assist the student-athlete by keeping him or her off the field if he/she is still exhibiting symptoms, and can bring attention to the significant and likely protracted psychological and cognitive needs of the student-athlete.

Student-athletes who have had one concussion are at an increased risk for another concussion. Student-athletes who are co-morbid with depression and LD/ADHD are at an even greater risk for protracted concussion. In addition, Guskiewicz et al. (2003) noted that three or more concussions can contribute to a complicated recovery from concussion. McGrath (2010) recommended that student-athletes should not be cleared from concussion until asymptomatic, including stability in memory functioning and post-exertion neurocognitive testing. With the harmful circumstances that can occur with cumulative impacts such as second-impact syndrome, post-concussion syndrome, or recurrent sub-concussive hits resulting in long-term negative consequences; it is

imperative that student-athletes are screened on arrival for concussion with neurocognitive baselines in order to assist in the best-practice management of concussion (Galgano, Cantu, & Chin, 2016).

CTE. Even small impacts to the head or body can affect brain function. For instance, recent attention to the phenomena known as “sub-concussive” mTBI from head impact is eliciting research on the possibility that cumulative minor hits can result in a long-term neurodegenerative disorder known as chronic traumatic encephalopathy (Barr, 2014). Saigal and Berger (2014) considered sub-concussion a milder form of mTBI and have found that the usual concussion set of symptoms are not present and are not acted upon by players, clinicians, coaches and athletic trainers leading to possible long-term injury effects and susceptibility to recurrent injury. Throughout the current literature, one shared finding permeates and that is the finding that repetitive concussive and/or sub-concussive hits are strongly suspected to be a source of causation for CTE (Bailes, Petraglia, Omalu, Nauman, & Talavage, 2013; Koerte et al., 2015; Montenigro et al., 2015). CTE can be defined as a progressive neurodegenerative disorder likely caused by multiple and repetitive mild traumatic brain injury (Bailes et al., 2013; Concannon, Kaufman, & Herring, 2014; Lenihan & Jordan, 2015; Montenigro et al., 2015).

Historically, in 1928 Harrison Martland noticed that boxers were exhibiting symptoms which included slow and atypical movements, tremors and confusion, speech difficulties, and subsequently called it “punch drunk syndrome”; in 1937 Millspaugh named this syndrome *dementia pugilistica* (Zetterberg & Blennow, 2015). Presently, much confusion exists concerning the cause and effect of CTE and prior to 2005 focused

on studies of boxers; however, in 2005 the first American football player was found to have CTE which elicited many studies thereafter (Gardner & Yaffe, 2015). Robbins et al. (2014) conducted a large study including the autopsies of 64 athletes and 21 military veterans, and found that 80% demonstrated the presence of a CTE brain. Additional studies by McKee et al. (2013) first demonstrated evidence of CTE in 97% of professional football players autopsied; and secondly revealed a correlation between the degree of neuropathological involvement with the number of years of football involvement, demonstrating a connection between cause and effect (McKee et al., 2013). Using the newly accepted criteria for diagnosing CTE (McKee et al., 2016), Bieniek et al. (2015) screened the Mayo Clinic brain bank of neurodegenerative disorders and neurological controls for the frequency of CTE among unselected individuals from the general population, which included a total of 1,721 male athletes and non-athletes from both contact and non-contact sports. They detected CTE in only patients with known contact sport histories; with 32% that played one or multiple contact sports (i.e., football, boxing, baseball, basketball, wrestling, and rugby) showing CTE pathology. Bieniek et al. concluded that the greatest risk for CTE is exposure to contact sports. Since all of the work has been conducted on brains at or after autopsy, the challenge exists in creating a paradigm for diagnosis of CTE in living individuals (Keener, 2016), in order to generate an effective and successful management plan for treatment of former and current athletes.

The path from healthy brain to a brain experiencing long-term effects, such as CTE, can be attributed to exposure and frequency over time to an accumulated history of concussive and sub-concussive head impacts for the individual athlete (Montenigro et al.,

2015). The average number per season of sub-concussive head impacts in football, as obtained by accelerometer measurement, began to accumulate early and continued throughout a player's career; for youth to middle school (5-14) it is 107, for high school (14-18) it is 625, and for the college student-athlete it is 1,125 (Bailes et al., 2013). Crisco et al. (2010) measured head impacts in 180 college football players using an accelerometer and documented 1,444 head impacts per player per season with 14.3 impacts occurring per game. In addition, the researchers found that offensive linemen are subject to the greatest number of impacts and typically record an impact on every play on the front of their helmets (Crisco et al., 2010). Schnebel, Gwin, Anderson, and Gatlin (2007) instrumented helmets with the Head Impact Telemetry System on the Casady High School and University of Oklahoma football teams. They found high numbers of impacts per player from high school and college student-athletes with impact velocities over the likely concussion threshold of >98g (based on NFL research) for skill positions once every 70 plays and once every 125 plays for linemen (p. 492-493); linemen experienced a greater number of impacts overall with the majority of lower magnitude (20-30g). Statistically, any impact over 60g was considered to be elevated (Schnebel et al., 2007). Sub-concussive hits are worrisome as they occur much more commonly than concussive/mTBI impacts but do not exhibit the acute symptoms of concussion, even though neuronal changes and alteration in the microstructure of the brain has been demonstrated by neuroimaging (Koerte et al., 2015).

Gardner and Yaffe (2015) described CTE as a tauopathy resulting from repetitive mTBI, and McKee et al. (2013) further explained that tauopathy is progressive deposition

of tau (p-tau) that appear in tangles and range from focal locations to widespread regions of the brain. Amyloid plaque (found in Alzheimer's Disease) can be seen early in CTE and some researchers contend that amyloid plaque deposition appears within days of TBI but tauopathy occurs in response to the toxic amyloid; on autopsy, tau is found in all CTE patients and amyloid in one half of the patients (Zetterberg & Gandy, 2015). Zetterberg and Gandy (2015) pointed out that amyloid can be tested for, and drugs exist to treat it; therefore if amyloid deposits lead to tau deposition then testing and treatment of amyloid in mTBI, or the acute phase of CTE, should be considered to possibly prevent CTE in the athlete's future.

The clinical symptoms of CTE can be organized into four categories; cognitive, mood, behavioral, and motor symptoms (Montenigro et al., 2015). Symptoms in Stage 1 begin eight to ten years after repetitive mTBI and include behavioral and mood difficulties such as irritability, impulsivity, aggression, depression, short-term memory loss and increased chance of suicide; Stage 2 exhibits neurological symptoms like dementia, gait and speech problems, and Parkinson's disease; Stage 3 has cognitive problems occurring with executive dysfunction and cognitive impairment; and Stage 4 displays dementia, word-finding difficulty, and aggression (McKee et al., 2013). Stages I-IV were associated with the collected histories of 35 autopsied football players including their length of time playing football, symptomology after retiring, and their age of death; for example, Stage 1 was associated with a shorter time playing, less severe symptoms after retirement, and older age at death (McKee et al., 2013). In addition to the former list of symptoms, many develop drug and alcohol abuse problems and exhibit

profound depression (Concannon et al., 2014). Unfortunately, there are no prevention strategies for CTE except for the avoidance of repetitive concussive and sub-concussive hits beginning with young student-athletes, and following the rest guidelines which prevent a concussed student-athlete from returning to play or school prematurely (Concannon et al., 2014). The media has informed the public about CTE and the hazards of playing contact sports, but this has created a jump to assumptions by many, and should instead be a subject for education and information-sharing which inform the student-athletes and parents about the possible risks of playing contact sports. Ultimately, the best means of preventing CTE is for the student-athletes, parents, clinicians, and athletic departments to acknowledge and practice the recommended guidelines on concussion identification, treatment, RTP and RTL, and continuing to develop safer playing rules.

Second impact syndrome. Second impact syndrome is a rare, usually fatal, traumatic brain injury where the person suffers a second impact before the symptoms of the first impact have resolved. Due to the limited number of cases in which this has been recorded, there is a great need for research to determine why this occurs so that it can be prevented (Weinstein, Turner, Kuzma, & Feuer, 2013). While it is rare, it is still something that needs to be considered by the medical staff in charge of caring for the student-athlete, and in the concussion management policies at higher education institutions. No matter how rare, there is evidence and prior knowledge of second impact syndrome (SIS), and it is important that those responsible and involved in the identification and treatment of concussions understand the risks and communicate those risks properly.

Concussion Management Guidelines and Policies

In 2010, the NCAA Executive Committee adopted a concussion policy and concussion management plan legislation (NCAA, 2013). The NCAA concussion policy and legislation requires all member institutions to have a concussion management policy on file with the following items included (paraphrased):

1. Annual education of student-athletes on the signs and symptoms of concussion and signed acknowledgement of responsibility
2. Process to recognize, remove, and evaluate student-athlete suspected of concussion by a medical staff member with experience in concussion management
3. Policy to preclude a student-athlete from returning to participation the same calendar day
4. Policy that requires medical clearance by a physician or physician's designee to return to athletic activity after diagnosis of concussion

Then in 2014, the NCAA provided its member institutions with an updated guideline on which to base their own concussion policies (Burnsed, 2014). These NCAA (2014a) concussion guidelines are recommendations only and are not enforced.

Therefore, there could be great variation in the content and implementation of concussion management policies among the member institutions. Moreover, Baugh et al. (2014) conducted the first study to determine member institutions' level of compliance to the 2010 NCAA Concussion Policy and Legislation and found the majority of schools had a concussion management plan. The study was based on a survey emailed to all 1,066

NCAA institutions' coaches, sports medicine clinicians and compliance officers. The results indicated that there was less compliance with the individual components such as the annual education of the student-athletes (Baugh, Kroshus, Daneshvar, et al., 2014); suggesting variation in concussion management among the NCAA institutions. This section will review in more detail the four major components of concussion management in college athletics; concussion education, testing, return-to-play, and return-to-learn.

Concussion education. The first step in communicating the risks of concussions and related conditions is through education. All major guidelines and policies, including the NCAA, on concussion management involves education of the concussion symptoms to student-athletes and coaches. However, concussion education needs to not only be a part of these policies but also needs to be effective. Research has shown that there is a significant lack of knowledge of concussion by student-athletes which has been suggested to play a role in the underreporting of concussion (Bird, 2014; Boyle, 2012; Fedor & Gunstad, 2015; Kaut et al., 2003; Kroshus, Baugh, Daneshvar, Nowinski, & Cantu, 2015; Miyashita, Timpson, Frye, & Gloeckner, 2013). Bird (2014) found student-athletes in contact-sports at one NCAA institution said that the main reason of underreporting was because it was not very serious of an injury. A retrospective study of Canadian college football and soccer players found only 23.4% of those who had suffered a concussion had recognized it at the time of injury (Delaney et al., 2002). This lack of knowledge and recognition of concussion symptoms by student-athletes highlighted the need for better education. In an early study on NCAA student-athletes' concussion knowledge, Kaut et al. (2003) found more than half of all student-athletes at one

Division I institution said they did not understand the problems related to head injuries. Since then, there has been an increase in public awareness on concussions, as well as, a push by researchers and some policymakers for better education. A survey in 2015 of NCAA Division I men and women student-athletes in all sports suggested there is an increase in concussion knowledge of common somatic and cognitive symptoms (Fedor & Gunstad, 2015). Yet, there remained a lack of full understanding of concussion symptoms such as emotional symptoms and sleep disorders (Fedor & Gunstad, 2015).

The continued lack of knowledge by student-athletes has prompted some researchers to determine what factors influence knowledge of concussion and the effectiveness of educational interventions. In 2012, Boyle found that collegiate student-athletes with a prior history of concussion scored significantly higher than student-athletes with no prior concussions. She also hypothesized that educational training would result in higher concussion knowledge scores, but did not find a significant difference. This contradicts many studies which have shown that formal educational programs are effective (Williamson et al., 2014). For example, a study of NCAA Division II men and women student-athletes in basketball and soccer found an increase in knowledge after the educational intervention even with a long delay in post-test (Miyashita et al., 2013). It is well-supported that there is a need for better education and reporting of concussions in order to prevent repetitive injuries especially any that may result in second impact syndrome (Williamson et al., 2014).

While the research on the effectiveness of concussion education is limited to survey research on student-athletes, there has been both qualitative and quantitative

studies determining the extent to which coaches, athletic trainers, physicians, and other medical personnel understand and apply concussion knowledge. Donaldson et al. (2014) conducted a review of more than 20 published studies which show limited knowledge and compliance with accepted concussion guidelines by physicians, athletic trainers, coaches, parents, and athletes (excluding college-level athletes). For example, only 3% of certified National Athletic Trainers' Association athletic trainers complied with their own position statement in 2005 (Notebaert & Guskiewicz, 2005); which has only slightly increased the following eight years (Rigby, Vela, & Housman, 2013). It is not much of a surprise that student-athletes lack a full understanding of concussion when those responsible for educating them (e.g., athletic trainers) do not fully implement the concussion guidelines. Unfortunately, even when key stakeholders (coaches and parents) are aware of the guidelines, it does not necessarily translate into changes in the student-athletes return to play behavior (Donaldson et al., 2014). Therefore, studies (Kroshus et al., 2015; Rigby et al., 2013) started to use the Theory of Planned Behavior to take into account motivational or behavioral intention to understand and hopefully apply interventions that increase compliance with concussion management guidelines and increase reporting behavior by student-athletes. Since the review of the literature yielded no qualitative studies of student-athletes who sustained a concussion in college, this interview study of student-athletes further aids in understanding why some student-athletes report and/or do not report concussion to varying support units.

Testing. With the lack of knowledge and reporting of concussions, it is important to have robust tools to accurately identify mild traumatic brain injuries in a timely

manner in order to prevent further complications. Unfortunately, there are no objective assessment tools that can definitively diagnose a concussion (Broglio & Guskiewicz, 2009); so, it is up to the medical support unit, preferably a neurosurgeon but usually a team physician and certified athletic trainer (Okonkwo, Tempel, & Maroon, 2014), to use several assessments along with disposition decisions (Putukian & Kutcher, 2014).

Fortunately, there is some promising research towards more valid and objective methodologies. One such example is a novel study looking at the retinal nerve fiber layer (RNFL) using optical coherence tomography (OCT) to determine if there was a relationship between RNFL changes and a history of mTBI (Bixenmann et al., 2014). Bixenmann et al. (2014) found significant RNFL thickening in NCAA Division I football players with at least one previously diagnosed concussion compared to the football players with no history of diagnosed concussion. They suggest a long-term pathologic difference between the student-athletes with a previously diagnosed concussion and the student-athletes without a diagnosed concussion.

Until the science catches up with the current needs, health care professionals will need to use the most up-to-date guidelines for assessment of concussion. There are three major times in which student-athletes are assessed during their respective sports seasons; preseason baseline testing, once an impact is suspected there is to be a sideline assessment, and follow-up (office) assessments if diagnosed with a concussion. Since this study focused on NCAA student-athletes' experiences following a concussion, I will concentrate on the NCAA's (2014a) suggested guidelines for concussion management as it is the governing policy over this population of student-athletes. In instances where the

NCAA's policy does not align with the scientific literature, the current research will be provided.

Before the student-athlete steps onto the field or court, he or she should go through a pre-participation assessment that includes previous concussion history, symptom inventory, cognitive assessment, and balance evaluation (NCAA, 2014a, p. 8), as well as, a history of associated modifiers of sports-related concussion and ideally include a comprehensive neurological evaluation (Putukian & Kutcher, 2014). The next step is the recognition and diagnosis in the event of an injury/head impact. The NCAA (2014a) does not provide specific guidance for recognition except that "student-athletes who are experiencing signs, symptoms or behaviors consistent with a sport-related concussion, at rest or with exertion, must be removed," and referred to an athletic trainer or team physician experienced in concussion management (p. 8). For diagnosis, the aforementioned health care provider "should conduct and document serial clinical evaluation inclusive of symptom inventory, cognitive evaluation, and balance assessment" (NCAA, 2014a, p. 9). The NCAA (2014a) then provides a numbered list of post-concussion management steps which do not align with all other guidelines on sideline assessment in terms of sequence but it does have the same generalized content. Immediately following injury (called Sideline Assessment), standard practice is to always rule out more serious injuries first by checking for loss of consciousness and the athlete's airway, breathing, and circulation (ABCs). Then, a standardized protocol should be used for diagnosis with an injury history, symptom inventory, observation (of speech and pupils) and palpation (pulse and blood pressure), cognitive evaluation, and a focused

neurological assessment including balance and postural stability (Broglia & Guskiewicz, 2009; Putukian & Kutcher, 2014). Of note, high blood pressure with an unexpected low pulse rate after physical exertion can represent increased intracranial pressure from a brain hemorrhage and would require emergency care (Broglia & Guskiewicz, 2009, p. 3). There are multiple options of tools that include the assessment of the symptoms, cognition, balance and neurological components. The Sideline Concussion Assessment Tool 3 (SCAT-3) is one such example developed by the Concussion in Sport Group and is suggested by the NCAA. Any symptom or sign presented during the assessments is enough to withhold a student-athlete from play (Broglia & Guskiewicz, 2009). NCAA (2014a) guideline states a student-athlete diagnosed with concussion should not return to participation for the remainder of the day; and oral and written home care instructions should be given to the student-athlete and another responsible adult who will monitor the student-athlete during the acute phase (p. 9). There should be a delay of 24 to 72 hours after the injury before the start of more in depth serial assessments (Okonkwo et al., 2014); during which the student-athlete should rest physically and mentally. Then, more in depth office assessments should take place with more comprehensive versions of the sideline assessments and neuropsychological testing to continue to monitor the concussion (Putukian & Kutcher, 2014).

It is important to note that every aspect of concussion evaluation is still greatly debated especially the immediate assessment of the injured athlete (Okonkwo et al., 2014). Okonkwo et al. (2014) stated “concussion evaluation remains a controversy with respect to diagnosis, management, and return-to-play guidelines for sports-related

concussion...especially true for the immediate evaluation of downed athletes on the sideline...” (p.82). There is no more timely example of this than during the 2015 NBA Western Conference championship when MVP Stephen Curry and Klay Thompson visually experienced two very different examples of head impacts which resulted in a delayed diagnosis of concussion for Thompson despite being cleared to return to play. This prompted the NBA Players’ Union to conduct a review of the NBA’s established protocol (Dubow, 2015). Clearly, concussion evaluation still has a way to go before concussion experts are confident in the assessment methods. Therefore, qualitative data from the student-athletes’ perspective on their experiences post-concussion will help researchers identify or improve testing methodologies such that increased understanding of their experience could lead to developing better techniques that increase reporting of symptoms.

Return-to-play. After a student-athlete is diagnosed with a concussion, the prescription is physical and cognitive rest to allow your brain to restore the energy lost during the trauma (Bailes & Hudson, 2001). This rest should include limiting computer use, texting, and video games to minimize over-stimulation of the brain, again this is so that the brain can recover its energy deficit. Once the student-athlete is asymptomatic, has a normal clinical exam, and is at their preseason baseline on the comprehensive concussion assessments while at rest (balance, cognition, and neuropsychological), then return-to-play progression can be initiated (Broglio et al., 2014; McCrory et al., 2013; Putukian & Kutcher, 2014).

Return-to-play (RTP) is a stepwise progression of monitoring symptom presentation through increases in physical exertion (NCAA, 2014a). The NCAA (2014a) guideline follows the graduated RTP protocol from the 4th International Conference on Concussion in Sport (see Table 1). After each stage, the student-athlete should rest for 24 hours and only move on to the next stage if asymptomatic. It would take at least a week to advance through the entire protocol if they are asymptomatic at rest at each stage; otherwise, if post-concussion symptoms persist then management should include a larger multidisciplinary medical team with expertise in concussion (McCrory et al., 2013). It has also been suggested that at the completion of the RTP progression, neurocognitive/neuropsychological testing should be conducted to determine full recovery (McCrory et al., 2013; McGrath et al., 2013).

It is important to note that RTP protocols are based on expert opinion and consensus not on empirical findings (West & Marion, 2014), therefore this protocol could change as more research is done specifically on RTP guidelines. To test the methodology of this RTP protocol, Lee, Sullivan, and Schneiders (2014) tested whether healthy individuals would experience postconcussion-like symptoms when submitted to the same tests as student-athletes diagnosed with a concussion. They concluded that the RTP protocol and cognitive tasks did not provoke additional symptoms in healthy individuals and supports the use of a symptom provocation model. While this theory is currently considered the best-practice for returning a student-athlete to athletic activity, there has

Table 1. 2014 NCAA Graduated Return to Play Protocol

Stage	Rehabilitation	Functional Exercise	Objective
1	No activity	Symptom limited rest - Physical (no exercise) - Cognitive (no TV, PC, gaming or intensive reading)	Recovery
2	Light aerobic exercise	Walking, swimming or riding a stationary bike. No resistance training	Increase heart rate
3	Sport-specific exercise	Individualized training - Running drills (aerobic) - No head impact activities	Add movement
4	Non-contact training drills	- More complex training drills (e.g. passing) and explosive movements - Progression from aerobic to anaerobic exercises	Exercise, coordination and cognitive rest
5	Full-contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6	Return to play	Normal game play	

Note. Adapted from (Feddermann-Demont et al., 2014, p. 1224; McCrory et al., 2013, p. 4).

been evidence to show that those responsible for managing student-athletes post-concussion are not fully compliant with these best-practices.

A retrospective study of one sports medicine physician's 159 patient records, who had provided systematic recommendations to those patients based on the existing consensus guidelines, discovered 43.5% of symptoms recurred or worsened after RTP and 44.7% after returning to school (Carson et al., 2014). Carson et al. (2014) suggested the premature return to play and learn is due to the lack of clear guidelines on cognitive rest and implementation of concussion management. A misunderstanding of cognitive rest was also found in a cohort study of 118 physical therapy students training to be sports medics (Sullivan et al., 2012). Both studies recommend better explanation of cognitive rest to the wider medical community. Another aspect of effective implementation is the baseline testing so that during the RTP decision making process the medical professional can accurately determine whether the student-athlete has returned to their baseline values. In a mixed-methods study, Chinn & Porter (2013) found that 71% of California Community College athletic trainers did not conduct baseline testing. A sample of those who did not conduct baseline testing were interviewed and explained that they did not have time on top of their job responsibilities and it was not necessary despite being familiar with the reported benefits. Clearly, better understanding and implementation of the currently accepted guidelines addressing the student-athlete's physical and cognitive domains is needed, as well as psychological modifiers and other co-morbid diagnoses when caring for the student-athlete holistically.

Return-to-learn. Even though collegiate athletes are also students, it is surprising that there is very little research and guidelines addressing the academic aspect of the student-athletes experience following a concussion. To date, there are no empirical studies on return-to-learn (RTL) protocol and very few studies that address the topic at all (Halstead et al., 2013). The limited number of studies on RTL may be the result of the majority of the research is conducted in the medical fields and not in the education fields. Only one study (Chinn & Porter, 2013) was found on concussion in a higher education journal when searched in the primary education publication database (ERIC) and scholarly search engine (Google Scholar). This study attempts to bridge the gap between the fields of medicine and sports with higher education where the majority of stakeholders and responsibility of the student-athlete reside.

The theoretical framework guiding this research study is one of those few studies that incorporates RTL as an integral part of concussion management. McGrath (2010) provides a concise guide for athletic trainers to follow for a comprehensive, more holistic concussion management program. His model was one of the first to suggest a multidisciplinary team to manage the academic and athletic sides of recovery. Since then, the more recent RTL guidelines (Hall et al., 2015; Halstead et al., 2013; NCAA, 2014a, 2014b) have included this key component in varying manners. When comparing these RTL guidelines, they all suggested RTL should occur before RTP protocol is initiated. As with RTP, the hallmark of care is rest and in the case of RTL it is most importantly cognitive rest. For the college student-athlete this means rest from the common cognitive activities such as reading, texting, watching TV, playing video games,

working on the computer etc., as well as not participating in team/sport-related activities including watching film, practice, meetings, travel to competitions, and student-athlete required study halls (Hall et al., 2015). It is suggested to rest completely for at least 24-72 hours post-injury but the total duration of rest will be based on the individual's recovery needs (Okonkwo et al., 2014).

In their concussion management plan, Hall et al. (2015) suggested neurocognitive testing and the SCAT-3 to be conducted during this period of complete rest before RTL and then RTP progression. This neurocognitive testing is then compared with the preseason baseline results by a neuropsychologist to make recommendations about treatment and RTL. After the complete rest period, a gradual RTL may begin with increased cognitive activities; if at any point symptoms reoccur or worsen then the student-athlete should return to cognitive and physical rest. Once asymptomatic, a third neurocognitive assessment and SCAT-3 should be performed. If after more than 10 days the student-athlete is not back at baseline, then the student-athlete should be referred to a concussion management expert, a neuropsychologist to perform more extensive testing, and disability services for more long-term academic accommodations. Only after assessments are back to baseline and the student-athlete is asymptomatic should the RTP begin.

Current guidelines for RTL (Hall et al., 2015; Halstead et al., 2013; McGrath, 2010; NCAA, 2014a, 2014b) provide the first step in educating key stakeholders in a more complete management of concussions. Even so, these guidelines also showed a lack of understanding of the academic accommodation process in post-secondary

education. Specifically, in the understanding of the laws (American with Disabilities Amendments Act, Section 504 of the Rehabilitation Act, Family Educational Rights and Privacy Act, and Health Insurance Portability and Accountability Act) that govern the process. In post-secondary institutions, it is the responsibility of the student to request and disclose any information pertaining to their disability (Chinn & Porter, 2013). Halstead et al. (2013) addressed the laws as they pertained to their audience of pediatricians which does not apply to post-secondary education, as the laws apply differently to these groups.

While all of these RTL guidelines suggested the inclusion of medical and academic support around the student-athlete, there are some very key variations that should be discussed. The NCAA (2014a) guideline includes the normative team physician, athletic trainer, neuropsychologist, counselor/psychologist, and coach, but also lists the faculty athletics representative or other faculty representative and individual teachers in their multidisciplinary team. The inclusion of faculty members would be inappropriate and would violate the privacy rights of the student-athlete according to federal law unless the student-athlete signed FERPA and HIPAA waivers for the release of protected medical information to the faculty members and the release of the educational information to the medical professionals (Halstead et al., 2013). Clearly, the current guidelines from the NCAA (2014a, 2014b) on RTL need to be updated with the aid of experts in the area of disability services in higher education, which has a professional organization called the Association on Higher Education and Disability (AHEAD). In addition, Chinn and Porter's (2013) qualitative interviews of community

college athletic trainers revealed athletic trainers were directly requesting academic accommodations from the student-athletes' instructors, but not all instructors were accommodating. Chinn and Porter suggest this can leave the student-athlete without any accommodations and recommended athletic trainers collaborate with disability services to help these student-athlete's during recovery. Another study by Jakiel (2013) of college disability services professionals' perceptions on concussion and mTBI concluded that increasing rapport and communication with athletic trainers would allow for better care of the injured student-athlete. The results from the survey showed that 59.3% of disability services professionals (N=133) from the Great Lake and Mideast Region said there is a need for more communication with athletic departments, 97.5% were familiar with concussion/mTBI, and ~91% had at least one case a year. As more accurate information is communicated among key stakeholders, student-athletes who sustain a concussion should receive the best possible care in the higher education setting.

Factors Influencing the Student-Athlete's Post-Concussion Experience

When conducting a qualitative study on student-athletes, factors external to the individual play a role in the student-athletes' experience post-concussion. Overarching factors such as the culture and subcultures of the institution and of sports, the media, and governing bodies, as well as personal influences on the student-athlete like their background and family may shape the individual's experience post-concussion. Some of the factors which will be discussed in this section include the long established culture of concussion in athletics, the NCAA, and the legal system.

Culture. A culture of resistance exists in sports that “negatively influences athletes’ self-reporting of concussion symptoms, and adherence to RTP guidance” (NRC, 2013, p. 3). When it comes to diagnosis and treatment of concussion, a primary concern expressed by the research community is the culture of underreporting. But many reasons exist for student-athletes’ subordination of their own health and welfare in light of a suspected or diagnosed concussion. Benefits exist for the student-athlete participating in the college experience such as learning to manage time, working with authority figures, goal-setting, self-challenge, and learning coping strategies to assist in winning and losing (Ferrante & Etzel, 2009). Unfortunately, student-athletes are also subjected to extreme stress in the form of institutional control over their daily personal choices, academics, and physical requirements; in short they have no representation in policy and lack of compliance can result in ejection (Ferrante & Etzel, 2009; Renick, 2013). Renick (2013) further stated that today’s college athletes are a part of a culture which operates for the benefit of their coaches, athletic department, university, conference, and the NCAA and, “he is treated as a commodity to be exploited for the benefit of others and is left with no viable alternatives to conformity if he wishes to participate in intercollegiate sports” (p. 551). The regulated life of a student-athlete does not allow for autonomous decision-making such as reporting a concussion, which might affect the team in a negative way, or jeopardize his or her playing time or scholarship (Huma & Staurowsky, 2012).

Student-athletes who report concussion or any injury which can require long-term rehabilitation may have feared that they would lose their scholarships. Until 2015, there was a one year cap on athletic scholarships per NCAA guidelines, and universities

renewed each student-athlete's scholarship yearly based on their commitment and how beneficial the student-athlete was to the team (Huma & Staurowsky, 2012). In this situation, both the academics and sport are no longer available to the student-athlete, and so there could be some student-athletes who decline to report concussion. Kerr et al. (2015) reported reasons for non-disclosure of concussions by 53 former college student-athletes, and they found: 1) did not think it was serious (90.9% [n=10]), 2) did not know it was a concussion (90.9% [n=10]), 3) did not want to leave game or practice (90.9% [n=10]), 4) did not want to let the team down (63.6% [n=7]), and 5) did not want to be pulled from future games and practices (54.5% [n=6]) (p. 609). Kerr et al. also noted that his study revealed that student-athletes have been influenced by today's media coverage of concussion.

The media could be initiating a culture change by virtue of exposure. Sports media, such as ESPN, have been shown to influence former collegiate student-athlete's knowledge. The previously mentioned, Kerr et al. (2015) survey of 130 former collegiate student-athletes, of which 53 reported sports-related concussions while in college, found that ~40% (n=21) of those who reported college sports-related concussions believed they had concussions that went undiagnosed (p. 609). The majority of the 21 respondents (~86%) said recent concussion knowledge from the media helped them realize they had head impacts that may have been undiagnosed concussions; half of them wrote ESPN specifically. This suggests that media plays a role in the education of student-athletes on concussion. However, the mission of ESPN is not to educate but to entertain sports fans: "to serve sports fans wherever sports are watched, listened to, discussed, debated, read

about or played” (Keller, 2012). The word educate is not in its mission statement but it is also not exclusionary either. Therefore, it may be valuable for the NCAA and athletic conferences to utilize their partners to include educational messages during their broadcasts of collegiate sports.

Coaches, parents, teammates and other peers also influence the culture of not reporting concussion in the collegiate student-athlete. Sports and athletes are elevated to extraordinary positions of regard, so when an athlete is side-lined with a concussion or other injury, the athlete is subjected to negative feedback of disappointment and unfilled expectations (Tunick, Clement, & Etzel, 2009). Student-athletes can be supported by educating the coaches, parents, and teammates about the severe consequences of not reporting concussions; which include second impact syndrome, post-concussive syndrome, accompanied by long-term sequelae such depression, cognitive impairments, and CTE (Collins et al., 1999; McGrath et al., 2013).

NCAA. The NCAA is grappling with calls to finally step up and provide new concussion guidelines backed up with oversight to assure full implementation. From 2002 to 2010, the NCAA did not update its concussion management policies despite being in possession of its own research indicating that between 2004 and 2009 there were 29,000 concussions sustained by college student-athletes with half of those in football (Pretty, 2014). Many student-athletes have suffered concussions during that time period alleged in a class action lawsuit against the NCAA (DeSantis, 2014) which was preliminarily approved by a federal judge in July 2016 for a \$75 million settlement (Berkowitz, 2016).

As a result of the settlement, the NCAA has agreed to preseason baseline testing for every student-athlete, no RTP by any student-athlete suspected of concussion in the same day, medical personnel at all games and practices for contact sports, requirement of universities to report and track concussions and their resolution, NCAA approved training to student-athletes, coaches, and athletic trainers preseason, and education of faculty for concussion-related accommodations (Luce, 2014). The NCAA has proposed and adopted policies and concussion management guidelines; however the NCAA needs to include implementation guidelines and enforcement, as well as a much more robust concussion policy to include long-term health benefits and integration of a vigorous return to learn (RTL) component.

In order to facilitate change in the NCAA concussion management policy, it is helpful to be aware of the process for organizational change within the governance structure. The NCAA is a large bureaucracy which requires cooperation from active members consisting of four-year universities, which are also another grouping of large bureaucracies. The recent changes to the structure of the NCAA will hopefully decrease the bureaucracy and provide a more effective means of supporting student-athletes. The NCAA Steering Committee (2014) stated that the rationale for change resulted from a need to decrease the hierarchal structure to a more collaborative structure which could engage more practitioners, not just administrators. In order to effect concussion management policy change which results in the NCAA adopting an effective and system-wide protocol, a proposal can navigate through the new Division I Autonomy Governance legislative process which can later be adopted by other divisions.

The NCAA Division I Board of Directors restructured the governance and legislative process in 2014 (NCAA, 2014d). This restructuring included significant changes to reflect an autonomous legislative process within the current NCAA Division I 2014-2015 Manual. In August 2014, the Proposed Division I Autonomy Governance Model included 65 schools within the five power conferences; ACC, Big 12, Big Ten, Pac-12 and SEC (NCAA Steering Committee, 2014). The NCAA business session for the Autonomy Governance schools was held during the second week of January in 2015, where proposals were introduced by the power conferences, and reviewed by the five conference Legislation Committee and the Governance Subcommittee of Board of Directors (NCAA Steering Committee, 2014). The structuring of the voting delegates from the 65 schools include 80 representatives; 65 votes representing each school as well as three student-athletes from each of the five conferences (NCAA Steering Committee, 2014). A vote could pass via two separate scenarios; 60% (48) of the 80 delegates and a simple majority from 3 of the 5 conferences, or a simple majority of the delegates (41) and a simple majority of 4 out 5 conferences (NCAA Steering Committee, 2014). The vote will then become final at the 5 conference business session every January and will not be subject to override (NCAA Steering Committee, 2014).

The components of the Autonomous Governance structure include specific areas and bylaws which can be acted upon: health and wellness, meals and nutrition, financial aid, expenses and benefits for student-athlete support, pre-enrollment expenses and benefits, insurance and career transition, career pursuits, time demands, academic support, recruiting, and personnel. Any changes in concussion management policy would

fall under the Health and Wellness NCAA Bylaw 16.4 (NCAA Steering Committee, 2014).

The new autonomous governance structure of the NCAA had several proposals up for vote at the 2015 NCAA Convention in January. Four of the autonomous components were proposed for legislative changes including; Insurance Career Transition (NCAA Bylaws 12.2 & 12.3) allowing borrowing for loss-of-value insurance against future earnings, Financial Aid (NCAA Bylaws 15.01.5-15.2.8.2) to include scholarships encompassing cost of attendance, General-to ratify the autonomous legislation collegiate model for the Power 5 conferences, and Health and Wellness (NCAA Bylaw 16.4) establishing (a) Concussion Safety Protocol Committee, (b) rehearse concussion procedures weekly in contact sports, (c) feedback to concussion committee on concussions experienced by student-athletes, (d) submit written compliance by coaches of contact sports (NCAA, 2014f). While these proposals provide a snapshot of the NCAA's influence on the student-athlete at the time of this writing, the NCAA is dynamic and evolving due to outside influences.

Legal and legislative implications. “Failure to properly regulate concussions has already exposed the NCAA to litigation, and will likely result in future court battles as more former college football players come forward to bring suits against the NCAA and its member institutions” (Pretty, 2014, p. 2361). Since that prediction was published in the Notre Dame Law Review, there have been more lawsuits by student-athlete plaintiffs and not just football players. On June 8, 2015, former University of Illinois soccer starter, Casey Conine, filed a lawsuit against the team's athletic trainer, soccer

head coach, athletic director, sports medicine director, and the Department of Intercollegiate Athletics for failing to follow their own protocol, mishandling her concussions, and ruining her career (Strauss, 2015). According to Rhim (1996), there is legal precedent for collegiate athletes to be provided a heightened duty of care for foreseeable injuries by colleges and universities (p. 348). Lawsuits against the NCAA (e.g., unsettled class action suit *Arrington v. NCAA*) and individual institutions (e.g. *Cody Silk v. Bowling Green State University*, 2013) may create a very strong incentive for change. If this holds true, student-athletes will receive more complete protection from their institutions. However, if the NCAA and its member institutions do not effectively address the concussion issue the Congress and other lawmakers seem more willing to legislate change (Pretty, 2014).

In 2006, a middle school football player, Zachery Lystedt, then 13-years old, suffered a preventable tragedy - second-impact syndrome. Lystedt played both offense and defense. At the end of the second quarter, as linebacker, he vaulted towards the opposing player to stop a touchdown and landed on the back of his helmet. He slowly and painfully got up, but did not lose consciousness, and walked to the sideline to sit out the required one play. Fifteen minutes later, another hit resulted in an intracranial hemorrhage and severe TBI. He continued to make great plays in the third and fourth quarters despite teammates noticing some uncharacteristic behavior like confusion. Moments after the game, he suddenly lost his vision, had a horrible headache, and collapsed. He underwent craniotomies after being airlifted to a hospital and survived with permanent disabilities. The premature return to play after his first concussion put

him at risk for the severe TBI. Then in 2009, Zachery's tragic story was turned into advocacy and the first concussion law to protect youth athletes (Ellenbogen, 2014; Williamson et al., 2014). Now, all 50 states and the District of Columbia have passed similar laws (Baugh, Kroshus, Bourlas, & Perry, 2014; Ellenbogen, 2014). Most of those laws include three action steps; 1) Education of coaches, parents, and athletes, 2) Removal of the athlete from play when suspected of concussion, and 3) Return-to-play after sitting out at least 24 hours after injury and only with permission from a health care professional (National Center for Injury Prevention and Control, 2014).

Baugh et al. (2014) conducted a systematic review and comparison of all 50 state laws on concussion for content variation, specifically analyzing the preseason concussion provision and acknowledgement of information receipt. They found a large variation in state law concussion information content and acknowledgement requirements; and suggested two rationales for inclusion of an acknowledgement form such as reinforcement of concussion education and the limitation of institutional liability. To examine the effects of the concussion acknowledgement provision and implementation, a pilot study of 734 male NCAA student-athletes on ten football teams was utilized. Of the eight teams that required an acknowledgement signature according to their athletic trainers, only 59.5% of those student-athletes answered yes to the survey question "were you required to acknowledge information about concussion signs and symptoms and that you have a responsibility to report concussion symptoms to medical personnel?" (Baugh, Kroshus, Bourlas, et al., 2014, p. 307). Their findings suggested signing an acknowledgement form did not necessarily translate into retained knowledge and

implementation of the NCAA's concussion policy and was inconsistent across institutions. In fact, an Ohio Court of Claims judge recently reversed a previous partial judgment to Bowling Green and is now allowing Bowling Green's "Release, Consent to Treatment, and Indemnification Agreement" to be called into question in the case of *Cody Silk v. Bowling Green State University* (Solomon, 2015, p. 1). In May 2016, Bowling Green settled with Cody Silk for \$712,000 stating uncertainty and risks at trial as reasons for settlement (Associated Press, 2016a). The outcome of this case and the growing number of class-action lawsuits filed against the NCAA and universities (Associated Press, 2016b) could influence the NCAA and individual institutions to dramatically change the current approach to educating student-athletes on concussion and use more effective strategies as suggested by numerous researchers (e.g., Kroshus, Baugh, Hawrilenko, & Daneshvar, 2014; Miyashita et al., 2013).

On the federal stage, there has been increased interest and bipartisan support for looking into the treatment and protection of student-athletes. In fact, there has been a recent renewed push for the National Collegiate Athletics Accountability Act (NCAA Act), HR 2903 that was introduced in the House in 2013 (Berkowitz, 2015). This time Reps. Charlie Dent (R-PA) and Joyce Beatty (D-OH) joined Reps. Bobby Rush (D-IL), John Katko (R-NY), Carlos Curbelo (R-FL), and Glen Thompson (R-PA) in introducing House of Representative Bill 2731 (2015) as an amendment to the Higher Education Act section 487(a) pertaining to the increased accountability of nonprofit athletic associations, and to have a commission to examine issues in intercollegiate sports.

Laws regulating concussion practices are also occurring on the local level. The City of Boston was the first to pass a law for the safety and well-being of college student-athletes (Solomon, 2014b). The Boston City Council proposed two ordinances: 1) “An Ordinance Creating a College Athlete Head Injury Gameday Safety Protocol (Gameday Safety Ordinance), and 2) “An Ordinance Creating a College Athlete Bill of Rights” (Bill of Rights Ordinance) (Santeusanio & McKendall, 2014, p. 1). The Gameday Safety Ordinance was passed and applies to all 4-year colleges and universities that participate in NCAA athletic events in any part of the city of Boston regardless of the domicile of the college or university. It requires the removal of any student-athlete that becomes unconscious or suffers a concussion from the event and bans the student-athlete from informal or formal athletic events in Boston until a licensed physician provides written authorization to return to play (Santeusanio & McKendall, 2014). For the sports of football, ice hockey, and men’s lacrosse at Harvard, Boston College, Boston University, and Northeastern, it requires an on-site neurotrauma expert consultant at all events located within the city limits which will apply to the host student-athletes as well as the visiting team members (Lee, 2014). Unlike the NCAA concussion policy, the Gameday Safety Ordinance will be enforced by the Boston Public Health Commission (Santeusanio & McKendall, 2014).

The proposed Bill of Rights Ordinance would be the first of its kind to directly address the long-term health issues related to concussions and other injuries incurred by student-athletes and their educational rights at the local level and goes beyond the enacted state laws (California and Connecticut) and proposed federal bills (Solomon,

2014a). Boston's Bill of Rights Ordinance would require Boston College, Boston University, and Northeastern University to cover a student-athletes full scholarship (up to 5 years) regardless of eligibility (unless not on academic good standing), and provide lifetime medical insurance and treatment for the student-athletes in cases where they were injured through participation in sport (Santeusano & McKendall, 2014). For comparison, the California law requires four PAC-12 schools in California to pay for insurance premiums and cover medical expenses for two years after eligibility is exhausted (Solomon, 2014b). Since the Bill of Rights Ordinance was in the proposal stage there is a chance it will be altered to compromise with dissenting stakeholders or shelved completely. During the public hearing in July 2014, representatives from Boston's three Division I schools did not support the provisions and voiced concern over the cost and potential competitive disadvantage (Associated Press, 2014). Despite some resistance, there is a growing concern by the public that has influenced changes by federal, state, and local policymakers. Still, more work has to be done to adequately meet the needs of these student-athletes post-concussion. Hopefully, this study gives a voice to those most affected.

Chapter 3. Methodology

Head injuries are a growing concern facing student-athletes who participate in sports. Student-athletes with concussions are at-risk for having permanent health issues that can affect their academic and personal success during and after they leave the institution in which they experienced the concussion(s). To further illustrate the challenges these student-athletes potentially face concerning concussions, the National Collegiate Athletic Association (NCAA) and university athletic departments have been impugned for the way university football players are inconsistently protected and treated pre- and post-concussion events based on NCAA guidelines and university concussion management plans (Rhim, 1996; Vaughan, 2013; Wolverton, 2013a). While there is a growing consensus on the management and safe return-to-play for athletes following a concussion of resting until symptom free, research has shown there is a significant lack of understanding concerning the concept of rest by those who have the primary responsibility of managing student-athletes recovering from a concussion (Chinn & Porter, 2013; McGrath, 2010; Sullivan et al., 2012) as well as a resistance to cultural change regarding concussions (National Research Council, 2013).

Student-athletes are educated to seek help from the team physician, athletic trainer, or health care professional before returning to play but they rarely are advised to rest from cognitive activities. Student-athletes could be resting physically, but not resting mentally if they continue to attend class, read, study, watch TV, play video games, browse the internet, or text-message; as these are all activities that can prolong the student-athlete's recovery (McGrath, 2010; Sullivan et al., 2012). However, little is

known about these students' experiences post-concussion. The purpose of this qualitative study was to understand student-athletes' experiences post-concussion and how it compared to concussion management policy. Using McGrath's (2010) framework for concussion management of the student-athletes' return to the classroom (Fig. 1), this study examined student-athletes' post-concussion experiences by addressing the following research questions:

1. What are student-athletes' experiences post-concussion?
2. How are concussions managed at the student-athletes' institutions?
3. What is the alignment between student-athletes' post-concussion experiences and concussion management policy?

Research Design

The use of qualitative inquiry helped enlighten the perspective of the student-athlete in concussion management (Morse, 2012); which had not been fully explored. Since the purpose of this study was to describe in-detail the experiences of student-athletes who have incurred a concussion while playing NCAA collegiate sports and then compare those experiences to concussion management policy, a two part methodology provided both the flexibility of data collection techniques, and multiple sources of data needed to address this study's research questions. This study used formal interviews and public documents as sources of data to describe, interpret, and understand the post-concussion experiences of student-athletes compared to concussion management (Merriam, 2009). From each current or former student-athlete's institution, I collected

institutional documents, specifically related to concussion management, in order to compare written policy to the student-athletes' post-concussion experience.

The key tenets of basic qualitative inquiry are “eliciting understanding and meaning, the researcher as the primary instrument of data collection and analysis, the use of fieldwork, an inductive orientation to analysis, and findings that are richly descriptive” (Merriam, 1998, p.11). Morse (2012) explained that qualitative research brings the researcher close to the participants so that data is personal, individual, and particular. Like Merriam (1998), Morse (2012) further expressed that in qualitative health research, the researcher documents individual events and evaluates care experiences, and groups these experiences to identify patterns. This approach allows for rich, thick description of the student-athletes' post-concussion experiences and a chronological examination of the events following a concussion.

Because the population of student-athletes who have incurred a concussion is not readily accessible, a qualitative health methodology was utilized. This particular approach was useful when seeking to identify phenomena or theories when participants have experienced a health issue (Morse, 2012). Modifications to the length of time and setting of the interview were needed and employed for former student-athletes with health concerns (Morse, 2012). Therefore, a basic qualitative study was best suited to gain an in-depth understanding of individuals with broad backgrounds and uncover the breadth of the student-athletes' experiences with concussion since they had not been studied. Each student-athletes' post-concussion experience illuminated the complexities of the situation and his/her meaning of the experience (Creswell, 2009; Merriam, 1998).

Furthermore, a qualitative design allowed for the ability to identify themes and compare them to a theoretical framework (Merriam, 2009). This qualitative study is compared to McGrath's (2010) framework (Fig. 1) and is descriptive and evaluative in intent (Merriam, 1998).

Population and Sample

This study used a purposeful sampling method. A purposeful sampling method (the most common type of non-probability sampling) is useful for identifying informants who can provide information-rich interviews (Merriam, 1998). The participants identified were current or former student-athletes who incurred at least one concussion while playing a collegiate sport. Study participants included current or recently graduated, former undergraduate student-athletes who participated in an NCAA collegiate sport as an athlete.

The population of student-athletes with a history of concussion is protected; and therefore, access is significantly restricted. Due to this difficulty in gaining access to this population, two types of purposeful sampling was employed. First, maximum variation sampling (Marshall & Rossman, 2011) was used to identify participants in a variety of sports, NCAA Divisions, and gender; for the purpose of documenting diverse variation in the population and identifying important common patterns (Marshall & Rossman, 2011). Next, snowball or network sampling was utilized to gain access to this population by identifying cases of interest from people who know student-athletes who have experienced a concussion and would be willing to discuss their experiences post-concussion (Merriam, 1998; Merriam, 2009).

Sample size was ultimately determined by information saturation (Merriam, 1998; Marshall & Rossman, 2011). Saturation was reached with seven participants who also provided a broad scope of student-athlete experiences. According to Merriam (2009) saturation is the point at which no new information is discovered, in other words, when redundancy is reached (p. 80). Once initial participants were identified, the setting (i.e., institution) of their experiences was used for determining the location for collection of the documents. Since maximum variation was the primary sampling method, the institutions also represent diverse variation in type and location (Merriam, 2009).

I identified potential participants through my professional and personal contacts, and networking. Then, I gained access to the student-athletes through their gatekeepers (e.g., their friends, family, and co-workers). I sent out requests for participation through email, Facebook, and/or text message, depending on the gatekeepers preferred method of communication, that outlined the study's goals and the interview process. The gatekeepers then decided on when and how they contacted prospective participants. This step was a required adjustment from the Institutional Review Board. In the original proposal, I was going to directly contact the prospective participants based on the contact information released to the gatekeeper with permission granted by the prospective participants. This adjustment created an additional barrier for access, as one of the gatekeepers put it: "that is more work for me and my friend, it would be so much easier if you could just contact him, here is their name and email..." Anecdotally, the population of recently graduated (especially since 2010), former student-athletes and gatekeepers preferred short communications through text messages or social media instead of email.

Data Collection

Two sources of data were collected in this study: interviews and documents related to concussion management. An application for expedited review was submitted to The University of Tennessee, Knoxville Institutional Review Board (IRB) and approved. In addition, an application for a National Institutes of Health Certificate of Confidentiality (NIH CoC) was submitted to the National Institute of Neurological Disorders & Stroke and approved through 08/26/2020.

Part 1: Interviews. One-on-one interviews were the primary sources of data for this study. I conducted semi-structured interviews (Merriam, 2009) with the participants to understand their post-concussion experiences (see Appendix A for interview protocol). A semi-structured interview was used as it allows the researcher to respond to the situation, and the emerging worldview of the participant, as well as to new ideas on the topic (Merriam, 1998). Interviews were conducted at the convenience of the student-athletes.

Every effort was made to conduct the one-on-one interviews face-to-face in a location most comfortable to the participant. However, interviews were face-to-face, over the telephone, or through the video-conferencing software, Skype. After confirmation of participation and scheduling of the interview, I sent out an email with the detailed logistics and a demographic data sheet (Appendix B). The demographic data sheet was intended to reduce the amount of time needed for conducting the interview; however, only one participant (the eldest) filled out the form prior to the interview. The informed consent was also attached to the email sent prior to the interview (Appendix C).

The informed consent form followed all guidelines set forth by the IRB and NIH and was distributed prior to the interview process. Consent was given verbally and recorded.

The interviews were recorded using a digital recorder and lasted approximately one hour. Prior to recording the interview, I discussed the purpose of the study and the participant's rights with them. The interviewees were assured of confidentiality through the use of pseudonyms, the right to end the interview for any reason, and that all data collected would be secured on a password-protected computer that no one else would be able to access. In addition, they would be protected against forced disclosure in any legal proceedings (Hicks, 2014) through the NIH CoC.

The recorded interview was transcribed verbatim following the interview, as this provides the "best database for analysis" (Merriam, 1998, p. 87). To assist in the data collection, I utilized field notes to provide a detailed account of my observations, feelings, experiences and perceptions throughout the interview process (Creswell, 2009). This aided in keeping an audit-trail of my interviews and provided context in the data analysis process.

Part 2: Documents. Public documents were the secondary data source collected to see if there was a discrepancy between the athletic program's policy and the student-athlete's experience. Document analysis is a rich method of portraying the values and beliefs of the participant's setting (Marshall & Rossman, 2011). I collected public NCAA and institutional concussion-related management and policy documents to determine the stated values and positions these entities have on concussion management of the student-

athletes. The concussion management documents were obtained for the period of time in which they were active student-athletes at their respective institution.

From each student-athlete's former institution, I collected institutional documents, specifically related to concussion management policies; to compare the written policy (a representation of the values of the institution) to the student-athletes' post-concussion experience. The documents were obtained through university websites, internet searches, and internet archives. I chose not to contact the athletic departments in order to protect confidentiality. Since one of the interview questions is, "Does your institution have a written policy?" this process will also act as a method for "checking the reliability of the informant" (Merriam, 1998, p. 91). This procedure was conducted simultaneously with the interview process so as to apply the linear but iterative process suggested by Yin (2009).

Data Analysis

Part 1. Data analysis and collection typically is conducted simultaneously and is an iterative process to allow coherent interpretation (Marshall & Rossman, 2011). After interview data was transcribed verbatim and organized, I read through all of the data again making notes regarding general ideas and tone (Creswell, 2009). Next, I began a detailed analysis of the data with coding using Tesch's (1990/2013, p. 142-145) steps of developing an organizing system (summarized below):

1. Chose one interview and wrote thoughts regarding their underlying meaning;
Went to step two after four data sets.

2. Chose a different interview, read it for topical changes and in the margin wrote the topics identified.
3. Repeated with additional interviews. Once I completed four interviews, I made a list of all topics, one column per interview, placing all columns on same sheet. Compared all topics by drawing lines connecting similar topics, and then clustered topics into groups. Chose labels for the topic groups and made a list.
4. Took list of topics and went back to data. Abbreviated the topics as codes and wrote codes next to the appropriate segments of the text. Looked for new categories and codes to emerge while working with all new interviews.
5. Found the most descriptive wording for the topics and turned them into categories. Reduced categories by grouping topics that relate to each other. Created a connecting concept/category map (see Appendix D for map created at this stage).
6. Made a final decision on the abbreviation for each category/code. Began first complete coding session on entire body of data (manually and using Nvivo).
7. Assembled data in one place belonging to each category/code and performed preliminary analysis manually. Preliminary analysis involved looking at each category at a time for content, then identified and summarized the content for each category. I looked specifically for commonalities, uniqueness, confusions, contradictions, and missing information with regard to research questions. Took stock of my organizing system.

8. When necessary recoded and made adjustments. Then, applied coding scheme to new data.

Throughout data analysis, I wrote memos to keep track of thoughts, ideas, and interpretations (Tesch, 2013). Next, I identified six (Merriam, 2009, p. 187) themes that resulted in the major findings for research question one and two. The themes were analyzed first by case then across the cases using data summary charts (see Appendix E for example chart) per category to aid the cross-case analysis and keep track of evidence (Bloomberg & Volpe, 2012). Then, the themes were compared to McGrath's (2010) themes (Creswell, 2009).

Part 2. Document analysis was conducted on concussion-related documents to identify institutional concussion management policy using the seven steps outlined by Love (2003, pp. 87–91):

1. Collected documents via internet searches, Internet Archive's Wayback Machine, and Time Travel by Memento.
2. Catalogued by assigning a pseudonym and the student-athletes pseudonym to the document(s) that can be used to track the document, its contents, and any analytical statements associated with it throughout the research process.
3. Determined context including its origin and reasons for being written or created, author, intended audience, the influences and conditions under which it was produced, and temporal, political, historical, and economic contexts in which it was written (Merriam, 1998).
4. Assessed authenticity.

5. Categorized by identifying a priori analytic categories that could be used later to sort documents as a way of searching for different patterns among categories (p. 90).
6. Coded using the organizing system created.

Part 3. The findings were compared and contrasted to determine alignment between the student-athletes' post-concussion experiences and concussion management policy. A simple matrix comparison was created to numerically evaluate the alignment to provide a consistent comparison between cases. I then used McGrath's (2010) framework to compare the lived-experiences of the student-athletes with the written procedures that student-athletes should experience. All of the data was searched for contradictory and confirming instances between the experiences, official documents, and the features of McGrath's model. The final step was to answer the question: "What were the lessons learned?" to inform interpretations that might suggest reform or change in the institutions' concussion management policies (Creswell, 2009).

Limitations

A limitation of interview studies is the accuracy of memory recollection or recall bias. However, all participants were interviewed within less than 10 years of their college experience and most within only a year or two of graduating; therefore, increasing the likelihood of accurate recollection (Kristman et al., 2014); and was a delimitation of this study. In addition, the use of network and snowball sampling was used to enhance the trust between the researcher and participant in hopes of increasing the likelihood of the student-athlete feeling comfortable in speaking freely, without fear

of retaliation. Therefore, no athletic departments or their employees were gatekeepers for this study. All interviews occurred away from their respective institutions.

The nature of qualitative research is not generalizable (Marshall & Rossman, 2011). To enhance the transferability of this study, several actions were taken including using maximum variation sampling method, and rich, thick description. The sample included current and former student-athletes from across the eastern United States in four separate sports, all NCAA divisions, and included both female and males student-athletes with both undiagnosed and diagnosed concussion histories.

There were also limitations to the document analysis; here is a quick note of caution to interpretation. Because all documents were obtained from public data sources, the concussion management information particular to each institution does not necessarily reflect the actual internal thoughts, actions or norms of the athletic staffs of each institution. However, for the purposes of this research, to understand the student-athletes' perspective, the documents are utilized to provide a deeper appreciation of their post-concussion experiences. In addition, due to the document collection archival nature of the data collection method it is also important to note that they may not represent all documents that were available at the time the student-athlete was at the institution (Love, 2003). To help mitigate the potential of missing an important document, much time and effort was spent searching archived webpages. Fortunately, several organizations around the world have been constantly archiving the internet for decades and college athletic site and institutional websites have all been archived frequently (International Internet Preservation Consortium, 2012).

Trustworthiness and Dependability

Trustworthiness was developed using rich, thick description, member checking, pilot interviews, triangulation, the presentation of negative/discrepant information, and clarifying researcher bias (Creswell, 2009; Merriam, 2009). By providing rich, thick description of each student-athlete's experience from the perspective of the participant and a description of the setting, the findings should become more realistic (Creswell, 2009).

Member checking allows the participant the opportunity to review and clarify statements and viewpoints for accuracy (Marshall & Rossman, 2011). After the conclusion of each participant interview, I discussed the desire to member check with the participants and provided them several choices of involvement, as suggested by Carlson (2010), in order to maintain rapport and avoid any harm to the "participant's dignity and voice" (p. 1112). I asked each participant if they would be willing and interested in reviewing their transcripts and/or initial findings. The majority of the participants wanted to receive the initial findings and the final report, but did not seem very interested in their transcripts. Therefore, I changed the proposed plan of sending the verbatim transcripts to sending partial transcriptions that would be included in the final report. According to Carlson (2010), this method increases trustworthiness and comfort in the eyes of the participant. In addition to the partial and interpreted transcription selections, the tentative interpretations (themes) were sent for determining if the participants felt the findings were accurate (Creswell, 2009). All responses from participants were positive and said the themes accurately portrayed their experiences.

Two pilot interviews were conducted to assure good order of questions, wording, and procedures (Merriam, 1998). The first pilot interview was conducted in-person with a current NCAA Division I football student-athlete who had incurred a concussion within the last 12 months. The second pilot interview was conducted over Skype with a former NCAA Division III football student-athlete who incurred a concussion over 12 months ago. The pilot interviews afforded the opportunity to practice the interview process, and allowed two unique participants the opportunity to give initial feedback on the interview protocol (Merriam, 1998). No changes were made based on the participants' feedback. Data from these participants were utilized in the study as the protocol and consent information was not altered. Consent was obtained from each participant after IRB approval.

Triangulation was used for both qualitative reliability and validity; and is an essential aspect of qualitative design (Merriam, 1998). The trustworthiness of the data was improved with triangulation of multiple sources of data (Yin, 2009). This study used interviews and documents to describe the post-concussion experiences of student-athletes, thus triangulating the data. The use of data from multiple perspectives, sources and procedures help ensure rigor and that the findings are useful (Marshall & Rossman, 2011). In addition, the use of university student-athlete profiles and other publicly available information was a third level of triangulation that confirmed key dates and demographic/background information provided by the student-athletes.

I also searched for disconfirming evidence in the data and presented the discrepant data in the final report to increase the trustworthiness of the findings

(Creswell, 2009; Marshall & Rossman, 2011). I did this by including discrepant evidence when discussing a theme. For example, when presenting evidence for a theme I included any contradictory perspectives from the general perspective of that theme (Creswell, 2009). In addition, an audit trail was kept to enhance reliability/consistency (Appendix F).

Ethical Considerations

The researcher has a responsibility “to respect the rights, needs, values and desires” of the participant (Creswell, 2009, p. 198). This study sought to not only respect the participants and do no harm, but to provide an outlet for these student-athletes to discuss their experiences, and potentially help educate others in the future. This section will discuss both “big E and little E issues” meaning ethical issues of respect, beneficence, and justice; as well as, everyday ethical issues that might arise during the research process (Marshall & Rossman, 2011).

IRB review. During interviews, sensitive information is frequently revealed (Morse, 2012). This is of concern for this study because of the student-athletes’ role and the institutions high visibility. Therefore, several precautions were used to protect the participant’s rights: 1) I have successfully completed ethics training through the Collaborative Institutional Training Initiative (CITI), 2) I obtained IRB approval prior to collecting data; 3) I obtained an NIH CoC to protect their confidentiality in legal matters, 4) I clearly explained the research objectives both verbally and in writing to each participant, and how the data will be used and collected including a description of data collection devices and procedures (see Appendix C); 5) I obtained verbal consent from

the participant to continue with the research; 6) verbatim transcriptions and tentative interpretations were made available to the participants; and 7) when choices were made regarding the reporting of the data, the participant's interests and wishes were prioritized (Creswell, 2009).

Interviews were conducted off-campus at a location of the participants' choosing in order to increase their comfort level. While there are minimal risks to the participants, one study risk is the inadvertent release of sensitive information from the interview. However, every effort was made to maintain the confidentiality of the study records, including the use of pseudonyms. All data were de-identified (transcripts did not include participants' names). Audio files were kept in locked offices and all transcripts were secured on computers with password protection to which only the investigator has access. All documents will be destroyed no later than December 2018.

Ethical concerns. Due to the fact that the participants in the study have experienced an injury, unique ethical issues may arise in the discussion of the participant's health such as depression or drug abuse. In addition, these student-athletes may feel pressure to not disclose their injury in the chance that it may affect their standing with their institutions.

Since, this topic is closely related to the medical field and a medical condition; prior to conducting the interviews, I sought advice and learned how medical patients feel when they discuss their symptoms, in order to "do no harm" to the participant, and anticipated potential ethical issues that might arise specifically related to one's own

thoughts regarding their injury. In addition, I sought advice on whether or not HIPAA regulations applied to this research.

Potential benefits. The use of a broad range of student-athletes from varying institutions may provide the ability for arriving at a concrete universal; whereby, if one was to encounter a similar situation the themes could be comparable and transferable (Merriam, 1998). By determining student-athletes' experiences post-concussion and how their experiences compared to current concussion management policy, this study seeks to educate the field of higher education, particularly university administrators, about a topic that has yet to be discussed in the literature, as well as to identify ways concussion management may be improved. Ultimately, this study sought to identify effective university policy that protects the health and well-being of student-athletes post-concussion.

Reflexivity Statement

I have never had a concussion or played an NCAA collegiate sport. My interest in concussions was inspired by my younger, adopted brother who suffered a concussion during football practice as a member of an NCAA Division I football team. Following that incident, I started to pay closer attention to national news stories and articles. Then, I saw the 2013 Frontline documentary "League of Denial: The NFL's Concussion Crisis," detailing the NFL's response to football-inflicted concussions, including its attempts to refute scientific evidence linking on-field collisions to early-onset dementia and brain damage (Kirk et al., 2013). This 117 minute long documentary changed my opinion of football, in the sense that as a result of the program, I cannot watch this sport in the same

way. Now, every time I watch sports on television I notice hits to the head and I am concerned; whereas previously I was an avid sports fan who enjoyed the intensity in which the game of football was played at all levels. I still enjoy watching college and professional sports but my heart drops now when an athlete suffers a hit or collision that could cause a concussion.

These experiences inspired me to read scholarly articles and reports on the topic of concussions. The combination of anecdotal information from my mother regarding my brothers' experiences and challenges, the growing media attention on the topic of concussions, and my physical therapist's insights as a former Division I football athletic trainer, helped me in deciding to begin reading the literature; where I ultimately found a major gap in higher education journals on this topic. The literature review yielded a wealth of results from the medical fields towards the importance of concussion management policies and education, but a dearth of information for the academic community educating these student-athletes. Therefore, I thought that the perspective of the student-athlete, having yet to be published, would be an important perspective to understand, in order to better educate both student-athletes who have suffered from concussions, as well as those who have not had a concussion. Just as important would be the need to educate the loved ones of the student-athletes in order to help them understand what a concussion is; its short- and long-term effects, resources for getting help and support, such as what they should do in the case their student-athlete experiences a concussion, and how to help them advocate and/or support him/her medically and academically.

I was also surprised by the lack of research in the field of higher education, because higher education consists of large populations of student-athletes who are directly under the purview of the institutions. I see this issue becoming more and more important as the number of lawsuits increase, and the publicly debated role of the student-athlete in terms of rights and responsibilities such as compensation increases. Therefore, higher education administrators and scholars should be aware of the perspective and issues concerning this group of students who are in many ways difficult to gain access to. This research aspires to give a voice to a population of students whose emotional, educational, and health needs may differ from other students; as well as, provide suggestions to aid higher education administrators in the decision-making process and to ultimately improve policies that benefit the welfare of these student-athletes and our universities.

Chapter 4. Findings

The purpose of this qualitative inquiry was to explore post-concussion experiences of collegiate student-athletes, their perceptions of concussion management, and how their experiences compared to concussion management policy. Seven student-athletes who experienced one or more concussions while participating in an NCAA sport were interviewed. Tesch's (2003) methods of qualitative analysis were employed followed by further analysis using data summary matrices (Bloomberg & Volpe, 2012; Miles, Huberman, & Saldana, 2014) to analyze the participant stories and concussion-related public documents from the institutions the student-athletes attended at the time of their residence. Seven themes emerged, framed in McGrath's (2010) framework for management of the student-athlete with a concussion, to answer the following research questions:

1. What are student-athletes' experiences post-concussion?
2. How are concussions managed at the student-athletes' institutions?
3. What is the alignment between student-athletes' post-concussion experiences and concussion management policy?

This chapter begins with profiles and background information of each participant, followed by the major thematic findings of this study in the following order of commonality and prominence; 1) Symptomology and its effects, 2) Pressure to return, 3) Lack of knowledge, 4) Inadequate support, 4) No rest, 5) "No" policy, and 6) Double-injury. Then, findings from a comparison of the student-athletes' experiences and the

concussion management policy is presented. The chapter ends with a brief summary of all findings.

Participant Profiles

The seven participants in this study represent four different contact sports from five different institutions across five different states in the South and Northeast. Table 2 shows a summary of demographic and concussion-related information for the sample. A profile of each participant is presented, in the order they were interviewed, for context and illustration. Each profile consists of a short description of the participant's background and an illustration of his/her concussion experience. The following short stories were based on the participant's interview responses but are illustrative in nature and in no way represent the complete story shared during the interview, as only facts around the concussion event(s) are included. The profiles also do not incorporate the feelings the participants expressed towards the events described for consistency and clarity.

The participants in this study represent a range of backgrounds and student-athletic experiences such as, football players from every NCAA division, with both diagnosed and undiagnosed concussions, and from varying institution types. Each participant has a unique story, experience, and perspective yet the data show many commonalities in their experience post-concussion.

John. A 24-year old Black male student-athlete, John had played football and basketball since middle school, but became very serious about football after his junior year in high school when college coaches from all over the country began sending him

Table 2. Participant Demographic Information

Name	Gender	Race	Age	Student-Athlete Status	Athletic Scholarship	Sport	NCAA Division	Region of Country*	Year(s) Experienced Concussion in College	Diagnosed immediately following injury ⁺	Previous Diagnosed Concussion
John	Male	Black	23	Current	Yes	Football	I	South	2013	Yes	No
Jack	Male	White	26	Former	No	Football	III	Northeast	2006	Yes	No
Alex	Male	White	23	Former	Yes	Lacrosse	I	South	2013, 2014	Yes	No
Smith	Male	White	23	Former and retired	Yes	Men's Soccer	I	South	2011	No	No
Jane	Female	White	22	Former and retired	Yes	Women's Soccer	I	South	2011-2012	No	Yes
Dan	Male	Black	23	Former	Yes	Football	I	South	2010-2014	No	No
Kevin	Male	White	25	Former	Yes	Football	II	South	2010-2013	No	No

Note. All information represents the participants' answers at the time of the interview.

*Official US Census Region of the Participant's NCAA Institution where he/she experienced concussion (Source: http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf).

⁺Diagnosed within one week of injury.

offer letters to play football at their university. He decided on Big Time University, a public research institution in the South, and was a star recruit and a starting offensive player at the large NCAA Division I university. John's career was progressing in a stellar manner in terms of player statistics and notoriety until he experienced a concussion in 2013. Prior to his concussion, he was aware of their existence, but became more informed about their impact during his own concussion and recovery.

John is tall in stature at over 6'5" with a very athletic build. When we sat down at his mother's kitchen table during his semester off from school to discuss his experience, his legs were so large and muscular he could not pull his chair underneath the round table. He explained to me that it had been several months since he had experienced his concussion during a practice in the previous season due to "a blow to the head" from a teammate during a routine play. He had run that play a million times, but this time it was different. It resulted in a lost day; a day that was only recounted to him later when he "woke up in the locker room." He was later told the student trainer "ran a bunch of concussion tests," but he did not pass any of them. A couple of days later, the team physician diagnosed him with a concussion. Even though he was held out of practice he was expected to go to class the next day, and to meetings the whole weekend with the worst headaches of his life, and all made worse by just a little sunlight. He decided on his own to stop going to class because he could not remember anything that was said. At his refusal to attend class, the head athletic trainer and team physician finally had him excused from classes. He missed the entire season, received a medical and academic redshirt; and at the time of this interview, he had not been cleared for physical contact.

Following the interview, he continued to play football and eventually pursued a career related to his sport.

Jack. D3 University, a private institution in the Northeast, recruited Jack to play as a starting defensive football player. He was a 26 year-old White male who appeared muscular and just under six feet tall. Jack was first diagnosed with a concussion in 2006 during his sophomore year of college. Jack was the only participant in this study who experienced his concussion prior to 2010, when the NCAA first required institutions to have a concussion management policy. According to him, when he played, concussions were not as big an issue as they are now. He first learned about concussions after he experienced one for himself, through what he described as self-directed learning and speaking with his brother who had experienced one “way back in the day.”

Over Skype, Jack described the first of what he thinks were four concussions he had experienced over his lifetime thus far: helmet-to-helmet contact with the opposing team’s scrambling quarterback, helmet hitting the ground, a broken nose, blood everywhere, and pain from a bright shining light in his eyes are all that he remembered. His team had only sent a “young assistant trainer” and two student assistants to the away game; so the three of them along with the opposing team trainer attempted to diagnose him on the field with “hey, follow my finger.” He returned to the game with no memory of the end of the game. The team arrived home late that evening. The head trainer said to Jack that it was too late for any testing, and to come in tomorrow morning for baseline tests. The next day, the head trainer conducted the memory tests to compare to his baseline and found them to be inconclusive for concussion, despite having symptoms of

loss of consciousness, sensitivity to light, and dizziness. They held him out for a couple of practices, then tested him to see how practice went, and ended up holding him out of the next game. He returned to practice and continued playing throughout his college career. After college, he continued to be involved in his sport by coaching collegiate football.

Alex. Alex excelled in academics, football, and lacrosse throughout middle school and high school. After receiving an athletic scholarship at one of the top lacrosse programs in the country, he left his home state to become a starting player at D1 University, a private institution. At D1 University, Alex was not only a four-year starter, he was also a stellar student and on the academic honor roll. His first diagnosed concussion was during his junior year of college in 2013, followed by a more serious one in 2014, his senior year. Prior to his concussions, he was minimally aware of their existence, and only then because of playing high-school football; but he became more informed about them his college freshman year during a pre-season presentation by the team doctor.

On a sunny afternoon in November, Alex and I met over Skype from our own apartments hundreds of miles apart. Alex was a 23 year-old White male with a large smile and relaxed attitude who seemed eager to relate his story. He had kindly taken a break from studying for a big, upcoming professional exam, to discuss his post-concussion experiences. Alex was no novice when it came to going through concussion protocol. Within one year, he had been through the protocol twice. The first was a mild concussion during a game his junior year, where he was cleared to practice the next day;

and the second was at a practice in the offseason of his senior year. The latter one was just prior to his last competitive season and it was different; this time he was diagnosed with a concussion by the head trainer. He took a direct hit to the helmet and was out for a full two weeks. Alex was tested frequently using the concussion protocols and he was eventually cleared to play full-contact, but he said it was a time of overwhelming tiredness and irritability. Alex returned for his senior season and after college moved to a major metropolitan area for a career in finance and banking.

Smith. Power House University, a large public research institution in the South, recruited Smith to play soccer. As one of the top players in the country, he left his home state to be a starter on the men's team. During his freshman year, Smith underwent pre-season concussion screening and learned of concussions via a physician delivered awareness seminar. His 2011 in-game concussion was never officially diagnosed because it occurred simultaneously with a major ankle injury. It was a priority to focus on Smith's ankle due to the severity and recovery time needed for getting him back onto the soccer field, and so his head was not evaluated.

Sitting at a kitchen table on a Sunday afternoon, Smith began to reflect on his career in soccer at two of the top universities for the sport in the South. He was a 23 year-old White male, approximately 5'7" tall, dressed in khaki shorts and pullover from the institution from which he graduated. Smith launched directly into the story about his double-injury involving both a concussion and ankle injury. All he remembered was getting hit in the head with the ball, waking up, and dragging himself towards the sideline at an away game. His ankle was so messed up he couldn't walk, but he also was seeing

spots, had a headache, and felt nauseous. He did not know if it was because of his ankle or head injury; either way, he did not tell the trainer. He said it would just mean more stress and only wanted to deal with one thing. The next day they boarded a plane to return to their campus, where Smith's teammate told the trainer "hey, he got like a head injury, you should like look at him." The trainer decided that since Smith was going to be out for four to five weeks due to his ankle injury, they did not need to look into the head injury. The trainer did follow-up on his head a couple of days later, but Smith admitted he misled her, telling her he was fine because he did not want to deal with a concussion injury, even though he had told his parents that he had probably had a concussion. His parents told him to tell the athletic trainer, but he "just never did." Smith eventually transferred to another top soccer university in his home state. He graduated college and started his career in the business world.

Jane. A top-rated soccer recruit, Jane became a star player for Big Time University, a public research institution in the South. She was also an outstanding student and on the academic honor roll. Her first and only diagnosed concussion was the summer before college. She had three or four undiagnosed concussions in college and she has estimated approximately 30 to 40 times in her soccer career where she got hit, hit the ground, or headed the ball on the top of her head. Jane had a team of physicians from a well-known teaching hospital that included neurosurgeons, neuroradiologists, neurologists, and others who determined that her rare symptoms were due to repetitive head trauma from years of headers and head collisions from soccer. She retired from

playing soccer with a medical disqualification, remained on the team, and graduated with honors. After college, she pursued her passion with a career in physical therapy.

We met in a busy coffee shop on a beautiful Saturday afternoon in the city where she lived. She was a petite woman who could easily be mistaken for a current college student-athlete; young, healthy, athletic. As she detailed her unique experience post-concussion, it was clear she was a well-informed and sincere woman. She had experienced concussions before, one diagnosed prior to entering her freshman year in college. In fact, when she arrived on campus a semester early, she was still recovering from that concussion. During the first team-led summer practice, she was hit in the eye, fell backwards, and hit her head on the ground. It was difficult for the athletic trainer to compare tests as her baseline was not truly baseline as she had not recovered from her previous diagnosed concussion. So, she was cleared to play. A year later, she was playing at an away game, after which she texted her friend “I got hit and my head really hurts.” But, she did not remember saying that. A week later, everything changed on a day she did not even play soccer. She was sitting in study hall feeling really tired, then later everything started spinning; thinking she was dehydrated or did not get enough sleep, she did not think anything of it. That game, she supported her team from the sideline. After the match when she and her teammates were signing autographs, she became dizzy and started getting really nauseous, like someone had drugged her or she was drunk. She was sick that entire night, went to urgent care, and was misdiagnosed with vertigo. Over the next seven months, she saw numerous medical professionals and went to physical therapy with no resolution. She could not see straight and was spinning

24 hours a day. She was then referred to a “neuro-ENT” and received a spinal tap. Her cerebrospinal fluid (CSF) pressure was very high, so the “neuro-ENT” drained some of the fluid. Jane was excited; “oh my gosh, I can see, this is awesome.” It lasted for one day. Over the next few years, she ended up having 14 spinal taps, and a referral to a neurosurgeon. At the time of the interview, she had undergone five brain surgeries.

Dan. As long as he could remember, Dan had played football. He grew up on the West Coast and received a full athletic scholarship to be a defensive football player for Big Time University, a large public research institution in the South. Dan was made aware of concussions in junior high when his friend suffered a concussion by falling off a bike and hitting his head. The experience was so disturbing that he has likened all concussions to that one for most of his life (including his own). His friend lost consciousness and had no memory of where he was, and then, slept all the time. Dan’s concussions throughout college were never diagnosed, but because he did not get knocked out, or sleep a lot, he did not report them to the trainers. Dan played for four years, and after college he continued to pursue a career related to athletics and training.

Over the phone, Dan had a rich and deep voice. He was a 23 year-old year old Black/African American male who played football from 2010-2014. He began with “I don’t think I have had a concussion to be honest,” well, not any major ones. He then explained the symptoms he had experienced throughout his football career. He would get hit and his vision would go all white like a blank piece of paper. He would not be able to see anything for about a half second to a second, and then his vision would be shaky and everything was hazy. He had headaches a lot, random migraines, light sensitivity, and

sometimes he would get nauseous. He dealt with his symptoms by drinking lots of water, taking Excedrin, and lying in a dark room. But, he always looked out for feeling drowsy because his friend from childhood slept, and his teammates would sleep when they had concussions, so he figured he did not have one. Looking back, he said that he now knows he had undiagnosed concussions, but in college he did not think they were severe enough for medical attention, and were never caught in the random concussion tests.

Kevin. D2 University offered Kevin an athletic scholarship for football as an offensive player from 2010-2013. Before transferring to D2 University, a Christian institution, Kevin had also played football for a junior college. Kevin had many injuries during his college football career including collar bone surgery; however his concussions were not diagnosed until an examination was done retrospectively by an NFL representative. Prior to his concussions, he was aware of their existence through stories from his father and the media. Several of the stories his father told him concerning his own concussions heavily influenced Kevin's concept and definition of concussion. Because of the concussions and other injuries Kevin experienced, he also had significant struggles academically but he did graduate. Following the interview, he continued to play football and pursue a career related to his sport.

Tucked behind a mall staircase at a small e-Cafe, Kevin arrived at our meeting; he was a 25 year-old White, tall, and very muscular male. He quickly detailed his experiences with concussion and other injuries throughout his football career. Kevin had not believed he had a serious concussion but as he related his concussion experiences he was able to identify the ones that had been undiagnosed. His sophomore year, Kevin was

running down the field blocking for a run play when his teammate took his legs out and the back of his head slammed off the ground. Everything went black, for a second, and when he stood up he was dizzy; but he was made to go back into the game by the coach. In another concussion during his senior year, Kevin again went up for the ball; his legs were taken out and his head slammed down on the ground, he then said he tried to leave the field but the coach told him “no, no, you need to stay in.” Those were two of the three concussions he remembered while playing college football. Each concussion had a temporary black out, dizziness, disorientation, inability to focus, and nausea. Since none of them had headaches or tiredness as symptoms, Kevin felt like he had not experienced a serious concussion until post-collegiate examinations by doctors.

Thematic Findings

The seven participants presented recalled their thoughts, feelings, perceptions, and experiences of concussion(s) in one-on-one interviews. From the data collected through interviews with these participants, seven major themes emerged that answer the first two research questions: 1) What are student-athletes’ experiences post-concussion? 2) How are concussions managed at the student-athletes’ institutions? Table 3 gives a summary of the thematic findings, sub-themes, and associated concepts.

The following seven sections present the major thematic findings in order of prominence and prevalence. Each subsection provides a discussion of the theme and sub-themes through evidence from participants’ responses. Participants’ quotations are derived from verbatim transcriptions of the audio-recorded interviews that have had the filler words of “um” and “you know” removed for clarity. In addition, the standard

Table 3. Summary of Major Themes

Major Themes	Associated Concepts
1. Symptomology and its effects	Symptom duration and severity, differences in diagnosis, impact on academics, hiding symptoms
2. Pressure to return	Internal pressure: wanting to play, duty to team and teammates, differences in game and position/role importance, non-disclosure/avoiding diagnosis, toughness External pressure: coaches, teammates, parents
3. Lack of knowledge	Student-athlete: general awareness, misunderstanding, influence on self-reporting Athletic program staff (athletic trainers/ coaches): lack knowledge, lack seriousness, need more education
4. Inadequate support	Lack support system, poor academic support, ineffective identification and baseline testing, feelings of no support by athletic staff, perception differences by diagnosis status, need better communication
5. No rest	No cognitive rest, varying symptom coping strategies, physical rest instructions, restrictions from practice, expected to attend meetings and class
6. No policy	Did not receive a concussion management policy, no recollection of receiving school's policy
7. Double-injury	Experienced simultaneous injury with concussion, complications with identification, diagnosis, and recovery

utilization of ellipses and author added brackets were used to provide further clarity. Italics within quotations represent words emphasized by the participant during the interview.

Theme 1: Symptomology and its effects. A major part of the participants' post-concussion experiences involved dealing with the symptoms caused by the concussive event(s). All participants in this study explained the concussion incident(s) along with the symptoms and feelings following the concussion(s) they incurred while playing in college. The specific symptomology of each student-athlete varied in the expression of symptom type and duration, thus representing a spectrum of concussion severity. The symptoms experienced post-concussion had effects on their academic and athletic lives.

Dan, who was never diagnosed, experienced headaches, visual changes, and nausea associated with his "smaller" concussions throughout his career. He recalled, "It would just be like a blank white sheet in front of my eyes for like at least a half a second to a second. And then after that one would go away, I'd feel a little hazy." On the other end of the spectrum, Jane described "seven months of complete misery," that started all of a sudden one day with an onset of exhaustion, then dizziness, nausea, and vomiting all night. During those seven months, her symptoms got worse and she "could barely get out of bed." Jane explained: "I can't see straight...I was constantly spinning like 24 hours a day, just spinning." Both Jane and Dan explained that their concussion symptoms were unpredictable and transient. Jane said "a lot of concussion symptoms come and go I'd say, and so, sometimes you are okay, other times you are really not." Dan described his headaches:

They come at random times, just sometimes throughout the day. But, they would definitely go away though, throughout the evening, especially later on after practice. Later on that day, sometimes they will happen in the early morning sometimes it will happen late at night, sometimes it would happen right after practice. I guess it is all depending on what we did that day or what kind of strenuous activity I was also doing on my body.

The most common symptoms participants described were headaches, hazy/dizzy/light-headed, memory loss, sleep disturbances, emotional symptoms of anger, irritability, frustration, nervousness, and helplessness, and vision changes with nausea. Also, every participant who experienced visual changes (4 of 7) also described nausea as a symptom following concussion. Smith recounted “I was seeing spots and I had a headache...I felt like nauseous.”

There were interesting commonalities within and across sports and diagnosis status. The majority of participants (5 of 7) from football, lacrosse, and soccer directly expressed how their symptoms affected their academic pursuits. Alex explained:

I definitely felt tired. Basically, I just kind of felt tired all of the time. I would sleep for 12 hours, and then I would wake up and still feel kind of groggy the first couple of days. Eventually, that went away. But I mean, even trying to read and do schoolwork for that first week it was pretty tough. So, I was excused from school work, but I didn't really want to get too far behind so I kind of tried to keep up as best as I could. But, it was pretty difficult, so I really didn't do school work for the next probably week and a half. I guess I just felt tired and a little irritable.

While Alex and Jane both expressed the feeling of not wanting to fall behind academically and pushed themselves to work before they were medically cleared to return to school, John and Kevin expressed a slightly different perspective when it came to the impact of their symptoms on classwork. They recalled the inability to learn when they had concussion symptoms, especially difficulty concentrating:

Anyone who is in pain is not going to pay attention to what you are learning...anybody who has a headache or is disoriented or experiencing some of those symptoms that come post-concussion. You don't pay attention. The last thing you are worried about is what you are learning. (Kevin)

...my symptoms as far as my headaches and I couldn't concentrate and I felt really sleepy. I felt really tired constantly, I laid in bed so much...it was in my best interest not to go to class cause it became a health issue at this point. It wasn't really about going to class and receiving an education, I got to take care of my health first... (John)

John and Jack commented on how going to class in the morning triggered their concussion symptoms of headaches from light sensitivity. Jack explained:

I would have like to have been told...stay away from bright light, cause that really messed me up, that's where I might not have gone to class or woken up early in the morning cause I remember all that week all I had was headaches going to class cause I had all morning classes.

Participants from every sport described symptoms of tiredness, headaches, light sensitivity and how the inability to focus impacted their ability to learn.

While symptomology was similar across all sports, frequency of the symptoms was greater among the football players. The majority of football players (3 of 4) and those specifically in high-collision positions expressed the chronic nature of concussion symptoms. John said “There is a play every single game that I get dizzy from, but I just continue to play and they call that fighting through the pain sort of thing.” Jack further explained “In football, you kind of always have a headache so it is hard to judge at that point.” The participants from football expressed how concussions are a part of the game:

I knew that like playing the game of football sometimes you are going to have headaches, it is a violent game. There are a lot of impacts. So, you know, this is a normal part of the game, and I play a part of it. It never really bothered me or worried about it. (Dan)

There was a difference in the duration of the symptoms with diagnosis. While the majority of participants (5 of 7) described post-traumatic amnesia and/or loss of consciousness, those participants who were diagnosed with a concussion within a week of the injury (4 of 7) expressed their lack of memory numerous times and lasting longer than those with undiagnosed concussions. John recalled:

I didn't remember too much. I took a blow to the head and I sort of well I blacked out and I really didn't know what was going on until I got back to our locker room. So, at that given time, you know I just I really didn't remember much. I

didn't know how the concussion happened I just remember waking up sort of and just you know asking what happened.

Those diagnosed were only able to recall their concussions based on information given to them by outside sources such as teammates, friends, film etc. Jane explained "...I had texted him [friend] saying like I got hit and my head really hurts. *And I don't remember saying that.* I don't remember texting that to him..." Undiagnosed participants had similar explanations and described in detail the temporary nature of their symptoms. For example, Kevin recalled:

Guy took my legs out, my back of my head slammed off the ground, and gave me a black out for a second. And then, get up, can't focus on anything. Feeling a little nauseous. ...You know my head did hurt for a second. It is like getting punched in the arm, it hurts for a second, goes away...I felt almost lethargic for the next play or so, before I just kind of got my bearing back about me.

The severity and duration of symptoms experienced by the participants played a role in their decision to self-report. The majority of participants did not disclose or lied about their symptoms (4 of 7), in college, and were not diagnosed within a week of injury. The expressed reasons for non-disclosure of symptoms were varied. Smith explained in relation to his simultaneous ankle injury: "...she [the athletic trainer] asked me about it and like questioned me 'are you okay?' but I told her like 'no, I am fine, I don't have a headache.' Cause I didn't want to have to deal with that too." A couple of the participants described the importance of remembering their concussion and not exhibiting more serious symptoms of concussion. Kevin commented "I never had any

memory loss. I never threw up after one of them. You know some of the major symptoms. Never experienced any of those.” Dan said:

...I was never at the point where I felt I wasn't I didn't know where I was or what I was doing. I never felt confused or you know out of body or anything like that. So, I guess I kept going with it you know until I seen anything that looked more serious.

A contributing factor to non-disclosure is discussed further in the following section, pressure to return. The underlying reasons for non-disclosure are complex and will be discussed in more detail in Chapter 5.

Theme 2: Pressure to return. All seven participants expressed the feeling of pressure to return to play after experiencing a concussion. The pressure to return to play after injury was due to two main sources: self and team.

Internal pressure. The strongest commonality among all participants was the feeling of self-pressure or wanting to play. Primarily, the student-athletes wanted to play each of their particular sports, even though a serious injury such as a concussion was confronting them. This was important because it could account for the subsequent participant perceptions on self-reporting of concussions; as well as their engagement and adherence to concussion management policies. Based on participant descriptions, there seemed to be a strong connection between values of hard work, dedication, team, playing time, and success. The participants defined success as a very short-term concept. Kevin described it in this way:

...you are not worried about 'hey I have a kid,' or you know, I have life after this. You are more worried about, 'well can I play?' Because in that moment, that is your life. And all the stuff that you do to prepare yourself and all the time that you put in, you don't want, you don't want any of that taken away from you, from an injury.

Jane reflected on the pressure she put on herself: "Oh pressure. I would like just stay awake at night like trying to figure out ways to come back faster." The expression of wanting to play varied from explicitly stating "wanting to play" to more implicit descriptions of their duty.

Most participants (4 of 7) described the pressure to return as an obligation to their team and specifically their teammates. Following are two illustrations regarding this sense of duty:

...I guess it is just the way I am. I am competitive, so I always wanted to help and play, do well. I guess being injured is, you are just watching and you like know you can help but you can't do anything about it. (Smith)

I just felt like I was letting them [teammates] down. So, when someone on the other team would score a goal I felt like I should be out there and kind of helping prevent that. And so, I just, it wasn't a good feeling. Just to see everyone else out there and you're just kind of on the sideline- helpless. (Alex)

The majority of participants (5 of 7) discussed the variability of pressure depending on importance of the game or their position on the team. Dan explained

“...there is always pressure depending on what position or what your role is on the team. I mean I felt like being a linebacker it is my role to always help no matter what injury or what situation...” Kevin described the value of a game and crucial play: “...that game my senior year, even though I wanted to come out, I was like I can't come out cause it was a critical time in the game.” Alex demonstrated his view with the following example:

I guess your priorities are a little different. I could think of a situation like I was saying we were in the Final Four and if you got a concussion and I think anyone would rather play in that game and risk whatever happened later in life because you only get one chance at that. So, I think you know I think people would take that sacrifice and try and play.

The fundamental value of wanting to play influenced the student-athlete's behavior. Several participants (3 of 7) specifically discussed the reasons behind not disclosing their symptoms and avoiding diagnosis:

“...I was just mad. (Ha-ha). I was mad because (ha-ha) like, our season started in a week or so. So, I, you know, I probably might have lied a little bit. So, they didn't think there was anything more to it. So, I probably lied a little bit, so that they wouldn't hold me back. They wouldn't keep me out of pre-season. Because I knew that, you know, my team needed me. I was a starter. So, I was really angry that, that happened [concussive event]. And you know, I was antsy. (Jane)

Yea and I think that is part of the reason why there is a little bit of I wouldn't say taboo, but there is, when you get under the concussion protocol you just kind of lose all control. So, it is like there is nothing you can do at that point. So, if you can just avoid that, that is kind of what most people want to do, is just not get under the protocol cause then you lose control over getting back and playing.

(Alex)

With detailed cross-case analysis, the data revealed an additional aspect to football players' perceptions of their own pressure to return. Two of the football players described toughness as a motivator of self-pressure. Jack explained:

I mean that like you know a little cockiness that have when they play football. It is fun to knock people out but you don't want get knocked out of the game. It is one of those things when you see the NFL, people are applauding with big hits and knocking people out, but if they are the ones getting knocked out it is just like you know maybe he is not strong enough, fast enough, good enough...I need to get back in there and prove that I wasn't knocked out. Like I'm fine.

Another participant reflected on his experience: "Well it starts younger, told to be tough, and so don't want to look weak. It's almost like you are brainwashed" (John).

External pressure. Pressure to return to play also came from outside entities including coaches, teammates, and parents. The majority of participants (5 of 7) indicated pressure to return to play while still injured. Given that only two participants expressed support from their coaches and teammates, it is not surprising that several

participants recalled difficult situations with their coaches. Many of the participants described various degrees of negative experiences with coaches:

And so, my coach, cause I started and I played every minute of every game, and I was my coach's star recruit whatever blah...I felt very pressured by him to come back...But, he was very *urgent*, because his job was on the line, to have me come back. And at the end of the year, we had our end the year meeting like we always do and...he said 'I really think I would still be there if you were, if you had played.' I was like 'thank you.' And so that kind of freaked me out a little bit. So, I was like wow I am the reason he got fired. Me jumping to conclusions, you know, it was obviously more than that. But um, so he didn't really understand. That was still in the stage where no one really understood what was happening. You know, they thought it was an inner ear and it would be healed in a month. And it wasn't. So um, he was getting frustrated and then he was let go... (Jane)

We were, the team I play for, we weren't doing too good. My position is kind of an important position...At this time, I was the best option we had at that position and they wanted me back really bad I guess. So, they pressured me to come back telling me things like 'we don't have many other options, you know, we need you back as soon as we can.' Every time I would meet with the coach, he would say 'we need you back out there man, we need you back on the field, we need you back on the field.' I'm like 'I wish I was back out there, I wish the same thing,

but you saying it and me doing it is a long shot.'...I didn't see that help from them, I didn't see that concern from them as far as my health. I just saw myself as more of like an object that needed to do what they said do at this point. So, when I would meet with the coaches they wouldn't ask how I was feeling they would ask when I would be back. That is one of the main things that I noticed then. It doesn't matter when I am coming back it is a matter how I am feeling and my health which they didn't seem to understand. So, I felt really pressured. I felt like everyone began to as far as the coaching staff began to act differently towards me because I wasn't coming back. I know their jobs are on the line and everything. Not even on the line but their first year they expected to do really good and everything. I don't know it just they weren't there like they should have been. And I feel like that happens quite often too. I'm just a player in their eyes. They are there to protect their jobs; they are just worried about winning games really. They weren't really concerned about my health. They were just worried about when I was coming back. I eventually didn't come back and our season didn't end up going that well but it happens. (John)

You know, in the game, my senior year, I actually tried to come out of the game my senior year. And they were like, I started walking to the sideline, and they were like 'no, no, you need to stay in' and you know kind of, somewhat disoriented I was just like 'alright,' so I just turned around. (Kevin)

While the majority of participants only expressed pressure from their coaches, one of the participants (1 of 7) also expressed pressure from her parents. Jane described their joy in watching her play and the feeling of not wanting to disappoint them. She explained “I think they were or at least I don't know if they actually were but to me I felt like they were disappointed that I wasn't able to play.”

Theme 3: Lack of knowledge. The third prominent theme that emerged from the data was a lack of knowledge regarding concussions. Based on the perceptions of the student-athletes, there was a lack of knowledge by both the student-athletes prior to incurring a concussion and the athletic programs' staff (athletic trainers, coaches, etc.); in terms of basic medical knowledge and proper concussion procedures. Retrospectively, the student-athletes were surprised by the misidentification and management of the concussion symptoms by the athletic trainers and coaches. While they were playing, the participants had a lack of knowledge concerning concussion symptoms and so they could not judge or assess their own risk of concussion, or the skill of the athletic staff. The lack of knowledge was compounded by the lack of information or successful concussion policy for the athletic staff, coaches, and student-athletes. The depth of concussion knowledge was minimal and most participants (4 of 7) referred to having only a basic knowledge of concussions.

Prior to experiencing a concussion, the majority of student-athletes diagnosed (4 of 5) described how they had a general awareness yet misunderstanding of mTBI. John explained:

Well, before I received my concussion, I just heard about concussions. I didn't know what it was or what it did really, I just knew that it was a problem. Even some guys in the locker room, they laugh about getting knocked out in a game, getting their bell rung and their eyes roll back in their head, and you get dizzy. Little do they know that is a form of concussion. I didn't even know that until now...But, now that I have been diagnosed with a concussion I know that is a form of concussion, before I didn't. That is one of the main things I now know. And it is a lot more serious than I thought it was.

Similarly, Jack said “going into it I didn't think much of it, it was just like ‘hey you forgot your memory’ that was about it. You didn't know all the other traumatic things that were going on with your head in the pad [helmet].” The participants also suggested that prior to getting a concussion they were unaware of the impact a concussion could have on their long-term health. Jane commented “I knew that concussions were bad but I really didn't understand at the time kind of I guess the future effects of it.” Jack commented how he still has symptoms of the concussion eight years later and wishes he had been better informed on how to avoid concussions and mitigate their effects.

The majority of participants (6 of 7) referred to the athletic program staffs as lacking the knowledge and seriousness for adequately managing the student-athletes post-concussion. John stated “I feel like our entire staff didn't have any knowledge of what to do about a concussion. I feel like they did the same thing over and over again. They didn't know how or what to do.” This lack of knowledge further reinforces the “Culture

of Resistance” that exists amongst athletes, parents, and coaches in reporting concussions (NRC, 2013). As demonstrated by John’s perspective:

I think the biggest thing is just lack of knowledge. A lot of people do not know how serious concussions can be and how to treat them. It is becoming a big deal in college sports and I think it is being overlooked every day. I think coaching staffs should be a little bit more educated also. I think they will be because previous incidences in the NFL, well I hope that they are. Concussions have been around for a long time and they are starting to learn about it now. So, I think the biggest thing is just lack of knowledge that people have and adjusting to it.

Dan further explained: “But, I do really feel like there should be a little more with the coaches and the trainers especially in college football...cause a lot of people get back, they come back too soon. And then, they are re-concussed within the next game.”

Participants expressed concern for the current level of knowledge of student-athletes and staffs; the majority (5 of 7) recommended education as an important method for improving student-athletes’ experiences post-concussion. Jack stated:

It was one of those things where I was not told or taught about concussions. Everyone knows what they are, yea you get knocked out, but what to do before or after would be key for my people [DI football cornerbacks] because a lot of people do not know when or when they do not get concussions. We would like to think that everyone is diagnosing them instantly but that is not the case. A kid gets a concussion then the next day tries to go for a run is light-headed and passes out or even feels light-headed he should know, oh

wow I had a concussion in Friday's game or something like that. But, I do not know if that is so much expressed in today's society as much as 'hey let's make the equipment safer' and the game safer. But, education goes a *long* way.

Jane said this about higher education administrators and faculty:

And so, I think that is really hard for people that haven't experienced it to grasp that. And so, I definitely think that people should be, you know educators etcetera, should be more educated on especially with athletes or anyone, if someone is riding a bike and they fall off and they hit their head like I think that people should, I think that people should be more educated on concussions.

It is noteworthy that two of the participants received formal pre-season education on concussions in the form of a presentation/seminar and neither mentioned the need for more education. Table 4 provides a summary of each participant's concussion management experience as related to McGrath's (2010) key areas of concussion management: concussion education, preseason baseline testing, post-injury testing, rest, RTL, RTP, and team of support. The table also shows the duration between diagnosis and injury of the participants and who handled their medical care.

Theme 4: Inadequate support. The fourth prominent theme that emerged from the data was the majority (6 of 7) of the participants' compelling descriptions of inadequate support. Participants initially related feelings of being powerless, confused, and misunderstood as they tried to navigate the detrimental effects of concussion; while at the same time, trying to function on the level of a non-concussed student-athlete. The

Table 4. Participant's Concussion Management Experience

Name	Concussion Education	Preseason Baseline Assessments	Post-injury Testing	Mental + Physical Rest	RTL	RTP	Team of Support	Duration between Diagnosis and Injury
John	Discussions	Yes	AT, TP (6+ doctors; NP - external medical care)	None	No	AT	No	Same week by TP
Jack	None	Yes	AT	None	No	AT	No	Next day by AT
Alex	Presentation by TP (included)	Yes	AT	2-3 days	AT	AT	No	Same day by AT
Smith	Freshman Seminar by TP (specific)	Yes	None	Physical Only	-	-	Yes ¹	Never diagnosed
Jane	Poster	Yes	AT, TP (20+ doctors; external medical care)	None	AA, TPsy, Disability Services	AT	No	> 1 year
Dan	Discussions	Yes	None	None	-	-	Yes ¹	Never diagnosed
Kevin	None	No	None	None	-	-	No	> 1 year

Note: AT= Athletic Training Staff (including student trainers), TP= Team Physician, TPsy= Team Psychologist, AA= Team Academic Advisor, and NP= Neuropsychologist. 1= perceived there “would have been” a team of support if their concussions would have been diagnosed. Dashes (-) = Not applicable

student-athletes soon discovered that deficiencies in knowledge by both the academic and athletic departments resulted in the deficit of support.

At first, the student-athletes were unaware of this occurrence. They were still experiencing the known effects of concussion. However, a multi-layered performance standard, consisting of input from the coaching staffs and the academic departments, soon revealed that only a token examination by the athletic trainers, with a resulting demand to undergo post-injury and return-to-play testing (as required) was the primary focus. Minimal standards were required for the overwhelming majority of participants (6 of 7) to return to the field of play, and minimal, if not sub-minimal, requirements were quickly satisfied without a demonstration of support.

According to John, “You think they have health in interest but when something like this happens I found they didn’t. That’s how I felt anyway.” John came to understand that all athletic staff really wanted was him to be back on the field playing, or in class to remain eligible to play, while at the same time he could barely function as an individual. He began to wonder why the coaches who represented themselves as caring and family began to turn on him. Eventually he concluded:

It also just comes down to how much you care about another person. Because I know if I was a coach I wouldn’t want anyone, being that I have been through a concussion, I wouldn’t wish it on any player at all. Especially, to go through what I went through in terms of lack of support from someone you take advice from every day by that I mean the coaching staff and the training staff.

Jack also began to feel betrayed by the lack of support from the athletic and academic staff. Jack had always looked to his coaches as the authorities on all things football, and by extension, the conduct and well-being of every football player. As one of the players, he looked to his coaches and staff as the professionals who would know what to do with his concussion. He quickly found out that all concerns were subjugated to getting him back into the game. The testing standard following his concussion was questionable and in Jack's words, "Well, I would say the baseline test was kind of not the best way cause I don't remember anything. And the baseline test, it was inconclusive but they were still going to let me play that week." He soon realized that he would have to take the lead on his own healthcare and well-being; but at the same time, this was a fine line to walk because it could result in a permanent exclusion from playing the sport he so loved. He knew he was on his own and that he would have to navigate himself through to playing again, without healthcare support spearheaded by the institutional staff. As Jack grasped the lack of support available he realized,

There wasn't like any special treatment or anything along those lines to assist me along or make sure I am doing the right things. So, I wasn't really taught what or what not to do in regards to concussion. I kind of did my own research on that one.

Jack, John, Jane, and Kevin quickly realized that their coaching staffs were more concerned with them being on the field, or being in the classroom for eligibility; than they were with their physical, mental, and emotional health. Through the fog of concussion, and the struggle to go through the motions of being their pre-concussive

selves, they came to the heart-breaking realization that they were on their own. Kevin said this in regards to support after an injury:

I didn't have a coach check on me in the hospital...before...they would come stop by, you know, talk to me whatever. They would talk to my uncle. After...they didn't really talk, no one ever stopped by, no one ever called me. So yeah, I just, I didn't really feel like they cared so.

Like many of the participants (4 of 7), Kevin explained how he would have liked his concussions to be taken more seriously. He said:

I wish they would have taken it a little more serious then. They wouldn't have been so uh pushy for me to stay in the game or go back into the game cause I could. Cause at some point when I am done playing football I will have a life to live, you know. So, I think that applies for really any sport.

While the majority of participants did not feel supported from their institutions, two participants felt support from their coaches and athletic trainers when it came to injuries. Smith described how the athletic trainers were in general supportive especially when it came to his ankle injury: "They were always helpful like if I ever had a doctor's appointment for my ankle or something, they would drive me cause I couldn't drive." But, when it came to Smith's suspected concussion he said: "I should have gotten tested probably right after that game." Analogous to Smith, Alex felt supported by his coaches, teammates, athletic trainers, and teachers. Even though he was frustrated and felt helpless not playing, he commented "So, I would say yeah everyone was pretty

supportive and that definitely made it a little bit easier.” Specifically, Alex described how his coaches supported him:

And so I was pretty close with all of them so I mean they understood and I would kind of talk to them normally and help coach on the side as best I could. While I was out to just to kind of feel involved and not feel like I [was] missing, missing out.

All five of the participants who were diagnosed at the time of injury or retrospectively felt that there was a lack of a support system. John simply stated “there was not a team of support.” The lack of a support system led some participants to provide recommendations for improvements to the current concussion management plans. Alex, who had felt supported on an individual basis by his coaches, teammates, athletic trainers, some faculty members, and family during his recovery; then shared that in spite of that support there was still a critical gap on the academic side and pointed out that catching up after missing classes was difficult because of a lack of coordination and communication. He explained how those difficulties could have been eased:

I think it would have been nice if the athletic trainer kind of interacted with some of the professors, so that it wasn't putting me out there. Cause I think in my case I was fortunate that my teachers were very understanding but I could see or envision a scenario when the professors aren't as understanding and it kind of creates a little bit of animosity between the student-athlete and the professor where the professor thinks the student-athlete is kind of procrastinating and is trying to get out of doing work. So, I mean if someone came from a third-party

and said...this is best for all parties involved and this is what the plan is to kind of recover from the concussion and not make it so the schoolwork is overwhelming. Alex and the other participants in this study seemed to agree that a support system would be ideal, similar to McGrath's (2010) model for concussion management. Jane exemplified the recommendation in the following way:

I just think it should be more of a team effort rather than an individual effort. Cause it can get very complicated very fast. I have dealt with that firsthand so...when you are dealing with something like a head injury it is already hard to begin with, but when you start having to go in between people to you know to tell someone you had a concussion whatever. Half the time you don't even know, like you don't really know yourself what is happening and...most of the time [you] are not feeling that great so I think that it puts a whole lot more pressure then there should be on a person that has a concussion. That could prolong recovery.

Theme 5: No rest. The hallmark of concussion management is immediate rest after incurring the concussion (McCrory et al., 2013). However, the overwhelming majority of participants (6 out of 7) did not rest from both cognitive and physical exertion after experiencing a concussion. In fact, excluding the participant with the simultaneous ankle injury, immediately following the concussive event the participants did not rest and returned to the game. Even Alex who was the only participant to rest both physically and mentally (Table 4) said "...I didn't go back in most of the game [event he was injured]."

A common rule for all concussion management guidelines including the 2010 NCAA regulation is not to return the student-athlete to play in the same calendar day. Despite this suggested standard of care, five participants in this study stated a return to play during the same practice or game independent of whether or not they ended up being diagnosed. John chuckled “I finished practicing actually, I don’t know how I did.”

When the participants did rest, they mostly portrayed it as relaxing or sleeping. Smith described his recovery: “I guess just staying, resting was the main thing. Like not doing physical activity, not doing mental like just relaxing I guess I don't know.” For those who were suspected of a concussion and received instructions from their athletic trainer, the majority (3 of 4) recalled being told to rest from physical activity but not from cognitive activities. Smith asserted “It was just physical activity, weren’t told to rest from anything else.” John illustrated his post-injury instructions:

Well, they told me to go home, lay down, but they didn't say I couldn't practice. They expected me to go to study hall the very next day. They expected me to go to all of my classes, all of my study halls coming up that weekend.... they expected me to attend everything...even football meetings. We would watch film and they expected me to be at all the meetings, the team meetings. Pretty much everything except practice I had to do.

Analogous to John’s initial concussion management experience, the majority of the participants that were diagnosed (2 of 3) following the injury were restricted from practice but expected to attend class. However, one participant was instructed to rest physically and mentally after being diagnosed with a concussion his senior year. He

explained the difference between his first suspected concussion and the second diagnosed concussion:

But, I think I missed the next day of practice as a precaution. But, there was no limitations really placed other than that. But for the second one [diagnosed], I was excused from all schoolwork and I was basically just ordered to sleep as much as possible afterwards and kind of rest. (Alex)

Unlike the majority of student-athletes in this study, on the surface Alex's second concussion management seemed to line up with current recommendations in terms removal from play and activity restrictions for the purposes of rest. While Alex was instructed to rest for two weeks from physical and cognitive activities, he expressed frustration and revealed how much he really rested:

Maybe two or three days more than normal. And then I kind of resumed a normal kind of routine, but I didn't practice the rest of that time. So, I kind of laid low for two or three days and then I kind of resumed a normal routine. I went to practice and everything, I just didn't participate. I just watched from the side.

The frustration with not being able and/or allowed to play was also conveyed by Jane when she was diagnosed with a concussion a month or two before entering college. She was trying to graduate early from high school to enter college a semester early. She explained the pressure she felt after she was diagnosed with a concussion and told to rest for 4 weeks (see Appendix H for Jane's summary of post-concussion management and recovery in Table A1 with all other participants with suspected concussions). Jane disclosed:

I kind of had to or else I wouldn't graduate on-time. So, I didn't really do what I was supposed to do. Which, my fault but. So, I did all my schoolwork. I did it in chunks cause I would get really tired, just really tired, headaches and what not.

Both participants who had been properly instructed to rest and restricted from play, rested for two to three days out of the two to four weeks. After the first two to three days the participants resumed as much of their normal routines as they could.

On the other end of the spectrum, Jack was diagnosed in 2006 with a concussion and did not receive any instructions from his athletic trainer: “But, she did not tell me what to do or what not to do at that point.” When the student-athletes are given no instructions they must figure out on their own how to handle the symptoms they are experiencing. For the majority (6 of 7) who either were not suspected, or did not receive proper instructions as in the case of Jack, they found different ways of coping with their symptoms. Besides sleep, the other forms of recovery included medication, outside medical care, and one participant did his best “...to ignore it and just keep it going” (Kevin).

Kevin further elaborated how on the day of his last concussion in college, also his 23rd birthday, he didn't rest at all: “...we were drinking on the bus and we stayed up the whole way home...a four hour ride and we went to a party after that...I was probably up until like 3:30 or 4 in the morning...” He went to bed that night “inebriated” but was “fine.” Kevin didn't learn about his concussion for two years when he was screened by the NFL. If he had been properly assessed at the time of the injury he may or may not

have had the same kind of birthday celebration but he would have been aware of his brain's traumatic injury.

Most of the participants no longer play their sport and have had time to reflect on their concussion experiences, including the effect lack of rest had on their post-concussion management. Participants noticed that rest improved their brain functioning and for several alleviated their frequent headaches. Dan related the following: "I am not playing as much anymore, has probably gave me the appropriate time for recovery." While Dan was never diagnosed, he suggested time away from football has led to fewer headaches. Even though Alex was diagnosed and was frustrated by the concussion protocol, he came to a similar reflection on rest:

...I guess, in hindsight, it was good to be held out of practice. I guess that kind of sped up the recovery and not doing school work and not exerting my brain probably helped....It was kind of just like let it heal and rest up and it will kind of solve itself.

Apart from the lack of rest when they were concussed in college, participants in retrospect seemed to know and understand the need for rest following a concussive event.

Theme 6: No policy. All seven participants said they did not receive or remember receiving their athletic program's concussion management policy. Smith's response was typical of most of the participants, he said "I don't remember. I don't think...Maybe they did, but I just don't remember." Two of the participants believed that there was one in place but they just didn't receive it, Alex explained: "I do not think so...there wasn't one distributed to everyone. I think they had a protocol in place that

they kind of followed from the athletic department or from the athletic trainers, but it wasn't distributed to the team.” While others did not believe there was a concussion management policy, they illustrated those beliefs in this way:

Not that I knew of. I mean there was just baseline tests and that was it. As long as you hit the baseline test it was kind of up to your own discretion when you return as long as you were symptom free. (Jack)

No definitely not. I mean if there was I think I would have gotten a little bit more help than I did. But, I didn't receive much help until I demanded it because if I didn't. If I hadn't demanded it, I do not think I would have received much help at all. I think the process would have continued how it was which is me having to attend every meeting and me having to attend every class. So, no there is no policy at all. (John)

The participants varied in their belief on whether or not their institution had a written policy in place at the time, but none of the participants remember actually seeing or receiving any information on a concussion policy. Therefore, even if the programs gave them their concussion management policy, it did not impact their experience enough for them to remember.

Theme 7: Double-injury. An additional and unexpected finding was first revealed during an interview with Smith, the former Division I men's soccer player. He prefaced the interview with the fact that he was “never clinically diagnosed” but was treated for a concussion in college. It was clear from the beginning (or so I thought at the

time) that his experience was slightly different from the participants I had previously interviewed; he had incurred two serious injuries simultaneously. It turned out that he was not the only one to mention this occurrence. There were three other participants that experienced similar double-injuries or minor injuries that complicated their post-concussion experiences.

Prior to entering college, Jane was diagnosed with her first concussion and severe whiplash. While in the air, “a girl [took] her out” causing her head to “whiplash forward,” and then backward hitting her own back and seeing bright red lights. With no athletic trainer present, her club soccer coach came out to remove her from the field. She was sitting on the bench with a headache, ringing ears, and trying to figure out what she was doing; when her coach asked “are you ready to go back in?” She said “ummmm, no,” and later went to the local emergency room where she was diagnosed by a neurologist. Unlike Smith, Jane was diagnosed and treated for both injuries.

For Smith and current collegiate student-athletes, it is most common for the medical care to be carried out by athletic training staffs (McGrath, 2010). Resembling Smith’s experience, another participant was retroactively diagnosed with a previous concussion that occurred when his tailbone was broken due to a late hit during a football game. In that instance the football program’s medical staff only diagnosed the broken tailbone and missed the concussion. John was diagnosed with this first concussion by a neurologist while he was being treated for his second diagnosed concussion.

Three participants in this study described the influence of simultaneously incurring multiple injuries on their post-concussion experience and medical care. Smith described his confusion around his symptoms:

So, when I was playing and got hit in the head with the ball and I kind of like, all I remember is getting hit and I don't really remember like right after it. Like I landed on my ankle apparently, and I came to, and then I kind of like, I went off, dragged myself off kind of like the sideline. My ankle was messed up, so I was more worried about that than my head at the time. It was kind of like a double-injury... The pain might have been from that [ankle] or being nauseated with probably that [ankle] and probably from my head a little bit, both.

These participants also detailed the complications multiple injuries have on the identification, diagnosis, and recovery. Not only did the participants themselves find sorting out their injuries challenging, the participants also described the difficulties medical staff had in identifying multiple injuries. Jack stated “What happened was I was trying to look at my broken nose to determine that, and they were asking me what happened. I couldn't really relate the details.” Smith illustrated it best when he said:

I was out because of my ankle so I didn't really. That is why they didn't really look into it, I don't think. Because I was going to be out for like four weeks, five weeks. So, they really didn't look into the head injury at all.

While all participants did not mention this finding, it could have significant implications for the improvement of medical care for student-athletes and should be studied further.

Alignment of Student-Athlete's Experience and Concussion Management Policy

A dominant aspect of the student-athletes' post-concussion experience is the support and care in dealing with the ramifications of a traumatic brain injury, and in some cases co-injuries. Symptomology disrupts the student-athletes "normal" cognitive, physical, and social experiences post-concussion and they must find ways to cope with this abrupt change. The institution, largely the athletic department, plays a key role in the student-athletes' perceptions of their concussion and its management. To better understand their perceptions in context, I investigated how the participants' institutions publicly expressed their standards of concussion management. I used Internet searches to obtain concussion-related documents from each of the student-athletes institutions at the time they attended and played. Following are the findings of a comparative analysis between the student-athletes' perceptions of how their concussions were managed and the institutions' publicly available policies and related documents.

It is important to put the participants' post-concussion experiences in the context of the policies dictating the minimum standard of care at the time they were student-athletes. All but one of the participants attended school and experienced their concussion(s) after 2010 when the NCAA mandated a concussion management plan for all NCAA institutions. Because Jack experienced his concussion prior to 2010 (before there were mandated governing policies); his perspective is not included in this section.

In 2010, the NCAA passed minimum requirements for the concussion management of all student-athletes in all three divisions (Brasfield, 2010). Figure 3 is an excerpt of the requirements from a memorandum sent from the Chair of the Division II

2010 NCAA Mandated Concussion Management Plan (3.2.4.2.17)	
A. Education	An annual process that ensures student-athletes are educated about the signs and symptoms of concussions. Student-athletes must acknowledge that they have received information about the signs and symptoms of concussions and that they have a responsibility to report concussion related injuries and illnesses to a medical staff member
B. Removal/Evaluation	A process that ensures a student-athlete who exhibits signs, symptoms or behaviors consistent with a concussion shall be removed from athletics activities (e.g., competition, practice, conditioning sessions) and evaluated by a medical staff member (e.g., sports medicine staff, team physician) with experience in the evaluation and management of concussions
C. Diagnosis/Rest	A policy that precludes a student-athlete diagnosed with a concussion from returning to athletic activity (e.g., competition, practice, conditioning sessions) for at least the remainder of that calendar day
D. RTP Medical Clearance	A policy that requires medical clearance for a student-athlete diagnosed with a concussion to return to athletics activity (e.g., competition, practice, conditioning sessions) as determined by a physician (e.g., team physician) or the physician's designee.

Figure 3. 2010 NCAA Mandated Concussion Management Plan Requirements.

Reprinted from Brasfield (2010).

Management Council, Kathleen Brasfield, to the NCAA Division II Directors of Athletics. It outlines four requirements NCAA institutions must meet: (a) concussion education and acknowledgement receipt of education from student-athletes, (b) process for removal and evaluation of student-athletes suspected of concussion, (c) policy for return to play not on the same calendar day if diagnosed with a concussion, and (d) medical clearance by physician or physician designee in RTP policy.

Taking these requirements as the assumed minimum standard of care, a comparison of the student-athletes' perceived concussion management experiences was conducted with concussion management documents collected from the institutions, or conferences in one case, covering the time of six participants' concussions. The documents ranged from conference-wide policies to parent brochures and student-athlete handbooks. For authenticity purposes, the 2015 concussion management policies were also collected. The comparative analysis was completed in two steps after document analysis was completed (see Chapter 3 for details of methodology): (1) Results (categories) from the document analysis were transformed into tables for each institution and organized by McGrath's (2010) framework for concussion management. In order to protect the identity of the student-athletes the titles of the categories were based on McGrath's framework and the NCAA guidelines. If an institution did not have additional categories above the 2010 NCAA mandate then the NCAA minimum requirements were used. For consistency and ease of comparison between cases, a binary scheme was used for each category where a check mark (✓) means the student-athlete's experience and perceptions aligned with the institution and an "N" means the student-athletes'

experiences and perceptions did not align with the institution's expressed policy. In order to compare between the six participant-institution pairs, I calculated the percent alignment by the number of aligned categories divided by the number of applicable standards. The findings are organized by institution and each subsection includes a description of the document obtained and findings for each participant-institution pair.

Big Time University. Three participants in this study experienced concussions between 2010 and 2014 at Big Time University. The university's detailed concussion management policy, a presentation from 2013-2014 on the concussion policy to the university administration, and the 2011 Student-Athlete's Handbook were used in this analysis.

Table 5 shows the findings from the document analysis of three primary sources from Big Time University in the left column: Pre-season education and baseline testing, post-injury and on-field evaluation, comparison to baseline, diagnosis by physician, academic accommodations through disability services, cognitive and physical rest, graduated RTL and RTP. Big Time University's documents showed several additional steps and procedures than the minimum required by the NCAA (2010). The policy documents show all the major steps outlined by McGrath (2010) including RTL in coordination with institutional resources such as the office in charge of academic accommodations for students with disabilities. The Director of Sports Medicine also stated the athletic department's staff included part-time, external physicians and sports psychologist to be involved in the recovery process. While the athletic department mentioned neuropsychology testing as an important part of the evaluation process similar

Table 5. Alignment of Big Time University Policy and Three Student-Athletes

Big Time University Concussion Policy	Jane¹	Dan	John
Pre-Season			
Education	✓	✓	✓
Baseline Testing	✓	✓	✓
Post-injury/On Field Evaluation*	✓	N	N
Diagnosis			
Referral to Physician	N	-	✓
Academic accommodations through Disability Services	-	-	N
Compare to Baseline	✓	-	N
Not to baseline; Cognitive and physical rest (no activity for 2-3 days)	-	-	N
Gradual Return to School (Physician cleared)	-	-	N
Gradual Return to Play Protocol	-	-	✓
Alignment with Policy	80%	67%	44%

Note: All criteria are equal in value; ✓=Aligned; N=Not aligned; Left blank (-) = Not applicable, and therefore, not included in % calculation (# Aligned/Total # Applicable).

*Assumes immediate removal after suspected concussion

¹Represents only one undiagnosed concussive event in 2011.

to McGrath and the consensus statements (i.e., McCrory et al., 2013), a neuropsychologist was not listed in association with the sports medicine program. Moreover, the text used was taken verbatim from the “Consensus Statement on Concussions in Sport 3rd International Conference on Concussion in Sport Held in Zurich, November 2008” and from an additional position statement. Of note, the presentation to the university administration on concussions had the pertinent information on concussion and policy, whereas the student-athlete handbook did not mention concussions specifically. All references to injuries were in the form of regulations and drug testing and no educational information was included. Based on the presentation and policy documents, Big Time University’s concussion management was aligned with the recommended standard of care for sports-related concussion. However, the student-athletes from Big Time University did not perceive their concussion management as closely aligned to that standard of care.

Among the three student-athletes from this institution, there were wide differences in the alignment. All three participants remembered experiencing baseline testing. However, each had slightly varying recollections and experiences of official concussion education (Table 5). Dan was the only participant to remember signing documentation. He recalled “...we definitely had to sign documentations... Yea, I mean there were multiple sheets. I, probably just for the team, for the coaches, one for the doctor, and one for the trainers. I believe.” While Jane had mentioned a poster in the training room (Table 4), she referred to it when asked about written policies and said “I don't really remember the poster but...it had a large emphasis on: if you get hit tell your

athletic trainer.” When asked about preseason concussion education she said “I really don't know. I don't remember.” Unlike the student-athletes from the other Division I institutions in this study, none of the participants at Big Time University recalled any formal concussion education from the athletic staff. All three participants recalled learning about concussions from experience; either prior experience with others dealing with a concussion or their own experience with concussion.

The next important step is the identification of a concussion and the removal from play once a concussion is suspected. In this study, there were no instances where a student-athlete was properly removed from play by Big Time University athletic training staff. In one instance, Jane was properly identified and removed from play in accordance with the university's stated policy. However, the identification was not done by the university's athletic training staff but by an independent athletic trainer hired to watch an unofficial summer training practice. Jane explained it in the following way:

So, the coaches aren't allowed to be there during the summer training. So, we had no one there but we had an athletic trainer from an outside place come in. So, he was like okay you should probably go to your athletic trainer just to be safe.

Once Jane returned to campus, her university athletic trainer conducted post-injury concussion tests, including ImPACT testing. He told her that her results were only a “little off” of her baseline test. However, her baseline results were not reflective of her true non-concussed neurocognitive state. The initial baseline testing was done when she arrived to campus while still recovering from a diagnosed concussion incurred a couple of months prior. The athletic trainer explained this to Jane: “...your baseline isn't really

that great but you know if something were to happen at least we can see a difference, if something were to get worse we could see a difference.” He then cleared her with no concussion and according to Jane said: “okay well if it gets worse then let me know.” She was later diagnosed with pseudotumor cerebri due to repetitive head trauma.

For all three participants at Big Time University, the athletic training staff did not effectively recognize their concussions based on their own stated standards of care. For example, Dan’s experience aligned with two out of the three (67%) applicable institutional standards because he was never suspected of a concussion by the athletic staff even though throughout his career he experienced the symptoms of concussion (Table 5). But, he never felt his concussions were severe enough to be evaluated. Dan described the feeling of being protected by the random concussion tests throughout the season: “It made me less scared of knowing that I could possibly have one.” Random concussion tests were not mentioned in the policy documents. It is worth noting that the other two participants from Big Time University also did not mention the random concussion tests.

Compared to the other participants from Big Time University, John had the lowest, approximately 44%, alignment with the institutional policy standards (Table 5). He experienced every aspect of concussion management at Big Time University post-concussion from education to RTP. However, he perceived five of those steps as inadequate. He was not removed from play immediately following his concussion, staff could not find his baseline testing results to compare post-injury, they expected him to

attend class and all meetings the next day, and was not rested for 2 to 3 days as outlined in the Big Time University policy documents. John poignantly said:

So in terms of support, I didn't feel like I had much support at all until I actually put my foot down and told them that I don't think I should be doing this, and I'm not going to do it. I don't feel like I was supported at all.

Overall, Jane's perceptions of the management of her summer 2011 undiagnosed concussion aligned more closely (80%) than the other two Big Time University student-athletes (Table 5). She was properly removed from play once an independent, non-university athletic trainer suspected the concussion. After she returned to campus, she was evaluated by the university sports medicine staff but was not referred to the team physician for diagnosis, thus not aligning with the proper physician referral guideline. It is important to note that Jane's alignment calculation only represents one concussive event and does not include how the institution helped manage her experience starting in 2012 that led to her diagnosis of repetitive head trauma. Big Time University's policies mentioned modifying factors such as accumulation of sub-concussive and repeated concussions over time, but there is no standard of care for cases such as Jane, and therefore, was not compared.

D1 University. One participant in this study experienced two concussions in 2013 and 2014 at D1 University. Five documents were collected and analyzed. These included the university's athletics policies and procedures manual with the detailed concussion management policy and procedures originally copyrighted in 2011, the 2011-2012 emergency action plan, the 2014-2015 returning student-athlete health information

packet, the 2013-2014 sports medicine letter to student-athletes and parents, and the 2014 conference concussion management guidelines that apply to D1 University.

D1 University had the most publicly available documents that were the easiest to find and did not require using archived Web pages. The NCAA Chief Medical Officer touted the conference's handling of concussion and concussion management guidelines. He said that it was clear that these member institutions viewed "student-athlete as a whole person who is engaged in academics, athletics, and the college experience." He was also impressed by the conferences' understanding of concussions from the student-athlete's perspective and willingness to coordinate high level plans and leadership regarding medical conditions. The conference's concussion management guidelines listed transparency as the first item, stating every institution's plan shall be made "publically available" through printed materials and/or Web sites.

Document analysis revealed the following categories: preseason education and baseline testing, sideline evaluation by athletic trainer or physician, diagnosis by a physician, baseline comparison, rest, and RTP (Table 6). It is clear from the documents that D1 University's athletic program takes head injuries seriously, as "head/neck injury" is listed under life-threatening in the emergency action plan. It is interesting that the classification and RTP listed in the concussion guidelines were taken from Cantu (1986) instead of more recent consensus based guidelines. There was also no RTL listed.

Alignment between D1 University policies and Alex's experience was very high with 86% (Table 6), which represents the highest alignment between a participant's experience and their institution's concussion policy. Only one aspect did not align with

Table 6. Alignment of D1 University and Alex's Post Concussion Experience

D1 University Concussion Policy	Alex
Pre-Season	
Education	✓
Baseline Testing	✓
Post-injury/On Field Evaluation*	✓
Diagnosis	
Referral to Physician	N
Compare to Baseline	✓
Not to baseline; Cognitive and physical rest (no activity for 2-3 days)	✓
Gradual Return to Play Protocol	✓
Alignment with Policy	86%

Note: All criteria are equal in value; ✓=Aligned; N=Not aligned; Percent alignment calculation (# Aligned/Total).

*Assumes immediate removal after suspected concussion

the stated policy. According to Alex, athletic trainers handled every aspect of his concussion management, whereas the policy stated that a physician conducts diagnosis. He said that there was a team physician but “I didn't see a doctor or anything, I was just doing the tests with the athletic trainer. Then he cleared me.” Another interesting finding was the absence of a RTL, especially in light of Alex’s chief concerns around difficulties in adjusting academically post-concussion. The lack of a process for handling the academic side of the student-athlete is an area for improvement at D1 University based on Alex’s recommendations. Alex also expressed frustration with the RTP process. While the athletic trainer followed the current standard of care as illustrated by Alex: “...basically, the first couple of days...I just kind of rested and then every day I would take a baseline or take the tests, and see how my results stacked up I guess to the baseline test.” He said that by the second week “I would come in and do the tests and I would kind of tell them I felt fine and they would hold me out another day. So, I got pretty frustrated with that.”

Overall, D1 University effectively managed Alex’s concussions. However, there is room for improvement in terms of emotional and academic support. Compared to the other institution-student-athlete pairs, Alex’s experience post-concussion aligned most closely to his institution’s stated concussion management.

Power House University. One participant in this study experienced a concussion in 2011 at Power House University. The 2011 sports medicine brochure with concussion guideline and take home guidelines originally created in 2008, the revised in 2012 concussion education acknowledgement form, as well as the 2011-2012 university

student athletic training handbook were analyzed. For confirmation purposes, a blog post on the athletics Web site from 2011 provided information of a meeting on concussions and detailed what was discussed. The full concussion management policy and documents were found as a link on an archived Web page, however, the documents were no longer available. Because Smith did not enter the concussion protocol, the missing documents did not affect the comparative analysis.

The 2011 blog post put concussion management at Power House University into historical perspective as the university's sport medicine, athletic training, and orthopedic hospital departments met and discussed the 3rd International Conference on Concussion in Sport held in Zurich which was held three and a half years earlier. A university's sport medicine physician said:

This current view abandons past standards of grading scales...which have now been found to be incomplete or inaccurate views of concussion. Many of the different scales and tools were inconsistent and there was no universally accepted method for classifying the severity of concussions and thus return to play criteria. The new standard makes at least classifying the injury relatively simple...

This document and the athletic training manual suggested that the university may have used the 3rd International Consensus Statement on Concussion in Sport (McCrory et al., 2009), along with other professional organization guidelines and the NCAA concussion mandates, to create their policy. Despite the historical context, this study only used available documents for the analysis.

Therefore, Power House University results represent the minimum standard of care along with the document analysis findings. The document analysis resulted in preseason education, acknowledgment of education, baseline testing, sideline and post-injury evaluation by athletic training staff (including student athletic trainers), diagnosis by physician, rest, and RTP (Table 7). Smith's concussion experience was mostly aligned (67%) with findings of the document analysis (Table 7); similar to Dan. Smith perceived his experience as mostly aligned to his institution's concussion management policy prior to experiencing a concussion, but described no post-injury testing after being suspected of a concussion. The availability of concussion education materials on the university athletic Web sites and sports medicine Web pages between 2011 and 2016 suggest an expressed value in concussion education. Smith also described the value his athletic program put on concussion education:

They did like a little talk or whatever a seminar on it. On like concussions and why we took the test...how we need to be cautious...they just went over the risks of it, and like how it could be dangerous to you like if you get two, like one of them and you keeping playing and get one again.

Power House University also required an acknowledgment of receipt of education which stated the responsibility is on the student-athlete to report all injuries and symptoms to medical staff and it is the responsibility of the student-athlete to seek out medical care in the case of injury. This expressed value put the onus on the student-athlete for their health and well-being, which is in direct opposition to the student-athlete's expressed values of "wanting to play." Moreover, Smith illustrated the

Table 7. Alignment of Power House University and Smith's Post-Concussion Experience

Power House University Concussion Policy	Smith
Pre-Season	
Education	✓
Baseline Testing	✓
Post-injury/On Field Evaluation*	N
Diagnosis/Rest 1 Calendar day	-
Gradual Return to Play Protocol	-
Alignment with Policy	67%

Note: All criteria are equal in value; ✓=Aligned; N=Not aligned; Left blank (-) = Not applicable, and therefore, not included in % calculation (# Aligned/Total # Applicable).

*Assumes immediate removal after suspected concussion

conflicting nature of disclosing his symptoms to the athletic trainer: “I only wanted to deal with one thing at a time...kind of put it on the back burner.” This leads to the essential category of detection and subsequent evaluation, which is the only category where Smith did not perceive proper concussion management from his university. He addressed this issue in the following way: “I probably should have gone through the concussion testing.” Similar to the participants at Big Time University, the expressed value of identification by Power House University was not met in reality for Smith.

D2 University. One participant in this study experienced concussions between 2009 and 2013 at D2 University. The university’s pre-participation physical exam form and student-athlete insurance and injury information Web page from August 9th, 2013 with a revised date of August 2011 were used in this analysis. Document analysis revealed language related to student responsibility and delineating institutional liability. The student was responsible financially for insurance and for reporting any injury incurred within 24 hours. The university stated they “will not be responsible for student-athlete injuries that occurred prior to enrollment at D2 University.” The only other publicly available document related to sports medicine was the pre-participation physical form, which included concussion history. The document analysis findings align with Kevin’s perceptions. He described no preseason baseline testing for concussion, just a basic physical exam and “basic physical paperwork.” He described his preseason experience in the following way: “They would bring physicians in and doctors to do all the physical testing...but I mean they were the only ones [for] 120 something people so it is...kind of lackluster really. They are just trying to get through it.”

Although the findings from Kevin's interview and the documents are aligned, they do not align with the NCAA's (2010) minimum concussion management standards. Table 8 shows the minimum standards in the left column and Kevin's perceptions of his concussion management in the right column. The comparative analysis showed no alignment with the minimum standard of care required by the NCAA (2010). Kevin did not recall any preseason education and he was never evaluated for concussions. Beyond that he did not feel the athletic training staff was competent. He explained the lack of confidence in the athletic trainers in the following way:

...we had a lot of issues with our training staff. A lot of misdiagnosis...at one point we had a trainer tell a guy that they had a sprained pectoral muscle and the guy ended up having a fractured spine...I don't know how you relate the two.

Overall, Kevin's perception of his post-concussion experience did not align (0%) with the basic standards of care (Table 8). He attributed the lack of proper care to not being at a Division I FBS institution: "...I am sure when you are at, you know, a program like John's or...a higher program...they are a little more serious about that, but not mine." What Kevin did not know is John also perceived a lack of seriousness at his Division I institution. Nonetheless, Kevin's experience had the lowest alignment with the minimum concussion management guidelines.

The majority of the institutions (3 of 4) expressed the minimum standard of care and went above the minimum mandated standards to include the current best-practices of the time. Based on the participants' perceptions, no institution perfectly managed concussions (Tables 5-8). The results of this comparative analysis suggest improvement

Table 8. Alignment of D2 University and Kevin's Post-Concussion Experience

D2 University Concussion Policy	Kevin
Pre-Season	
Education	N
Post-injury/On Field Evaluation*	N
Diagnosis/Rest 1 Calendar day	-
Gradual Return to Play Protocol	-
Alignment with Policy	0%

Note: All criteria are equal in value; ✓=Aligned; N=Not aligned; Left blank (-) = Not applicable, and therefore, not included in % calculation (# Aligned/Total # Applicable).

*Assumes immediate removal after suspected concussion

is needed in education, sideline detection and identification of concussive injuries, cognitive rest instructions, RTL, and coordination of support.

Summary

Seven collegiate student-athletes representing four separate contact sports from five different institutions across the South and Northeast contributed perspectives to this study. There was one female and six males who represented NCAA Divisions I-III, and encompassed both private and public universities. A short background of each of the participants was included and then their stories, which also included the facts of each of their concussion experiences. Eight major findings were derived from the backgrounds and stories obtained by interview of these student-athlete participants and public documents to answer the three research questions. The seven thematic findings were symptomology and its effects, pressure to return, lack of knowledge, inadequate support, no rest, no policy, and double-injury; and were utilized to answer the first two research questions. Significant aspects of the student-athletes' post-concussion experiences were the lack of a support system and the non-disclosure of their concussion injuries were intermingled throughout the themes, specifically effects of symptoms, internal and external pressure, and the lack of understanding. Differences in diagnosis status were also exhibited throughout all the thematic findings. To look closer at the support and handling of the student-athletes' concussions and answer the third research question, a comparison of the student-athletes' perceived concussion management experience to the publicly expressed representation of their concussion management policies was

presented. Findings showed none of the participants' experiences post-concussion aligned adequately with McGrath's concussion management policy.

Chapter 5. Discussion and Recommendations

The purpose of this study was to explore collegiate student-athletes post-concussion experiences and compare their post-concussion experiences to concussion management policy. Three research questions guided the study:

1. What are student-athletes' experiences post-concussion?
2. How are concussions managed at the student-athletes' institutions?
3. What is the alignment between student-athletes' post-concussion experiences and concussion management policy?

To address these research questions, data were collected from six former collegiate student-athletes and one current collegiate student-athlete, and from publicly available concussion related documents. Data were analyzed in three steps: (1) interviews were transcribed and coded individually then compared to identify emergent themes, (2) documents were grouped by institution then coded using the established coding scheme and McGrath's (2010) framework, and (3) a comparative analysis was conducted between the student-athletes' perceptions and their institutions' concussion management policies. A summary of the findings is presented in this chapter, followed by a discussion of the findings with recommendations and conclusions.

Summary of Findings

The seven participants in this study represented a diverse group of current and former collegiate student-athletes from four contact sports and five institutions. Eight major findings emerged from the data to answer the research questions:

1. The most pervasive theme throughout the student-athletes' post-concussion experiences was their **difficulties contending with concussion symptoms**. The student-athlete's symptoms varied in type and duration according to whether the concussion was diagnosed or undiagnosed. The majority of participants ($n = 5$) reported that problematic symptoms impacted their ability to learn.
2. The **pressure to return to play** after experiencing a concussion was exerted on all the student-athletes ($n = 7$) by the individual participants themselves and by outside influences ($n = 5$) including coaches, teammates, and parents. The student-athletes listed reasons for self-pressure such as duty, game and role importance, and toughness.
3. A **lack of knowledge** and understanding of concussions by the athletic staff was noted by the majority of the student-athletes ($n = 6$). The student-athletes believed large gaps existed in the coaches and trainers knowledge base of information and skill in the management of concussions. Participants expressed only a general awareness and misunderstanding ($n = 4$) prior to experiencing a concussion and recommended education as a means to improve student-athletes' post-concussion experiences ($n = 5$).
4. All participants reported **inadequate support** by the athletic staff ($n = 4$) whether the concussion was diagnosed or undiagnosed. All diagnosed student-athletes ($n = 5$) experienced a lack of support system and the majority of them ($n = 3$) specifically explained a lack of academic support.

5. Majority of participants ($n = 6$) **did not rest cognitively and physically** immediately following a concussive event. The participants suspected of a concussion ($n = 5$) were not instructed by athletic training staff to rest from cognitive or physical activities other than practice.
6. All participants asserted a **lack of a concussion management policy** at their institution or did not remember receiving the information from their athletic programs.
7. **Double-injury** or an additional injury during the time of the concussion injury happened to three of the participants and complicated the identification, diagnosis, and recovery of the student-athletes from the concussion.
8. Since 2010, the majority of the student-athletes' institutions (3 of 4) had published concussion management policies that met or exceeded the 2010 NCAA concussion mandate requirements. However, there was **discrepancy between the student-athletes experiences and concussion management policy**. None of these participants' ($n = 6$) experiences fully aligned with their institution's required and written standards of concussion management.

Discussion

The findings from this study are discussed and compared to the relevant research and are organized in the following chronological order based on McGrath's (2010) framework: pre-concussion influences on self-reporting behavior, concussion response, and concussion recovery. Each section includes a discussion of the study's findings that agreed, disagreed, and were novel compared to existing research. In general, there was

strong agreement with the literature and this study's major findings on lack of concussion knowledge and the need for education, non-disclosure, and inadequate identification, removal from play, post-concussion rest, diagnosis, post-injury testing, RTP, RTL, and concussion management support. In addition, one thematic and two minor findings of this study did not align with previous research or had not previously been discussed. The influence of childhood experiences with concussion on illness behavior, complications of double-injuries on the procedure for identification of concussions, and the negative effects of serial post-injury evaluations on the student-athletes' academic success each represent original findings in concussion research that could have significant implications for the management of concussion.

Pre-concussion influences on self-reporting behavior. Both internal and external pre-concussion influences motivated student-athletes' self-reporting behavior. These influences were synthesized from cross-theme and cross-case analysis and included a lack of effective pre-season concussion education, childhood experiences, chronic headaches, social networks, and sports culture. The literature has reported motivations underlying non-disclosure such as the external influences of college and the internal influences of a lack of knowledge (Kerr, Register-Mihalik, Kroshus, Baugh, & Marshall, 2016). This study is in alignment with the numerous motivations found in the literature; however findings further revealed unreported motivations, such as the impact of childhood experiences, gained by the vivid descriptions given by the participants. In addition, after the analysis of the findings and literature, this study found that illness behavior could be considered an umbrella of motivations for not self-reporting

concussion. Mechanic (1961) published his concept of illness behavior, describing it as “the ways in which given symptoms may be differentially perceived, evaluated, and acted (or not acted) upon by different kinds of persons” (p.189). Illness behavior comprises the student-athletes’ own perspective and views on what concussion meant to them, and how to cope with it using their own collection of life experiences, pulled from a complicated collection of influences that interact internally and externally. The pre-concussion influences on the motivations for non-disclosure of concussion education, chronic headaches, childhood and background experiences, cultural norms and social networks, and sports culture will be discussed; in addition to the concept of illness behavior and its role in the motivation of self-reporting.

A primary concern in public health research is the non-disclosure or underreporting of concussions (Kroshus, Baugh, Hawrilenko, & Daneshvar, 2014) that may lead to increased negative health outcomes (Robbins et al., 2014). Previous research on self-reporting behavior has focused on student-athletes’ concussion knowledge and contextual influences (Kerr, Register-Mihalik, Kroshus, Baugh, & Marshall, 2016). The most prevalent finding throughout the literature was the lack of education and knowledge by key stakeholders such as student-athletes, coaches, and athletic trainers (Donaldson et al., 2014; Fedor & Gunstad, 2015; Kaut, DePompei, Kerr, & Congeni, 2003; Kroshus, Garnett, Baugh, & Calzo, 2015; Miyashita, Timpson, Frye, & Gloeckner, 2013; Rigby, Vela, & Housman, 2013). This study’s findings align with the literature in indicating a lack of understanding of concussion exists among the key stakeholders from the student-

athlete's perspective and plays a large role in student-athletes not self-reporting (Meehan, Mannix, O'Brien, & Collins, 2013).

Additionally, the participants in this study reported a personal lack of knowledge prior to incurring a concussion despite receiving some form of preseason concussion education. This lack of knowledge theme suggests current policy and practice about concussion education is not an effective technique of knowledge transfer. The literature supports this finding as Baugh et al. (2014) found 71.5% of Division I schools, 68.9% of Division II schools, and 71.3% of Division III schools confirmed they had an annual process for educating student-athletes, yet Fedor and Gunstad (2015) found student-athletes had incomplete knowledge of the signs and symptoms and limited understanding of concussion. Considering the lack of effective education found by this study and the literature (e.g., Kroshus et al., 2015), a compelling need exists for improved concussion education. Education theory and effective pedagogical practices could be applied to improve this aspect of the student-athletes post-concussion experience. The CDC seemed to agree with its creation of a free online education program called HEADS UP to Schools in 2010 for school professionals and teachers (Centers for Disease Control and Prevention, 2013).

Researchers have suggested education for the student-athlete (e.g., Kroshus & Baugh, 2016) and the staff (e.g., Rigby, Vela, & Housman, 2013) is essential in the management of concussions. According to McGrath (2010) it is important for student-athletes and their support systems to understand what a concussion is, the symptoms of concussions, and what to do after receiving a concussion. Significantly, Baugh, Kroshus,

Bourlas, and Perry (2014) found that education efforts mandated by the NCAA were ineffective with 40% of pre-season student-athletes denying acknowledgement of concussion education training. Similarly, pre-concussion education gaps were found in this study as five of the participants did not recall experiencing any formal education interventions.

A pre-concussion influence not previously discussed in the concussion literature was the influence of the student-athletes' background and how their close family and friends' concussion experiences helped shape their own post-concussion experiences. Dan and Kevin both had influential experiences in their childhood when family or friends had terrible experiences with concussions. Dan witnessed his childhood friend fall off a bike and hit his head. He described what followed:

He was knocked out but he also woke up pretty fast. But when he woke up he didn't know where he was at. He didn't know what was going on, he was delusional. And (sigh) that was the first time I ever experienced somebody going through a concussion. So, I mean I remember ever since then I felt fine on how to act and what I needed to know if somebody did get a concussion. Cause he was really, really exhausted. So, afterwards all he wanted to do was go to sleep.

Dan went to the emergency room with his friend and explained how the doctor instructed them that his friend should not sleep. He reflected on the instructions: "You want to do something opposite of what your body is trying to do. So, I just always had that in the back of my mind if I ever felt like I possibly could have had a concussion." It was clear from Dan's retold memory that the experience shaped his perception and

knowledge of concussion since that time. In fact, when Dan later described his concussion response, he explained how he self-monitored his symptoms and what symptoms would indicate a serious concussion:

I never felt tired from the migraine. Or after any hit or anything like that, never felt the need of falling asleep. I think that is only thing that I always looked out for, if I had a concussion. Cause I know people that had them and they like they both went to sleep afterwards and sometimes they felt tired. So, I really never had any symptoms of feeling drowsy after they hit me like that.

Dan exemplified a common pre-concussion factor based on childhood observational learning and experiences, among the undiagnosed participants, of taking an observed specific symptom linked to a serious concussion, and then inaccurately misdiagnosing their own concussion. Childhood experiences were a common influence on the participants' perceptions and behaviors along with background characteristics and symptom duration and severity.

Another internal factor that may lead to the underreporting of concussion by student-athletes involves the chronic nature of headaches that student-athletes experience and that has not been found in the literature. The chronic and everyday challenge of headaches in football made it difficult for the student-athlete to recognize concussion symptoms and made it more difficult for self-reporting, since the actual symptoms of concussion reduced the likelihood for the football players in this study to report a concussion for diagnosis. These chronic headaches are particularly present in high-collision positions and have made it difficult for the student-athlete to recognize

concussion symptoms and thus lead to reporting symptoms differently. Dan noted, “I experienced headaches a lot during the season. But during practice or like uh just playing games, during games or even at home. Sometimes I would get random migraines.” Dan is one of the student-athlete participants who was never formally diagnosed with a concussion. Dan further revealed that he never reported a concussion because he didn’t think they were serious enough, which Kerr, Register-Mihalik, Kroshus, Baugh, and Marshall (2016) noted is one of the major reasons athletes do not disclose a concussion.

Previous research on self-reporting behavior for non-disclosure also has been focused on external factors such as the social networks including teammates, coaches, health care providers, parents, fans, media; being treated as a commodity; and having a regulated life without autonomous decision-making (Ferrante & Etzel, 2009; Huma & Staurowsky, 2012; Renick, 2013). These external factors also influenced the participants in the study. Researchers (e.g., Ferrante & Etzel, 2009) from the fields of counseling and psychology have revealed that stress is created from a lack of control and autonomous decision-making on the student-athlete. The feeling of stress and lack of control over whether they could return to play, return to class, ever be allowed to play again, or concern about letting their teammates down were found to impact the participants negatively in this study. For instance, Alex explained:

...after maybe 4 or 5 days I felt like I was fine [and] I still wasn't allowed to practice. So, I think it was a little bit frustrating because it was out of my control and it didn't matter what I did there was a protocol that had to be followed. I just felt a little bit helpless...

Cultural norms in college athletics also create external pressures for the student-athletes. For example, Tunick et al. (2009) suggested negative feedback from coaches, parents, and teammates influenced non-reporting behaviors. Findings from this study were similar; for instance, Jane described feelings of disappointment from her parents, specifically, while all participants related instances of coaches and/or teammates reinforcing non-disclosure behaviors. This suggests the NRC's (2013) “culture of resistance” still exists and a different approach is needed for cultural change. Further, several participants in this study perceived athletic departments, specifically coaches and athletic trainers, as caring more about their own jobs than the well-being and health of student-athletes. This aligned with previous literature (Pretty, 2014; Renick, 2013) that suggested student-athletes are treated as commodities.

Further, illness behavior envelopes and serves as an umbrella for numerous factors that explain the reasons for different responses to certain injuries including: class, ethnicity, age, gender, position/role in social environment, learned behavior, religion, childhood training experiences, stress (specifically, interpersonal stress), illness recognition, and illness danger (Mechanic, 1961; Mechanic & Volkart, 1961; Young, 2004). External factors that influenced the student-athletes in this study included the culture and subcultures of each institution and sport, athletic conferences, the NCAA, the NFL, and the media; as well as the internal factors noted earlier such as concussion knowledge, childhood experiences, and symptomology corresponded to aspects that helped explain illness behavior. After analysis of the findings, a phenomenon of illness

behavior was discovered and will be used during this interpretation to more effectively explain the causes and variances for student-athletes who do not self-report concussion.

Until now, alignment between pre-concussion influences and illness behavior theory has not been posited as an explanation for non-disclosure by student-athletes. This study revealed different perceptions of concussion between the student-athletes who were formally diagnosed with concussions (4 of 7) and went through post-concussion protocols and those who experienced concussion but were undiagnosed (3 of 7). The student-athletes all shared the same symptoms but were eventually grouped by diagnosed and undiagnosed categories due to inadequate reporting of their concussion symptoms. In line with illness behavior, this study found that reporting, treatment, and management of concussion was correlated to the participants' different perceptions of concussion and support. The diagnosed participants' perceptions of concussion allowed self-reporting of concussion symptoms when they were entered into a concussion protocol. At that point, the student-athletes acquired and reinforced the knowledge needed for post-concussion management, either on their own, or with the medical expert. However, the undiagnosed participants' perceptions of concussions which could include differences in background, symptom duration, knowledge of concussion or reasons such as not realizing it was important, could have all led to why that particular student-athlete did not self-report. Kerr et al. (2015) pointed out that one of the most prevalent reasons for non-disclosure of concussion in former college student-athletes is that they did not think their symptoms were serious enough to report. The participants shared a common experience to the extent that they experienced a concussion as a student-athlete. However, the pre-

concussion influences under the umbrella of illness behavior resulted in the non-disclosure of concussion, and in different post-concussion management experiences for the undiagnosed student-athletes with concussion. For example, none of the diagnosed participants could remember the concussive event and displayed post-concussion amnesia; this aligned with research that has shown student-athletes do not realize they have suffered a concussion (Delaney, Lacroix, Leclerc, & Johnston, 2002). Differences in perceptions were shown between the student-athletes who were never clinically diagnosed and those that were diagnosed at the time of injury or retrospectively and strongly influenced their decision for non-disclosure.

In general, these student-athletes were not effectively supplied the needed information to facilitate seeking help with the desired end result of returning to play. The availability of help was influenced by the student-athlete's concern over playing and the coach's desire to win (Wolverton, 2013b). The message from coaches may need to be reframed as "to maintain your health and safety," instead of the implied (and often experienced) fact that a concussion might keep them from returning to play. The experiences of the starting players in this study specifically demonstrated the need for a change in messaging. A possible consequence to the language used regarding concussions could be creating concern in regards to not being able to return to their sport, in effect scaring them away from reporting concussion. Moreover, Tunick et al. (2009) suggested negative feedback from coaches, parents, and teammates leads to non-disclosure. Therefore, effective educational practices must be used to change reporting behaviors and the culture around the student-athletes. Finally, the research on self-

reporting of concussions has found stress (Ferrante & Etzel, 2009), learned behavior (Kaut et al., 2003), illness recognition (e.g., Kerr et al., 2015), while this study added chronic headaches, childhood experiences and illness behavior as important aspects that explained differences in the perceptions of the participants' post-concussion experiences; future studies should consider illness behavior to further explain self-reporting behavior.

Concussion response. A pivotal moment in concussion management is the immediate response following a concussive event. The concussion response involves the initial recognition of the concussive event, immediate removal from play, post-injury evaluation, and diagnosis by a physician. This section discusses the issues in identification and diagnosis; specifically, ineffective medical care regarding detection and removal from play, double-injuries, baseline testing, and diagnosis.

Identification and diagnosis of concussion immediately following injury are the most difficult and controversial steps in concussion management and require a concussion specialist on the sidelines (Okonkwo, Tempel, & Maroon, 2014). This study found only two participants were immediately removed from play and suspected of a concussion by a health care professional (i.e., athletic trainer) at the time of their injury. Increasing the effectiveness of identification is extremely important as student-athletes with a concussion are at a much greater risk of secondary head injuries that can result in devastating outcomes such as second-impact syndrome (Weinstein, Turner, Kuzma, & Feuer, 2013), increased brain damage (Galgano et al., 2016), and delayed recovery (Asken et al., 2016). Unfortunately, the research has shown 20% to 50% of concussions are undetected and go undiagnosed (Baugh et al., 2016; Kaut, DePompei, Kerr, &

Congeni, 2003; Meehan, Mannix, O'Brien, & Collins, 2013) based on survey research. Among the seven participants, at least 12 concussions (~70%) went undetected in college based on the participants' low-end estimates mainly from retrospective diagnosis by a concussion expert or in a couple of cases self-recognition. This is consistent with previous research and suggests potentially greater numbers of concussions are occurring without being addressed by medical professionals or reported in survey-based research.

Current procedures for immediate identification and removal from play are dependent on either someone witnessing the concussive event and acting on it or the student-athlete recognizing that they are concussed immediately after a traumatic brain injury. In the environment of a practice or game, especially for contact sports where the natural movement of the sport includes constant opportunities for collisions, it may be very difficult for individuals (teammates, coaches, athletic trainers, etc.) performing many responsibilities to also notice a specific concussive event. The NFL, Big Ten Conference, and the City of Boston have instated the use of independent spotters at games for the purpose of recognizing and managing concussive events (National Football League, 2016a; SI Wire, 2014; Solomon, 2014b). This added layer was also recommended by one of the participants, Kevin, who tried to come out of a couple of games after suffering a concussion but was told by his coaches to remain in the game; disoriented, he complied. Kevin explained that mild concussions do not get evaluated and believed they should.

I would say even with the a mild one...the trainer [should] go ahead and check you out, just making sure you are okay...putting you through that screening

process...Immediately after...maybe having somebody whose sole job is to pay attention to [concussion].

Concussion guidelines (Broglia et al., 2014; NCAA, 2014e) and numerous researchers (Asken et al., 2016; Giza et al., 2013; Guskiewicz, Teel, & McCrea, 2014; Notebaert & Guskiewicz, 2005; Okonkwo et al., 2014) have suggested many reasons for the difficulty in identification and diagnosis including disagreement within the medical community on definitive diagnosis and proper guideline use, limited objective tools for identification, and the reliance on a clinical diagnosis. This leads to dependence on self-reporting of concussion symptoms by the concussed student-athlete. As discussed in the previous section, reliance on self-reporting is ineffective and flawed in the sports setting due to both internal and external influences on the student-athlete such as illness behavior. For example, using survey research, Kerr et al. (2015) found self-reporting differences in gender, with males reporting more undisclosed concussions than females. However, this study found no differences between Jane and the male participants' nondisclosure attitudes or behaviors when describing similar concussive events resulting in comparable symptom severity and duration. The discrepancy may reflect higher incidence among male student-athletes rather than differences in self-reporting attitudes and behaviors (Evans, 2016; Kerr et al., 2016).

Some researchers (Baugh et al., 2016; Baugh, Kroshus, Daneshvar, et al., 2014; Baugh & Kroshus, 2015; Chinn & Porter, 2013; Donaldson et al., 2014) have focused on whether concussion management guidelines have been effectively implemented by medical professionals, coaches, and NCAA compliance administrators. These studies

revealed a disparity between concussion management guidelines and practices, which was consistent with the findings from this study. Specifically, the majority of participants in this study described a lack of support attributed to a lack of knowledge by the athletic training staff and coaches. When comparing the participants' experiences with concussion management policies, the findings suggested ineffective medical care and mismanagement of these student-athletes with concussion by athletic trainers in terms of identification, removal from play, take-home instructions, and diagnosis.

An unexpected finding was the complication of simultaneous injuries on the identification of concussion, especially when the co-injury was distal to the head. After an in-depth search of the literature, no study was found to describe this issue in the identification of concussion. However, the concept of multiple injuries was discussed in studies on injury surveillance (Engebretsen, Steffen, Alonso, Aubry, & Junge, 2010; Fuller et al., 2007; Meeuwisse, Sellmer, & Hagel, 2003). The occurrence of multiple injuries is common enough for it to have specific instructions and definitions in the injury surveillance programs that are usually submitted to by athletic trainers. Therefore, athletic trainers are aware of their occurrence yet the topic has not been addressed in any of the concussion management guidelines or consensus statements on concussion in sport. Two participants from different sports, John and Smith, experienced distal injuries simultaneously and were not diagnosed with concussions. In John's case, the athletic trainers tended to a fracture of his lower extremity, but missed a concussion that was later diagnosed retrospectively when he experienced post-concussion syndrome after a second concussive event. Smith's athletic trainer was told by his teammate that he had a

concussion, but the athletic trainer decided to only address the severe ankle injury. Smith removed himself from play and did not return to the field, as he was unable to walk. While the immediate removal from play was ideal for the concussion, neglecting to manage the suspected concussion was inconsistent with concussion management guidelines. Because Smith's concussion was never addressed, he did not receive instructions on how to manage his potential brain injury. During the first 24 to 72 hours, or the window of vulnerability (Barkhoudarian, Hovda, & Giza, 2011) when the brain is requiring rest in order to heal, John and Smith also did not rest mentally or from academics, potentially prolonging their recovery. In order to reduce the risks of future complications, concussion management policy should include guidelines for double-injuries in order to increase identification of these types of undiagnosed concussions.

Once a student-athlete is suspected of a concussion, post-injury assessments are conducted immediately on the sideline screening for severe brain injuries, then in a more-controlled setting such as an office or quiet locker room for diagnosis of mTBI (Okonkwo et al., 2014; Putukian & Kutcher, 2014). Acute evaluation should include patient history, symptomology, observation, and comparison of baseline and post-injury cognitive and neurologic assessments (Broglio & Guskiewicz, 2009). However, Baugh et al. (2016) found less than half of NCAA institutions' sports medicine clinicians reported multimodal baseline and post-injury assessments as recommended by the NCAA and medical community. In this study, there was only one instance where baseline testing was effectively used and interpreted by the athletic training staff. In three cases, baseline tests were lost, inconclusive, or inaccurate. These findings support the caution expressed

in the literature on using standardized assessments alone for diagnosis and the need for comprehensive medical evaluation by a concussion specialist (Evans, 2016; NCAA, 2014e; Okonkwo et al., 2014). In fact, five participants explicitly recommended a concussion specialist. John explained his recommendation due to athletic trainers' ineffectiveness: "...it was just in their little handbook that they should give a player a concussion test. They didn't even know what to do after that...I mean they waited three to four days before I saw a doctor." Another participant, Alex, illustrated the need for a concussion specialist in the following way: "he [his athletic trainer] used the same lists every time so people would start to know the words. So, I guess people kind of cheated the system a little bit." From Alex's perspective, his athletic trainer properly followed guidelines but was ineffective. Chinn and Porter (2013) suggested beyond lack of knowledge, growing responsibilities and workload play a role in athletic trainers practice and compliance to concussion guidelines. Despite medical consensus and increasing responsibilities of athletic trainers, the vast majority of NCAA institutions' respondents said the athletic trainers administered and interpreted baseline and post-injury assessments in 2013 (Baugh et al., 2016).

Athletic trainers also need to properly instruct and refer individuals with single or double-injury concussions to the team physician for diagnosis as required by the 2010 NCAA concussion mandate. However, most of the participants never saw a physician within 72 hours of their suspected concussion, if at all. This is directly opposed to recommendations in the literature; where early diagnosis is considered the most important aspect of concussion management due to long-term issues developing from

lack of rest (McCrory et al., 2013; Okonkwo et al., 2014). Baugh et al. (2016) also found that only 51.9% of NCAA clinicians referred student-athletes to a physician within 24 hours in 2013, while 74.6% said they encouraged limited academic activities, 94.3% encouraged limited exposure to other stimuli, and 98.2% prohibited the student-athlete from resuming practice or game. The findings from this research suggest that those estimates may be greater than actual clinician behavior and more indicative of proper concussion management knowledge.

Concussion recovery. After the participants were diagnosed with concussions, they entered the initial phase of concussion management protocol known as return to play (RTP) and return to learn (RTL). Once diagnosed and cleared to play by a physician; the athletic team, inclusive of the trainer and coaching staff, launched into post-concussion testing regarding RTP, including ImPACT (Immediate post-concussion assessment and cognitive testing) testing and comparison to ImPACT baseline if obtained, and RTL (McGrath et al., 2013). All but one of the participants who had diagnosed concussions were not counseled to rest, nor assessed for a RTL plan, but instead were sent quickly back into the classroom. The student-athletes who incurred concussions and were not diagnosed continued to play and attend class even though concussion symptoms also interfered with their academic performance. The concussion recovery and post-concussion management protocol for the participants in this study examined in this section include premature RTL, premature RTP, academic accommodations, and a holistic team of support.

The premature return to play and learn experiences of the participants in this study directly contradicted previous literature (Carson et al., 2014; Okonkwo et al., 2014) and guidelines on proper concussion management (McGrath, 2010; NCAA, 2014a). McGrath (2010) recommended that student-athletes should go through a period of neurocognitive and neuropsychological initial assessment upon arrival, which could then be compared, post-concussion, to determine their readiness for RTL while they were being evaluated for RTP. Wasserman, Kerr, Zuckerman, and Covassin (2016) found student-athletes with concussions had greater cognitive dysfunction, especially those with previous concussions and females, as compared to other student-athletes with injuries after one week, and the cognitive functioning did not return to baseline until after one month. This was significant because cognitive testing accurately predicted when the student-athlete's brain was safe for learning. For example, Kevin who was never diagnosed in college, recalled how his symptoms affected his experience in the classroom: "it was hard to pay attention to class at times...because you are just...not able to keep your attention, you are not able to focus on what you need to focus on." This also aligned with Halstead et al.'s (2013) recommendation that if the student-athletes were given cognitive rest, followed by academic accommodations, then most concussions would resolve in three to four weeks from injury; however, they noted that student-athletes with prolonged symptoms for many months should have a more formal academic accommodation plan.

Many participants expressed difficulty with symptom intensification when returning to the classroom, which aligned with the findings in literature. A premature

return of student-athletes to the classroom nullifies the basis for resting the concussed brain. The increased learning activities or any work of the brain exerts a demand of energy on a brain that is already depleted, which could worsen the symptoms of concussion (Hall et al., 2015; Halstead et al., 2013). John lost consciousness during practice and reported it to the athletic trainer along with the symptom of the worst headaches of his life, the inability to wake up, and the pain from sunlight; but he was forced to return to class the next day and to meetings over the weekend. His coaches and academic advisors insisted on his attendance because he had barely maintained his grades for eligibility, and his role on the team was critical. John should have rested immediately and not subjected his symptomatic concussion to three days of premature RTL, because his recovery could have been less protracted and prolonged and could have resulted in healing; instead he had to withdraw for that school year.

According to Wasserman, Bazarian, Mapstone, Block, and van Wijngaarden (2016), most student-athletes with concussions returned to baseline in four weeks after cognitive rest and academic accommodations. However the student-athletes in the study who had undiagnosed concussions were more vulnerable because they received no rest and returned to play and the classroom with brains that were depleted in energy reserves with active symptoms. Kevin momentarily lost consciousness during a play and attempted to leave the field, but his coach sent him back in. He was returned to both play and the classroom without accommodations or support. Without the diagnosis of concussion and subsequent academic support, these student-athletes entered the classroom environment where faculty, lacking concussion knowledge, assumed the

student-athletes were lazy or slow academically (Engstrom, Sedlacek, & McEwen, 1995; Fletcher, Benshoff, & Richburg, 2003).

The majority of the participants (5 of 7) with both diagnosed and undiagnosed concussions revealed difficult, and at times insurmountable, struggles in their academic challenges. The participants labored to manage challenges associated with severe concussion symptoms in addition to the internal and external pressures to play, and the additional academic requirements of a college student. Chinn and Porter (2013) suggested that symptoms of headaches, sensitivity to light and noise, slower cognitive processing speed, and difficulty with focusing required academic accommodations. Hall et al. (2015) contended that the stress and impact of returning to learn was underestimated by the constituents of the institutions and suggested a return to academics concussion management policy, on a case-by-case basis, protected the student-athlete from long-term academic consequences. This was consistent with Alex's experience. He emphasized the difficulty he had when returning to the classroom after missing two weeks and still recovering:

...it was also tough because playing a sport and trying to make up for two weeks of schoolwork after that was pretty tough to kind of get back in the swing of things. So, assignments kind of built up over those two weeks and then I was coming off concussion then I had to do all of that schoolwork. That was a little overwhelming.

College student-athletes have demanding schedules that frequently begin extremely early and end late with seven day a week schedules, including holidays

(Ferrante & Etzel, 2009). During the careers of student-athletes, time constraints and a high level of additional expectations from the athletic and academic programs, fans, and NCAA place more of a burden to succeed on this population and frequently hinders normal college student development (Etzel et al., 2006). During these hours they have practices, conditioning, meetings, tutoring, and games; but to function in the arena of both student and athlete requires much of the student-athletes' executive brain functioning and sharpness. In addition, the participants in this study had symptoms which complicated their daily lives more. Several struggled with getting out of bed, Kevin had to wear sunglasses and had a prescription for his car's window tint, and John could not remember what was said in the class he had just attended. For many of these top student-athletes who had only known success, this was an unfamiliar challenge that could not be attacked in the weight room or even in the classroom without assistance.

Carroll and Rosner (2011) stressed that concussions are a silent epidemic and indeed the hidden, transient nature of symptoms makes it difficult to objectively assess in student-athletes returning to the classroom. An mTBI/concussion has no objective signs, so student-athletes with inexplicable drops in their grades are misunderstood and ineffectively supported academically. This aligned with the findings of this study. For example, Jane pointed out that she had maintained a 4.0 GPA until her concussion crisis, but it was difficult to deal with her new role as needing help and accommodations, "the big thing is you can't see it...so I think that is the hardest thing for administration people...and it's really hard for them if they haven't experienced it...so I think they should be educated on it for athletes or anyone."

Coaches, professors, even athletic trainers can easily focus on broken bones and sprains and can calculate the time period for healing in a cast or brace; but concussion healing is open-ended and silent to the eyes of the observer. Smith who experienced an ankle injury at the same time as his concussion credited his ankle injury for the accommodations he received from his professors, “yea, my professors were lenient on me getting to class cause I was in a boot...I just told them, ‘hey I got injured last week and I am on crutches’...and they were all okay with it.” While Smith received the accommodation for arriving late to class due to his physical disability, he did not receive accommodations that would aid his cognitive recovery due to his athletic trainer neglecting his suspected concussion and preventing a proper diagnosis.

Three participants in this study that were diagnosed with a concussion experienced days to months of daily serial testing as part of the recommended RTP procedure. Unlike RTL, the participants perceived experiences with RTP aligned with “best-practices” in the literature (Lee, Sullivan, & Schneiders, 2014) and guidelines (Broglio et al., 2014; McCrory et al., 2009; NCAA, 2013, 2014c) in concussion management. However, these participants described a loss of control (see Pre-concussion influences on self-reporting behavior section for further discussion) and worsening of symptoms that affected their academic pursuits. The accepted RTP procedure is a graduated symptom provocation model where the student-athlete is physically tested daily to determine where in the step-wise progression he or she experiences symptoms (Lee et al., 2014; Table 1). If the student-athlete begins RTP prematurely, before he or she has rested and is asymptomatic after RTL, then the student-athlete could experience

worsening of symptoms (Carson et al., 2014). Participants described daily testing provoked their symptoms and made it difficult for them to concentrate on schoolwork. The findings were consistent with the link between worsening of symptoms and delayed recovery with premature RTP (Asken et al., 2016; Carson et al., 2014). Jack recommended RTP should not be rushed and should involve a progression based on the student-athletes' symptomology:

...do the baseline test, memory...small stuff that doesn't require physical abilities because your equilibrium and all that stuff is going to be a little thrown off, so stick to the memory. Once you get the memory back, you know once you are symptom free, take the baseline test then ...balance or something like riding the bike.

Jack's recommendation further highlights the need for more detailed studies on RTP practices and empirical studies as RTP is currently based on expert opinion (West & Marion, 2014).

Miscommunication between student-athlete, coaches, university academics and healthcare can result in ineffective or non-existent academic accommodations. The literature recommends a team approach to academic support (Chinn & Porter, 2013; Halstead & Walter, 2010; McGrath, 2010; Weber, Welch, Parsons, & McLeod, 2014). The majority (6 of 7) of participants agreed that a team of support would have helped them to navigate the challenges of academics and healthcare while they were concomitantly struggling with concussion. Alex was the only participant to receive immediate cognitive intervention and accommodations. He was put on cognitive rest and

excused from schoolwork for two weeks until he was no longer symptomatic. After he returned to the classroom two weeks later he said he was overwhelmed with the workload and tried to find out all the exams, papers, meetings, etc. which he missed and then noted, “the one thing I would say is to have a liaison between the athletic department and the athletes and then to the school and to the faculty.”

Jane’s academic struggles finally resulted in academic accommodations, and she recommended a team of support because as an individual with a concussion it was overwhelming. She commented:

I just think it should be more of a team effort rather than an individual effort, cause it can get very complicated very fast, half the time you don’t really know yourself what is happening and a lot times people were not at their best.

Jane suggested that the team of support should reflect people who had been involved in her care: academic advisors, athletic trainers, team physician, neurologist, psychologist, faculty, and disability services. John eventually received accommodations as well, but accessed them by going through outside evaluations and then presented them to the disability services department. He was able to do this after taking both a medical and academic redshirt for the academic year he had his concussion. He also recommended a team of support that included family in addition to the same members Jane listed. He also suggested occupational therapists, vocational therapists, audiologists, neuropsychologist, and a psychiatrist. Jane and John’s recommendations for a support team were similar to McGrath’s (2010) framework for concussion management.

The findings of this study overwhelmingly aligned with the literature on the need for a team of support to direct the individual academic needs, which developed as a result of concussion symptoms. This suggests an individualized plan since the needs of each concussed student-athlete can be dependent upon factors such as severity and duration of the symptoms, gender, negative perceptions by faculty, and lack of awareness concerning academic accommodations (Chinn & Porter, 2013; Engstrom et al., 1995; Hall et al., 2015; Halstead et al., 2013). Instruction of the faculty on the difficulties the student-athlete faces post-concussion and providing a facilitated contact person for the staff member could help to change any pre-existing attitudes toward providing academic accommodations (Engstrom et al., 1995).

After consideration of the participant's responses and experiences in RTL and academic support as compared to the institution's actual delivery in concussion management protocols, it was clear there was an inconsistent and ineffective application of these elements to the detriment of the short- and long-term health of the student-athletes.

Recommendations

Every aspect of concussion management needs improvement. Recommendations from this study address three major focus areas: cultural change through education, NCAA practices, and higher education practices. Specifically, this study provides several strategies, which are discussed in this section. These include the following:

- Use warning messaging and public service announcements on television broadcasts

- Apply effective pre-season education
- Enforce implementation of concussion management guidelines
- Leverage media partnerships
- Invest in concussion specialists, and
- Create a team of support.

Cultural change through education. The need for cultural change has been established with the normative health behavior of concussion (Centers for Disease Control and Prevention, 2015; McGannon, Cunningham, & Schinke, 2013; NRC, 2013). Findings from this study confirm the need for cultural change in college athletics regarding the identification, treatment, and recovery of concussions and other head injuries. Successful change from a “culture of resistance” to a culture of health will take time and is influenced by all stakeholders, including the public (NRC, 2013). A document published by the CDC (2015) provided suggestions of small adjustments for specific stakeholders that would aid the progress of culture change. However, real change surrounding the culture of concussion requires a multi-faceted transformation. Recommendations that hold the potential to result in cultural change include the use of warning messaging and public service announcements (PSAs) on TV broadcasts, and effective pre-season education.

Use warning messaging and PSAs. Reduction in tobacco use is considered one of the greatest improvements in public health history (Livingood, Allegrante, & Green, 2016). Significant similarities are found in the rise and decline of tobacco use with the rise and current climate of sports-related concussion in football. Based on lessons

learned from the cultural shift in tobacco use, this study recommends using warning messages during college football television broadcasts and PSAs.

Historically, the rise of tobacco use and its corresponding impact on health is surprisingly similar to the growth in popularity of football and the growing concern over concussions. Both tobacco use and collegiate athletics were leisure activities that achieved meteoric, rapid integration into American society. This rise was accomplished due to a variety of factors such as corporate propaganda and advertising, successful lobbying and litigation, focus on safer product/equipment improvements, and support from the medical community and media (Borio, 2001; Crowley, 2006; Goodell, Batjer, & Ellenbogen, 2014; Muggli, Hurt, & Becker, 2004; National Cancer Institute, 2008; National Football League, 2016b). Despite being an integral component of American culture, both activities are laden with negative health impacts. Tobacco companies and the NFL used propaganda and advertising to increase growth (National Cancer Institute, 2008; National Football League, 2016b). For example, the Monday Night Football ads and broadcasts included imagery and sounds of two helmets directly hitting each other, and announcers used celebratory language when players would be injured after a big hit (Trujillo, 1995). From 1920 to 1950, the tobacco industry used the split in the medical community on the link between cancer and smoking to cast doubt by saying “the case is not proved” which created uncertainty in the public (Borio, 2001). The NFL used the same rhetoric regarding the link between CTE and football (Baker, 2016). With the same factors leading to the rise of both tobacco and football, it could be helpful to examine the

factors that led to the most successful cultural change in public health- tobacco accommodation to intolerance (Livingood et al., 2016).

Contributing factors to the decline of tobacco use included increasing numbers of death and health issues, increasing medical research that linked smoking to negative health outcomes, policy changes, media, regulations at the local, state, and federal level, investigative journalism, the anti-smoking movement's annual "Great Smokeout" event, businesses accommodating to non-smokers, and large companies no longer working with the tobacco industry (Borio, 2001). Other factors included health communication interventions, changes in attitudes and behavioral norms, and public consensus (Livingood et al., 2016).

One of the most impactful changes in terms of educating the public was the use of warning messages on televised programming, which provided audiences with important safety information. Without warning of the dangers of smoking when showing smoking behaviors, the audience is withheld pertinent information contradicting the safety of that behavior. Warning messages provide a brief reminder to the audience of the danger associated with the behaviors being shown. Based on the widespread and positive effects warnings had in raising awareness and influencing cultural change (Erickson, McKenna, & Romano, 1990), a digital on-screen graphic warning visible on all broadcasts and commercials of any NCAA aired contact sport where concussion may result from regular play is recommended. The warning graphic should be located somewhere on the screen that is visible without obstructing the view of the action. This could be next to the score placard or other common locations of logos. Warnings in commercials should follow the

current FCC standards of warning against any negative health outcomes or side effects such as located at the bottom of all pharmacopeia commercials or could follow the current pre-show warnings of stunt shows like “WWE.” The warnings could read, for example, as follows: “Activities demonstrated in this airing can cause traumatic brain injuries. Helmets do not prevent concussions.” This recommendation will likely be accomplished through federal regulations like those from 1950 to 1970 regulating tobacco advertisements which involved litigation by the Federal Trade Commission, restriction by the FCC, and a law being signed by President Nixon banning all advertising of tobacco products on TV (Borio, 2001).

Cultural change through mass media requires high frequency, extended reach, and long duration compared to the counter imagery (Erickson et al., 1990). In the example of tobacco, Erickson et al. (1990) stated high frequency refers to one PSA per 3-12 cigarette ads, extended reach means virtually complete audience penetration through three national TV networks, and long duration was three years of creative, multiple-appeal advertising (p. 242). PSAs on the dangers of repetitive brain trauma would reinforce warning messages and would reach a larger audience if aired outside of sporting events. While warning messages would have negligible costs, PSAs could be funded through multiple sources such as non-profits and partnerships between the CDC, NCAA, NFL, and networks (see Leverage media partnerships section for further discussion).

Apply effective preseason education. Effective education is extremely important and all stakeholders need to increase their understanding of concussion in order to change the culture. However, this study found a particular need for enhancing effectiveness in

the preseason education of student-athletes. While the majority of participants (6 of 7) reported some form of preseason education, only one participant could recall a specific negative outcome associated with not reporting concussion symptoms from the preseason education provided by the institution.

A refined preseason education program would begin with accounting for the participants' pre-knowledge of concussion gathered through childhood experiences. Pedagogy should involve establishing what the student-athletes knew prior to entering the educational session. For example, one approach is beginning with small group discussions of personal stories with concussion encounters, prior to showing participants the new information in a more traditional format such as presentation or lecture. Methods that assume no prior knowledge of concussion, like those currently used, such as lecture, poster, and/or signing acknowledgment forms, are ineffective on their own. Incorporating activities that engage all types of learners (e.g., verbal, logical, visual, kinesthetic, rhythmic, interpersonal, intrapersonal) would result in increased retention and understanding (On Purpose Associates, 2010).

After the initial small group discussion and the interactive presentation of new information, an activity that reinforces the feelings and symptoms of concussion should be performed, followed by take home information of the concussion management policy. One idea for an activity would involve development of a simulation either using Google Goggles or an augmented virtual reality application, similar to the Excedrin Migraine Experience App (GSK, 2016; Novartis Consumer Health, 2015), that shows the student-athletes what concussion symptoms look and feel like so the student-athletes can better

recognize varying degrees of symptomology. The use of direct measures is recommended to determine whether the student-athletes gained understanding of concussions. For example, an open-ended assessment at the end of the preseason education session or a delayed follow-up interview with the facilitator (i.e., nurse practitioner) depending on the size of the athletic program would provide a direct measure of learning outcomes (Tucker, 2014). The added value of a brief follow-up interview is the potential to build rapport with the student-athletes, increase visibility, and address in vivo any remaining misunderstandings the student-athlete may have regarding concussions.

In addition, increased transparency of policies would aid understanding of concussion management processes for the student-athletes once the student-athlete experiences a concussion. None of the participants in this study recalled receiving their school's concussion management policy. Access to the concussion management policies by the student-athletes, parents, and faculty through public websites would reduce barriers to knowledge and facilitate easy communication between involved parties. Specifically, the student-athletes in this study that were diagnosed with concussion described feelings of frustration and loss of control, and explained they all researched concussions on their own. Easily accessible policy documents would also allow the student-athletes frustrated about the process the ability to privately gain knowledge and manage expectations of the recovery process. Overall, the widespread, frequent warning messages and PSAs combined with more effective preseason education practices and

increased transparency will promote cultural change and will help improve future student-athletes post-concussion experiences.

NCAA practices. Increased media attention and a class-action lawsuit have motivated the NCAA to make sweeping changes in its concussion safety guidelines and regulation (Berkowitz, 2016). The five NCAA Division I autonomy conferences passed proposal number 2014-11, titled: “Autonomy Proposal-Concussion Safety Protocol” (NCAA, 2016). The group appointed a Concussion Safety Protocol Committee to assure that there would be an annual process with the goal that student-athletes should receive education on the signs and symptoms of concussion (and have these given to the student-athletes), including a policy on RTL. The Committee adopted several new recommendations, including procedures for pre-participation of baseline testing for all student-athletes, reducing exposure to head injuries, and ensuring proper concussion management aligns with current best-practices and the NCAA guidelines. Lastly, athletic directors would be required to sign a certificate of compliance for the university ensuring that all of these measures are done. The rest of the NCAA Division I, Division II, and Division III are considering similar legislation for 2017 (Stark, 2016). However, as helpful these actions may be, they represent the minimum required by the terms of the class-action lawsuit. The most glaring issue is that there are no stipulations for enforcement of individual schools to comply beyond athletic director signature. Also, the 2016 legislation does not require effective educational practices despite consistent research finding the NCAA educational requirements are ineffective in transferring knowledge. A more refined and effective change would include enforcement of the

NCAA mandated concussion management guidelines, as well as, leverage media partnerships as consumers to deliver accurate information on concussion.

Enforce implementation of concussion management guidelines. The NCAA should institute implementation guidelines and monitor institutional practices. The adopted protocol and guidelines exhibit a more robust concussion policy and includes a RTL component that previously was not required. However, it will be dependent upon the individual school to implement. Findings from this study suggest these types of policies do not translate into proper implementation. If legislation by the NCAA leaves out mandates and punishments for universities who refuse to follow the protocol, then the outcome will be spotty and inconsistent. If instituted appropriately, it could assist student-athletes in increasing their knowledge on concussion and at the same, enhance their awareness and ability to help teammates who may be suffering from concussions. Hopefully, the NCAA is willing to consider greater oversight and enforcement of concussion policies which would include mandated implementation and monitoring.

The Concussion Safety Protocol legislation is based on the NCAA (2014c) concussion guidelines compared in this study (see Discussion). Therefore, the issues found in this study would not be addressed or improved such as the complication in identification of double-injuries. A suggestion to improve future concussion management would be to propose a mandate through the Autonomous Governance Committee of the NCAA that requires universities to adapt a comprehensive concussion management plan that includes a team of support, independent concussion specialists, RTL, and effective education of all stakeholders to address inadequate care of student-

athletes following a concussion (NCAA, 2014e). This recommendation would be both regulatory and redistributive, meaning that not only would this include punishment for non-compliance but it would also change the current system (Alexander, 2013). In a review of 20 studies, Donaldson et al. (2014) found stakeholders such as physicians, athletic trainers, coaches, and parents had poor compliance with concussion guidelines due to deficiencies in concussion knowledge. Effective implementation of these guidelines could result in numerous changes to multiple stakeholders; including the job responsibilities of those in the proposed support network of athletic department personnel. This proposed protocol would be very different from the existing practices. Although it is also the least flexible, it would provide the most adequate care for the student-athlete, and ultimately protect the university from contentious legal assaults.

Leverage media partnerships. The NCAA and its member schools have a financial relationship with the media outlets that results in billions of dollars a year on partnerships with sports networks (Smith, 2014). It would be advantageous if both the media (using accurate play-call language), and the NCAA with member institutions through their athletic conferences, could provide accurate information on concussion, and further partner to deliver accurate public service messages concerning concussion. Consistent with this study, Kerr et al. (2015) found that media played a role in student-athletes' knowledge of concussion. A certain level of social responsibility should be placed on the media outlets to provide assistance in educating the public including student-athletes (Ahmed & Hall, 2016).

A suggestion to improve education about concussion is for the NCAA to partner with media to broadcast educational messages to future, current, and former student-athletes about the dangers of concussion, as well as to the general public (Ahmed & Hall, 2016). This could be mandated as suggested previously, through public service announcements, or in partnership between ESPN and the NCAA. One step is to have game announcers educated on concussion, as too often they provide inaccurate information and assessment during the broadcasts (Parker, 2016). The CDC published guidelines and information for the media in order to assure that information given out is accurate. In addition, Ahmed and Hall (2016) created a media checklist to address the inaccurate and diminishing language modifiers that sports journalists use when reporting on brain injuries. This would benefit the student-athletes as well as provide the television network and the NCAA a positive image in the public.

Higher education practices. Higher education institutions should be involved more holistically to help address the issues and gaps found in current concussion management practices; first, for the health and safety of its student-athletes, and second, for liability reasons. Beyond ethical obligations, all NCAA member institutions accept the responsibility for caring for the health and well-being of student-athletes per Article 2.2 of the NCAA Constitution which states, “athletics programs shall be conducted in a manner designed to protect and enhance the physical and educational well-being of student-athletes” (NCAA, 2014c, p. 3). In addition, Sawyer (2015) explained in *Campus Legal Advisor* that the courts have found colleges and universities are liable for injuries if they are not properly treated and managed by qualified personnel. Sawyer advised

institutions to shift the responsibility from team athletic trainers and staff to outside medical professionals for evaluation, RTP, and RTL; in order to reduce the scope of institutional control, and therefore liability. The findings from this study showed all but one participant experienced improper management during at least one stage of concussion management. Therefore, two recommendations are presented to address the aspects of concussion management in which participants did not receive care aligned with their institutions' concussion management policy and the NCAA (2014d) guidelines. This study proposes that higher education institutions should invest in concussion specialists and create a team of support.

Invest in concussion specialists. Ineffective medical care has been shown in the areas of baseline testing, identification, immediate removal from play, and take-home instructions for rest. Each of these areas could be improved if the current sport medicine staffs followed recommended concussion management guidelines. Unfortunately, this study, as well as the literature and current news articles, have suggested little progress has been made in the management of student-athletes with concussion. Therefore, higher education institutions must consider alternative means, such as employing concussion specialists, to ensure the health and safety of the student-athletes who are their attending institutions.

Most of the focus on concussions has been on understanding how to better educate, and at the same time, increase reporting among student-athletes. However, putting the responsibility solely on the student-athlete is problematic. The findings from this study showed a commonality that student-athletes wanted to be on the field, which is

an innate, unchangeable aspect inherent to being an athlete. Concussion specialists should be hired to monitor the practices and games of the contact sports, in order to increase effective management of concussions, and decrease their liability exposure. Specifically, a concussion specialist would be trained to handle appropriate sideline identification, immediate removal from play, further monitoring, instructions on cognitive and physical rest in the first 24 to 72 hours after the concussive event, and then referral to the institution's nurse practitioner in charge of concussion management (see Create a Team of Support below).

Ideally, a sideline concussion specialist should be independent from the athletic department. This person could be an independent athletic trainer, EMT, nurse certified in concussion management, or a more specialized nurse practitioner, neurologist, or neurotrauma expert depending on the institution's resources. An independent concussion specialist would take the pressure off team athletic trainers and coaches, and ease the burden on student-athletes to self-report. It would also be symbolic to the parents, fans, and public that the institution cares about the long-term health of its student-athletes.

Create a team of support. The participants and the literature called for a team of support to help manage the student-athletes' post-concussion recovery and facilitate academic success. Beginning with McGrath's (2010) framework and including the participants' suggestions from this study, various elements could be combined to form an individualized student-athlete concussion plan (ICP) to deliver an improved prognosis for the student-athlete after experiencing concussion. The team of support foremost would include a nurse practitioner or other similarly qualified medical professional as the

facilitator who would be particularly suited to lead the team due to the position's concussion base of knowledge. This individual also would manage the needs of the student-athlete with the institution's academic department, work with other student services that might include disability services, counseling, and student-health, as well as coordinate with adjunct experts such as psychologists for neurocognitive education testing.

Nurse practitioners with a specialty concentration in neurology would have expert knowledge of concussion management and would be able to expedite and communicate the medical recovery with physicians and maintain the on-going medical requirements of the student-athlete. Their understanding of the principles of care and their ability to also diagnose and write prescriptions if needed would work in conjunction with the team physician. Because the nurse practitioner would be available on a daily basis, if a student-athlete sustained a concussion, he or she could be seen during the vulnerable 24-hour time period of identification and render a diagnosis. This also addresses concerns expressed by the participants that they could only see the team physician on a scheduled weekly basis, with John not being seen until four days after his concussion occurred. Not only would the nurse practitioner be able to see the student-athletes to assess them for RTP and RTL, they would be able to collaborate with the neuropsychologists if prescriptions were needed and provide follow-up care. Fortunately, the use of nurse practitioners to see student-athletes for on-going assessments normally reserved for physicians could decrease the overall costs of care.

At first, leading the various departments and coordinating the many requirements of the student-athlete with a concussion would be a challenge for an independent nurse practitioner to navigate. However, once acclimated they would be able to collaborate effectively with the other members of the team to provide recommendations based on needs, and to arrive at an individualized care plan of care. As facilitator the nurse practitioner would coordinate all aspects of care with the athletic trainer and coach, academic advisor, disability services, and counseling/psychology services. Meetings would include the athletic trainer to review the recent post-concussion testing and ImPACT results; the academic advisor to review the status of all classes, work, and faculty input; counseling/psychology services to assess any psychoeducational testing or mental health needs; and disability services if accommodations were required, and to act as liaison to encourage and help the student-athlete in requesting and scheduling the needed interventions.

For instance, student affairs (i.e., disability services and student health) could more effectively assist with the concussed student-athlete issue by providing input on the university policy on concussions, as well as aid in the implementation of an objective and effective protocol for managing, treating, and clearing the student-athlete for RTP and RTL. To further clarify, the athletic trainer and student-trainers are presently responsible for identifying concussion and then recommending physician treatment, but many trainers are not as knowledgeable as nurses or physicians, and frequently recommend return to play (or classroom) before the student-athlete should (Guskiewicz, Ross, & Marshall, 2001; Sullivan et al., 2012). Sullivan et al. (2012) said that returning to the

classroom can be as damaging to a concussed student-athlete's brain as returning to play early. Experts in brain and medical care for injured student-athletes should be making the decisions about their RTP and RTL, as their primary job responsibility is improving the health and well-being of the student-athlete and they are not connected to the athletic department staff.

Student-athletes who have undergone a concussion and have cognitive deficits should be evaluated and cleared by departments within the university by personnel with expertise. Collins et al. (1999) established that long-term deficits in executive functioning, speed of information processing, speeded word fluency, and memory deficits occur with concussions; therefore outside neuropsychologists or psychologists through student health and disability services could become involved in order to perform neuropsychological testing on the student-athlete and move forward with an individualized accommodation plans. Many coaches, trainers, and athletic department tutors do not understand the necessity of brain rest and reasonable accommodations for recovering student-athletes (McGrath, 2010; Williamson et al., 2014). In addition, concussion symptoms and post-concussion syndrome can create deficits in academics, classroom participation, and interpersonal functionality (McGrath, 2010; Wasserman, Bazarian, et al., 2016). As a result, academic advising is necessary to assist the student-athlete by designing course schedules that could help them balance an academic course load with the requirements of returning to play; as well as, educate the faculty and coaches about the student-athlete's unique situation of injury, academics, and athletics (Majerske et al., 2008; Watt & Moore, 2001). Disability services would need to assist by

assuring that academic testing, evaluation, communication with professors, and accommodations were instituted as needed.

Chinn and Porter (2013) discussed the gap of knowledge that exists for student-athletes with concussion, noting that they were unaware that academic accommodations were available and could be accessed through disability services. Concussion and its associated symptoms qualifies for protection under the Rehabilitation Act of 1973 Subpart E which states disabled university students must be given the opportunity to compete with their non-disabled peers through accommodations legislated by the American Disabilities Act of 1990, 2008 (ADAAA); for schools that receive federal aid, and it further provides that all students with a disability are entitled to protections and services. Under the ADAAA a disability is defined as an impairment that substantially limits one or more major life activities and includes activities such as seeing, hearing, sleeping, learning, reading, concentrating, thinking, communicating; and bodily functions such as neurological and brain impairments (U.S. Department of Labor, n.d.). None of the participants were initially aware that they were eligible for accommodations from their individual universities, and only one participant was advised by a psychologist to seek accommodations.

Finally, the counseling unit would be a necessary lifeline for the recovering student-athlete with concussion. As noted earlier, concussion and post-concussion syndrome frequently present with hallmark emotional symptoms of depression and irritability. However, coaches and athletic staff rarely know how to deal with a depressed student-athlete, usually attributing it to a sign of weakness and not attributable to a

physical injury (Broughton, 2001). Broughton (2001) also found that counseling student-athletes after an injury should be based on a developmental model and a holistic approach and should include discussions on missing athletic play, career-related concerns, social isolation, and a fear of failure.

The amount of time and money to develop and implement a team approach to concussion management on a sufficient scale would require significant resources. The investments would most likely be in the time and effort to redistribute the responsibility of care from athletic departments to already in-place departments on campus. In some cases, it may require hiring new professional staff. Overall, it would require capacity-building and the willingness for cultural change. The interplay of outside and inside support could help the student-athlete with concussion manage the injury physically, mentally, socially, and academically. It also represents an objective solution for creating a robust and protective policy guiding the university, athletic department, and student-athletes in concussion management and protocol.

Suggestions for Future Research

While this study may be the first to systematically report the student-athlete's perspective on post-concussion management in college, it was limited in scope with seven student-athletes from four sports at one specific snapshot in time. This study should be repeated with student-athletes in the future to monitor the changes and improvements of the student-athlete post-concussion experience as the needs may change. Also, this study should be replicated with individuals in other sports not traditionally represented in the current concussion literature such as gymnastics,

cheerleading, equestrian, wrestling, bull riding, swimming, softball, and baseball. Since only one female was included in this study, additional qualitative study with female student-athletes on the topic of non-disclosure would provide greater insight into conflicting results with previous survey research.

A qualitative study afforded a deeper understanding of the participant's experience, however, the interviews were limited to 90 minutes each. After speaking with several participants, I realized that a more in-depth study would be beneficial to understanding the reasons for non-disclosure and the culture. I suggest more in depth studies with a few participants should be conducted using grounded theory, ethnography, or single case study. For example, a case study of Jane could assist our understanding and management of repetitive head trauma.

An interesting occurrence during the interview with Kevin was the triggering of strong memory of a prior concussion in high school which he had never thought of previously. This memory trigger from the interview protocol could be a potential avenue for establishing concussion history in the clinical and research setting. Methodological research of memory trigger and concussion history could help clinicians more accurately address the needs and care of student-athletes with concussions.

The discovery of double-injury and the effectiveness of medical care when a student-athlete suffers more than one injury simultaneously have yet to be discussed in the literature. This described phenomenon was unanticipated and should be given further consideration and research to determine its prevalence, issues, and how to improve concussion management in these instances.

Conclusion

No matter the division, sport, or gender, post-concussion experiences for these NCAA student-athletes were filled with uncertainty, frustration, confusion, pressure, and a range of symptoms that make collegiate life more difficult. Differences in their backgrounds, knowledge of concussion, duration and severity of symptoms, diagnosis status, and support led to varying perceptions and illness behavior. The differences were reflected in the varying management of their concussion(s). However, none of the student-athletes experiences fully aligned with their institution's stated concussion management policies or aligned with all four minimum requirements of the 2010 NCAA concussion mandate. Areas of improvement include more effective concussion education and transparency of policies, baseline testing and record keeping, identification and immediate removal from play, better communication and take-home instructions for rest, and a team of support to navigate medical, athletic, and academic responsibilities during recovery. It was clear from the participants that during the time they attended college between 2006 and 2014 that progress had been made in terms of greater awareness of severe mTBI, however, much is left to do. Hopefully, these student-athletes' post-concussion experiences will provide insight for researchers, athletic program staffs, faculty, university administrations, and policymakers in how to improve the health and well-being of future student-athletes who experience concussions.

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Appendices

Appendix A Interview Protocol

Student-Athlete Post-Concussion Experiences

1. What was it like for you when you experienced a concussion?
 - a. Did you rest from physical and/or mental activity?
 - b. How long did you rest?
 - c. From what activities were you told to rest from?
 - i. Were you told to rest from TV, video games, or other cognitive activities?
 - d. How was your concussion diagnosed?
 - i. Was there baseline testing (did you take a computer test prior to the season)?
 - e. How did you feel at the time?
2. What helped you through the recovery process?
 - a. Who handles your medical care?
 - i. Tell me about that process.
3. Whom do you talk to about your concussion?
 - a. Whom did you meet with following your concussion and what was discussed?
 - b. Was there a team of support? (trainer, coaches, academic advisors etc.)
 - c. Inside and/or outside the athletic program?
4. In what ways are you supported?
 - a. Who supports?
 - b. Did you receive any accommodations?
 - i. If so, for how long?
 - ii. What were the accommodations?
5. How are/were you not supported?
6. What would you like to be done differently?
7. Do you feel any pressure to return?
 - a. By whom?
 - b. Please tell me about that feeling.
8. In what ways were you made aware of the concussion?
 - a. Could you give me an example of when you were told about concussions?
 - b. Is there a written policy?
9. Please describe what you think the ideal process should be after you experience a concussion?
10. Is there anything else you would like to share?

Appendix B Demographic Data Form**Student-Athlete Post-Concussion Experiences
Participant Demographic Data Form****Race/Ethnicity:****Gender:****Age:****Academic Class:****Sport:****NCAA Division:****Do you receive an athletic scholarship?****When did you experience a concussion?****Was this your first concussion that you know of?**

Appendix C Informed Consent Form

Consent Summary Information Sheet

Post-Concussion Experiences of Collegiate Student-Athletes

INTRODUCTION

You are invited to participate in a research study because you have been identified as a student-athlete that has incurred at least one concussion while participating as a member of a NCAA collegiate sport. The purpose of this study is to understand student-athletes' experiences post-concussion and how it compares to concussion management policy.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

<u>Participant Inclusion:</u>	NCAA student-athletes who recently participated in a collegiate sport.
<u>Number of Participants:</u>	20 student-athletes
<u>Study Procedures:</u>	I will conduct 20 one-on-one semi-structured interviews with 20 student-athletes. All interviews will be audiorecorded and transcribed verbatim. Each participant will have the choice to review their transcript for accuracy. The interviews will last approximately 60 minutes.

RISKS

All research carries risk. Participation in this study will incur minimal risk. The standard for minimal risk is that which is found in everyday life. Anything more than minimal risk or discomfort is not anticipated; however, if you do not wish to answer or feel uncomfortable at any time during the interview, you have the right to decline to answer any question and/or to end the interview. You do not have to participate in this study. If you choose to participate, you may stop at any time without any penalty. A potential risk is the inadvertent release of sensitive information from the interview. However, every effort will be made to maintain the confidentiality of the study records; including the use of pseudonyms. Audio files and all transcripts will be secured on computers with password protection to which only the investigator has access. All documents will be destroyed no later than December 2018.

Possible Risk	Measures to Minimize the Risk
Standing with institution or current team	- No identifiable information will ever be linked to participants responses - Use of pseudonyms - Deletion of audio files after transcription - Interviews conducted off-campus at a location of the participants' choosing
Painful memories from injury and after events	Will provide a pamphlet/resources for seeking further medical help
Court subpoena	- Certificate of Confidentiality from NIH (see Confidentiality below) - Not using UTK email account because of sunshine laws

BENEFITS

A direct benefit may include recognition of past injuries that participants may better understand and/or could seek medical care for their injuries. In addition, increased knowledge of student-athletes' experiences post-concussion, how their experiences compare to current concussion management policy and in what ways university concussion management policy may be improved could benefit future student-athletes with concussions through policy changes. This study seeks to identify effective university policy that protects the health and well-being of student-athletes postconcussion.

CONFIDENTIALITY

The information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study unless participants specifically give permission in writing to do otherwise. No reference will be made in oral or written reports which could link participants to the study.

To help us protect your privacy, we have also obtained a Certificate of Confidentiality from the National Institutes of Health. The researchers can use this Certificate to legally refuse to disclose information that may identify you in any federal, state, or local civil, criminal, administrative, legislative, or other proceedings, for example, if there is a court subpoena. The researchers will use the Certificate to resist any demands for information that would identify you.

You should understand that a Certificate of Confidentiality does not prevent you or a member of your family from voluntarily releasing information about yourself or your involvement in this research. If an insurer, medical care provider, or other person obtains your written consent to receive research information, then the researchers will not use the Certificate to withhold that information. The Certificate of Confidentiality will not be used to prevent disclosure to state or local authorities of intent to harm to self or others.

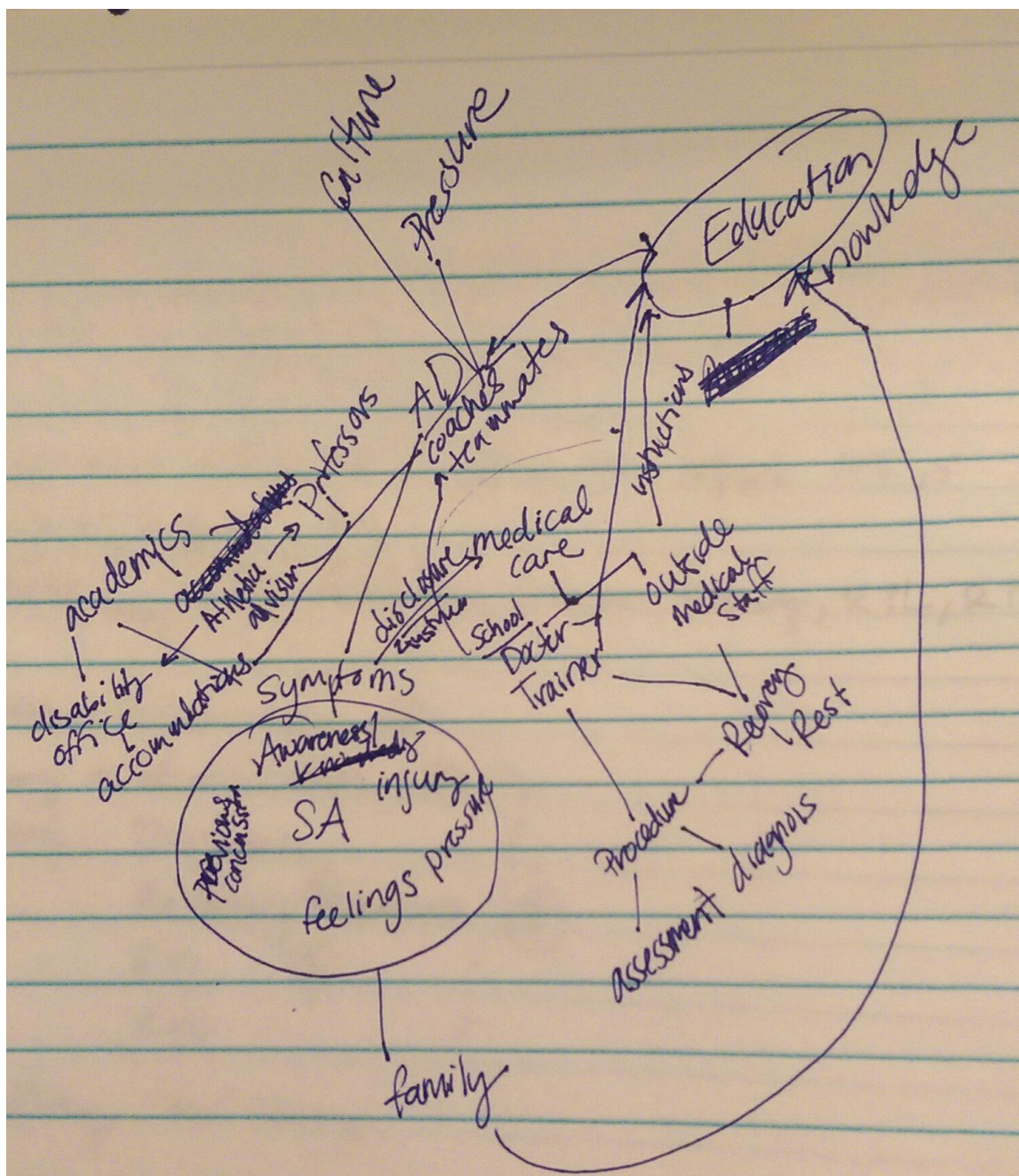
CONTACT

If you have questions at any time about the study or the procedures, you may contact the researcher, Katie Singer, at 1122 Volunteer Boulevard, Claxton 326, Knoxville, TN 37996-3430, or (865) 974-4142. If you have questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-7697.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

Appendix D Initial Concept Map



Appendix E Example Data Summary Matrix

Name	“Want to play”	Avoid diagnosis	Coaches/staff	Teammates	Self-pressure - Duty	Varying pressure
Alex	X	X	opposite	opposite	X	X
Dan	X	opposite	X	X	X	X
Jack	X			X		
Jane	X	X	X	X	X	X
John	X		X			X
Kevin	X	X	X	X		X
Smith	X		opposite	opposite	X	
N = 7	7 = 100 %	3 = 43 %	4 = 57 %	4 = 57 %	4 = 57 %	5 = 71 %

On print out used check marks for yes and x's no contrary perception. Also, took notes and tallied quotes for quality and type.

Appendix F Audit Trail

1. Transcribed all interviews of student-athletes with concussions after the interview.
(Had one interview with a former student-athlete that did not experience a concussion but their friend did). Simultaneously searched for concussion management policies and related documents.
2. After first two interviews, I conducted data analysis creating primary categories.
Also, continued to seek out potential participants.
3. Made notes (memos) as I transcribed.
4. Organized into folders both on computer and manually. Had all forms (informed consent, demographic sheet, protocol, interview checklist etc.) in an individual folder for each participant. No real names were written down on any papers, only pseudonyms.
Only location of real names were in email communications in a password protected newly created google account to which I was the only person with access.
5. Followed Tesch (2013) exactly and started over with all seven participants interview transcripts.
 - a. Read 3 transcripts and wrote topics in the margins
 - b. Made a spreadsheet w/ 4 columns of lists of topics
 - c. Read an additional transcript, and then filled in columns with all the topics
 - d. Printout and used different colored pens and highlighters to connect and cluster topics across case.
 - e. Created new sheet of paper with list of clustered topics (those connected)

6. Imported all the transcripts and documents into Nvivo 10 and manually coded them by high level topics
7. Printed out/saved each coded category text to read and analyze manually.
8. Described each category at a time:
 - a. Identified and summarized the content for each category for commonalities, uniqueness, confusions, contradictions, missing information w/ regard to research questions
9. Used Bloomberg & Volpe (2012) template for Data Summary to look at cross-case & research questions, and simple road map
10. Then incorporated/compared to my finding from my pilot study.
11. Created Participant Profiles
12. Got frustrated
13. Went over all coded into themes
14. Reorganized (manually) for results section/ final coding/ writing themes
15. Went back to Nvivo to recode to the themes and manually, looked at what % coverage for each
16. Ordered by number of references and sources into themes to get a sense of initial prominence
17. Found all most important quotes for each participant (they were bolded)
18. Identified themes on the transcripts. Compared theme to participants and tallied on the Data Summary Table for each theme/ combined some.

19. Wrote research questions on a big post-it note wall sheets of paper and then brainstormed ideas for the answers (from memory to think big picture). This actually helped a lot after being so drilled down and immersed in the data. The two sheets had the 3 research questions in black with space between. Sheet one was for Themes and written in blue; Sheet two was for Discussion/Ideas (green marker) and student-athlete recommendations (pink marker) and used orange for my recommendations that came to mind last.
20. Document analysis for the concussion management: first read through all the documents again, authenticated etc.
21. Then compared documents with the corresponding student-athletes (more comparative than originally planned in proposal so adjusted methods.
22. Again, lots of memoing throughout data analysis. Questioned if I was doing grounded theory so went and read more about qualitative methodology.
23. Went through all transcripts again for symptoms to check after brainstorm session suggested that as an important answer to the first research question. (Selective coding)
24. Wrote first theme section, keeping track of quote usage on a Master tally sheet with each theme per column (another data summary table) using S for short and L for long quotes by participants, in order to all show triangulation
25. After selective coding, went back through codes and tallied by subtheme, then used that to determine which quotes to use for each theme. Started best quotes.

26. While working on No Rest theme table thought of idea for a table, created it and it led to a discussion of effectiveness of concussion management policy in health care of the student-athletes with concussion.

27. Revised coding was completed manually using post-it note tabs that are easy to move and change as well as easy to see. I would write sub theme codes on the color coded tab.

Note: Miles, Huberman, Saldana (2014) Matrix coded task can be quoted for manual and computer.

28. Visual literacy.org Periodic Table- Perspective Diagram used for thinking through No Rest subtheme relationships.

29. Clustered and partitioned the columns on tally sheets while I was analyzing and writing (apparently Miles, Huberman, & Saldana 2014 call that process meta-matrices on p. 114).

30. Confirmed triangulation and followed up things that stood out, looked for rival explanations.

Appendix G IRB and NIH CoC Approval

THE UNIVERSITY of TENNESSEE 

KNOXVILLE

Office of Research & Engagement
INSTITUTIONAL REVIEW BOARD (IRB)

1534 White Ave.
Knoxville, TN 37996-1529
865-974-7697
fax 865-974-7400

August 27, 2015

Dr. Patrick Biddix and Ms. Katie Singer
UTK - Educational Leadership & Policy Studies
Bailey Education Complex
1122 Volunteer Boulevard
Knoxville, TN 37996-3430

Re: UTK IRB-15-02429-XP

Study Title: Post-concussion experiences of collegiate student-athletes

Dear Dr. Biddix and Ms. Singer:

The UTK Institutional Review Board (IRB) reviewed your **application** for the above referenced project. It determined that your application is eligible for **expedited** review under 45 CFR 46.110(b)(1), categories (6) and (7). The IRB has reviewed these materials and determined that they do comply with proper consideration for the rights and welfare of human subjects and the regulatory requirements for the protection of human subjects. Therefore, this letter constitutes full approval by the IRB of your application version 1.2 as submitted. Approval of this study is valid from August 27, 2015 to August 26, 2016.

In the event that subjects are to be recruited using solicitation materials, such as brochures, posters, web-based advertisements, etc., these materials must receive prior approval of the IRB. Any revisions in the approved application must also be submitted to and approved by the IRB prior to implementation. In addition, you are responsible for reporting any unanticipated serious adverse events or other problems involving risks to subjects or others in the manner required by the local IRB policy.

Finally, **re-approval** of your project is required by the IRB in accord with the conditions specified above. You may not continue the research study beyond the time or other limits specified unless you obtain prior written approval of the IRB.

Sincerely,
Colleen P. Gilrane, Ph.D.
Chair


DEPARTMENT OF HEALTH & HUMAN
Public Health

National Institute of
Disorders &
600 Executive
Rockville, MD

10/16/2015

The University of Tennessee, Knoxville
Dr. Patrick Biddix
1534 White Avenue
Knoxville, TN 37996

Dear Dr. Biddix,

Enclosed is the Confidentiality Certificate, protecting the identity of research subjects in your singlesite/single-protocol project entitled "Post-concussion experiences of collegiate student-athletes".

Please note that the Certificate expires on 08/26/2020.

Please be sure that the consent form given to research participants accurately states the intended uses of personally identifiable information and the confidentiality protections, including the protection provided by the Certificate of Confidentiality with its limits and exceptions.

If you determine that the research project will not be completed by the expiration date, 08/26/2020, you must submit a written request for an extension of the Certificate three (3) months prior to the expiration date. If you make any changes to the protocol for this study, you should contact me regarding modification of this Certificate. Any requests for modifications of this Certificate must include the reason for the request, documentation of the most recent IRB approval, and the expected date for completion of the research project.

Please advise me of any situation in which the certificate is employed to resist disclosure of information in legal proceedings. Should attorneys for the project wish to discuss the use of the certificate, they may contact the Office of the NIH Legal Advisor, National Institutes of Health, at (301) 496-6043.

Correspondence
should be sent to:

Lupe Aquino
National Institute of Neurological Disorders & Stroke
6001 Executive Blvd
Rockville, MD 20852

Sincerely,

Approved Date: 10/15/2015

Lupe Aquino
National Institute of Neurological Disorders & Stroke

Enclosure


DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service

National Institute of Neurological
Disorders & Stroke
600 Executive Blvd
Rockville, MD 20852

CONFIDENTIALITY CERTIFICATE

CC-NS-15-003-A2

issued to

The University of Tennessee, Knoxville

conducting research known as

"Post-concussion experiences of collegiate student-athletes"

In accordance with the provisions of section 301(d) of the Public Health Service Act 42 U.S.C. 241(d), this Certificate is issued in response to the request of the Principal Investigator, Dr. Patrick Biddix, to protect the privacy of research subjects by withholding their identities from all persons not connected with this research. Dr. Patrick Biddix is primarily responsible for the conduct of this research, which is funded by:

Under the authority vested in the Secretary of Health and Human Services by section 301(d), all persons who:

1. are enrolled in, employed by, or associated with The University of Tennessee, Knoxville and its contractors or cooperating agencies, and
2. have in the course of their employment or association access to information that would identify individuals, who are the subjects of the research, pertaining to the project known as "Post-concussion experiences of collegiate student-athletes".
3. are hereby authorized to protect the privacy of the individuals, who are the subjects of that research, by withholding their names and other identifying characteristics from all persons not connected with the conduct of that research.

This qualitative research study explores post-concussion experiences of student-athletes and the relationship between student-athletes' perceptions of their concussion management and concussion management policies. Approximately a total of 20 current, former, and retired NCAA collegiate student-athletes who sustained at least one concussion while playing a collegiate sport will be recruited to participant in one-on-one interviews not exceeding a duration of 75 minutes per participant.

A Certificate of Confidentiality is needed because sensitive information will be collected during the course of the study. The certificate will help researchers avoid involuntary disclosure that could expose subjects or their families to adverse economic, legal, psychological and social consequences.

No identifiable information will be linked to participants (transcripts will not include participants' names- use of pseudonyms); verbal consent and deleted audio files after transcription; interviews conducted off-campus at a location of the participants' choosing; all linking information and files will be secured on computers with password protection to which only the investigators have access; all documents will be destroyed no later than December 2018.

This research begins on 09/30/2015 , and is expected to end on 08/26/2020.

As provided in section 301 (d) of the Public Health Service Act 42 U.S.C. 241(d):

"Persons so authorized to protect the privacy of such individuals may not be compelled in any Federal, State, or local civil, criminal, administrative, legislative, or other proceedings to identify such individuals."

This Certificate does not protect you from being compelled to make disclosures that: (1) have been consented to in writing by the research subject or the subject's legally authorized representative; (2) are required by the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or regulations issued under that Act; or (3) have been requested from a research project funded by NIH or DHHS by authorized representatives of those agencies for the purpose of audit or program review.

This Certificate does not represent an endorsement of the research project by the Department of Health and Human Services. This Certificate is now in effect and will expire on 08/26/2020. The protection afforded by this Confidentiality Certificate is permanent with respect to any individual who participates as a research subject (i.e., about whom the investigator maintains identifying information) during the time the Certificate is in effect.

Sincerely,

Signed Date:

Alan Willard PhD
Deputy Director, NINDS
National Institute of Neurological Disorders & Stroke

Appendix H Table A1

Table A 1. Participants' Concussion Management Experiences of their Pre-College and College Suspected Concussion(s)

Name	Suspected Concussion ¹	College or Previous	Removed from play immediately?	Actual Rest		Time until		Take Home Instructions	Diagnosis Result	Diagnosed By	Year/Season
				Physical	Mental	RTP	RTL				
Jack	1	D3 University	No	None	None	1 week	None	None	mTBI; Broken nose	AT	2006
Jane	1	Previous (Club Soccer)	Yes	4-6 weeks	3 days	4 weeks	~2-4 weeks	No phone, computer, TV, video games, reading, or anything that gets your heart rate up	mTBI; Whiplash	Hospital Neurologist	2010 (Winter)
Jane	2	Big Time University	Yes	None	None	None	None	Keep eye on it; sleep	No concussion; Black eye	AT	2011 (Summer)
Smith	1	Power House University	Yes	3-4 weeks	None	3-4 weeks	None	Physical rest	Severe Ankle Injury	AT	2011
John	1	Big Time University	No	None	None	6 months	None	Sleep	mTBI; Post-concussion syndrome	TP; Outside Concussion Specialist	2013
Alex	1	D1 University	Yes	1 day	None	1 day	None	No limitations	No concussion	AT	2013
Alex	2	D1 University	Yes	2-3 days	2-3 days	2 weeks	2 weeks	Excused from schoolwork, no practice, and sleep	mTBI	AT	2014
Summary	7 (6)		% Yes = 71 (67)	% Rest:		% Restricted from:			% mTBI = 57 (50) % AT = 71 (83)		
(excluding those not suspected in college, i.e., Previous)			% No = 29 (33)	Physical = 57 (50)		Practice = 86 (83)			% Other injury = 57 (50)		
				Mental = 29 (17)		Class = 29 (17)					

Note: Does not include concussions that went unreported or unacknowledged by the athletic training staff at the time of injury. Each row represents one concussion.

¹Numbers represent order of concussions if the same person mentioned more than one suspected concussion.

Vita

Kaitlin Iris Singer was born in Durham, NC. She grew up in Chapel Hill, NC where she graduated from Chapel Hill High School. After high school, she attended North Carolina State University to study geology under the Lauren Bonatz Scholarship. During her freshman year, she received the prestigious Caldwell Fellowship which provided a unique opportunity each year as an undergraduate to grow in scholarship, leadership, and service. She graduated valedictorian from North Carolina State University in May 2006, with a Bachelor of Science in Geology. She then decided to stay at North Carolina State University for her Master's degree under the guidance of Dr. R.V. Fodor and graduated in August 2009. Following her Master's degree, she moved to Knoxville, TN to pursue a doctoral degree in Planetary Geochemistry at The University of Tennessee, Knoxville. During her second year of her PhD in Planetary Geology, she decided to change disciplines to a PhD in Higher Education Administration.