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Collegiate Student-Athlete Perceptions of the Impact of Concussion on Academic Performance

A dissertation

presented to

the faculty of the Department of Educational Leadership and Policy Analysis

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Doctor of Education in Educational Leadership

by

Robert H. Baker

May 2016

Dr. Catherine Glascock, Chair

Dr. R.J. Elbin

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Keywords: Concussion, Academic Accommodations, Higher Education

ABSTRACT

Collegiate Student-Athlete Perceptions of the Impact of Concussion on Academic Performance

by

Robert H. Baker

The purpose of this qualitative study was to indicate the experiences of collegiate student-athletes in meeting academic demands when experiencing prolonged recovery from concussion and if they perceive a need for academic accommodations. There is a gap in present concussion and an absence of studies that examine if academic accommodations are helpful during concussion recovery. The study was guided by 3 research questions focused on the return to learn during the recovery process. The study was limited to 9 student-athletes currently enrolled at three postsecondary institutions: Christian Brothers University, Rhodes College, and the University of Memphis. The study participants met pre-established criteria for the study, were recruited by their athletic trainer at their respective institution, and voluntarily participated in individual interviews with the researcher or co-interviewer. Through a phenomenological approach, individual interviews were conducted with the participants. Four themes were identified in the data: negative impact on academic performance, academic pressures, inequity of student-athlete treatment, and impact on concentration ability. Each study participant's story was shared through the data analysis process, and significant statements from the interviews as related to the research questions were included in the data analysis section. Ultimately, the data suggested that future research continue to focus on how student-athletes' recovery from concussion impacts their return to learn process.

DEDICATION

I would like to dedicate this dissertation to my wife of 22 years, Kathy Baker, who has been supportive of this journey every step of the way, even when my work got in the way of our family and parenting duties.

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I would first like to acknowledge my dissertation committee Chair, Dr. Catherine Glascock, who was present when my idea originated for this study in her Qualitative Research class on campus. Dr. Glascock inspired me to pursue a qualitative study on my topic and provided fuel for my fire to passionately pursue this study. I also would like to acknowledge the other exceptional members of my dissertation committee, who challenged me through this process and were always supportive of my topic and passion to conduct this study on concussions: Dr. Hal Knight, Dr. Jim Lampley, and Dr. R.J. Elbin. Thank you all for challenging me. I also would like to acknowledge my close friend, Dr. Brian Johnston, who always encouraged and inspired me to keep working.

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CHAPTER 1

INTRODUCTION

Colleges and universities with Division I athletic programs are mandated to ensure that their student-athletes are making progress each year toward earning their bachelor's degree. This mandate is governed by the NCAA's Academic Progress Rate (APR), a part of an academic reform package that was passed in 2003 (NCAA, 2014). The APR translates to increased standards and accountability for institutions, athletic departments, and coaches to ensure that their student-athletes are maintaining academic progress. If the progress is not met consistently, then the NCAA will levy consequences for the institution, that can include a ban of postseason competition and loss of scholarships (NCAA, 2014).

This accountability then translates to pressure on coaches and at times, student-athletes. If a student-athlete falls behind in his or her studies, there can be consequences for athletic eligibility and ultimately athletic aid. In comparison to their non athlete counterparts on campus, student-athletes must attempt to balance their academic workload with up to 20 hours of practice per week; missed classes, lectures, notes, and exams due to away game travel. A recent publication by the NCAA shows that Division I student-athletes graduated at a 65% rate, their highest rate in history, which is a percentage point higher than non athletes at Division I institutions (NCAA, 2013). Despite this high graduation rate, the reality is that participation in Division I college athletics is demanding on student-athletes and they face challenges to avoid getting behind in coursework when they have to balance their coursework with practice, travel, and missed classes.

When a student-athlete sustains a concussion the ability to maintain a demanding pace of balancing academics and athletics is impacted (Sirmon-Taylor & Salvatore, 2012). The purpose

of this study is to indicate the experiences of collegiate student-athletes of meeting academic demands when experiencing prolonged recovery from concussion and if they perceive a need for academic accommodations.

A recent trend in medical management of concussion is the increased focus on a return to the classroom for concussed student-athletes and an increased focus on how concussion impacts this area of recovery (Covassin, Crutcher, Elbin, Burkhar, & Kontos, 2013; Giza & Hovda, 2014; Halstead et al., 2013; Harmon et al., 2013; Kontos et al., 2012; Popoli, Burns, Meehan III, & Reisner 2014; Porter, Constantinidou, & Marron 2014; Sirmon-Taylor & Salvatore, 2012). McLean, Temking, Dikmen, & Wyler (1983) was one of the first groups to indicate that concussion not only affects sport participation but also the athletes' social and academic functions. A review of concussion literature not only demonstrates that the number of student-athletes experiencing concussions is increasing, but so is the research on the impact concussions have on student-athletes both physically and cognitively (Covassin et al., 2013; Giza & Hovda, 2014; Halstead et al., 2013; Harmon et al., 2013; Kontos et al., 2012; Porter, et al., 2014; Sirmon-Taylor & Salvatore, 2012). Research is needed on student-athletes' perceptions of how concussion impacts their cognitive and subsequent academic abilities. Another barrier to understanding how concussions affect academic performance is the tendency of student-athletes to underreport their symptoms. For example, in a survey of University of Akron student-athletes from 1995 to 2001, the participants rarely reported symptoms from their concussion that interfered with academic activities such as concentrating and studying (Kaut, DePompei, Kerr, & Congeni, 2003). After completing a review of articles on concussion incidence rates from 1985-2000, Tommasone and McLeod (2006) recommended educational efforts for athletes in sports at high-risk for concussions and education on symptoms and the importance of proper reporting of

their symptoms to medical professionals. Further investigation is needed to acquire a better understanding of what student-athletes' experiences are during prolonged concussion recovery with meeting academic demands and if there is a need for academic accommodations.

There are numerous published studies revealing the impact concussions have on cognitive abilities and the need for cognitive rest (Carson et al., 2012; Covassi et al., 2013; Dalsgaard et al., 2004; Grady, Master, & Gioia, 2012; Harmon et al., 2013; Majerske et al., 2008). However, there are few studies that investigate the perceptions of student-athletes' and how concussions impacted their abilities to complete academic work. This study will fill a gap in the literature by exploring the unique experiences of individual student-athletes during prolonged concussion recovery and if academic accommodations are needed.

Statement of Problem

Multiple research teams have identified that a concussion causes a degree of neurocognitive impairment, specifically impacting basic cognitive abilities like memory and information processing speed, which can have a detrimental effect on collegiate student-athletes for days, weeks, or even months after their injury (Bernstein, 1999; Halstead et al., 2013; Harmon et al., 2013; McLeod & Gioia, 2010; Porter, Constantinidou, & Marron, 2014). There is a gap in concussion literature indicating if academic accommodations would prove to be helpful during concussion recovery. The need for more research on the extent a concussion impacts academic work and if academic accommodations would aid the recovery process is identified by multiple research teams (Grady et al., 2012; Majerske et al., 2008). Specifically, academic accommodations could be helpful for athletes whose concussion recovery period last longer than 2 weeks with prolonged symptoms (Meehan et al., 2013; NCAA, 2014).

The purpose of this study is to indicate the experiences of collegiate student-athletes of meeting academic demands when experiencing prolonged recovery from concussion and if they perceive a need for academic accommodations.

Concussion

Concussion is defined in varied ways in the research. Harmon et al. (2013, p.2), defined concussion as a “traumatically induced transient disturbance of brain function” and “complex pathophysiological process.” Harmon et al. (2013) also referred to concussion as “a subset of mild traumatic injury (MTBI) which is generally self-limited and at the less-severe end of the brain injury spectrum.” McCrory et al. (2009) indicated that concussion impacts the brain function by impairing neurologic function for a short period of time usually, although symptoms could persist long term in a small percentage of cases. McLeod and Gioia (2010) indicated the impairment of neurometabolic functioning as the foundation of a concussion, requiring close clinical management during the recovery period to avoid a worsening of symptoms. Valentine and Logan (2012) also used the terms neurometabolic dysfunction when referencing the impact concussions have on brain activity and indicated the importance of cognitive rest until normal neurometabolic functioning occurs.

Athletic trainers and team doctors who care for student-athletes face the challenging task of identifying concussion symptoms and determining when student-athletes can be cleared to return to play or return to the classroom. This task was referred to by Kaut et al. (2003) as one of the greatest challenges faced by medical personnel working with high school and collegiate student-athletes. The medical assessment process is further complicated by the student-athletes’ participation and often underreporting or overlooking of symptoms during post concussion

recovery (Sandel, Lovell, Kegel, Collins, & Kontos, 2013), a contributing factor to the statement of the problem in concussion management with student-athletes.

The life of a collegiate student-athlete includes academic responsibilities, strength and conditioning responsibilities, practice responsibilities, and competition responsibilities that can total 20 hours per week. During this time there can be missed classes due to team travel, late nights due to game or practice schedules, and inconsistent meal times due to game, practice, and study hall schedules, all of which can interfere with sleep patterns (Kontos et al., 2012). This schedule becomes more difficult to manage for student-athletes when they are recovering from concussion due to cerebral energy crisis, decreased brain functionality, and cognitive symptoms such as alterations in memory, reaction, and balance (Giza & Hovda, 2001, 2014; NCAA, 2014; Solomon, Johnston, & Lovell, 2006).

It is critical that medical practitioners and student-athletes recognize the impact that a concussion has on normal academic activities and cognitive functioning for those individuals in the post concussion recovery process. The impact that concussions have on brain functions has led to the establishment of return to learn guidelines by many medical experts. For example, Master et al. (2012) described a typical concussion recovery plan for children and adolescents entitled a return to learn plan that includes rest from academic work, accommodations, and a gradual return to learn. During this plan the student-athlete gradually increases cognitive activity over the course of the recovery period following the concussion. It is critical that higher education institutions have clear policies in regards to providing academic accommodations for students during the post concussion recovery period, and to support them adequately in their educational pursuits and maximize their potential for success. Otherwise, student-athletes are expected to comply with established course expectations including exams, quizzes, homework

assignments, and lectures while suffering from post concussion symptoms. It has been common practice for physicians treating student-athletes with concussions to prescribe restrictions from play and physical activity, but cognitive activity restrictions have not consistently been considered (Majerske et al., 2008). Cognitive activity restriction, commonly referred to in the literature as cognitive rest, is considered one of many potential academic accommodations to be considered for concussed athletes (McCrory et al., 2005). In a recent lawsuit settled with the NCAA, it was mandated that all current and former NCAA student-athletes will be afforded academic accommodations during their recovery (NCAA, 2014). The purpose of this study is to indicate the experiences of collegiate student-athletes of meeting academic demands when experiencing prolonged recovery from concussion and if they perceive a need for academic accommodations.

Research Questions

This study is guided by three research questions:

- 1-What difficulties with academics are reported by collegiate-level student-athletes with prolonged recovery from concussion?
- 2-For student-athletes who are afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?
- 3-For student-athletes who are not afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

Scope of Study

The study is limited to student-athletes currently enrolled at 3 postsecondary institutions in the west Tennessee area who have experienced concussions within the past 2 semesters and whose recovery period lasted longer than 2 weeks. Student-athletes who have experienced a concussion within a two 2window of when the study is conducted were excluded because their recovery may not be complete.

The Setting: Three West Tennessee Postsecondary Institutions

This study took place on the campuses of three postsecondary institutions in West Tennessee: Christian Brothers University, Rhodes College, and the University of Memphis. The participants were collegiate student-athletes participating in various sports. The qualitative, individual interviews occurred in natural settings (McMillan & Schumacher, 2010) on the campuses the student-athletes attend. The interviews focused on the participants' concussion recovery experiences, perceptions of academic difficulties while in recovery and perceived need for academic accommodations, if any.

Delimitations and Limitations

The delimitations of the study are as follows:

- The study is limited to those student-athletes with concussions that occurred within the past 2 semesters.
- The study is also limited to participants whose concussion recovery period lasted longer than 2 weeks. There is consensus in the literature that the majority of concussions (between 80%-90%) resolve within the first 7-10 days of recovery and also college student-athletes most often achieve full recovery from concussion within 1-5 days

following a concussion (Field, Collins, Lovell, & Maroon 2003; Iverson & Schatz, 2006; Macciocchi, Barth, Littlefield, & Cantu, 2001; McCrea et al., 2003).

- The study is limited to only student-athletes who attend postsecondary institutions in one region of Tennessee: Christian Brothers University, Rhodes College, and the University of Memphis.
- The literature review did not include studies that review how concussions impact balance and coordination as related to athletic performance.

The limitations of this study are as follows:

- The accuracy of the data is dependent upon honest and accurate self-reporting of concussion symptoms and recovery experiences of student-athletes age 18 or older.
- Because the sample size of the participants was small, the findings cannot be generalized to the larger population.
- The study was limited to one individual interview with each participant with the goal of lasting no more than 1 hour, with no preliminary plans for follow up interviews, unless necessary.

Definitions of Terms

Academic accommodations: an allowance or service made possible to individuals with disabilities that could impact learning; examples include preferential classroom seating, provision of tutoring, test taking accommodations or classroom accommodations, which can be designed to aid the learning process (Concussion, 2013).

Academic demands: intercollegiate student-athletes arguably have greater academic demands than many athletes due to the following requirements: an average of 20 hours of

practice and conditioning per week; extensive travel away from campus for competitions which involves numerous missed classes; missed lectures and in-class notes that can contribute to inadequate exam preparation; irregular sleep patterns due to schedule demands, which can contribute to greater academic difficulties (Kontos et al., 2012).

Concussion: a complex pathophysiological process affecting the brain's functioning induced by traumatic forces such as contact with a teammate, opponent, or the ground that involves neurologic dysfunction and may or may not involve a loss of consciousness (American Academy of Neurology, 1997; Aubry et al., 2002, p.6; Giza & Hovda, 2001; McCrory et al., 2005, 2009; Porter et al., 2014; Sirmon-Taylor & Salvatore, 2012).

Division I: one of three NCAA divisions for colleges or universities; members of Division I ordinarily possess the largest student bodies, athletic budgets, and largest number of athletic scholarships for wide range of athletics participation opportunities (NCAA, 2015).

MTBI: a mild traumatic brain injury; a term often used interchangeably with concussion (Collins & Hawn, 2002; Duma & Rowson, 2014; Majerske et al., 2008; Sirmon-Taylor & Salvatore, 2012).

Student-athlete: a postsecondary student who is enrolled in classes and on an active athletic team roster at one of the three participating postsecondary institutions.

Return to learn: a concept that is similar to return to play when treating those who have suffered concussions; the hallmark of return to learn is cognitive rest following concussion NCAA (2014).

Summary

In summary, this study will contribute to the increasing literature by providing an in-depth understanding of student-athlete experiences during concussion recovery. Furthermore, the data will provide student-athlete perceptions of their need for academic accommodations during their concussion recovery . The contribution will be primarily obtained through acquiring perceptions of student-athletes at three institutions who experienced concussions and an ensuing recovery period that lasted longer than 2 weeks. The participants were asked open-ended questions aimed to explain their experiences while recovering from concussion and determine if any academic difficulties could have been aided through academic accommodations.

Overview of the Study

Chapter 1 of this study includes an introduction, statement of the problem, background of the study, research questions, and significance of the study. Chapter 2 includes a comprehensive review of the literature. Chapter 3 includes the research methodology and design. Chapter 4 includes an analysis of the data with identification of any themes. Chapter 5 includes findings and analysis of the qualitative data, conclusions, and recommendations for practice of future studies.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

This literature review is a fusion of the research on sport-related concussions. The sequencing of information included in the literature begins with an overview of concussion with the genesis of the definition, pathophysiology, and biomechanics of what happens during the injury. This overview is followed by the prevalence and incidence rates of concussion and its effects, including signs, symptoms, and impairments to the injured individual. Once the background information is introduced, the clinical management strategies and procedures are reviewed along with an introduction to the concept of cognitive rest. Finally, the phases of recovery, including acute, sub acute, and chronic are discussed along with the commonly prescribed academic accommodations for concussion victims and how and when these accommodations are provided.

Overview of Concussion

Definition of Concussion

The study of concussion spans back to as early as the ninth century and Rhazes, a physician out of Tehran, Iran who focused on the shaking of the brain as a cause of concussion (Halstead, 2012; Solomon et al., 2006; Zarshenas, 2012). Since that time the study and definition of concussion has evolved with at least 42 working definitions of concussion to date (NCAA, 2014). In 1997 the American Academy of Neurology defined concussion as: “a trauma-induced alternation in mental status that may or may not involve loss of consciousness” (p. 582). Traditionally, concussion was inaccurately referred to as a “ding” or as “getting your bell rung”

(Adler & Herring, 2011, p. 468). These terms present a misconception that concussion is not a potentially serious injury and should not be used (Guskiewicz et al., 2004).

The primary group charged with reviewing how concussion is defined is the International Symposium on Concussion in Sport. This group has met three additional times since the original meeting in 2001: 2004, 2008, and 2012 and defined concussion in their first three meetings as: “a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces” (Aubry et al., 2002, p.6; McCrory et al., 2005, p. 196; McCrory et al., 2009, p. 176). Before the 2001 symposium the standard medical practice in concussion management was to classify concussions using grading scales of I, II, or III. McCrory et al. (2005) recommended that the practice of using grading scales in concussion diagnosis be abandoned. This group originally recommended the use of simple versus complex terminology in classifying types of concussions, whereas simple concussions resolve in 7-10 days and complex translates to more persistent symptoms and longer recovery. McCrory et al. (2009) then determined to stop recognizing the terminology of simple versus complex concussions in concussion diagnosis to avoid confusion – one is either concussed or not concussed. At the 2012 symposium, the definition was slightly changed to include the classification of concussion as a brain injury (McCrory et al., 2013). The definition has advanced to exclude language on the loss of consciousness and include language classifying concussion as a type of brain injury. Whether or not a loss of consciousness occurs is no longer a part of the definition and is a common misconception. Giza and Hovda (2001) stated that loss of consciousness in concussion does not always occur and should not be considered a pre requisite for the diagnosis of concussion. In a study of over 1,000 concussions in high school student-athletes, Meehan, d’Hemecourt, Collins, & Comstock (2011) reported that a loss of consciousness was reported in only 4.2% of the

concussions reported. Similarly, Collins et al., (2013) also reported that 90% of all concussions occur without a loss of consciousness.

Concussion and mild traumatic brain injury (MTBI) are used interchangeably in much of the research (Collins & Hawn, 2002; Duma & Rowson, 2014; Majerske et al., 2008; Sirmon-Taylor & Salvatore, 2012). Nearly 90% of concussions in sport are considered mild in nature, as such, concussion is sometimes referred to as an MTBI (Solomon et al., 2006). There are also researchers who distinguish between the two terms, indicating that an MTBI involves the loss of consciousness and concussion does not necessarily involve a loss of consciousness (Willer & Leddy, 2006). The panel at the 3rd International Conference on Concussion in Sport clarified that concussion and MTBI should not be used interchangeably because they are two different injuries (McCrory et al., 2009). Harmon et al. (2013) also clarified that concussions are a subset of MTBIs, are less severe compared to other more serious brain injuries on the brain injury spectrum, and it is undetermined exactly how long a concussion will last.

The literature on concussion has increased since 2001 when the first International Conference on Concussion in Sport was held, yet there is still the indication that identifying and diagnosing a concussion is not an exact science. Collins and Hawn (2002) stated that due to its subtle presentation, concussions could be easily misdiagnosed and improperly treated. Covassin et al. (2008) also acknowledged the ongoing debate regarding the diagnosis of concussions among sports medicine professionals. It is critical for medical professionals to understand the definition and presentation of concussions to know how to accurately diagnose and aid the recovery process. The following are additional examples of the definition's progression:

Table 1

Definitions of Concussion

Author (s)	Yr.	Definition	pg.
American Academy of Neurology	1997	“a trauma-induced alternation in mental status that may or may not involve loss of consciousness”	582
Giza & Hovda	2001	“any transient neurologic dysfunction resulting from a biomechanical force”	228
Willer & Leddy	2006	“instance in which an individual experiences transient alteration in mental status, especially from a sports-related head injury”	416
Sirmon-Taylor & Salvatore	2012	“a complex multisystem event caused by a direct blow or jarring motion to the head or body that may or may not involve loss of consciousness, resulting in impaired neurological function”	71
Harmon et al.,	2013	“a traumatically induced transient disturbance of brain function” that “involves a complex pathophysiological process”; “a subset of mild traumatic injury (MTBI) which is generally self-limited and at the less-severe end of the brain injury spectrum”	15
Covassin et al.,	2013	operational definition of concussion identifying the following criteria: on-field signs such as amnesia, loss of consciousness; on-field symptoms such as dizziness or headache; a decrease from baseline levels in postconcussive neurocognitive scores	

Note: definitions of concussion listed in chronological order as obtained through literature review.

The similarity in these definitions highlights the impact concussions can have on brain functioning that can lead to an interruption in normal life for any individual physically, mentally, and cognitively. Giza and Hovda (2001) and Sirmon-Taylor and Salvatore (2012) identified that symptoms of concussion can include impaired abilities in the areas of balance and coordination,

attention, memory, and cognition and attention difficulties. McCrory et al. (2009) warned that academic and other normal activities that require attention and concentration may intensify a concussion's symptoms and delay the recovery process.

Advances in Concussion Research

Over the past 10 years there has been a surge in medical research and studies designed to determine the impact and effects of sports-related concussion. This increased research is in response to increased frequency of concussions (CDC, 2007, 2011; Duma & Rowson, 2014; Mitchko et al., 2007; Noble & Hesdorffer, 2013; Sandel et al., 2013) and the lack of scientific understanding of concussion recovery and physiology (McClincy, Lovell, Pardini, Collins, & Spore, 2006). Historically, the focus of concussion research was on determining when it is safe to allow student-athletes to return to play. Recently, the impact of sport-related concussion has on student-athletes' academic performance is growing in the literature with approximately 7,000 articles published in 2012 (Popoli et al., 2014). A contributing factor to this surge is the attention brought to concussion by litigation and legislation. In 2013 the National Football League settled a lawsuit with 4,500 former players in the amount of \$765 million, and 49 states and the District of Columbia have legislation currently in place addressing sports concussion (Belson 2013; Miles, 2014). Despite the increased attention given to this injury, Majerske et al. (2008) reported in their study on neurocognitive performance and concussion symptom reporting that there is a lack of literature indicating how concussion impacts student-athletes' cognitive abilities to complete required schoolwork. It is imperative for medical practitioners who treat collegiate student-athletes to have an understanding of how this complex injury affects academic abilities. As an example, concussion can impair functions of the brain that directly correlate with a

student-athlete's ability to complete academic tasks including: memory, concentration, and speed of information processing (Solomon et al., 2006).

Kaut et al. (2003) referred to the recognition and management of concussion among student-athletes as one of the greatest challenges facing athletic trainers and other medical personnel at the high school and collegiate levels. One reason for this challenge is that professionals rely on participative reports by student-athletes, which is an often unreliable source of information. Sandel et al. (2013) indicated in their study on the relationship of recovery perceptions to neurocognitive performance that athletes have a tendency to overlook symptoms when considering and reporting their recovery. A contributing factor to this challenge faced by medical personnel is the fact that many institutions in higher education do not adequately educate their student-athletes about concussion. Wolverson (2014) recently reported that 23.9% of universities/survey respondents in a joint study completed by Boston and Harvard Universities admitted they did not have a formal process for annual concussion education. In a recent NCAA lawsuit settlement, concussion education for coaches and student-athletes was mandated for institutions to provide as a part of their pre season orientation (NCAA, 2014).

Pathophysiology of Concussion

In order to understand how a concussion impacts academic and daily activities requiring brain functioning it is imperative to understand the pathophysiology of concussion, i.e., what changes occur in the brain following the injury. Giza and Hovda (2001) referred to these changes as a cascade of events occurring in the brain. Unlike a knee injury, a concussion's impact causes chemical changes within the brain including an outflow of potassium from the brain and increase in flow of calcium (Collins et al., 2014; Giza & Hovda, 2001; Kontos & Collins, 2013). The changes in potassium outflow and calcium intake ultimately force the brain

to try and regain its chemical balance, which then experiences a shortage of oxygen and glucose as energy sources (Solomon et al., 2006). This leads to an energy crisis or imbalance of energy supply and demand that can lead to decreased brain functionality and what is referred to as a period of depressed functioning. During the first 5 to 10 days following a concussion, after the brain has entered in the depressed state of functioning, it is common for cognitive changes to occur, making a return to the classroom a difficult task (Field, et al., 2003; Lovell et al., 2003). Also during this depressed state, the demand for energy is occurring while the blood flow to the brain is reduced due to decreased activity, creating a supply-and-demand issue within the brain. During this chain of events the brain tries to regain a chemical balance but it is ordinarily a slow healing process (Giza & Hovda, 2001, 2014; Solomon et al., 2006). Majerske et al. (2008) described how this cascade of events leads to “cellular membrane disruption and ionic imbalances” in the brain (p. 265), also referred to as a crisis by Kontos and Collins (2013). This energy crisis and supply-and-demand issue in the brain causes impairments. Common impairments include poor memory, delayed reaction time, and imbalance among other cognitive, physical, and emotional symptoms, all of which can potentially make the return to classroom difficult for collegiate student-athletes (NCAA, 2014). In an effort to correct these imbalances within the brain and restore brain functioning, there is an increase in glucose metabolism which combined with a diminished blood flow leads to the energy crisis (Giza & Hovda, 2001, 2014; Kontos & Collins, 2013; Majerske et al., 2008). While this imbalance is occurring in the brain, Harmon et al. (2013) stated that premature physical or cognitive activity can delay the recovery and prolong the symptoms.

Biomechanics

A concussion occurs as a result of biomechanical forces affecting the brain. Often in sports the force causing a concussion comes from the head's impact with another object such as another head or the ground and the brain rebounding within the skull in cerebrospinal fluid. However, a concussion can also occur from shaking of the head, if strong enough, causing the brain to rattle inside of the skull. This leads to a diffuse axonal injury. A diffuse axonal injury involves movement of the brain within the skull and can cause difficulties with concentration and memory (Brain Injury Institute, 2011; Willer & Leddy, 2006). Another term for this type of head injury is a severe closed head injury, as it involves brain tissue tearing and internal swelling to occur and can range in severity from mild confusion to death (Brain Injury Institute, 2011; Duma & Rowson, 2014).

There is the possibility of a linear or rotational impact when a concussion occurs. In a linear impact (a.k.a., acceleration-deceleration) a force causes the student-athlete's head to accelerate causing the brain to move in one direction, then the head is stopped by hitting another head or the ground (deceleration), stopping the brain from moving. In a rotational impact a force causes the head to move from one side to another causing the brain to strike the skull. The rotational impact is most common in sports related concussions. Both of these impacts can cause tearing and stretching of blood vessels and neurons within the brain that can lead to diffuse axonal injury (Solomon et al., 2006).

Prevalence of Concussion

Sport related concussion is arguably the most complex injury faced by sports medicine professionals. This is because the presentation of its symptoms relies on honest reporting by the athlete and also because some concussion symptoms can be delayed for several hours in their

appearance (Broglia et al., 2014; McCrory et al., 2009). The actual numbers of concussions occurring in sport seems to vary depending on the study, but they appear to be on the rise over the past 10 years. In 1997 there were reportedly 300,000 sport-related concussions per year with an average of 822 per day in the United States (Center for Disease Control and Prevention, 2007). Guskiewicz et al. (2003), Gessel, Fields, Collins, Dick, & Comstock (2007), and Noble and Hesdorffer (2013) also reported 300,000 sport-related concussions that occur each year and with sports as the leading cause of traumatic brain injuries in young people ages 15-24, second only to motor vehicle crashes. The Center for Disease Control (2011) reported that the concussion rate for young people aged 10-19 increased by 100,000 per year from 2001-2009. Multiple research teams estimated that between 1.6 and 3.8 million concussions occur each year as a result of sport (Langlois, Rutland-Brown, & Wald, 2006; Mitchko et al., 2007) and are 7.9% of all collegiate injuries (Hootman, Dick, & Angel, 2007). Mitchko et al. (2007) also referred to multiple concussions within a brief time period as potentially fatal or catastrophic. In their research Mitchko et al. (2007) found that coaches generally considered concussions very serious because the injury's effects are not easy to identify immediately following the incident.

Moser et al. (2012) cited that the incidence of concussions had increased by more than 200% from 1997-2007 for children ages 14 to 19 years old. More recently many researchers referred to concussion as a major public health concern (Duma & Rowson, 2014; Moser et al., 2012; Noble & Hesdorffer, 2013; Sandel et al., 2013). Through their work at the University of Pittsburgh Medical Center's Sports Medicine Concussion Program, which treats 18,000 concussion patients each year, Collins et al. (2013) also reported that between 1.7 and 3 million concussions occur each year in sports or recreation.

These numbers may be in fact higher than what it is reported in consideration of how many concussions go unreported (Daneshvar, Nowinski, McKee, & Cantu, 2011). The underreporting of concussion symptoms is well documented in the literature as many athletes do not report their concussion symptoms because they do not understand what the symptoms are or they are hiding their symptoms so that they can return to playing sooner (Kaut et al., 2003; Kontos & Collins, 2013; McCrea et al., 2004). Harmon et al. (2013) estimated that 3.8 million concussions occur per year in the U.S.A. with up to 50% of concussions going unreported.

Concussions are particularly a concern for football student-athletes who have the highest rates of any contact sport (Gessell et al., 2007; Marar et al., 2012). In a 2010 study of 188 student-athletes from three NCAA football teams, Crisco et al. (2010) indicated that most football student-athletes suffer a minimum of 400 head impacts each year in practice or competition and can receive up to as many as 1,400 during a season. Daneshvar et al. (2011) reported that while the rate of concussion has increased steadily in recent years, variability exists still in the literature on the rate of concussion in football student-athletes, which is attributed to changes in diagnosis practices and increased awareness but also caused by increased collisions and bigger, stronger athletes. Marar et al. (2012) reviewed 1,936 concussions and found that 47.1% or 912 resulted from the sport of football and 13.2% of all reported injuries in 20 sports were concussions. Collins et al. (2013) also reported that football has the highest number of reported concussions with 300,000 on average per year. After football (40.5% or 55,007), the majority of concussions in young student-athletes occur in the girls' soccer (21.5% or 29,167), boys' soccer (15.4% or 20,929) and girls' basketball (9.5% or 12,923) (Gessell et al., (2007).

The care and treatment of concussion victims is difficult, dangerous and expensive. West and Marion (2014) reported that concussions cost \$76.5 billion each year in combined expenses

related to health care, rehabilitation, and days of work lost. One factor in this figure is that concussions are not an exact science and in an effort to avoid a catastrophic injury or legal action, medical practitioners are more inclined to run multiple tests immediately following the concussion and during the recovery period. West and Marion (2014) echoed the theme in the literature that treating concussions is not an exact science and there is no one test that can be used to definitively determine if a concussion has occurred. The on the field or court assessments are based on participative reporting and suspected incidents of concussion. Despite the lack of precise concussion numbers, there is increased awareness of concussions in modern society and increased media attention, both of which have elevated concussion injuries to that of a primary health concern (Duma & Rowson, 2014).

Effects of Concussion

Signs and Symptoms

It is commonly presented in the literature that the presentation of concussion symptoms can vary from one individual to another, making it possible that a concussion could go unrecognized (Collins et al., 2014; Collins & Hawn, 2002; McCrory et al., 2009). Despite the difficulty involved, it is imperative for medical professionals to know how to identify a concussion when it occurs, through assessing the varied signs and symptoms. Concussion research has advanced over the last 10 years, and many researchers recognize the following signs indicating a concussion: amnesia (not always), headache, nausea, dizziness, irritability, drowsiness, and other sleep related difficulties, (Aubry et al., 2002; Collins & Hawn, 2002; Kontos et al., 2012; Kontos, Collins, & Russo 2004).

At the 2nd International Conference on Concussion in Sport in 2004 concussion symptoms were identified in the areas of cognitive features, typical symptoms and physical signs.

Cognitive features identified included confusion, amnesia, loss of consciousness, and an unawareness of the period, opposition, or score of the game. Typical symptoms included headaches, balance problems, nausea, irritability, and visual and hearing changes. Physical signs included poor coordination or balance, loss of consciousness, loss of balance, slow to answer questions, vomiting, inappropriate emotions, slurred speech and poor concentration. An athletic trainer or physician often identifies these symptoms through a commonly used instrument called the SCAT or Sideline Concussion Assessment Tool. The SCAT offers assessments of concussion signs, symptoms and the individual's balance and memory (Collins et al., 2014; McCrory et al., 2005).

Willer and Leddy (2006) classified concussion symptoms slightly different from McCrory et al. (2005) and referred to categories labeled somatic, neurobehavioral and cognitive. Somatic symptoms included headaches, nausea, vomiting, balance problems, sensitivity to light, numbness and blurred vision. Neurobehavioral symptoms included drowsiness, fatigue, depression, nervousness and irritability, and abnormal sleep patterns. Cognitive symptoms included feelings of being dazed and difficulties concentrating or remembering.

Alla, Sullivan, and McCrory (2010) noted the difficulty in identifying concussion symptoms, as they can be prevalent in university students who do not have concussions. Examples include: sleeping problems, irritability, poor concentration, and fatigue. College students often have irregular sleep patterns that can contribute to these symptoms. Furthermore, a college student with a learning disability could exhibit similar symptoms, which presents a key reason for baseline testing of neurocognitive performance. Sady, Vaughan, and Gioia (2011) indicated that the common physical symptoms of concussions such as blurry vision, headaches, and sensitivity to light or noise can all impact the student-athlete's academic abilities. Other

researchers identified similar concussion symptoms that could have a detrimental effect on academic abilities, including headaches, dizziness, memory loss, difficulty concentrating, nausea, fogginess, irritability and sleep disruptions (Kontos et al., 2012; Sandel et al., 2013; Solomon et al., 1997). A study of 1,056 concussion in high school student-athletes yielded the following breakdown of concussion symptoms and their corresponding percentages:

- Headache (94.3%)
- Dizziness (75.5%)
- Concentration difficulties (53.9%)
- Confusion or Disorientation (44.0%)
- Visual difficulties or light sensitivity (34.4%) (Meehan et al., 2011)

These symptoms can cause problems for students and their abilities to maintain their academic responsibilities or cope with life at school while recovering from concussion. A headache caused by concussion can, for example, cause the student to be distracted from concentrating in the classroom and can also be triggered throughout the day by fluorescent lights and loud noises (Halstead et al., 2013). Concentration difficulties can cause the student trouble with recalling previously learned information, test taking, and the ability to learn new tasks. A list of other concussion symptoms and the corresponding problems caused for students is listed in Appendix D (Halstead et al., 2013).

Impairments

Impairments in multiple areas occur during normal recovery from concussion. As a result of the energy crisis and cascade of chemical changes occurring in the brain following a concussion, axonal injury and impaired neurotransmission occurs. Impaired neurotransmission

manifests symptomatically with impaired cognition, slowed reaction time, and processing (Giza & Hovda, 2001; 2014). Numerous researchers reported that a concussion causes cognitive impairment such as slowed reaction times (Aubry et al., 2002; Collins & Hawn, 2002; Kontos, et al., 2004; McCrory et al., 2005). Kaut et al., (2003) found in their survey of University of Akron student-athletes from 1995 to 2001 that 4.5% (17 out of 381) experienced academic difficulties after suffering a concussion. These difficulties included problems studying, concentrating, or completing classwork. Other symptoms identified in this study included 23% who indicated poor memory, 11.2% who indicated headaches, and 10.7% who indicated dizziness or vertigo (Kaut et al., 2003). Willer and Leddy (2006) also connected diffuse axonal injury caused by a concussion with cognitive difficulties in the areas of memory and concentration

Multiple studies indicated that collegiate athletes' memory impairments from concussion resolved within 24 hours of the injury, although there is notable research indicating a longer recovery period for some athletes. Field et al. (2003) and Pellman et al. (2006) noted in their studies that high school athletes experienced significant memory impairment 7 days postinjury. In addition, the number of athletes whose concussion symptoms remain after a week can reach as high as 15%, thus impacting both academic and sports performance areas (Berstein, 1999; Macleod, 2010). Memory impairment along with other post concussion symptoms can lead to academic difficulty and poor performance for student-athletes. Moser et al. (2005) reported in their study of 238 high school athletes that athletes with two or more concussions averaged a lower cumulative GPA and diminished performance on tests that required close attention, concentration, and processing compared with others without a history of one concussion or no concussion. In a study of 223 high school athletes Moser et al. (2005) and Covassin et al. (2008) found in their respective studies that concussed participants experienced impairments on tests of

their attention, concentration, memory, mental flexibility, reaction time, and processing speed when compared to others with no history of concussion. In contrast, Majerske et al. (2008) reported that the potential impact of concussion symptoms on cognitive activities and schoolwork was an unexplored area. Through their study the researchers found that cognitive activities immediately after a concussion could worsen the energy crisis and mismatch in the brain and thus recommended a restriction of cognitive activities during concussion recovery (Majerske et al., 2008).

Typical impairments following a concussion lead to executive functioning difficulties including, were not limited to the following: impaired attention and memory functioning, deficits in the areas of word retrieval, processing speed, and cognitive efficiency. In addition, a student recovering from a concussion is likely to be distracted easily and have challenges with visual and auditory comprehension (Sirmon-Taylor & Salvatore, 2012). These impairments combined with the demanding schedules student-athletes have is a formula for disaster academically. For example, Kontos et al. (2012) that collegiate athletes compared to high school athletes had more sleep-related symptoms during their recovery from concussion. They attributed this to collegiate student-athletes' greater academic demands (midterm exams, papers) combined with greater athletic demands (including 20 hours of practice or competition per week, travel and missed classes), all of which often result in less time for sleep. Multiple studies have indicated that a sport-related concussion's impact on collegiate athletes varies in length of time and may impair their abilities to perform academically, including decision-making capabilities, with symptoms lasting days, weeks, or in some cases months after the injury (Covassin et al., 2013; Halstead et al., 2013; Harmon et al., 2013; Porter et al., 2014).

Historically, researchers have recognized the commonly found vestibular impairments in concussion victims with 50% of athletes reporting dizziness in the immediate days following their injury (Hoffer et al., 2004; Lovell et al., 2004). Commonly identified vestibular symptoms are unstable vision, focus and motion difficulties, imbalance, and dizziness (Collins et al., 2014; Kontos et al., 2012). The amount of dizziness caused by concussion can also lead to ocular motor dysfunction, which is present in as much as 65% of concussed patients and in a small number of student-athletes this can impair their ability to drive a car after their injury (Collins et al., 2014; Iverson & Schatz, 2015). The onset of ocular motor problems commonly present blurred vision and multiple problems with reading, including loss of place when reading and overall difficulty reading. These impairments also translate to poor work or academic performance by student-athletes (Collins et al., 2014).

Clinical Management

On-Field Management

Harmon et al. (2013) recommended that the identification and diagnosis of concussion should be completed by licensed healthcare providers with the proper training in how to treat and manage concussions. The ability of athletic trainers, other medical personnel, and coaches to identify if a concussion has occurred during practice or competition has been enhanced through the development of tools and modern technology to be used as part of the medical assessment. Tools such as the SCAT, IMPACT, and PCSS have been developed to assist in the on-field management of concussion. The use of neurocognitive assessments like the SCAT or IMPACT are not to be used to diagnose concussions, rather to demonstrate how concussions cause cognitive changes (Porter et al., 2014). These instruments should be used in conjunction with

patient interviews to accurately assess the injury and determine the treatment or recovery plan with the highest likelihood for success.

At the 2004 International Conference on Concussion in Sport, the SCAT or Sideline Concussion Assessment Tool was recognized as a standardized tool to assess sports concussion and educate patients (McCrory et al., 2006). The SCAT includes a checklist to evaluate symptoms, exercises to assess cognitive functioning including assessments of balance and memory, and a physical exam (Collins et al., 2014; McCrory et al., 2005; Willer & Leddy, 2006). A drawback to the SCAT is that it does not effectively assess vestibular or ocular motor functioning, or neurocognitive functioning such as reaction time and information processing speed. Researchers recommend the use of a clinical interview with the SCAT any time that a concussion is suspected (Collins et al., 2014).

Another tool that is commonly used to immediately test patients suspected of having a concussion is the IMPACT or Immediate Postconcussion and Cognitive Test. IMPACT is a neuropsychological test that is administered on a computer, is brief as it takes approximately 30 minutes to complete, the results are processed immediately and generated on a report. IMPACT measures cognitive functioning, attention, memory, reaction time, and information processing speed. The outcomes yielded by the IMPACT include verbal and visual memory, visual motor speed, reaction time, and impulse control measures (Collins et al., 2014; Majerske et al., 2008; Pellman et al., 2008). For example, Covassin et al. (2013) used the IMPACT in their study of 104 concussed athletes to yield composite scores measuring verbal and visual memory, motor processing speed, and reaction time.

A self-reporting instrument also often used with student-athletes who have suffered a concussion is the Postconcussion Symptom Scale (PCSS). The PCSS is one part of the IMPACT

neuropsychological test and is a Likert scale designed survey measuring 22 symptoms covering cognitive and neurocognitive symptoms (Kontos et al., 2012; Majerske et al., 2008). These 22 symptoms are found in Appendix B.

In addition to using one or more of these instruments in the medical assessment, practitioners also rely on participative symptom reporting by student-athletes or the concussion victim. The literature indicates that this is somewhat unreliable due to the student-athlete's tendency to underreport (Gessell et al., 2007; Tommasone & McLeod, 2006). Tommasone and McLeod (2006) found that the phenomenon of concussion underreporting was viewed to be substantial. They found that more than 50% of high school football student-athletes did not honestly report concussion symptoms. In addition, their data analysis showed that 66% of the high school student-athletes did not think their injury was serious enough to report, 56% of collegiate athletes reported that they were not aware of their concussion's consequences, and 30.4% of football student-athletes surveyed reported that they continued to play in a game with a headache after receiving a blow to the head. Gessell et al. (2007) also noted an underestimating and underreporting of concussions by student-athletes who are more worried about their playing time and status on the team than the effects of their concussion.

Medical professionals who are given the daunting task of treating concussion victims must be aware of these underreporting tendencies as well as the typical recovery time periods. Recovery from concussion varies depending on the individual and can range from days, weeks, to months (Berstein, 1999; Elbin, Schatz, Lowder, & Kontos 2014; Iverson & Schatz, 2015; Macleod, 2010). Collins et al. (2006) noted that a sports related concussion's recovery period is 3 weeks for 80% of youth athletes, compared to the 1 week trend in recovery time for the majority of concussions in older athletes. McCrory et al. (2009) noted the widespread

recognition that the younger the student-athlete, the longer the recovery period from sports-related concussion. Current literature on concussion recovery enforces a theme of the unknown factor and “considerable individual differences” when trying to predict how long symptoms last in student-athletes (Iverson & Schatz, p. 26, 2015).

Cognitive Rest

The incidence rate of concussions in high school, collegiate and professional sports is increasing (CDC, 2007, 2011; Duma & Rowson, 2014; Mitchko et al., 2007; Noble & Hesdorffer, 2013; Sandel et al., 2013). High school and collegiate student-athletes face a different level of challenge from professional players during their recovery from sports-related concussion. A key difference between amateur (high school, college) and professional athletes relates to their academic and cognitive demands, whereas professional athletes do not have homework and classroom responsibilities ordinarily. Traditionally, the focus of concussion management has neglected the student-athlete’s academic role. However, studies dedicated to understanding the impact concussions have on cognitive abilities have increased. In a study of 393 athletes from four university football programs who were administered neuropsychological assessments, Collins et al. (1999) found a relationship between a history of concussion (2 or more) and impaired information processing abilities and the brain’s executive functioning. When concussion symptoms exist for more than few days or weeks, in some cases a month a longer (Meehan et al., 2010, 2011) , the return to the classroom can be especially difficult. More recently in concussion research, the student-athlete’s successful return to academics is increasing in its significance with physical and mental rest recognized more commonly as the most effective prescription for concussion, helping to alleviate the mental strain of academic activities (Grady et al., 2012; McCrory et al., 2009; McLeod & Gioia, 2010; Moser et al., 2012).

The technical term for alleviating mental strain through rest for concussion victims is cognitive rest that allows the concussion victim to avoid activities that may pose mental challenge and stress during the post concussion recovery period. The initial presentation of cognitive rest was at the 2nd International Conference on Concussion in Sport in 2004 held in Prague, and since that time it is referred to in the literature as the cornerstone of effective concussion management (McCrory et al., 2009; Moser et al., 2012). McCrory et al. (2005, 2009) continued in their subsequent meetings to define cognitive rest as the practice of limiting activities requiring concussion patients to pay attention, use memory, or use reasoning abilities. The practice of identifying and prescribing the appropriate length of mental rest for a concussion victim is not an exact science, partly because it is still a relatively new concept. Majerske et al. (2008) noted a lack of research on whether or not age-related differences in concussion symptoms impact student-athletes' cognitive activities needed to complete academic work. Cognitive rest for the student-athlete who is recovering from concussion involves the avoidance of all activities that involve mental strain including use of computers, cell phones, watching television, listening to music or playing video games, and academic work (Gibson et al., 2013; Master et al., 2012; McCrory et al., 2005, 2009; McLeod & Gioia, 2010). A key challenge for medical practitioners is determining how much recovery time is needed for a full recovery to be achieved and how much physical and mental rest is needed as not to delay the recovery process. Multiple researchers (Dalsgaard et al., 2004; Grady, 2010; Majerske et al., 2008; McLeod & Gioia, 2010; Sady, et al. 2011) noted that when a student-athlete participates in cognitive activities prior to full recovery from concussion, risk of further injury or delayed recovery occurs. Grady (2010) also noted that high school athletes require a lengthier recovery period

than older athletes and implied that more research needs to be conducted on recovery periods needed for older athletes.

Despite the increase in research on the use of cognitive rest with concussion victims, there is still a need for educational efforts and research. For example, after completing a study of physical therapy students and their knowledge of concussion management strategies, the authors concluded that even though physical rest is widely accepted in athletics, the concept of cognitive rest is not (Sullivan et al., 2011). Sullivan et al. (2011) also commented on the challenging nature of working with high school, university, and college student-athletes who have experienced concussions because they often do not equate rest with taking time away from their studies. Sady, et al. (2011) noted that the treatment of traumatic brain injuries has primarily involved physical rest, not accounting for the mental and cognitive recovery needs in concussion victims. They also noted that another common concussion symptom is anxiety. Anxiety not only impacts cognitive abilities but also interferes with the student-athletes' willingness and ability to follow medical recommendations. The need for more education on the importance of cognitive rest was also demonstrated in a study of 159 students with a concussion, where 44.71% of the participants returned to school prematurely (Carson et al., 2012). In another study referenced as one of the initial to examine concussion symptoms following a cognitive task, 165 athletes completed the ImPACT and PCSS tests at the 3 and 10 day mark following their concussion, a twenty minute cognitive task. The researchers of this study proposed that concussed athletes who complete cognitive tasks, even as simple as twenty minute baseline concussion tests, could be compounding their symptoms. The researchers also stated that more complex cognitive tasks such as reading texts or processing information may cause concussion symptoms to linger for weeks (Covassin et al., 2013).

The pressure on collegiate student-athletes to not get behind in their studies combined with the need for cognitive rest in the initial stage of recovery from concussion is not a good combination and can be anxiety producing (Gibson et al., 2013). It is during this part of the concussion recovery period that academic accommodations such as reduced class attendance and workload, note takers, or extended test taking time may be particularly useful for student-athletes, helping to facilitate a gradual return to school (Gibson et al., 2013; Harmon et al., 2013).

Arbogast et al. (2013) surveyed medical providers and reviewed electronic medical records (EMRs) of children who had suffered concussions. The results indicated that only two of 84 clinicians surveyed prescribed cognitive rest for their patients and 10 out of 91 EMRs had documentation of prescribed cognitive rest. The authors also found that as much as 18% of their patients' symptoms impacted their school performance and 30% overall experienced a decline in their performance in the classroom.

In another study of high school and college student-athletes who suffered a concussion between April 2010 and September 2011, the participants were prescribed a minimum of 1 week of physical and cognitive rest as part of their concussion management plan. This plan included several restrictions including no homework or classroom activities, no texting and use of phone unless necessary, no trips outside of the home, and no video games. As a part of the study, a subgroup of 28 athletes was created and assigned an additional rest period. They found that the additional rest had significant positive effects on cognitive functioning; of 49 student-athletes studied, the 28 who received additional rest had significant differences in their recovery experiences compared to the 21 athletes who did not receive additional rest (Moser et al., 2012).

In contrast, Gibson et al. (2013), in their retrospective cohort study of 184 concussion patients, found no significant relationship between the cognitive rest recommendation for the patients and their duration of concussion symptoms. Similarly, Brown (2014) led a study of 335 patients between the ages of 8-23 years studying how many days of cognitive rest were needed during post concussion recovery. Brown experimented with gradual amounts of cognitive activity during the recovery periods and acknowledged that even though cognitive rest is prescribed often by medical practitioners, there is a shortage of data demonstrating its importance. Brown found that her patients who participated in the most cognitive activities after the initial 3-5 days, took the longest to recover; also indicated data which that indicated that some cognitive activity (mild to moderate amounts) after the initial rest period does not slow the recovery process and may be beneficial to the patient (Brown et al., 2014).

Broglio et al. (2014) also noted that rest and return to learn should be carefully considered as to not delay the recover process; on a continuum of cognitive activities ranging from very limited (no school attendance) to full activity (normal school attendance). As the attention on concussions and their implications for student-athletes increases, there is a need for increased consistency in the prescription of cognitive rest, the duration of which to be determined individually.

Phases of Recovery

It is well documented in the literature that recovery from concussion time periods vary in individuals, ranging from days, weeks, to months (Bernstein, 1999; Elbin et al., 2014; Iverson & Schatz, 2015; Macleod, 2010). This recovery variance includes differences based on gender in indicated in some studies. For example, Kontos et al. (2012) found in their study of high school and collegiate athletes who had suffered concussions that female student-athletes exhibited more

baseline concussion symptoms than males and experienced higher rates of sadness, nervousness, and emotional feelings than males. Similarly, Sandel et al. (2013) reported the following in their study of 101 high school student-athletes:

- Male student-athletes had a higher perceived recovery rate than females, suggesting that females experience more severe postconcussion symptoms
- Female student-athletes' perceived recovery scores in tests administered were related to less postconcussion symptoms than males, suggesting that male student-athletes are better at judging their recovery

There is a need for more studies comparing perceptions of concussion recovery between male and female student-athletes.

In general, recovery from concussion is defined by three characteristics:

- 1) symptom-free at rest and during physical exertion, after ending all medication
- 2) neurocognitive test scores at or above baseline values
- 3) balance symptom scores at baseline levels (Gibson et al., 2013; Meehan et al., 2013).

Concussion recovery is also characterized by three stages: acute, sub acute or sub chronic, and chronic, depending on the length of the recovery and return to normal symptom free functioning (Elbin et al., 2014; Popoli et al., 2014). While most concussion recovery periods resolve within the first week or within 7 to 10 days, some last longer and may require accommodations or continued medical interventions (Belanger & Vanderploeg, 2005; Majerske et al., 2008; McCrea et al., 2013). McClincy et al. (2006) found through their study of 104 high school and collegiate student-athletes that neurocognitive impairments persisted for 14 days or more with verbal memory indicating the most severe impairment at 14 days or more post concussion. In a more

recent study of over 1,000 concussion in high school student-athletes, researchers reported that 77.2% of the participants were symptom free after 7 days; 19.2% exhibited symptoms lasting longer than 7 days but less than a month; and, 2.8% exhibited symptoms lasting longer than a month (Meehan et al., 2011).

Acute Concussion Recovery

There are differences in the literature on the definition of each recovery phase and the normal number of recovery days. The acute phase of concussion recovery is defined as the first 7 days following the injury (Krainin, Forsten, Kotwal, Lutz, & Guiskiewicz, 2011). Whereas, Popoli et al. (2014) defined the acute period of concussion recovery as between 0 and 13 days following the injury and during this stage symptoms can be severe with common symptoms of headache, difficulties with balance, and drowsiness. Much of the literature indicates that a concussion resolves over a period of 3-14 days in the acute phase (Lovell et al., 2003; McClincy et al., 2006). Multiple research teams reported that most or 80%-90% of concussions resolve within 7-10 days for adults with an estimated 10% displaying symptoms past that time period (McCrorry et al., 2009; Moreau, Langdon, & Buckley, 2014; Willer & Leddy, 2006). Sirmon-Taylor and Salvatore (2012) identified that in the acute stage of concussion recovery it is critical for student-athletes to receive proper care if they are to avoid long-term academic consequences. Grady et al. (2012) stated that as a result of the brain cells being particularly vulnerable in this state, cognitive activity in this phase could worsen the injury, and also acknowledged the limited number of studies in this area.

Sub Acute Concussion Recovery

In the sub acute phase of recovery from concussion, also referred to as subchronic, the concussion victim continues to experience difficulty and display symptoms between 14 and 28 days following the concussion incident (Popoli et al., 2014). This is compared to Krainin et al. (2011) who stated that the sub acute recovery phase can last between 8 and 89 days.

McCrea et al. (2013) compared a prolonged recovery group with a typical recovery group of concussed participants. They concluded that 10% of athletes who had experienced sport-related concussions demonstrated postconcussive symptoms beyond the typical 1 week recovery period. They also applied this percent to the estimate of 3.8 million concussions per year (Langlois et al., 2006) and estimated that up to 190,000 victims could present symptoms after 1 week and up to 50,000 would present symptoms for several weeks after the injury.

Chronic Concussion Recovery

Although rare, it is possible for concussion symptoms to last longer than 28 days. This is referred to as the chronic period of recovery (Popoli et al., 2014) or as defined by Krainin et al. (2011), 90 days or longer. In a longitudinal study of over 18,000 young athletes who had suffered a concussion over a 10 year period, McCrea et al. (2013) stated that 10% of their participants showed postconcussive symptoms beyond the usual 7 days that had been indicated in previous studies. The researchers also noted that additional studies are needed to help medical practitioners gain clarity on the persistence of symptoms in some athletes and what factors contribute to prolonged symptoms. In another recent study of hospital concussion patients ages 11 to 22 years old, Eisenberg et al. (2013) indicated that there are not clear, easy to identify factors when prescribing recovery periods. Eisenberg's team also identified a normal recovery

period of 12 days for patients who had no prior history of concussion with a recovery period of twice that long for patients who had experienced a concussion with the past year.

Academic Accommodations

Traditional prescription for concussion recovery has been physical rest and removal from practice or competition for athletes without consideration for the demands of schoolwork that student-athletes face. This prescription does not account for the cognitive demands and mental exertion that come with school activities (McLeod et al., 2010). Multiple research teams have supported that concussion management practices include recommendations surrounding the return to school while recognizing the need for more research on the impact of concussion on academic work (Grady et al., 2012; Majerske et al., 2008). The studies completed by these teams indicate that the practice of assigning academic accommodations for collegiate student-athletes suffering from concussions is needed. In addition to the increasing popularity of prescribed cognitive rest, other potential academic accommodations are available for consideration with concussion victims.

In secondary school aged children and younger accommodations during recovery from concussion can be addressed through the Individuals with Disabilities Education Act (IDEA). In this instance concussion is referred to as an acquired injury. Another option for students at all levels to receive assistance during recovery from concussion comes via Section 504 of the Rehabilitation Act (1973), which requires schools or programs who receive federal U.S. Department of Education funding to provide education and meet all educational needs of its students. According to the Rehabilitation Act for an impairment to be considered a physical or mental disability, it must impact the student's ability to learn among other major life events (Sirmon-Taylor & Salvatore, 2012; Thomas, 2000). Once this determination is made by school

and medical personnel, then accommodations such as preferential classroom seating, distraction free test taking environment, or others can be provided for the student in most circumstances (Sirmon-Taylor & Salvatore, 2012). However, Sirmon-Taylor and Salvatore (2012) also referenced the interpretive controversy that often exists when making this determination for temporary impairments such as concussions. Meehan et al. (2013) stated that academic accommodations may not be necessary within the first few days of the injury occurring. In general, academic accommodations could be necessary for the student-athlete showing concussion symptoms beyond 2 weeks, what is considered prolonged symptoms that can impact the student-athlete's verbal and visual memory abilities and reaction times (Meehan et al., 2013; NCAA, 2014). The American Medical Society of Sports Medicine recommends that concussion victims be afforded extended test taking time, reduced workload or days off from school (Popoli et al., 2014). As there are no standardized guidelines for providing academic accommodations to concussion victims (Popoli et al., 2014), the type of accommodation available depends on the individualized need and on the campus Office of Disability Services, if dealing with a collegiate student-athlete. There are 14 common accommodations considered for student-athletes in recovery from concussion (Appendix C, McGrath et al., 2010), including excused class absences, use of a reader and note taker, and temporary tutoring assistance.

The University of Pittsburgh Medical Center (UPMC) is widely considered to be at the forefront of concussion research. UPMC researchers compare the need for academic modifications and accommodations in student-athletes who have experienced concussions to that of prescribed physical rest for an athlete with any injury. A similar list to McGrath's list (2010), UPMC medical professionals indicate the following as possible academic accommodations to consider for student-athletes during their postconcussion recovery period:

- Excused class absences
- Preferential classroom seating – this could help minimize distractions
- Extended deadlines for assignments and exams
- Provision of tutoring/ academic support to assist with organizing and prioritizing
- Rest periods
- Classroom accommodations to help with light/noise sensitivity
- Excused from sports, physical education activities
- Test date postponement, delays or excused
- Test-taking time accommodations (distraction free rooms, tape-recorded tests to allow for self-paced) (Concussion, 2013)

Return to Learn

It is consistent in the literature that the student-athlete's return to learn process while recovering from a concussion should be handled equally as cautious as the return to play. Majerske et al. (2008) analyzed neurocognitive test results of 86 athletes before and after their concussions. They recommended the following academic accommodations for high school and collegiate student-athletes during their recovery process: shorter school day, reduced course load, rescheduling of exams, and class sessions with a 1:1 student instructor ratio. Grady (2010) and Valentine and Logan (2012) stated that athletes are often allowed to resume normal schoolwork activities prematurely, which can complicate an injury, and cognitive work should increase only in gradual amounts during recovery. The concussion treatment process is also complicated by student-athletes as they often overlook symptoms when forming perceptions of their recovery (Sandel et al., 2013).

The implications on athletes' cognitive recovery are too serious for academic considerations to be carelessly overlooked. As schools and support programs revise their policies and procedures to better accommodate student-athletes with concussions, the multi-disciplinary team should develop a comprehensive concussion management plan at the beginning of the year and include cognitive rest. This plan should clearly address return to play guidelines

and return to classroom guidelines, with a plan to identify and assess cognitive assertion effects (McLeod & Gioia, 2010).

There appears to be a gap in the literature identifying clearly defined guidelines or recommendations for return to learn with concussion victims. Sady, et al. (2011) indicated that return to learn protocols are gaining momentum in the medical field and currently there is a lack of legislation that addresses the process for student-athletes. In a recent lawsuit settlement between former student-athletes and the NCAA, one of the tenants of the agreement was that all current and former NCAA student-athletes will be afforded academic accommodations during their recovery (NCAA, 2014).

Unfortunately for concussion victims, most aspects of high school and college student-athletes' academic lives involve activities that could impact their cognitive recovery if conducted prematurely. Studies on this within recent years highlight a lack of understanding by student-athletes as well as the professionals who are treating them during recovery. For example, Carson et al. (2012) conducted a study of 159 students who had obtained a concussion and whether or not they had returned to school too soon. They found that 44.71% of the students returned to school too soon. Carson et al. (2012) also identified a lack of literature on how cognitive rest should be prescribed for student-athletes in recovery from concussion and the need for a plan to assist with the student-athlete's return to school. Recently, Carson et al. (2014) completed a study to determine if returning to play or learn too early had an impact on concussion symptoms and recovery. Their results indicated a premature return to school that caused concussion symptoms to worsen in 44.7% of patients. The study also indicated that a barrier to recovery success can be lack of concussion management knowledge by educators and administrators.

In a recent landmark lawsuit settlement by the NCAA the college athletics governing body agreed to provide \$70 million for concussion awareness, assessment, testing, and academic accommodations. The guidelines of the NCAA's settlement agreement include the following provisions for student-athletes who are diagnosed with a concussion:

- Baseline concussion testing
- Mandatory one day of no playing or practice and required physical clearance
- Mandatory presence of a medical professional with specific training in concussion management, diagnosis, and treatment at all games and practices
- Mandatory reporting process for all schools in reporting concussions and their resolution (NCAA, 2014).

The research is limited on evidence based approaches to managing the return to learn process for concussion victims, although there is evidence that the use of the brain to complete cognitive related activities while recovering from a concussion can be harmful. This can add stress to an already energy deprived brain and could worsen the symptoms and recovery process (Halstead et al., 2013). Recent research and legislation have consistently contributed to the need for cognitive rest and other academic accommodations to become the mainstream for concussion management prescriptions. For example, Porter et al. (2014), listed the following accommodations that should be recommended to faculty for concussed student-athletes:

- Postponement of exams
- Postponement of assignments
- Extended time for exams
- Extended time for assignments
- Preferential classroom seating (with consideration of sensitivity to noise or light)

- Distraction-free classroom environment for in-class assignments, quizzes, or exams
These accommodations should be afforded until all concussion symptoms subside in order to achieve normal cognitive functioning.

In a case study of a baseball student-athlete who experienced a concussion, he could not sleep well that night and could not concentrate on academic tasks in the classroom the next day; this led to decreased performance on his assignments, tests, and participation in class. The same student-athlete, after being provided academic accommodations, showed improvement and began to feel better after 2 weeks (Sports Concussion Institute, 2013). Case studies of this nature and research designed to understand individual experiences and perceptions of concussion victims' experiences are important to the continued understanding of this complex injury.

Conclusion

The current literature base on the impact concussion have on student-athletes is comprehensive in the representation of the need for rest and a proper recovery plan. In fact, rest from athletic participation has historically been agreed upon as one of the most common parts of the prescription and recovery plans for concussion patients (DeKruijk, Twinjstra, Meerhoff, & Leffers, 2001). There seems to be less agreement among the common concussion researchers on the duration and type of rest (Silverberg and Iverson, 2013). Gibson et al. (2013) urged medical practitioners to consider an extended period of absence from the classroom for concussion patients in recovery. In a study of adolescent student-athletes Sandel et al., (2013) reported that athletes "may ignore or be unaware of cognitive deficits when performing perceptions of recovery from concussion" (p. 65). This further complicates the task of the medical practitioner in prescribing how much rest is needed for full recovery from concussion.

While concussion research has increased, research is still needed on student-athlete perceptions of their symptoms and abilities to comply with academic demands during their post concussion recovery. In a phenomenological study of four collegiate student-athletes and their post concussion experiences, all participants reported that they did not receive any academic accommodations following their injury. Two of the participants reported a decline in academic performance during their recovery from concussion, including difficulty taking notes and a decline in test grades. The researchers claimed that concussed student-athletes' perceptions of their concussions are "largely unexplored" and recommended that future studies expand their findings, including a possible mixed methods approach (Moreau et al., p. 63, 2014).

The current concussion research approaches recommend removal from play, comprehensive medical assessment, and interview to diagnose this complex injury, with limited research on how to effectively treat concussion (Moser & Schatz, 2012). The need exists to learn more about student-athletes' individual experiences related to academic demands during prolonged concussion recovery periods. Specifically, a study designed to better understand treatment and accommodation best practices for concussion victims whose recovery lasts longer than the norm would be helpful to the concussion management field. A qualitative analysis derived from interviews with concussed student-athletes who are experiencing a prolonged recovery would mirror the information obtained from clinical interviews and provide valuable insight to whether or not they would benefit from academic accommodations. This study will add to the literature by exploring the unique experiences of individual student-athletes during their concussion recovery and their perceptions of the need for academic accommodations.

CHAPTER 3

METHODOLOGY

This chapter outlines the methodology of this study, beginning with the research questions that guide the study. The chapter also includes an overview of why a qualitative research approach was chosen, description of participants and the participant recruitment, ethical protocol, data collection, interview questions, data analysis, sample type and size, validity and reliability, and triangulation strategies.

Individual qualitative interviews were conducted with nine collegiate student-athletes age 18 or older who had sustained a concussion in the past, most immediate two semesters and needed more than 14 days of recovery to be cleared to resume activity. For the interviews with University of Memphis student-athletes, a co interviewer was used. This was done to avoid the appearance of any research bias, coercion or influence the researcher may have had, because the researcher works with University of Memphis student-athletes daily in advising and monitoring capacities. Through a phenomenological approach the researcher listened to the participants' stories in an attempt to explore the in-depth experiences of student-athletes who suffered concussions, which also allowed the researcher to obtain information directly from the source (McMillan & Schumacher, 2010). This process included an examination of their perceptions of the need, if any, for academic accommodations.

Research Questions

The study was guided by three research questions:

1-What difficulties with academics are reported by collegiate-level student-athletes with prolonged recovery from concussion?

2-For student-athletes who are afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

3-For student-athletes who are not afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

Participants

The participants were chosen based on the following criteria that were communicated by the Head Athletic Trainer:

- Student-athlete has experienced a concussion in practice or competition within the past, most immediate 2 semesters but not within the preceding 2 weeks
- Student-athlete's recovery from the concussion lasted longer than 2 weeks (sub acute recovery period)

The sports represented in the study were: football, women's basketball, women's soccer, men's soccer and women's lacrosse. The interviews ranged in length from 15-30 minutes.

Participant Recruitment

Participants were recruited for the study with the help of the athletic trainers at each institution. Athletic trainers made the initial contact with the prospective study participant and upon initial agreement to participate, the athletic trainer had the participant read and sign the Authorization to Release Contact Info form, providing name of the student-athlete, institution name, contact information (email address and phone number), and signatures of both the student-athlete and athletic trainer. Upon receipt of this authorization, initial contact was established

with prospective study participants to set up a meeting time and place. The prospective participants were contacted by the researcher to set up a mutually agreed upon interview time and location on their respective campuses. It was explained at that time to the participants that the purpose of the study was to indicate their experiences, any challenges they faced during their concussion recovery, and if they had a need for academic accommodations.

The first 5 minutes of the interview was spent reviewing the Research Study Informed Consent form and explaining the purpose of the study. Participants were informed that their participation in the study was anonymous and confidential and would only be used to better explain the phenomenon of prolonged concussion recovery experiences. Upon this explanation and meeting, each participant signed a second consent form acknowledging the confidentiality and anonymity and agreeing to participate in the study.

Prior to asking the study questions in the interview, participants were informed that the conversation would be recorded to ensure accurate and thorough evaluation of responses but that their identity would be confidential and the written transcript of their interview would be labeled with a pseudonym. Participants were informed that interview transcriptions and recordings would be maintained for 5 years, per IRB protocol.

All Institutional Review Board (IRB) procedures for the administration of a qualitative research study were addressed before the participants were invited to participate in the study. IRB approval to conduct the study was obtained from East Tennessee State University, as well as approval to complete a study involving human subjects from the University of Memphis, Rhodes College, and Christian Brothers University.

Ethical Protocol

Because the study required participation by student-athletes from three institutions, permission was obtained from the head athletic trainer at each institution to recruit the participants and to conduct the study on their respective campuses. Participants also signed two informed consent forms, one that authorized the trainers to provide their contact information to the researcher and one that formalized their agreement to participate in the study. The East Tennessee State University IRB document, *Checklist for Informed Consent*, was used in the development of the informed consent forms developed for the study (ETSU, 2015). Participants were given the option of discontinuing the interview at any time if they experienced, for example, sadness, confusion, or painful emotions relating to their recovery or recalling difficult experiences. In an effort to not be intrusive on the participants' time, the interviews were limited to 1 hour or less. In fact, most of the interviews took less than 30 minutes to complete. Further, the participants were reminded that they can stop the interview at any time if they become tired or for any other reason.

Data Collection

The data collection process was designed to indicate the participants' experiences during their concussion recovery period, and to indicate their perceptions of the need for academic accommodations. This is consistent with process orientation, as it was anticipated that the interviews would explain how the participants' lives and academic abilities were impacted or changed during their recovery (McMillan & Schumacher, 2010). Confidential data collection was employed as the researcher knew the identity of each participant, provided by the athletic trainer, and the participant's identity remained anonymous in the summary of data collected and research findings (University of Memphis, 2015).

Data collection for this study was conducted through one-on-one interviews with nine collegiate student-athletes from three postsecondary institutions. The institutions in which the participants attended consisted of a 4 year public research institution and two 4 year private institutions. Each interview was recorded, stored electronically and labeled with the date and participant's name and institution. This was done to corroborate any misunderstood data or statements obtained during data collection (McMillan & Schumacher, 2010). Transcripts of the taped interviews were saved in two locations, on the researcher's work computer on a secure drive (UM drive) and a backup copy on a jump drive. The interview transcripts were listened to and reviewed multiple times to evaluate the content and look for consistent themes that emerged during individual interviews and points relevant in support of or contrary to the research questions (McMillan & Schumacher, 2010).

Qualitative Interviewing

Semi structured interviews were conducted with each participant individually in an effort to allow the participants' voices to be heard. The flow of the interview process was flexible in design as to allow the participants' responses and participation levels to guide the interviews. The interview process was instrumental in the researcher's acquisition of accurate perspectives of the participants and in obtaining information directly from the data source. Denzin and Lincoln (2005) stated that by using this approach in individual interviews, the researcher should be able to acquire "rich detail and description" to help "capture their point of view" (2005, p. 12). This process provided a rich description of the participants' experiences during postconcussion recovery, their abilities to complete academic responsibilities, and the perception of their need for academic accommodations (McMillan & Schumacher, 2010).

Interview Questions

The interview questions (Appendix A) were primarily open-ended and directed at understanding what happened during the participants' concussion recovery, what concussion symptoms manifested in the participants, how the symptoms impacted (if at all) the participants' academic abilities, and if the participants perceived academic difficulties or a need for academic accommodations during the recovery period.

Data Analysis

Interview sessions served as the primary source of data on the participants' concussion recovery experiences. These sessions were recorded so that the interviews could be played back as needed to verify what was said and aid in identifying themes or anecdotal statements and stories. During the interviews the researcher employed member checking as a verification process by repeating to the participants what they said for clarification. Member checking was also used after the interview had concluded as each participant was emailed a transcript of the interview and asked to verify its accuracy. This was an important step in verifying the accuracy of responses provided in the interview.

The qualitative interviews for this phenomenological study were conducted with student-athletes who had a concussion and a prolonged recovery period of 2 weeks (longer than 10-14 days) and consisted of a minimum of nine open ended interview questions. Creswell (2007) stated the goal of a phenomenological study is to describe "what all participants have in common as they experience a phenomenon" (p. 58). The phenomenon described in the interviews is recovery from concussion, and the data described in this chapter come directly from the individual interviews. The design of the interview questions was to acquire an in-depth understanding of the participants' experiences and to identify any commonalities or themes. In

analyzing and representing the data, Creswell's (2007) data analysis approach for phenomenological studies was employed:

1. "Create and organize the data" – I personally listened to and transcribed each interview, replaying the interview as needed to ensure I captured significant statements and an in-depth understanding of the participants' experience. After the transcription I reviewed the transcripts numerous times to identify any commonalities or themes or other significant findings.
2. "Read through text, make margin notes, form initial codes" – As I reviewed each interview transcript multiple times, I made notes and highlighted data relevant to possible themes, significant statements, and the research questions.
3. "Describe personal experiences... the essence of the phenomenon" – I described personal experiences of each participant in the study as spoken directly from each participant. This was done in an attempt to capture the essence of their concussion recovery experience and the challenges and barriers to their successful recovery.
4. "Develop a list of significant statements... group statements into meaning units" – I identified significant statements made by the study participants in each interview, determining if they were related and could be grouped together into themes or similar experiences. These statements were identified as significant if they contributed to the study's research questions, were related to common themes in the data, or if they were simply unique as compared to the experiences of the other participants.
5. "Develop a textural description of what happened" – I wrote a description of what the participants experienced generally in their prolonged recovery from concussion with specific examples or statements describing their experience.

6. “Develop a structural description of how the phenomenon was experienced” – I described how each concussion occurred, the setting and details surrounding the event leading to their prolonged recovery experience.
7. “Present a narration of the essence of the experience” through a discussion – I described how the participants attempted to manage their lives and academic activities throughout their recovery experience.

(Creswell, J.W., 2009, pp. 156-157).

The data from the audio recordings and transcripts were secured and maintained by the researcher in a locked file cabinet within a locked office. The data analysis process employed inductive reasoning where the researcher collected the data, identified categories and as McMillan and Schumacher (2010) described, synthesized the data to form generalizations related to the study. This data were interpreted in a manner as to avoid misstatements or misinterpretations of the participants’ responses. The data were used to accurately represent what was seen and heard in the interviews, the accurate perceptions of the participants.

Sample Type and Size

Criterion sampling was used in this study, as participants met pre determined criteria in order to be included in the study (Creswell, 2007, p. 127):

- Student-athlete experienced a concussion within the past, most immediate 2 semesters but not within the preceding 2 weeks
- Student-athlete’s recovery from the concussion lasted longer than 2 weeks

This approach worked well for the study because all participants had experienced the same phenomenon, a concussion with extended recovery time (Creswell, 2007, p. 28). A sample of 7-10 participants was planned for the research as I anticipated a small sample size due to the study's criteria of a recovery period lasting longer than 2 weeks. It is consistent in the literature that the majority of concussions (between 80%-90%) resolve within the first 7-10 days of recovery and also college student-athletes most often achieve full recovery from concussion within 1-5 days following a concussion (Field et al., 2003; Iverson et al., 2006; Macciocchi et al., 1996; McCrea et al., 2003;). Through assistance provided by the athletic trainers at three participating institutions, nine subjects were able to meet all inclusion criteria. One participant interviewed experienced his concussion when classes were not in session, so most of the interview questions were not relevant to his experience. His concussion occurred in his sport's pre season camp, between the end of summer classes and the beginning of fall classes. His concussion symptoms had subsided by the beginning of fall classes, so there was no impact on his academics and return to learn. The fact that this participant met the criteria for the study but could not provide relevant answers to most of the interview questions revealed a weakness in the study's criteria. This could have been avoided by including study criteria that prospective study participants had experienced a concussion during a term in which academic classes were in session. This would have allowed for an exploration of the participant's evaluation of how concussion symptoms impacted, if at all, academics and the return to learn process.

Triangulation

Triangulation was obtained through reviewing multiple sources of data, including referrals from the athletic trainers at each institution, individual interviews with participants,

which were recorded and reviewed, member checking with the participants during the interviews, and member checking with a review of the transcript after the interview.

Validity and Reliability

McMillan and Schumacher (2010) define validity in qualitative research as “the degree to which the interpretations have mutual meanings between the participants and the researcher” (p. 330). Several strategies were employed to achieve validity in the study, which included individual interviews to acquire direct knowledge from the participants on their experiences. The data from the interviews included both participant language to capture quotations and anecdotal stories or statements from participants. The use of electronically recorded data allowed the researcher to carefully check the audio transcript of the interviews for accuracy and also allowed participant review (McMillan & Schumacher, 2010). In an effort to enhance research validity, member checking was used throughout the interviews by repeating to the participants what they said for clarification (McMillan & Schumacher, 2010). Additionally, after each interview was conducted, a follow-up email was sent each participant to verify the accuracy of the interview transcript and to ask a follow-up question regarding a possible theme in the data. Throughout several of the interviews, the responses indicated a difficulty concentrating on school work or in class for more than 20 minutes in one sitting. The following question was sent to each participant along with the member checking transcript review:

Can you recall if you were able to comfortably study and maintain concentration on your homework or in class for more than 20 minutes at a time during the first 2 weeks of your recovery without having to take a break or without experiencing any symptoms?

The participant responses to this follow-up question are provided in Chapter 4 as one of the themes in the data.

Thick Description

One of the purposes of using an audio recorder during the interview sessions was to ensure that all information and details from the participants were accurately obtained and preserved. As opposed to taking notes during the interviews, the use of an electronic recording device allowed the researcher to focus on the participants and truly listen with the intent of understanding their experiences and how their concussion impacted them. The combination of observations and playing back the interview responses allowed the researcher to provide thick description of the data, identify themes in the data, record quotations and direct statements from the participants, which helped to fully understand the participants' perceptions and their reality (McMillan & Schumacher, 2010).

Summary

Chapter 3 has been a description of the methodology used to design and conduct a qualitative research study using phenomenological methods. The chapter identified the research questions that guided the study along with a description of the participants, participant recruitment process, ethical protocol, and data collection. Additionally, chapter 3 provides the interview questions which that guided the study, a description of the data analysis process, and the overview of the sample type and size. Lastly, the triangulation, validity, and reliability strategies employed are reviewed, including member checking procedures.

CHAPTER 4

RESULTS

Chapter 4 is divided into two sections containing the data obtained from the study. The first section includes the description of the three institutions where the study interviews were conducted and then the stories of each individual study participant with excerpts from the interviews. The purpose of the interviews and in recording them for review was to accurately capture and explore the in-depth experiences of the participants' concussion recovery and return to learn experiences in alignment with a phenomenological approach. The second section of chapter 4 is a description of the themes that emerged from the data, including significant statements from the interviews relating to each theme. Four themes linked to the study's research questions were identified in the data:

1-What difficulties with academics are reported by collegiate-level student-athletes with prolonged recovery from concussion?

2-For student-athletes who are afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

3-For student-athletes who are not afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

Institutions

There were three institutions in which the study interviews were conducted and where the study participants currently attend and participate in athletics. The first institution, Christian Brothers University, is a 4 year, private institution located in an urban setting in Memphis, TN,

which houses Division II intercollegiate athletics programs. The second institution was Rhodes College, which is also a private institution located in an urban setting in Memphis, TN. Rhodes houses Division III intercollegiate athletics programs. The third and final institution in the study was the University of Memphis, the largest of the three institutions. The University of Memphis is an urban institution that houses Division I athletic programs.

Participant Stories

Frannie's Story

Frannie is a women's soccer student-athlete who received a concussion during a team practice session. The incident occurred when she was jumping for the ball and another player inadvertently kicked her in the face. In the beginning of the interview, Frannie described her immediate reaction when the incident occurred:

The only way I can really describe it is when it first happened...it was almost like being like a little slow, and dazed a bit...when I tried to go back in goal again after the next rotation, shots were coming in and I knew I should be moving, but I wasn't moving...then that was the end of practice and it was actually my coach who said I should go to the training room, I was going to ride my bike home and my coach told me not to and to go to the training room. I didn't feel like myself, I don't know how to explain it really...I was disoriented, and almost a bit moody and didn't mean to be.

Frannie's concussion had an impact on her ability to complete normal activities, including academic related tasks:

I missed class the next day...it was hard for me to sit in my apartment and watch TV with the light on...it would give me a headache if I had the lights on...so I missed class the next day, after that I went back to school and then ended up leaving after the first period the following day because I wasn't following anything...had a headache, and concentrating for me is hard anyway, but it was even harder that week...and I actually had a test that Wednesday after I got concussed on the Monday and it was just, it didn't go very well.

Frannie continued to describe her recovery period with ongoing headaches and specifically how her concussion symptoms interfered with her academic related responsibilities such as concentrating and listening to faculty lectures and continued sensitivity to lights:

There would be good days and bad days...days where I didn't have a headache and felt like myself again...there would be days where it would be fine but little things like listening to instructions were fine again, but then I would just randomly get a headache...and on some days things like sitting in a classroom listening to a teacher was hard...things would go in one ear and out the other...I didn't really take in anything. Yeah with the whole reading thing, I would read something and I would go straight back over it...because I didn't really know what I had just read, but like when I tried to study for that test, I knew I knew it but I could not recall it as such...it was pretty difficult.

During Frannie's recovery she reported that she received no academic accommodations:

...no like I said I had a test on the Wednesday and still had to take the test...I emailed my teachers saying that I had sustained a concussion in practice and I won't be in class for

the next day, but a day off was not an excused absence or anything like that...I was still expected to carry and go to my classes. I received no accommodations.

As Frannie described her faculty members' response to her injury, she did not seem bitter or frustrated, rather she genuinely believed that there was a lack of understanding on their part of the seriousness of a concussion:

...no they all were sympathetic that I had a concussion, they were like 'that sounds terrible, but...you'll be okay'. I think it's hard for people that have never...concussions are a bit like...you know if you break an arm, then you have a cast on, something like that and people can physically see that you are hurt...but I think there is a common misconception of concussions that I can't see that you have a concussion so how do I know that you have a concussion...so there was the aspect of that that I experienced when I had a concussion, 'ohhh... you have a test on Wednesday, that is very convenient that you sustained a concussion at practice'...it's hard to explain to someone that has never been in athletics.

When asked what academic accommodations could have been helpful during her recovery, she admittedly could not identify anything in particular within reason that would have helped. She could only reiterate how her injury impacted her ability to complete academic tasks:

I think stuff like you know if teachers had been like 'don't worry about coming to the classroom and sitting/actually coming to the lesson'...I think you need a period for your brain to just like chillax for a bit...and then maybe they could then be like you can come to my office and I can go over what you missed...I don't think it's helpful to sit in the classroom right after a concussion because the material is not being processed

properly...it's more beneficial to give yourself 2-3 days of rest...like real rest and then have them talk to you on a one to one basis and explain things a little bit...for me, recovering from my concussion it took a few more, few times going over something to get it or a few more explanations to get it than it would normally

Marlon's Story

Marlon is a men's soccer student-athlete who received a concussion during a competition. The incident occurred as Marlon went for a tackle and another player coming towards him hit his knee into Marlon's head, causing his head to slam onto the ground:

...my last one was labor day (two and a half weeks ago) and we were playing and I went down for a tackle, the guy coming towards me went down as well and I took his knee to my forehead and just slammed on the ground...I blacked out a little but I got up and jumped straight up and was feeling all right, but the field was spinning and just fell to the ground...started forgetting things and spinning

Marlon described the first few days of his recovery as if things were moving "super-fast" around him and he was moving really slow among other physical symptoms which made normal, daily life challenging:

I had a headache everyday all day but it was a weird headache, not a normal one, just kind of lingered in the back of the head...the first couple of days I was real fuzzy, foggy, everything seemed to be moving super-fast around me, felt like I was moving super slow...my short term memory was kind of going...umm...that was about it

Marlon described how his concussion recovery symptoms interfered with his academic abilities:

Reading was out of the question, I couldn't focus on the book...couldn't really focus on the words to read them...I didn't read. I tried going to class on Tuesday, this happened on a Monday, but in class I just kind of sat there stared off into space and didn't do anything...so I didn't get anything done...and then I had a quiz that Friday and couldn't do it...the teacher just said try and do what you can do and we'll see what you get...I mean reading and studying was kind of a struggle, but I could sit through class...wouldn't really take notes, just sit there really. It was hard to concentrate like when I would look at something and try to focus on it, I couldn't really do it, so reading was a struggle, I couldn't really read that much...then if I couldn't read, I didn't even really try the homework because I didn't know what was on the homework.

When asked about receiving any academic accommodations, Marlon reported that he did not receive much assistance from his faculty:

I didn't really...the teacher just said...I talked to my professors about it and they just said when you are feeling better come back to class but I still had to take the quiz, he wouldn't let me skip the quiz for some reason...the instructor said it is just a quiz and not worth a lot, you might as well just take it, it's not going to be worth a lot. I had to take the quiz and then the two other classes I had we were just lecturing the week I was out...so they just said to pick up the notes from a classmate.

Corina's Story

Corina is a women's soccer student-athlete who suffered a concussion during a soccer game in which she collided with another player. She could not remember if it was the other player's head or elbow, but the injury resulted in a laceration above her eye which required

sutures. Corina stated that after getting her eye stitched up, she returned to play and felt fine for a day, but then started feeling dizzy, nauseous, had “a lot of headaches”, and her recovery lasted a few weeks. She described how her headaches made it hard to function normally:

I didn't really do that much because I had a headache, I really just sat in my room...for the first week I would try to go to class and then I would come back to my room and just kind of sit there and maybe try to watch TV or something.

Corina elaborated to describe the difficulties she experienced in classes and in completing out-of-class academic assignments:

My Psych class because there was a lot of readings...I just wouldn't do them...I would just get caught up later or that I didn't read them and just listen in class...it was not easy listen in class, it was more the lights in class that would bother me so I'd not really look up I would just look at something else...my Psych class had a lot of bright lights and in the front of the class there was a projector and that class more than all of my others bugged me the most...it just made my eyes hurt and give me a headache.

Corina reported no missed classes while recovering from her injury, as she attended class right after her injury. She also reported not receiving any academic accommodations, but her responses indicate that she may have been able to access accommodations if she needed them:

- “...for the first week I would try to go to class and then I would come back to my room and just kind of sit there and maybe try to watch TV or something.”

- “No...they told me I didn’t have to go to class if I didn’t want to...but I didn’t want to miss anything, the trainers just said if you don’t feel good, then just don’t go to class.”
- “They said if it was bad then I could ask my teachers to extend my test dates but for like two weeks I didn’t have any tests or anything.”

Through Corina’s interview, it was apparent that her concussion recovery was difficult and presented ongoing symptoms, but it occurred during a time in which she did not have many academic assignments or exams occurring.

Pablo’s Story

Pablo is a football student-athlete who suffered a concussion at football practice when he was hit by a teammate. Pablo described the following symptoms that lasted for “like two weeks”: headaches, dizziness, blurred vision, could not concentrate, could not eat, slept all day. When he attempted to return to activity with the team and tried to lift weights, he would get a migraine, blurred vision, and dizziness, all of which was compounded by loud music and the loud banging of weights in the weight room. When asked about his experiences in attending class following his concussion, Pablo reported significant difficulties:

I couldn’t...I would be in class for like 10 minutes and I would have to get up and leave or do something...sometimes I would even go to class, I had to take incompletes in two classes...like for example, one test was like five days after my concussion...macroeconomics...I was 10 questions in on a 100 question test and I just bubbled A on all of the answers...like in 5 minutes...I told him I just can’t do this right now...he let me retake it later on in the year...like that’s how bad it was, I couldn’t do

anything...I couldn't really remember anything in the first 2 weeks...I would do it but wasn't comprehending it and it was not fun.

It has been several months since Pablo's concussion and he stated in the interview that he feels like he is still recovering and sometimes forgets what he is going to ask the instructor in class:

I feel like I'm still recovering. For example, when I wake up my neck is still tight, I still don't feel like I'm fully recovered...for example, I'll be sitting in class and I will raise my hand to ask a question and then by the time the professor asks me the question, I forget what I was going to ask...it takes me a couple of seconds to remember...and when she calls on me in my 8:00 class, I just stare at her for a second and can't really remember.

Pablo acknowledged that he stopped playing football and was placed on the "medical exception" list, which allowed him to continue to pursue his education and receive his scholarship, but he was not required to participate in practice, strength and conditioning sessions, or games. He comments on how this change has helped him in his recovery:

Right now I'm the best I have been because I'm not doing football and am not physically drained all of the time and I'm trying to participate in class...don't have as much stress on me. I'm able to go to class and do what I want after class. Academically it was almost impossible to do...when I would read something I wouldn't comprehend it, I just couldn't get nothing done.

When asked about academic accommodations that were helpful during his recovery, Pablo reported that his faculty and campus was in general helpful:

They allotted me the extra time at the end of the semester, they gave me like 45 of 60 days, they did give me accommodations to help me...otherwise I would have failed...those accommodations helped me. Otherwise, I would have had a bunch of zeros...the extra time allowed me to get the make-up work turned in. The people that supported me was really my teachers...within the first month when I was still with football, I was getting pressure just to say I was getting better...which was pissing me off...then when I met with my coach and he offered the medical exemption but to pay my tuition and stay in school, he gave me like a week...and it was nice to go without getting picked on by the coaches or the training staff in order for me to get back on the field and possibly get another concussion...my biggest concern was that it would take more than 2 months to get back if I had another concussion...to this day, I stay up every night because I can't sleep...I have to take a 'Z-quil' and then I sleep, but I still get up at 7:00 so I'm really only getting 6-7 hours of sleep a night.

Eileen's Story

Eileen is a field hockey student-athlete who suffered a concussion in the first home game of the year when she was hit in the nose with a struck ball. She acknowledged that her immediate concern was the bleeding from her nose and she didn't notice any concussion symptoms until the next morning. She attempted to read and could not read for more than 5 minutes without realizing that something was wrong. Eileen elaborated on her symptoms for the first week or two:

The first week or two I had a constant headache, it would come and go at different levels, mainly pretty bad though, I would sit in my room with the lights off and basically do

nothing, just kind of sleep or lay there, when I started feeling a little better, I would maybe like do something easy like color or something...symptom wise, headache, sensitivity to light and noise, umm...really bad long term memory I guess... people would tell me something happened, then the next morning I would forget that it happened, I felt like I could not memorize anything and I felt foggy all of the time...in a fog...oh...and then blurred vision...like if I would look at something and then look away really quick and try to look back, it would take me a second to re focus...that only lasted like for the first week or so...the main symptoms were like headache, fogginess; the sensitivity to light and noise was basically there a lot...I feel like even now when I drive at night I'm sensitive to light...that's been over a year I guess.

Eileen described in her interview how hard it was to do homework, especially assigned readings:

The first few days I didn't go to class, I skipped almost a week of classes...homework wise I would do maybe 20 minutes tops without having to stop and then I would maybe get up, walk around or go get water and just not look at a book for a while or anything and then I could come back and try to keep going, until I would start feeling weird again or headachey...if it got to that point I would just stop...it would take a lot longer to do assignments, so with reading I would feel like I was going a lot slower, my eyes would move slower and I would process what I was reading a lot slower...during that first week it was hard to take in information and make the sentences make sense... I would be reading a sentence or paragraph or whatever and I'd have to stop and think about what I read and it was slower to process, I would have to take a second to try and piece together what I just read and break it down...I mean it was very, very slow...it was very

frustrating to have get up and walk around and take a break when I was reading, I would have to like put my head down and take a break...that was frustrating.

Eileen reported a positive experience with the type and amount of academic accommodations and support she received through her institution:

My institution does have an accommodations office and when a concussion happens my trainer goes to them and meets with them every week with updates on who has a concussion and then they email all of your teachers for you...it's very helpful...all of my teachers knew the next day that I had a concussion diagnosed by the Athletic Department...I also emailed them and said I would make up the work as quick as I can...one or two of my classes I had an exam and my teachers let me postpone it until I was comfortable taking it...and then one of my classes which is online and you are supposed to turn in your work every day, I got an extension on the assignments for that class...most of the teachers were very accommodating here. I didn't get penalized for delaying my work so I was able to slowly catch up in the time that was convenient for me. They do cover a good bit here I would say...I wouldn't expect them to be like oh, you are excused from having to write this paper, I know I have to do the work...extended deadlines with the teachers being understanding is good in my opinion.

Neville's Story

Neville is a football student-athlete who suffered a concussion in a football game. He is a wide receiver and was running a route across the middle and was hit by two players from the opposing team at the same time. His head hit the ground and when he got up, he felt "kind of fuzzy" and he stated that since he had a concussion previously in a game, he knew something

was wrong so he exited the playing field. He said he was really dazed, went blank and didn't remember anything...next thing he knew it was 15 minutes later and he was in the training room.

Neville described the first few days after his concussion:

Physically I was kind of like in a fog or so, for about 4-5 days...the first 2 days it was pretty heavy, hard to explain, I just didn't feel myself, I was off...then I was like not fully there, I had trouble focusing or you know I was sensitive to like noise and light, like loud noises would make my head hurt or if I watched TV too long, I would get a bad headache... I just kind of felt weird, not necessarily like I was in a dream still, there was just something wrong with me, it was just odd.

Neville described the first couple of days when he returned to class in the second week as difficult because of focus difficulties and headaches:

The first couple of days of class, it was hard to focus, just sitting in class and like I was trying to focus on schoolwork, but it was so easy to like focus on something else....and then I would kind of get these slight headaches from when I would look at things on the overhead, like or a projector...staring up at a big screen would make my head feel almost light headed, I would feel like slight nausea, sometimes when the air conditioning would blow, I felt like the words were moving so looking at them moving would make me nauseous...but that was only like the first two days I went back to class, however, it was difficult to do work, because any time I would focus for like twenty minutes or so my head would hurt and feel pressure and so I would just take breaks every here and there whenever I would be focusing too hard on an assignment...but then after that week it started getting better...like I had a week off from school and went to classes the second

week after the concussion and that is when all of those symptoms occurred...so I actually had a week off from school.

In the second week after his concussion, Neville attempted to return to class, but as he reports, he continued to experience concussion symptoms that interfered with his academic abilities:

At first, just staring at a small sheet of paper or a computer screen, my head was not a fan of that, so anytime I would try to read small print or something like that, it would make my head feel uneasy...so I would like read for a little bit but then I would find myself wandering off a little more than unusual...it was hard to re read lines and stuff...they recommended 10-15 minutes reading and 10-15 minutes off...the problem is I didn't really like stick with like taking a 10-15 minute break, instead I would take like a 5 minute break...which I guess could have like prolonged my symptoms. I did find the hardest thing coming back, one of my classes is a straight lecture class for an hour and 15 minutes so it's just me staring at a teacher talk for that long, I probably focused for a total of like 10 minutes in the first 2 days I was back, just because it was so hard to look at him and not have any visuals of what he was saying...in my computer science class, it was kind of hard to look at the screen the whole time, but it's easier a little bit because it was hands-on and I had instructions of what I needed to work on more so than just sitting there and some guy is talking.

Similar to Eileen's experiences, Neville also had positive experiences with the support and accommodations he received from his faculty and institution:

All of my professors were really understanding, they were willing to work with me...I feel like I should have worked with them a little more, because I came back to my work sooner than I needed to...they were understanding, I just felt like I was taking too much time off...so the concussion happened on a Saturday, I was held out of school for all five days, Drew contacted my professors, they understood, I didn't do any work, was not required to turn in any projects or anything during that time, they were all understanding so when I went back to class and to talk to them on Monday, I was supposed to like just sit in class and not do the work, but then a lot of the teachers asked me if I could get all of last week's work turned in by the upcoming Friday and I said that's fine, but I didn't really realize how much work that was going to be because I was basically cramming two weeks of work into one week...and so I think I kind of put a lot of pressure onto me in my head because after doing no work for a week, I was doing double the work in 1 week, so that kind of added some pressure and stress into my head, so yeah they were understanding but I guess I didn't take advantage as much as I should have. They were lenient on the deadlines, and then they were there for help, they really didn't offer anything, but they were there for help if I needed it. So, if I had any ideas I think they would have been okay with any other things, but they didn't really offer anything else....other than just being open for input.

As he elaborated on his recovery experiences related to the support he received from his faculty, Neville provided an interesting perspective regarding his self-inflicted pressure to return to learn:

A lot of the problem is, the worst thing is you kind of put this all on yourself that you want to get back sooner, even though they accommodate you for all of this, all it is is just

building up, I know that nothing goes away and I'm not saying they should say okay you don't have to do this, but it's just kind of like okay I can take another week off but if I miss two weeks of school, then I will have two weeks of school breathing down my neck and so I mean that's not really on the teachers, it's just on the situation that concussions kind of work out that way where you can't use your brain, if you do it's just going to hurt you more but it's hard to just go and do nothing at all knowing that there is stuff building up, so I don't know it's just kind of like a catch-22 or something...you want to go back but you can't...but the teachers here are very cool, they understand...I think it's kind of like because this is a small school and you know your teachers, you can just talk to them and have a bond and they just understand...I really like the professors here.

Banita's Story

Banita is a women's basketball student-athlete who suffered a concussion in the weight room when struck in the lateral aspect of her head by a dumb bell during her team's strength training session. Banita described how her recovery process took longer than she thought was normal because this was her fifth concussion, which led to "as many precautions as possible" to make sure she was fully recovered. She described the incident and her initial physical reaction to the incident:

I was in the weight room and we were lifting weights after practice, I was spotting my teammate and she was doing dumbbell inclines and when she went down her arms gave out and she dropped the weight so I bent over to kind of move out of the way and she like clocked me in the head...in my temple. I was kind of out of it, had

headaches, sensitivity to light...very drowsy, fatigued, I just kind of wanted to lay down and rest.

Banita then described her post concussion symptoms during the first week of her recovery and her difficult adjustment back to normal academic life (attending class, completing assignments):

I pretty much sat in my room in the dark, all day every day, sleeping all day that I could, and that was pretty much what I did for that whole week. When I first started going back it was pretty hard, I was still having headaches trying to concentrate on the instructors and what they were saying and on my work and since most of the work is on the computer, looking at the computer screen was hard because my head was always hurting...so it was pretty much dealing with all of the headaches and stuff.

Banita continued to describe how difficult her return to learn was in the second week of her recovery:

Yeah like I said before that was the hardest thing...I would try to do my work in increments because if I tried to like overdo it and focus and think for too long then it would make me have a headache for longer than I wanted to have one...so it was very difficult when I first started going back but eventually as I took time to do it, the headaches went mild.

Banita described the assistance and accommodations she received during her recovery as helpful and she provided insight into how normal classroom attendance and activities can impact you when recovering from a concussion:

Yeah the doctors and you know my advisor and Bob and all of them sent emails to all of my professors telling them to allow me to have extra time and to take my tests, exams or any other things outside in the peace and quiet so I would not have the distractions going around in the classroom...that, which I am still getting now, actually helps because I can just focus on myself and the test at the time. It helped me because, like I said, there is so much that goes on in these classrooms that you would not even think would affect or bother you and me being able to take the test on my own and in my own little room, I can just focus on the test and not worry about being distracted and losing focus...or you know my head starting to hurt, trying to keep tuned out what is going on in there and focus on the test.

Maria's Story

Maria is a student-athlete on the women's basketball team who suffered a concussion in practice. Her experience was unique in that Maria did not know she had a concussion for 2 days until her next game:

I didn't really know I had a concussion until like two days afterwards and we had a game because when I hit the ground my body was hurting but my head wasn't really feeling anything and then after I got up...shot some free throws, then practice was over I went to get my back iced because my back started feeling bad and then everything was fine after that, I felt fine...then we had a game a day or two afterwards...and during the third quarter I went down to get some water and I started feeling like really dizzy and my head starting hurting and then after the game was over I asked the athletic trainer for some

Tylenol...she asked me why and we went through it and I had to go see if I had one or not.

Maria described her recovery as “really uncomfortable” and initially reported that no one advised her not to attend class, so when she did attend, it seemed to exacerbate her headaches and symptoms:

Nobody advised me not to go to class, so I went and my headaches were worse in class than they were just sitting around or anything...it wasn't hard to concentrate, it was just hard to listen and it was just really uncomfortable...I mean I could do the work and everything, I didn't need more time, it was just really uncomfortable.

In an attempt to clarify just how Maria felt during her recovery, I asked her to elaborate on what “really uncomfortable” meant:

Just sitting in class and I would have weird faces going on and my head would be hurting and I just didn't feel like I should have been there...I'm not sure how to describe it...my headaches were really bad. It was okay to study outside of class...looking at paper it was fine, I was told not to look at my phone as much but I did it anyway, I would notice after I would look at my phone or computer for a little bit, because I would have homework on the computer, like the light would mess with me and my head would start throbbing, my headaches would come back.

In general, even though her recovery period lasted 2 weeks, she reported less difficulty in returning to learn compared to other study participants, particularly when working on her own outside of class:

Everything was fine, like if I was looking at paper it would not affect me, my computer screen was super bright so I had to adjust it down a lot...everything seemed fine, it was only like when I was in class, but whenever I was doing something myself it was fine.

Themes

As Creswell defined phenomenological study, he identified the primary focus of the researcher is to describe “what all participants have in common as they experience a phenomenon” (2007, p. 58). There were numerous commonalities shared among the participants, some of which formed themes in the data. Overall, four themes emerged through the data based on interview responses from the participants and email communications through the member checking process: negative impact on academic performance, academic pressures, inequity of student-athlete treatment, and impact on concentration ability.

Negative Impact on Academic Performance

The first theme in the data was the impact the post concussion symptoms and recovery process had on the participants’ academic performance. While some of the participants attempted to return to learn within a day or two following their injury, others were able to take the first week off from their academic responsibilities. All participants reported post concussion symptoms that impaired their abilities to complete academic assignments and responsibilities.

Frannie attempted to return to class on the second day following her concussion but found it challenging to concentrate: “concentrating for me is hard anyway, but it was even harder that week...and I actually had a test that Wednesday after I got concussed on the Monday and it was just, it didn’t go very well.” Frannie also mentioned the difficulty of certain types of classes and in general paying attention to classroom lectures when recovering from concussion:

I had an art class which is one that I left early...not sure why it caused so much difficulty, maybe it's because you know in art you have to visualize things and put it down on paper, but having to organize your drawing on paper was giving me a headache more than the classes where I would just sit there be lectured at...I guess when you are being lectured at and it's in one ear and out the other...it's fine because you are really not doing anything but with the art class where you actually have to do something, it was hard to draw and come up with ideas...that was probably the most difficult class for me.

The second participant in the study, Marlon, also reported headaches, confusion and memory challenges during the initial stage of his recovery:

I had a headache everyday all day...the first couple of days I was real fuzzy, foggy, everything seemed to be moving super-fast around me, felt like I was moving super slow...my short term memory was kind of going...umm...that was about it.

Marlon commented on his inability to read and pay attention in class as a result of his post concussion symptoms:

Reading was out of the question, I couldn't focus on the book...couldn't really focus on the words to read them...I didn't read. I tried going to class on Tuesday, this happened on a Monday, but in class I just kind of sat there stared off into space and didn't do anything...so I didn't get anything done...and then I had a quiz that Friday and couldn't do it...the teacher just said try and do what you can do and we'll see what you get...I mean reading and studying was kind of a struggle, but I could sit through class...wouldn't really take notes, just sit there really.

Marlon had a similar difficulty with focus in his biology class:

...in the bio lab, we have different labs we have to be ready for and do like 3-4 experiments...and the experiments we were doing we have to look through a microscope and so we had to look in there and find the right...focus it with the microscope thing...so I couldn't really focus in just looking at things so trying to focus in looking through a microscope was a bit hard...and then there was a lot of fast...we had to move through things quickly in all we had to do...and that was the day after so I was still feeling...slow, out of it and foggy so it was a struggle to try to keep up and make sure I got everything done.

Corina also experienced ongoing headaches that made academic work difficult per this excerpt from her interview: "I don't know if it was a real concentration issue, I just always had a headache and couldn't do my work." Corina also specifically commented on the difficulty she experienced with a class that was heavy in lecture and readings:

My psych class because there was a lot of readings...I just wouldn't do them...I would just get caught up later or that I didn't read them and just listen in class...it was not easy to listen in class, it was more the lights in class that would bother me so I'd not really look up I would just look at something else...my psych class had a lot of bright lights and in the front of the class there was a projector and that class more than all of my others bugged me the most...it just made my eyes hurt and give me a headache.

Pablo's experience and recovery time was somewhat different from other participants in the study. He reported that his recovery lasted "two and a half months" and he was concerned that if he continued to play his sport and suffered another concussion that the recovery would

take as long as his initial one. He reported that when he returned to the classroom, he “would be in class for like 10 minutes and I would have to get up and leave or do something.” He also reported having to take incomplete grades in two classes. Pablo also reported short term memory loss during class at times during his recovery:

I’ll be sitting in class and I will raise my hand to ask a question and then by the time the professor asks me the question, I forget what I was going to ask...it takes me a couple of seconds to remember...and when she calls on me in my 8:00 class, I just stare at her for a second and can’t really remember.

Overall, Pablo reported a significant difficulty in getting any academic work accomplished during his recovery as evident in these two excerpts from his interview:

“academically it was almost impossible to do...when I would read something I wouldn’t comprehend it, I just couldn’t get nothing done.”

“I had a meeting with my counselor and professor...my English professor, just because it was so hard to write a paper, I wouldn’t remember what I was writing or talking about...it was not too fun.”

Eileen also reported constant headaches for the “the first week or two” and a general sense of “fogginess,” both of which impacted her memory and academic abilities:

people would tell me something happened, then the next morning I would forget that it happened...I felt like I could not memorize a lot of things, that really didn’t help me in school...um...I felt like foggy all of the time...in a fog...oh...and then blurred vision...like if I would look at something and then look away really quick and try to look back, it would take me a second to re focus.

During her recovery Eileen also reported being so physically tired that she lacked motivation to do anything like hang out with her friends, go to dinner, or study: “it was hard to get myself motivated to want to do anything...like try to go read or do work...just not motivated.” Eileen also reported that her concussion symptoms caused her to process her readings for classes slower than normal, which was frustrating:

I would be reading a sentence or paragraph or whatever and I'd have to stop and think about what I read and it was slower to process, I would have to take a second to try and piece together what I just read and break it down...I mean it was very, very slow...it was very frustrating to have get up and walk around and take a break when I was reading, I would have to like put my head down and take a break...that was frustrating.

When asked what specific classes or situations were the most difficult to deal with during her recovery, Eileen relayed the challenge of long, lecture classes and her challenges with focus:

...class wise I think focusing for the whole class period was difficult, like if I had to go to a class that was 50 minutes or an hour, it was hard, it was a lot to stay focused for that long.

Neville also experienced headaches during his recovery, which were aggravated by normal classroom activities, making the return to learn transition a challenge:

I would kind of get these slight headaches from when I would look at things on the overhead, like or a projector...staring up at a big screen would make my head feel almost light headed, I would feel like slight nausea, sometimes when the air conditioning would blow, I felt like the words were moving so looking at them moving would make me nauseous.

Neville also described the challenge of completing simple academic tasks like reading a sheet of paper or words on a computer screen and how they would affect his headache:

...just staring at a small sheet of paper or a computer screen, my head was not a fan of that, so anytime I would try to read small print or something like that, it would make my head feel uneasy...so I would like read for a little bit but then I would find myself wandering off a little more than unusual...it was hard to re-read lines and stuff.

Neville also found listening to faculty lectures in the early part of his recovery particularly challenging:

I did find the hardest thing coming back, one of my classes is a straight lecture class for an hour and 15 minutes so it's just me staring at a teacher talk for that long, I probably focused for a total of like 10 minutes in the first two days I was back, just because it was so hard to look at him and not have any visuals of what he was saying.

After staying in her room and sleeping all day for the first week, Banita attempted to return to the classroom in week 2 of her recovery. Similarly to other study participants, Banita described intense headaches that made it hard to concentrate in the classroom and in completing assignments. Banita also reported that her headaches lasted longer than what she expected and made the return to learn difficult:

When I first started going back it was pretty hard I was still having headaches trying to concentrate on the instructor and what they were saying and on my work and since most of the work is on the computer, looking at the computer screen was hard because my head was always hurting...so it was pretty much dealing with all of the headaches and stuff.

Maria returned to the classroom with ongoing symptoms including light sensitivity, headaches and difficulty concentrating. She reported that when she first returned to class it was hard to listen to the faculty and “really uncomfortable.” She attempted to participate in class and “do the work and everything” despite her physical symptoms. Maria did not reference anxiety about falling behind in her studies as some of the other participants did, she simply did not think she needed academic accommodations or rest and did not seem concerned with her recovery and symptoms. This could be because of a lack of education on the potential dangers of concussion.

Academic Pressures

A second theme that emerged from the data was the academic pressures felt by the participants, both self-imposed pressures and pressures to complete make-up work imposed by faculty. Most of the participants presented with a fear of falling behind academically during their recovery from concussion. For example, many participants received the accommodation for excused class absences during their recovery but chose not to use it for fear of missing in-class work or getting behind in their coursework. The conflict between the participants’ ongoing concussion recovery symptoms that impaired academic abilities and the pressure of getting behind academically was prevalent in the responses. This conflict led to a premature return to learn for many of the participants and a lack of true cognitive rest, which, as the literature indicates, is a central component of a proper recovery from concussion.

Frannie only missed 1 day of class, the day after her concussion incident. She attempted to attend class the day after and struggled to cope with concentrating and listening: “so I missed class the next day, after that I went back to school and then ended up leaving after the first period the following day because I wasn’t following anything...had a headache.” Even though she

recognized her difficulties with concentration and attendance, she attempted to return to her normal academic expectations:

I would read something and I would go straight back over it...because I didn't really know what I had just read, but like when I tried to study for that test, I knew I knew it but I could not recall it as such...it was pretty difficult.

Frannie also was expected to take a test only a couple of days after suffering her concussion despite her physical condition:

I had a test on the Wednesday and still had to take the test...I emailed my teachers saying that I had sustained a concussion in practice and I won't be in class for the next day, but a day off was not an excused absence or anything like that.

One of the most significant statements made by Frannie was related to the common misconception of the seriousness of a concussion:

I think it's hard for people that have never...concussions are a bit like...you know if you break an arm, then you have a cast on, something like that and people can physically see that you are hurt...but I think there is a common misconception of concussions that I can't see that you have a concussion so how do I know that you have a concussion...so there was the aspect of that that I experienced when I had a concussion, oh... you have a test on Wednesday, that is very convenient that you sustained a concussion at practice...it's hard to explain to someone that has never been in athletics.

Based on her personal experience, Frannie makes suggestions for post concussion accommodations and refers to the importance of cognitive rest:

I think you need a period for your brain to just like chillax for a bit...and then maybe they could then be like you can come to my office and I can go over what you missed...I don't think it's helpful to sit in the classroom right after a concussion because the material is not being processed properly...it's more beneficial to give yourself 2-3 days of rest...like real rest and then have them talk to you on a one to one basis and explain things a little bit...for me, recovering from my concussion it took a few more, few times going over something to get it or a few more explanations to get it than it would normally.

Marlon also did not want to miss class during his recovery and reported a return to learn on the second day following his injury:

I tried going to class on Tuesday, this happened on a Monday, but in class I just kind of sat there stared off into space and didn't do anything...so I didn't get anything done...and then I had a quiz that Friday and couldn't do it.

Similar to Frannie and Marlon, Corina did not miss many classes during her recovery. This was not because she was not afforded the accommodation for approved class absences, rather she did not want to get behind: "No...they told me I didn't have to go to class if I didn't want to...but I didn't want to miss anything, the trainers just said if you don't feel good, then just don't go to class." Corina went against the medical advice of her athletic trainers and attempted to return to learn while experiencing multiple symptoms impacting her academic abilities: "it was just hard being in class and paying attention without your head hurting." When asked what accommodation would have been helpful during her recovery, Corina's response further defines

the fear of getting behind academically: “I would say just not going to class, but you can’t do that.”

Pablo also attempted to return to the classroom prematurely within his first 2 weeks of recovery and while his symptoms were still present:

like for example, one test was like five days after my concussion....macroeconomics...I was ten questions in on a 100 question test and I just bubbled A on all of the answers...like in five minutes...I told him I just can’t do this right now...he let me retake it later on in the year...like that’s how bad it was, I couldn’t do anything...I couldn’t really remember anything in the first 2 weeks.

Even though Eileen received adequate academic accommodations through her institution, she still presented as returning to learn prematurely, before her concussion symptoms had subsided. She describes her attempts to do homework during the first week after her concussion while her symptoms were still significant:

...homework wise I would do maybe 20 minutes tops without having to stop and then I would maybe get up, walk around or go get water and just not look at a book for a while or anything and then I could come back and try to keep going, until I would start feeling weird again or headachey...if it got to that point I would just stop...it would take a lot longer to do assignments, so with reading I would feel like I was going a lot slower, my eyes would move slower and I would process what I was reading a lot slower...during that first week it was hard to take in information and make the sentences make sense

Neville received approval from his faculty and institutional to miss 5 days of classes yet still acknowledged prematurely returning to the classroom:

All of my professors were really understanding, they were willing to work with me...I feel like I should have worked with them a little more, because I came back to my work sooner than I needed to...they were understanding, I just felt like I was taking too much time off.

Neville described both the self-inflicted pressure to not get too behind in his studies and pressure subtly applied by his faculty to get caught up on missed work:

I was supposed to like just sit in class and not do the work, but then a lot of the teachers asked me if I could get all of last week's work turned in by the upcoming Friday and I said that's fine, but I didn't really realize how much work that was going to be because I was basically cramming two weeks of work into one week...and so I think I kind of put a lot of pressure onto me in my head because after doing no work for a week, I was doing double the work in one week, so that kind of added some pressure and stress into my head, so yeah they were understanding but I guess I didn't take advantage as much as I should have.

Neville continued in his interview to describe his conflict between his need to take advantage of accommodations and the challenge of getting behind in his schoolwork:

A lot of the problem is, the worst thing is you kind of put this all on yourself that you want to get back sooner, even though they accommodate you for all of this, all it is just building up, I know that nothing goes away and I'm not saying they should say okay you don't have to do this, but it's just kind of like okay I can take another week off but if I miss two weeks of school, then I will have two weeks of school breathing down my neck and so I mean that's not really on the teachers, it's just on the situation that

concussions kind of work out that way where you can't use your brain, if you do it's just going to hurt you more but it's hard to just go and do nothing at all knowing that there is stuff building up, so I don't know it's just kind of like a catch-22 or something...you want to go back but you can't.

Banita also felt pressure to not get too behind in her academics; as she tried to return to doing her homework before her concussion symptoms had totally subsided:

I would try to do my work in increments because if I tried to like overdo it and focus and think for too long then it would make me have a headache for longer than I wanted to have one...so it was very difficult when I first started going back but eventually as I took time to do it, the headaches went mild.

Banita's experience with pressure from her faculty was similar to that of Neville's when it came to making up missed work from the first week of recovery:

I did have some of the professors that gave me like a week to make up some of the work that was a lot of stress on me to make up all of that work that they had plus keeping up with the work that we are currently doing.

Inequity of Accommodations

A third theme that emerged from the data was the inequity of academic accommodations offered to and received by the participants. Comparatively, there were distinct differences between the three institutions where the participants are enrolled, with some receiving more accommodations and assistance than others. Table 2 represents each study participant and the academic accommodations each received:

Table 2

Academic Accommodations Received

Participant	Academic Accommodations Received
Frannie	None
Marlon	None
Corina	None
Pablo	Extended due dates, excused class absences
Eileen	Excused class absences for the first week, extended due dates on exam and assignments
Neville	Excused class absences for the first week, extended due dates
Banita	Excused class absences for the first week, extended due dates, extra time on tests, distraction free test taking environment
Maria	None

Note: adapted from study interviews; report by participant of academic accommodations received

Frannie reported that she received no accommodations, attended class the day after her concussion, attempted to return to learn, and even was expected to take a test 2 days after her injury:

I missed class the next day, after that I went back to school and then ended up leaving after the first period the following day because I wasn't following anything...had a headache, and concentrating for me is hard anyway, but it was even harder that week...and I actually had a test that Wednesday after I got concussed on the Monday and it was just, it didn't go very well. I emailed my teachers saying that I had sustained a concussion in practice and I won't be in class for the next day, but a day off was not an

excused absence or anything like that...I was still expected to carry and go to my classes.
I received no accommodations.

Marlon also did not report receiving any accommodations from his campus or faculty, as he was mandated to take a quiz the same week of his injury while suffering from multiple post concussion symptoms: “and then I had a quiz that Friday and couldn’t do it....the teacher just said try and do what you can do and we’ll see what you get.” When asked if he requested an adjusted or delayed date for the quiz based on his concussion recovery symptoms, Marlon reported the faculty member denied the request: “he was just like it is just a quiz and not worth a lot, you might as well just take it, it’s not going to be worth a lot.”

When asked about what accommodations may have been helpful to him during his recovery, Marlon reported that it would have been helpful for faculty to print their in-class lecture notes out to share with him as he struggled to focus and take notes in class. He reported that other than his biology faculty member, his other faculty members told him the notes were online or he could just get them from a classmate.

When asked about her experience with academic accommodations, I had to explain to Corina what typical examples of accommodations are for temporary or permanent disabilities, as she was not familiar with the terminology. Corina did not receive much from her faculty or campus in terms of academic accommodations: “I only told one of my professors that I had a concussion...he just said do what you can.” Other than that conversation with one faculty member, Corina did not report any other forms of accommodations or efforts on her behalf.

Pablo reported positive and supportive experiences from his faculty: “The people that supported me was really my teachers.” Pablo presented as grateful for his institution’s

accommodations and assistance during his prolonged concussion recovery, acknowledging the benefit of the extended due dates for his assignments:

They allotted me the extra time at the end of the semester, they gave me like 45 of 60 days, they did give me accommodations to help me...otherwise I would have failed...those accommodations helped me. Otherwise, I would have had a bunch of zeros...the extra time allowed me to get the make-up work turned in.

Eileen was satisfied with the assistance she received from her athletic trainer and described his procedures when a student-athlete her institution suffers a concussion. The athletic trainer meets with faculty representatives every week to review what student-athletes have a concussion, and emails the faculty for the student-athletes immediately following any concussion incident and with follow-up reports. She reported this process as “very helpful.” Eileen also reported being satisfied with the accommodations and support received from faculty:

I also emailed them and said I would make up the work as quick as I can...one or two of my classes I had an exam and my teachers let me postpone it until I was comfortable taking it...and then one of my classes which is online and you are supposed to turn in your work every day, I got an extension on the assignments for that class...most of the teachers were very accommodating here. I didn't get penalized for delaying my work so I was able to slowly catch up in the time that was convenient for me.

Neville described his faculty members as “really understanding” and “willing to work with him” but he also could not identify any specific accommodations received. He mentioned that his athletic trainer served as a mediator between him and his faculty and offered to help reach out to his faculty if necessary. Neville further indicated that while his faculty “were understanding

of the situation, they were not really offering anything else or any other help.” Neville also mentioned that a lot of his faculty asked him to make up all of his work in a short time frame. It appears that Neville could have asked for extended due dates for his assignments and maybe received it from his faculty. However, his self-inflicted pressure to return to the classroom sooner and resume his academic demands prevented him from utilizing accommodations that he could have benefitted from in his recovery.

Banita described initially receiving extra time and distraction-free environments as accommodations during the first week of her recovery:

...allow me to have extra time and to take my tests, exams or any other things outside in the peace and quiet so I would not have the distractions going around in the classroom...that, which I am still getting now, actually helps because I can just focus on myself and the test at the time.

Similar to Corina and Marlon, Maria did not miss much class and was not afforded any academic accommodations. She describes one interaction with a faculty member indicating a lack of concussion awareness:

I did have a sheet of paper that my athletic trainer had signed and I brought it to my chemistry teacher because I am struggling in that class anyway; and he told me that I would have to officially get something signed by a doctor and have to take it to the dean so the dean could approve it and just go through like a lot of steps; I just didn't bother with it but I mean I don't think I was offered anything.

Maria blamed herself for not asking for academic accommodations and continued to minimize the impact her concussion had on her studies:

I missed class the Friday after my concussion and so when I came back that next Monday I had not been in school for four days and it still felt the same, I told my teachers that I had a concussion...umm...they never really offered to help me with anything...I felt like it was on me because I never went and asked them for any help...umm...I didn't feel like I was doing any worse than I had been.

Impact on Concentration Ability

At the conclusion of the interviews it was apparent that several of the participants reported difficulty concentrating on academic assignments or in class for more than 20 minutes at a time. As a member checking procedure employed in the study, the following question was sent to each participant following their interview:

Can you recall if you were able to comfortably study and maintain concentration on your homework or in class for more than 20 minutes at a time during the first 2 weeks of your recovery without having to take a break or without experiencing any symptoms?

Six out of nine participants responded to the follow-up question per Table 3 below:

Table 3

Member Checking Question Responses

Participant	Response	Statement
Marlon	No	And to answer the follow up question the first week after my concussion I couldn't concentrate at all not even for 20 minutes. The second week I was able to concentrate a little bit longer but wasn't fully back to normal. I still had to take breaks pretty often.

Table 3 (continued)

Neville	No	During the first two weeks of recovery, it was difficult to study and concentrate longer than 20 mins at a time. I would usually lose focus or just stop, but sometimes I would go longer than 20 mins at a time, but then I would usually get a headache or head pressure.
Frannie	No	I remember getting a really bad headache, when I was trying to study for the test that was scheduled for the Wednesday and that lasted a while. After that, doing any sort of prolonged reading gave me a dull headache and typically the homework that I completed for the next couple of weeks after my concussion was below the standard that I had been completing homework before my concussion.
Pablo	No	As for being able to concentrate twenty minutes into class would be an almost impossible task for me today still; every day I experience symptoms and every day I struggle to even open my eyes to start the day. So yes It is hard for me to concentrate for being in class for as little as twenty minutes.
Maria	No	I remember sitting on the couch trying to do homework online and I couldn't concentrate that well because of the light on my screen, and when I was in class it wasn't that much different. During lecture, some days, I would have major headaches and I would stop what I was doing, put my pen down, put my hands on my temples, and close my eyes. My hands are always cold so the coolness helped ha-ha. Not every day was the same though, some worse than others and some better.
Eileen	Yes	Throughout the first two weeks of my recovery (after being cleared to go to class), it wasn't too difficult to concentrate for 20 minutes or so, but I would say somewhere past 40 or 50 min would be at the point where I felt like I needed a break.

Note: adapted from study interviews; responses to member checking follow-up question regarding concussion symptom's impact on concentration ability for 20 minutes or more.

Per the participants' responses, the lingering effects from their concussion made concentrating on school work more difficult than usual and required a break from studying after

a short time period. This is consistent with the research on cognitive rest which outlines the avoidance of activities that cause mental strain during the initial stage of recovery from concussion, such as use of cell phones, watching television, listening to music or playing video games, and academic work (Gibson et al., 2013; Master et al., 2012; McCrory et al., 2005, 2009; McLeod & Gioia, 2010). When the study participants engaged in these activities before full recovery was achieved, they risked delaying their recovery process and increased risk for further injury (Dalsgaard et al., 2004; Grady, 2010; Majerske et al., 2008; McLeod & Gioia, 2010; Sady, et al., 2011).

The four themes identified in the data indicate varied experiences for the study participants with prolonged recovery from concussion. The data indicated through the themes also provide meaningful insight into the study's research questions on the participants' perceptions of how their concussion impacted their academic abilities and need for academic accommodations.

CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Chapter 5 includes the following sections: an overview of the data collection and analysis processes and information on the sample size and type; a summary of the findings obtained from the study linked to the study's themes and research questions; a conclusion section with a discussion of the implications for higher education professionals; and recommendations for future research.

Data Collection

Data collection for this study was conducted through one-on-one interviews with nine collegiate student-athletes from three postsecondary institutions. The institutions in which the participants attended consisted of a 4 year public research institution and two 4 year private institutions.

Participants were recruited for the study with the help of the athletic trainers at each institution. Athletic trainers made the initial contact with the prospective study participant and upon initial agreement to participate, the athletic trainer had the participant read and sign the Authorization to Release Contact Info form, providing name of the student-athlete, institution name, contact information (email address and phone number), and signatures of both the student-athlete and athletic trainer. Upon receipt of this authorization, initial contact was established with prospective study participants to set up a meeting time and place. The first 5 minutes of the initial meeting was spent reviewing the Research Study Informed Consent form and explaining the purpose of the study. Prior to beginning the interview, participants were informed that the conversation would be recorded to ensure accurate and thorough evaluation of responses. Participants were informed that interview transcriptions and recordings would be maintained for

5 years, per IRB protocol. The sports represented in the study were: football, women's basketball, women's soccer, men's soccer and women's lacrosse. The interviews ranged in length from 15-30 minutes.

Summary

The findings section of this chapter begins with an overview of the data represented in the four themes linked to the study's three research questions:

1-What difficulties with academics are reported by collegiate-level student-athletes with prolonged recovery from concussion?

2-For student-athletes who are afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

3-For student-athletes who are not afforded academic accommodations during their concussion recovery period, what was their experience like in meeting their academic demands?

The themes generated from the data were: negative impact on academic performance, academic pressures, inequity of accommodations, and impact on concentration ability.

Negative Impact on Academic Performance

Eight of the nine study participants who experienced concussion recovery symptoms during a time in which their classes were in session reported difficulties with their academics and return to learn. All participants reported consistent headaches that were often exacerbated by their

attempts to attend class which often came with bright lights and noise. Table 4 lists each participant and the symptoms each reported experiencing during their recovery.

Table 4

Concussion Symptoms

Participant	Reported Symptoms
Frannie	Headaches, sensitivity to lights, difficulty concentrating and listening, difficulty with reading comprehension
Marlon	Headaches, difficulty focusing, concentrating and listening, difficulty with reading comprehension
Corina	Headaches, sensitivity to lights, difficulty concentrating and listening, difficulty with reading comprehension
Pablo	Headaches, dizziness, blurred vision, sensitivity to noise, difficulty concentrating and listening, difficulty with memory
Eileen	Headaches, sensitivity to lights and noise, difficulty with long term memory, blurred vision, fogginess, difficulty with information processing and reading comprehension
Neville	Difficulty with focus, sensitivity to light and noise, headaches, nausea
Banita	Headaches, difficulty with focus, concentrating and listening
Maria	Headaches, difficulty listening, sensitivity to light

Note: adapted from study interviews; list by participant of all concussion symptoms reported during recovery.

All of the participants experienced difficulty during their return to learn when headaches, sensitivity to light and noise among other symptoms were present. It could be argued that each of the participants returned to learn prematurely and did not have adequate cognitive rest. This potentially lends credibility to the importance of true cognitive rest cited in multiple studies (Carson et al., 2012; Covassin et al., 2013; Dalsgaard et al., 2004; Grady et al., 2012; Harmon et al., 2013; Majerske et al., 2008).

Frannie, Pablo, and Eileen reported memory difficulties when attempting to listen to lectures or when completing academic assignments such as reading. Additionally, Frannie, Marlon, and Pablo reported specific challenges when each attempted to complete a quiz and test in class. Focus and concentration challenges, whether in class attempting to pay attention to faculty lectures or when attempting to complete homework assignments, were identified by all participants, even those who missed the first week of classes following the concussion.

Academic Pressures

Throughout the interviews it became prevalent that most of the participants felt pressures to return to learn (class, completing homework assignments and readings) while their concussion symptoms were present. Neville, Eileen, Banita, and Maria acknowledged returning to class while their concussion symptoms were present. Neville referred to the self-inflicted pressure to return to learn to avoid not getting too behind academically as a “catch-22 or something.” He knew that he was not ready to return to learn due to lingering concussion symptoms but also did not want to continue to miss work and get behind.

Other participants’ responses to the interview questions indicated a premature return to learn. Eileen reported that she “would try to keep going until she started feeling weird again or headache” when completing homework. She also reported that when reading, she would have to put her head down and take frequent breaks, which was frustrating. Maria also reported challenges when she returned to class and was trying to focus on a professor’s power point in class, reporting that she had to stop paying attention and just put her head down in class.

Some participants also experienced pressure from their faculty to get caught up on make-up work from missed classes. For example, Neville was given a deadline from his faculty to get

caught up on all missed work, which meant he had to combine 2 weeks of work into 1, all while still experiencing lingering concussion symptoms. Neville acknowledged that this was stressful. Banita also reported that while her faculty were lenient with due dates on missed assignments, she felt “a lot of stress” to complete all of her make-up work while at the same time keep up with work that was currently due or being done in her classes. It is possible that this pressure and premature return to learn could delay recovery. Halstead et al. (2013) reported that completing cognitive activities during concussion recovery can add stress to an energy deprived brain that can worsen symptoms and delay the recovery process. Carson et al. (2014) completed a study to determine if returning to play or learn too early had an impact on concussion symptoms and recovery. Their results indicated a premature return to school that caused concussion symptoms to worsen in 44.7% of patients.

Inequity of Accommodations

Of the eight study participants whose concussion occurred when classes were in session, four reported receiving academic accommodations during their recovery, though most were only minimal, as displayed in Table 2.

Frannie, Marlon, Corina, and Maria reported no accommodations, other than 1 day of missed classes following their concussion incidents. This led to poor performance on a test for Frannie and in-class quiz for Marlon. At the same time, both were held out of athletic practice and competition for a longer period of time than they were for their academic responsibilities. Frannie reported that according to her faculty even though she missed 1 day of classes, this was “not an excused absence or anything like that” and she was still expected to keep up with the workload. Maria also reported opposition from her chemistry faculty member when she reported

her concussion and attempted to provide a class absence excuse from her athletic trainer. She was advised that she would have to submit an official form signed by a physician and get the dean to approve it as well. Marlon, who also attends the same institution as Frannie and Maria, reported that he was not allowed to miss a quiz in one of his classes, his faculty member responded that “it is just a quiz and not worth a lot, you might as well just take it.” This raises the question of a lack of understanding by Marlon’s faculty on the dangers of returning to learn prematurely and how it can impact cognitive functioning. Marlon was advised by other faculty to “pick up notes from a classmate” for the 1 day of classes he missed. Other study participants (Pablo, Neville, Eileen, and Banita) reported academic accommodations including excused class absences and extended deadlines for missed assignments.

Banita, who attends the largest institution in the study, was the only one who reported the accommodation of a distraction free test taking environment from her faculty. Banita said that this accommodation helped her focus on her test.

Neville and Eileen, who attend the same private institution, reported receiving reasonable accommodations from their faculty, but they also reported feeling more pressure than others to get caught up with missed work and to not get further behind academically. Eileen said that her athletic trainer was very helpful in the way he continuously communicated with her faculty about her injury and ongoing recovery. She was allowed to postpone an exam because her trainer had communicated that she was still symptomatic to her faculty. She also reported that she was not penalized for delaying her work, submitting assignments at a time that was convenient for her. Similarly at the same institution, Neville praised the efforts of his athletic trainer in communicating constantly with his faculty. He was allowed to not do any work for 5 days and was afforded extended deadlines for missed assignments. The challenge for Neville, as indicated

above, was that he felt pressure when getting behind and then was asked by his faculty get all of his missed work in by the upcoming Friday, which contributed pressure and stress. As Neville described his missed lectures and attempt to return to a class with heavy lecture, it was apparent that a note taker would have been helpful. This accommodation may have been useful to others like Marlon, Frannie, and Maria who returned to learn after only minimal cognitive rest.

Impact on Concentration Ability

The fourth theme obtained from the interviews was how the concussion symptoms impacted the participants' concentration abilities. During the individual interviews the majority of participants reported challenges paying attention to faculty lectures and concentrating on readings and homework assignments. As a form of member checking, the following question was sent to all study participants and the results are displayed in Table 3.

Can you recall if you were able to comfortably study and maintain concentration on your homework or in class for more than 20 minutes at a time during the first two weeks of your recovery without having to take a break or without experiencing any symptoms?

Six out of nine study participants responded to the follow-up question. Five out of the six reported difficulty concentrating for more than 20 minutes at a time without having to take a break or put their head down to rest. The sixth respondent reported that her concentration ability was impacted after 40-50 minutes, then she would have to take a break from her studying. The reason for this is a direct result of how concussion impacts the brain's activity. Quite simply, it takes time for the brain to fully recover from a concussion. It is consistent in concussion recovery literature that returning to learn before all concussion symptoms have subsided can be prohibitive to the recovery process and length. Valentine and Logan (2012) refer to

neurometabolic dysfunction as how concussion impacts brain activity and cited the importance of cognitive rest until normal neurometabolic functioning occurs. It was apparent that the majority of student-athletes participating in this study resumed normal academic activities before their brains had resumed normal neurometabolic functioning, hence the need for concentration breaks. As alluded to, this can be attributed to the pressures felt by some participants to not get too behind and also a lack of awareness of exactly how the brain is impacted by concussion.

Conclusion

Implications

This study presents implications for multiple groups of professionals within higher education. The data suggest that student-athletes who participated in this study were not aware of the dangers of returning to academic and classroom activities before their full recovery from concussion and normal neurometabolic functioning was achieved. The risk of injury and prolonged recovery when returning to learn before normal neurometabolic functioning has occurred is well documented in the research (Dalsgaard et al., 2004; Grady, 2010; Majerske et al., 2008; McLeod & Gioia, 2010; Sady et al., 2011). This presents a need for educational efforts on the behalf of higher education professionals who work daily with student-athletes. The education should be on what concussion symptoms are, how they manifest during the recovery process, and guidance on the importance of communicating honestly if those symptoms exist despite the common pressure to return to learn or fear of getting behind academically. The technical education piece on what normal neurometabolic brain functioning feels like should also be a focus of educational efforts.

Implications for Academic Affairs

The academic affairs departments on college and university campuses can potentially have significant impact on student-athletes when they are recovering from concussion. For example, most large universities employ athletic academic support advisors whose job is to support student-athletes in their academic pursuits. The nature of these individuals' work often involves frequent contact with student-athletes as they are mandated by NCAA eligibility guidelines to closely monitor their academic progress. Departments and professionals of this nature can be included in recovery plans to ensure that reasonable accommodations are provided for the student-athlete to last the duration of the concussion symptoms. Due to their frequent contact with student-athletes they could assist with monitoring the concussion recovery process and whether or not post concussion symptoms are interfering with the return to learn. For smaller universities who do not have athletic academic support advisors, other campus advisors and student services staff could be included in the recovery plans and discussions.

Implications for Athletic Departments

College athletics professionals also should recognize the need to educate collegiate student-athletes on what potential academic accommodations exist on their respective campuses. Many of the participants in this study acknowledged not receiving any academic accommodations through their recovery, partially because they were not aware of the possibilities and they did not ask for help. Coaches, athletic trainers, and other athletic administrators invest financially through scholarships and support services to ensure that their student-athletes' welfare is ensured. By increasing or improving concussion awareness and educational efforts, they can

increase the likelihood that student-athletes will be more aware of their symptoms and needs during recovery from concussion.

Additionally, athletic department administrators need to review and refine if necessary their concussion protocols and how they interact with academic affairs and faculty. Multiple study participants assumed their faculty members would offer them specific academic accommodations, other than approvals to miss classes or extended due dates on assignment deadlines, which were offered to most study participants. Concussion recovery and treatment does not appear to be an exact science and many faculty may not be aware of what appropriate academic accommodations are for a student recovering from a concussion. An educational campaign could be conducted on campuses with the faculty by the athletic medicine staff, with support of the athletic director and president of the institution. The faculty educational campaign could be accomplished by inviting a concussion management professional to campus as a guest speaker. This educational effort should also be considered for faculty to increase their understanding of this challenging injury.

Implications for Student Affairs

At many institutions the office of disability services is located in student affairs. These offices and their staff should be a part of the discussion on the well-being of student-athletes who suffer from concussions. By involving these professionals in a treatment team type of setting, concussions could be evaluated if it should be considered a temporary disability. One accommodation that was mentioned in two of the interviews was the possibility of a note taker, which is a commonly used academic accommodation for students with certain types of learning or physical disabilities. When the study participants engaged in academic activities such as

taking notes during lectures before full recovery was achieved, they risked delaying their recovery process and increased risk for further injury (Dalsgaard et al., 2004; Grady, 2010; Majerske et al., 2008; McLeod & Gioia, 2010; Sady et al., 2011). As staff and faculty of higher education institutions are educated more on a concussion's impact on the brain and the need for true cognitive rest, the note taker accommodation should be considered. There may be other academic accommodations such as distraction free test taking environment that could be prescribed if the concussion recovery is classified as a temporary disability. Banita received distraction-free test taking environment from one of her faculty member during her recover and reported that it was helpful as she completed make-up work.

Implications for Coaches

Recently there is a heightened awareness on the dangers of athletic concussion in mainstream society, media, and even most recently, the entertainment industry. Collegiate coaches must be aware of their institution's concussion management protocols and must ensure the welfare of their student-athletes. Many times in the prospective student-athlete recruiting process coaches commit to parents that they will watch over their son or daughter and ensure that they receive support services. There is a potential impact on the recruiting process if a coach could promise parents of prospective student-athletes that when they receive concussions there is certain protocol in placed that will be used to help them so that they will not fall behind academically.

Recommendations

This study provided further exploration into student-athletes' concussion recovery experiences and the impact on academic performance. The data suggest that future research

continue to focus on how student-athletes' recovery from concussion impacts their return to learn. Student-athletes in this study presented data that there could be a lack of understanding of the impact a concussion has on cognitive abilities by staff, faculty and student-athletes. While it is well documented in the literature that a premature return to learn during concussion recovery can be harmful, the student-athletes who participated in this study returned to academic activities while still experiencing concussion symptoms. Moreau et al. (2014) reported that concussed student-athletes' perceptions of their concussions are "largely unexplored" and recommended that future studies expand their findings, possibly in a mixed methods approach. In addition to expanding research on the student-athlete perceptions of their recovery experience, it would be informative to study a larger group of study participants to learn the following:

Number of participants who received no academic accommodations during their recovery

Type of academic accommodations the participants are aware of that existed on their campuses

Number of participants who reported the need for a note taker during their concussion recovery

Number of participants who experienced a decline in academic performance as a result of their concussion recovery and/or symptoms

In addition to the above areas for potential continued research with collegiate student-athletes future research should be conducted on the effect of concussion on youth athletes and their return to learn.

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APPENDICES

APPENDIX A

Interview Questions

- 1- *Can you please describe your last concussion? Where? When? How?*
- 2- *Can you please describe how your concussion made you feel physically and any symptoms that you experienced?*
- 3- *Can you describe the first week after suffering the concussion? What was it like to complete normal academic activities, like attend class, study, etc.?*
- 4- *What can you tell me about how you felt during your recovery?*
- 5- *Describe what it was like to concentrate on your readings and/or homework assignments during your recovery period?*
- 6- *Were you offered any academic accommodations during your recovery that you took advantage of? What were they? If not, were you made aware that they were available?*
- 7- *If yes to 6, did the accommodations help you? In what ways did they help you? Also, who provided the services (the person's position on campus or office)*
- 8- *Can you describe any support or accommodations you received from your faculty during your recovery (inside or outside of class)? If not, will you please describe any situations/classes in which it was difficult for you to deal with during your recovery?*
- 9- *Can you think of any other academic accommodations that would have been helpful during your recovery?*

APPENDIX B

Post Concussion Symptom Scale

Post Concussion Symptom Scale

Headache	Nausea
Vomiting	Balance Problems
Dizziness	Fatigue
Trouble Falling Asleep	Sleeping More Than Usual
Sleeping Less Than Usual	Drowsiness
Sensitivity to Light	Sensitivity to Noise
Irritability	Sadness
Nervousness	Feeling More Emotional
Numbness or Tingling	Feeling Slowed Down
Feeling Mentally 'Foggy'	Difficulty Concentrating
Difficulty Remembering	Visual Problems

(Kontos et al., 2012, p. 2377)

APPENDIX C

Academic Accommodations

1. Excused Absence from Classes
2. Rest Periods During the School Day
3. Extension of Assignment Deadlines
4. Postponement or Staggering of Tests
5. Excuse from Specific Tests and Assignments
6. Extended Testing Time
7. Accommodation for Oversensitivity to Light, Noise or Both
8. Excuse From Team Sport Practice and Gym Activities
9. Avoidance of Other Physical Exertion
10. Use of a Reader for Assignments and Testing
11. Use of a Note Taker or Scribe
12. Use of a Smaller, Quieter Examination Room to Reduce Stimulation and Distraction
13. Preferential Classroom Seating to Lessen Distraction
14. Temporary Assistance of a Tutor to Assist With Organizing and Prioritizing Homework Assignments (McGrath, 2010, p. 494-496).

APPENDIX D

Concussion Signs and Symptoms

Concussion Signs and Symptoms	Potential Problems for Student
Headache	Distract from concentration Can vary throughout the day; may be triggered by exposures such as fluorescent lighting, loud noises
Dizziness	Could indicate vestibular system injury Difficulty standing quickly or walking in crowded areas
Visual difficulties	Trouble with slide shows, movies, computers, smart boards, reading and copying or paying attention to any visual tasks
Noise sensitivity	Difficulty in lunchroom, music, shop or P.E. classes, hallways
Difficulty concentrating, remembering	Difficulty learning new tasks or remembering previously learned ones, test taking; lack of focus in classroom
Sleep difficulties	Memory and focus issues, tardiness or absence from class, sleeping in class

(Halstead et al., 2013)

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