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EFFECTS OF A FACULTY TRAINING PROGRAM ON KNOWLEDGE AND AWARENESS
OF STUDENT CONCUSSION AND ACADEMIC PERFORMANCE

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A DISSERTATION

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OF STUDENT CONCUSSION AND ACADEMIC PERFORMANCE

Abstract

Concussion and the cumulative effects of repetitive head injury are a growing health concern (Ahmed & Hall, 2017). Although a major emphasis throughout the literature related to concussion is on ‘return to play’, there is a growing body of literature focused on safe return to school following concussion. However, many educators and school personnel are unaware of the potential impact of concussion on academic performance or how to implement return to learn procedures following concussion (Dreer, Crowley, Cash, O’Neill, & Cox, 2016; Wing, Amanullah, Jacobs, Clark, & Merritt, 2015). Although college students may face unique challenges when returning to school following concussion, (Hall, 2015) there is limited literature focused on return to learn for the college student or information on how college faculty should be trained. The purpose of this study was to determine the effects of a return to learn after concussion educational program on faculty knowledge and attitudes regarding concussion and the effect on learning and return to school. The study utilized a mixed method design, with a pre-test and post-test to measure concussion knowledge before and after a didactic presentation on concussion and academic performance. Semi-structured interviews gathered information on faculty’s perception of concussion and academic performance as well as potential impact on future teaching practices.

Overall, faculty reported having limited knowledge prior to the training, and felt that the training improved explicit knowledge of concussion. Following the training, they felt more inclined to be attentive to the needs of students, including looking out for signs of concussion, and that they would be willing to implement or adhere to recommendations for academic accommodations. Lastly, they did not receive specific information from the school about the school's policies and procedures for concussion and return to learn. Results indicate that a didactic presentation on concussion and academics may be an effective method for training college faculty. Faculty report the importance of carefully observing all student behaviors and being flexible and open to academic accommodations. Training in concussion and other issues related to emotional and mental health may be of benefit for faculty teaching in institutions of higher education.

University of New England
Doctor of Education
Educational Leadership

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CHAPTER ONE

INTRODUCTION

In 2013, there were approximately 2.8 million traumatic brain injury related emergency department (ED) visits in the United States, including mild traumatic brain injury (mTBI) or concussion (Taylor, Bell, Breiding, & Xu, 2017). In addition, sport related traumatic brain injuries have increased between 2001 and 2012 (Coronado et al., 2015). This number may be an underestimate, as this number only encompasses emergency department visits (Coronado et al., 2015). As a result, the implications for traumatic brain injury have become a matter of public health concern with growing attention to concussion and the long-term effects of repetitive head trauma becoming more apparent within both the medical community and mainstream culture (Ahmed & Hall, 2016; Kerr et al., 2015).

Although the majority of attention is devoted to athletes, particularly professional football players, there is growing attention to injuries sustained in college, high school and even grade school athletes. To address the growing number of identified concussions, health care professionals, coaches, and athletic trainers have developed protocols for safely transitioning the individual back to full participation in athletic activities. Consequently, there is significant literature and attention devoted to ‘return to play’ protocols that provide specific guidelines for return to play (Leddy, Baker, Kozlowski, Bisson, & Willer, 2011; Lang, Michael, Chitale, Judy, & Kevin, 2013; McCrory et al. 2017). Despite the importance of managing concussion symptoms for safe return to school, there is much less attention devoted to ‘return to learn’ protocols that provide guidelines for returning to school (Master, Gioia, Leddy, & Grady, 2012). There is varying information about the benefits of cognitive rest and the negative effects of cognitive exertion, but the literature suggests that a gradual return to activity that is

individualized to the student and his or her clinical presentation and academic needs may be most optimal (Halstead et al., 2013; Rose, McNally, & Heyer, 2015). The importance of a team oriented approach to return to learn has been emphasized (Sady, Vaughan, & Gioia, 2012). However, many teachers and school personnel report feeling inadequately prepared to contribute to the return to learn process due to perceived lack of knowledge (Dreer, Crowley, Cash, O'Neill, & Cox, 2016; Wing, Amanullah, Jacobs, Clark, & Merritt, 2015). A concussion training program for educators and school personnel has the potential to improve knowledge in order for teachers to facilitate the process of return to school. To date, there is limited literature that examines the concussion knowledge levels of college faculty; nor is there literature that provides data on available training programs for college faculty.

Statement of the Problem

Although there is literature that provides guidelines for return to learn following concussive injuries, there is significantly less focus on return to learn protocols for college students, although collegiate athletes are found to sustain concussions at higher rates than high school athletes, specifically during games and competitions (Dompier, 2015; Gessel, Fields, Collins, Dick, & Comstock, 2007). In addition to the increased incidence of concussion in college athletes, college students who have sustained concussions may face unique challenges when transitioning back to classes. Since the typical college student may experience changes in sleep patterns, study habits, and eating habits during their college career (Buboltz, Jenkins, Soper, Woller, Johnson, & Faes, 2009; Pilcher, Ginter, & Sadowsky, 1997), the student who has sustained a concussion may experience even more significant sleep disturbances, since sleep changes are also common following a concussive injury (Kerr et al., 2017). Disturbed sleep can in turn impact ability to concentrate and manage academic tasks. Since typical college students

are challenged by a more autonomous approach to education, which allows for greater freedom and less structure (Hall et al., 2015), the college student who has sustained concussion may have more difficulty transitioning back to school in a less structured environment. Concussion protocols should be individualized to the college student population.

To address the growing issue of concussion in collegiate athletes, the National Collegiate Athletic Association (NCAA) has recently mandated that all Division I schools develop and implement a comprehensive concussion protocol for college students including a return to learn protocol (NCAA, 2016). The NCAA provides recommended best practice guidelines for management of concussion, including return to learn guidelines (NCAA, 2016). There is limited information that provides guidelines for how the protocol should be disseminated to educational staff, including college faculty. In other literature, studies have examined the knowledge and attitudes regarding concussion and return to learn amongst school nurses and elementary school teachers (Dreer et al., 2016 ; Wing et al. 2016). Results indicate that teachers expressed feeling less confident and were interested in seeking out additional knowledge to learn more about concussion, while school nurses felt they did not receive adequate training to manage students who have sustained concussion (Dreer et al, 2016; Wing et al., 2016). As a result, it is apparent that despite the presence of concussion protocols and regulations within schools, many personnel do not feel adequately trained to properly implement and adhere to concussion return to learn protocols.

Since no formal training or guidelines for concussion and return to learn protocols are recommended for college faculty throughout the literature, there is little known about the knowledge base and attitudes toward concussion amongst college instructors. College faculty have the unique opportunity to observe individuals who are have recently sustained a concussion

participating in academic tasks that require cognitive exertion, which may potentially increase post concussive symptoms (Brown et al., 2014). In addition, college faculty may provide formal or informal accommodations based on the recommendations of the physician due to persistent post concussive symptoms (NCAA, 2016). Despite the potential role of college faculty in facilitating return to learn following concussion, there is limited literature that provides guidelines for how faculty should be informed of the impact of concussion and post-concussive symptoms on academic performance. The elementary school literature suggests that it may be helpful to examine existing teacher knowledge regarding concussion before formalizing recommendations into a policy (Dreer et al., 2016). Furthermore, it is suggested by Providenza and Johnston (2009) that knowledge regarding concussion is best translated when the information is delivered in a manner that is best suited to the target audience. However, there is limited information available that suggests how information should be delivered, particularly in the college setting. Thus, the focus of this study was to study the problem of limited concussion education amongst college faculty by examining the effects of a concussion return to learn professional development program that delivers targeted information to college faculty.

Purpose of the Study

The purpose of this study was to determine the effects of a faculty concussion return to learn educational program on faculty knowledge and attitudes regarding concussion and the effect on learning and return to school. Gathering information on the effects of a faculty training module has the potential to provide valuable data on the impact of formal training and the implications for college return to learn protocols. Although there is literature that provides guidelines for return to learn following a concussion (e.g., 2016 Consensus Statement on Sport

Related Concussion), there is limited information available on how these protocols should be disseminated and how educators should be trained, particularly in the college setting.

Research Questions

The focus of this study was to explore the effects of an educational training module on college faculty members' knowledge of concussion and implications for returning to school. A mixed method design was utilized to gather both quantitative and qualitative data on faculty knowledge levels and perceptions of concussion and return to school following a formal educational training. The specific aims of the study were to determine the following:

- What is the effect of an educational training module on college faculty's knowledge and attitudes toward concussion and return to learn?
- How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice?

Conceptual Framework

According to Ravitch and Riggan (2017), the purpose of the conceptual framework is to conceptualize and articulate an argument for the significance of the research topic and methodology. Marshall and Rossman (2011) further propose three necessary elements to the development of a conceptual framework including an argument for the significance of the study that has implications for the development of protocol and policy, common themes or traditions found in the literature and, lastly a gap in the literature. The conceptual framework for this study emphasizes the challenges of returning to school following a concussion, including the unique experiences of the college student. Furthermore, the proposed study is rooted in the argument that education, training, and dissemination are integral components of effective implementation of formal protocols. The guiding framework for the study is based on principles of the theory of

knowledge transfer and exchange, which examines the application of research findings to the development of different polices (Mitton, Adair, McKenzie, Patten, & Perry, 2007). The concepts of knowledge transfer and exchange provided the foundation for which the training program will be developed and ultimately disseminated to faculty. Thus, the conceptual framework for the study is comprised of the following constructs: return to school following concussion, the unique experience of the college student, and application of the theory of knowledge transfer and exchange to the development of a faculty return to learn concussion training module. The conceptual framework is further illustrated in Figure 1, which highlights the theory of knowledge transfer and exchange as a critical component of development and dissemination of concussion return to learn protocols. The theory of knowledge transfer and exchange provided the foundation for the development of a concussion training program that was utilized for this study.

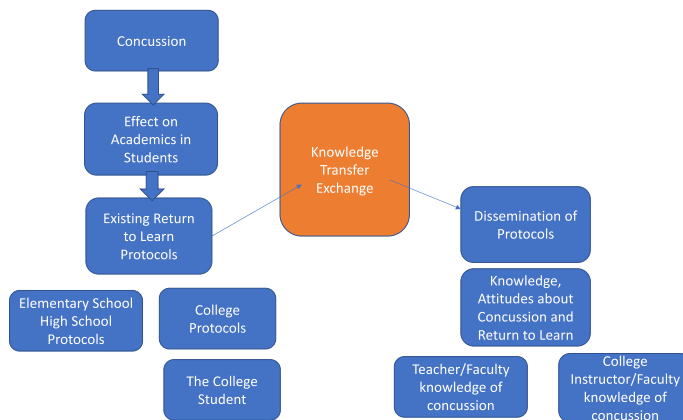


Figure 1.1 Conceptual Framework. This figure illustrates the conceptual framework with the theory of Knowledge Transfer Exchange as the main foundation of the study

Significance of the Study

Due to growing concerns over the long-term effects of concussion, there has been increased attention devoted to the management of concussion. (Ahmed & Hall, 2017; Kerr, 2015;

Popoli, Burns, Meehan, & Reisner, 2014). Medical professionals, coaches, athletic trainers, and families have become more aware of the potential dangers of concussion and more measures are being taken to ensure safe participation in sports at all levels. Children and adolescents who have sustained concussion may not only have difficulty with return to sports, but they may have difficulty returning to school as cognitive exertion may also exacerbate symptoms (Brown et al., 2014). Therefore, the student returning to school will require guidance and recommendations to safely transition back to classes without worsening of symptoms (Halstead et al., 2013). The college student in particular, has the potential to experience unique challenges such as sleep disturbances and larger work volumes (Pilcher et al., 1997). However, there is limited research focused on return to learn protocols that are specific to the college student. Of the existing protocols and guidelines, there are few that focus on how these protocols should be disseminated to college instructors. However, it has been suggested that before return to learn protocols are formalized, it is helpful to examine existing teacher knowledge (Dreer et al., 2016). In addition, it is suggested that education for a specific protocol should be customized to the target audience, which is in this case, college faculty members. In order for colleges to effectively implement concussion return to learn protocols, faculty should be informed of the protocols and information should be delivered in a manner that is specific to the existing knowledge and values of faculty members.

This study provided information regarding the effects of a concussion training program on faculty members' awareness and knowledge of concussion as well as the effects on academic performance. Information on the efficacy of a faculty training module can contribute to further development of training programs for educators at all levels. Furthermore, focused concussion

return to learn education programs that are specific to educators may help students who have sustained concussion transition back to school with less difficulty (Dreer et al, 2016).

Definition of Terms

Athletic Trainer: “highly qualified, multi-skilled health care professionals who collaborate with physicians to provide preventative services, emergency care, clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions” (National Athletic Trainers Association, n.d.).

Cognitive rest: freedom from physical or mental discomfort, an abstinence from mental exertion, and a sense of mental and emotional balance (Schneider, 2016); decrease in cognitive activity, which may include removal from school or academic tasks, (DeMatteo et al., 2015), avoidance of mental challenge; eliminating activities such as computer use, watching television, cell phone use, reading, playing video games, text messaging, or listening to loud music (Sady et al., 2011).

Concussion: a traumatic brain injury induced by biomechanical forces. Several common features that may be utilized in clinically defining the nature of a concussive head injury include:

- may be caused either by a direct blow to the head, face, neck or elsewhere on the
- typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.
- may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.

- results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged. The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc.) or other comorbidities (e.g. psychological factors or coexisting medical conditions). (McCrary et al., 2017, p. 2)

National Collegiate Athletic Association (NCAA): general legislative and governing body for intercollegiate athletics that is responsible for developing and enforcing regulations for play and eligibility for student athletes (The Editors of Encyclopedia Britannica, 2016).

NCAA Division II: a division of the NCAA that typically enrolls both local or in-state student-athletes. Division II athletics programs are financed in the institution's budget like other academic departments on campus. (NCAA, n.d.)

Post-Concussion Syndrome: “A syndrome that occurs following head trauma (usually sufficiently severe to result in loss of consciousness) and includes a number of disparate symptoms such as: headache, dizziness, fatigue, irritability, difficulty in concentration and performing mental tasks, impairment of memory, insomnia, and reduced tolerance to stress, emotional excitement, or alcohol” (World Health Organization, 2007).

Return to Learn: Refers to the process of returning to school following a concussive injury.

Assumptions

The study utilized a mixed method design that utilized a pre-test and post-test as well as semi-structured interviews to measure the effects of a faculty concussion return to learn training module on faculty knowledge, and attitudes regarding concussion and return to learn. The

concussion training module was developed collaboratively with the Sports Medicine Center within one Division II college. An assumption based on the design of the study was that participants would answer questionnaire and interview questions honestly and thoughtfully. It was assumed that participants would be college instructors with varying types of graduate level education in different academic areas. The pool of participants included faculty teaching at the graduate level within the Schools of Health Professions and Computer Science and Engineering. Furthermore, it was assumed that faculty had experience teaching college students and may have had experience teaching collegiate athletes, but did not have formal training in concussion and the effects on returning to school.

Limitations

Since this training module was administered to the faculty within one Division II school in a specified geographic region, it may have not been representative of all college faculty, including those within Division I and III schools and schools located in other regions. Since the program was voluntary, there was potential for bias, as participants may have volunteered to attend the program due to a prior interest or familiarity with the topic of concussion and academic performance. Lastly, since the qualitative portion of the study was a sub-group of the original sample, the sub-group may not have been representative of the entire sample.

Conclusion

Concussion is becoming more widely recognized as a growing health concern (Ahmed & Hall, 2017; Kerr et al., 2015). Parents, teachers, and coaches are all becoming more aware of the importance of recognizing the signs of concussion and preventing re-injury by carefully monitoring when athletes return to play. Children and adolescents who participate in sports are not only athletes, they are students. Since both physical and cognitive exertion can potentially

exacerbate concussion symptoms, consideration should be given for how students should be best transitioned back to the classroom following a concussive injury (Brown et al., 2014). Although there are existing return to learn protocols in place, there are limited protocols that are specific to college students. Furthermore, there is limited information on how return to learn protocols should be disseminated, particularly to college instructors.

This study began with an introduction to the topic and problem of practice. The need and purpose of the study are identified and research questions are listed. Chapter 2 will provide an in depth review of the literature, examining information available on concussion and the implications for academic performance, cognitive rest, return to learn procedures, and knowledge regarding concussion. Chapter 3 will discuss the research design, data collection procedures, and methods for recruiting participants in detail. Chapter 4 will provide an overview of the results of the data and Chapter 5 will provide an interpretative discussion of the results. Bibliographic references and appendices will follow.

CHAPTER TWO

REVIEW OF THE LITERATURE

Within both the medical community and mainstream culture, there is a significant increase in attention to concussion and the long-term effects of repetitive head trauma (Ahmed & Hall, 2016; Kerr, 2015; Popoli et al., 2014). As a result, health care professionals, coaches, and athletic trainers have worked to develop protocols for safely transitioning the individual back to full participation in athletic activities. Consequently, significant literature has called attention to ‘return to play’ protocols that provide specific guidelines for return to play (Leddy, et a., 2011; Lang et al., 2013; McCrory et al., 2013). Despite the importance of managing concussion symptoms for a safe return to school, much less attention is devoted to ‘return to learn’ protocols that provide guidelines for returning to school (Master et al., 2012).

There are varying approaches to return to learn following concussion, but recent literature suggests that a gradual return to activity that is individualized to the student and his or her clinical presentation and academic needs may be most optimal (Halstead et al., 2015). Furthermore, the utilization of a team approach to return to learn has also been emphasized as an effective strategy for facilitating return to learn (Sady et al., 2012). Despite the importance of a team approach to return to learn, the literature suggests that many school personnel feel that they do not have adequate knowledge to facilitate the return to learn process (Dreer et al., 2016, Wing et al., 2016). As a result, many school faculty and personnel may not be adequately prepared to apply principles of return to learn as outlined by consensus statements. Thus, the need for more formal mechanisms of increasing knowledge levels regarding concussion may be warranted amongst educators and school personnel.

Conceptual Framework

According to Ravitch and Riggan (2017), the purpose of the conceptual framework is to conceptualize and articulate an argument for the significance of the research topic and methodology. In addition, Ravitch and Riggan (2017) emphasize the importance of the conceptual framework as a means for selectively examining the literature and establishing specific connections and relationships. Maxwell (2013) further proposes the argument that the development of the conceptual framework is a constructive process that synthesizes information from multiple different sources. He states the conceptual framework is something that is constructed, not found, and emphasizes that the researcher essentially develops the structure of the conceptual framework. In order to construct the conceptual framework, Marshall and Rossman (2011) propose three necessary elements. The first element is the argument for the study's significance that provides evidence that the study has potential significance for practice and policy and is likely to contribute to the ongoing discourse about the topic (p. 31). The second element proposed by Marshall and Rossman (2011) emphasizes "the important intellectual traditions that guide the study" (p. 58). Marshall and Rossman (2011) further propose that these intellectual traditions are identified through a comprehensive and thorough literature review. The third element to a conceptual framework as proposed by Marshall and Rossman (2011) is the identification of a gap in the literature by reviewing and critiquing existing literature. In summary, the role of the conceptual framework is to provide an overarching lens that argues for the significance of the research topic and methodology.

Return to School Following a Concussion

Throughout the literature there is increased attention devoted to the importance of concussion detection and management (Ahmed & Hall, 2016; Kerr et al., 2015). A significant

portion of the literature is focused on safely returning athletes to sport (Lang et al., 2013; Leddy, et al., 2011; McCrory et al., 2017) with less emphasis on returning students to school. However, there is evidence that cognitive exertion has the potential to exacerbate concussive symptoms, and there is evidence that some type of cognitive rest is needed as the individual transitions back to the classroom (Valentine & Logan, 2012). In addition, recent studies have reported academic challenges following a concussion including increased time spent on homework, headaches interfering with learning, failure to keep pace, failure to complete schoolwork, problems keeping pace with and expanding workload, and perception of poorly controlled symptoms (Ransom et al., 2015). Thus, it is apparent that a student who has sustained a concussion has the potential to face unique academic challenges following a concussive injury.

The Unique Experience of the College Student

Although there are emerging protocols for return to learn following concussion noted throughout the literature, there is significantly less focus on return to learn procedures for college students, although collegiate athletes appear to sustain concussions at higher rates than high school athletes, particularly when actively competing in games (Dompier, 2015; Gessel, 2007). In addition to the increased incidence of concussion in college athletes, college students who have sustained concussions have the potential to face unique challenges when transitioning back to school due to the more autonomous nature of college coursework (Hall et al., 2015). For example, the college experience is different from the elementary and secondary school settings in that the college student spends less time in a traditional classroom, has more frequent and prolonged breaks, and often requires more work outside the classroom (Hall et al., 2015). Furthermore, the typical college student's experience is often influenced by multiple other variables including sleep disturbance, alcohol use, and numerous other psychosocial factors

related to changes in family and friend relationships (Hall et al., 2015). As a result, many typical college students face a number of unique challenges and stresses. Concussion and resultant symptoms can potentially complicate already existing stress levels and challenges, thus making the college student's return to learn process unique to the challenges of other students.

Theoretical Framework: Knowledge Transfer and Exchange

The theory of knowledge transfer and exchange (KTE) is an element of organizational theory that examines the process of applying scientific research findings to facilitate decision-making and the development of protocols. The main purposes of KTE are to increase the use of research findings in the development of different policies and when making key policy related decisions, and to facilitate the development of policy related research questions (Mitton et al., 2007). Ultimately, "the transfer and exchange of knowledge involves collaboration to engage in problem solving, where learning occurs through planning, disseminating and applying new or existing research in the decision making" (Canadian Health Services Research Foundation, 2009, as cited by Provvidenza, 2009, p. i69). Specifically, the theory of knowledge transfer and exchange suggests that the target audience should be defined and shaped so that information is delivered in a manner that is consistent with the audience's existing values. Furthermore, according to KTE, the methods of teaching or disseminating should consider the optimal method of delivery, based on the learner's needs (Reardon, Lavis, & Gibson, 2006, as cited by Provvidenza, 2009). KTE was used to develop the training program and provided a rationale for the need for education programs to facilitate the dissemination of protocols.

Defining Concussion and Post-Concussion Syndrome

According to the most recent consensus statement on sport-related concussion, concussion is defined as a traumatic brain injury caused by biomechanical forces, and may be

caused by a direct blow to the head, face, neck or other part of the body that transmits a force to the head (McCrory et al., 2017). Symptoms are thought to be short lived and resolve spontaneously, and appear to be the result of a functional disturbance rather than a structural disturbance, as there are typically no positive radiological findings following injury (McCrory et al., 2017). Symptoms often affect several different domains and may include cognitive changes, such as difficulty concentrating, emotional symptoms such as irritability, physical symptoms such as headache or dizziness, and sleep disturbances (Center for Disease Control, 2017).

Diagnosis and assessment of concussion requires comprehensive testing of multiple different areas including clinical symptoms, physical impairments, cognitive impairments and sleep disturbances, as well as a detailed evaluation of concussion history (McCrory et al., 2017). Due to the complexity of this diagnosis, it can be difficult to determine the trajectory for recovery but it is suggested that most individuals should recover spontaneously from concussion within ten to fourteen days for adults, and within four weeks for children (McCrory et al., 2017).

Individuals who experience symptoms beyond this timeframe are thought to be experiencing *persistent* symptoms (McCrory et al., 2017) that present longer than the expected recovery time. The World Health Organization (WHO) characterizes persistent post-concussive symptoms as a

syndrome that occurs following head trauma (usually sufficiently severe to result in loss of consciousness) and includes a number of disparate symptoms such as headache, dizziness, fatigue, irritability, difficulty in concentration and performing mental tasks, impairment of memory, insomnia, and reduced tolerance to stress, emotional excitement, or alcohol (World Health Organization, 2007).

There are several factors that are thought to be associated with prolonged symptoms including a history of Attention Deficit Hyperactivity Disorder (Bonfield, 2013), as well loss of consciousness at the time of injury, post-traumatic amnesia, and more severe acute symptoms at the time of injury (McCrea et al., 2013). For the patient with post-concussion syndrome, persistent symptoms are found to be correlated with decreased quality of life and inability to participate in activities of daily living (Heitger et al., 2009). Furthermore, persistent post-concussive symptoms can also interfere with academic performance and overall educational outcomes (e.g. graduation rates) (Mayers, 2013).

Cognitive Rest and Academic Performance

The literature examining the impact of concussion on academic performance is varied, with some studies reporting subjective worsening of perceived academic performance following a concussion, while others report no objective change in academic performance. It has been argued that post-injury symptoms and academic performance appear to be affected by the extent of cognitive exertion and relative cognitive rest. It appears that while a high level of cognitive exertion may be associated with increased symptoms (Brown et al., 2014) excessive cognitive rest may also be associated with increased symptoms (Thomas, Apps, Hoffman, McCrea, & Hammeke, 2015), suggesting that a balanced return to cognitive activity is be most optimal.

Concussion and Cognitive Rest

Although there are varying definitions and conceptualizations of cognitive rest throughout the literature, Schneider (2016) proposes defining attributes of cognitive rest, which have been extracted from the literature. Key attributes include a freedom from physical or mental discomfort, an abstinence from mental exertion, and a sense of mental and emotional balance (Schneider, 2016). Other literature does not explicitly define cognitive rest, but suggests that

cognitive rest refers to a decrease in cognitive activity, which may include removal from school or academic tasks, (DeMatteo et al., 2015), avoidance of mental challenge (Sady et al., 2011), or elimination of activities such as computer use, watching television, cell phone use, reading, playing video games, text messaging, or listening to loud music (Sady et al., 2011).

Effects of Cognitive Rest on Symptoms

Literature focused on cognitive rest is varying with some studies suggests that cognitive rest may improve symptom duration (Brown et al., 2014), while other studies suggest that excessive cognitive rest may prolong symptoms (Thomas et al., 2015). In a study conducted by Thomas, et al. (2015), a randomized control trial was utilized to examine the effects of strict rest versus moderate rest on perceived post-concussive symptoms in children and adolescents. Participants ages 11-22 who presented to the emergency room within 24 hours of a concussion were recruited for the study and underwent comprehensive concussion assessment, including cognitive and balance testing. Participants were then randomized to either strict rest for five days or usual care, which was described as 1-2 days rest, followed by a graduated return to full activity. The participants were then instructed to complete a diary in order to record activity level, exertion, and reported post-concussive symptoms. Neurocognitive and balance assessments were then repeated at three and ten days post-injury. Results indicate that there was no clinically significant difference in balance and cognitive outcome measures. However, the intervention group reported more daily post-concussive symptoms, indicating that excessive rest offers no greater benefit, and may actually contribute to a worsening of symptoms. Based on the results of this study, Thomas et al. (2015) suggest that, “Endorsing *modest* physical and cognitive rest after injury is an effective strategy for recovery” (Thomas et al, 2015).

Another study conducted by Varner et al. (2016) sought to determine if patients who received instructions to gradually return to activity had a decrease in their Post-Concussion Symptom Score (PCSS) two weeks after MTBI as compared to patients who received general MTBI guidelines. Results of the study indicate that there was no significant difference in scores between the control and experimental groups. The authors argue that there may not be adequate evidence to support the recommendation of cognitive rest, but suggest that a limitation of the study was that there was no way of verifying compliance with the recommendations.

Gibson, Nigrovic, O'Brien, and Meehan (2013) also conducted a study to determine if cognitive rest was associated with duration of post-concussion symptoms. The study examined 135 medical records of individuals who have sustained concussions. In 63% of the cases, cognitive rest was recommended, and 59% of cases had prolonged concussion symptoms. The authors found that only initial PCSS score was associated with duration of concussive symptoms, and suggest that cognitive rest may not necessarily be beneficial.

Alternatively, a study conducted by Brown et al. (2014) suggests that excessive cognitive activity may be associated with prolonged concussive symptoms. Patients who presented to a Sports Concussion Clinic within 3 weeks of injury were asked to record average level of cognitive activity at scheduled follow up visits. Results of the study indicate that individuals who reported the greatest amount cognitive of activity were found to have the highest level of post-concussive symptoms.

Overall, there is varying information available in the literature regarding concussion and cognitive rest. It appears that strict rest may be associated with increased post-concussive symptoms, (Thomas et al, 2015) while higher levels of cognitive exertion may also be associated with increased post-concussive symptoms. Lewis, McCleod, Whelihan, and Bacon (2017)

conducted a systematic review of the literature regarding concussion and rest. One of the key themes extracted from the review is the need to determine what the optimal type and amount of rest is following concussion. They further state that “there is a significant need to translate knowledge of best practices in concussion management to primary care providers” (Lewis et al, 2017). As a result, there is a need to not only determine what constitutes best practice regarding concussion and rest, but also how this information should be disseminated.

Impact of Concussion on Academic Performance

A study conducted by Ransom et al. (2015) examined the academic effects of concussion on 349 students ages 5 to 18 who sustained a concussion and had returned to school. The participants were stratified into two groups, with one sub-set of the participants labeled actively symptomatic and/or presented with impairments on neuropsychological testing, while the other group was labeled recovered, as defined by no increase in symptoms and no neurocognitive impairments found on neuropsychological testing. Students and parents each completed the Concussion Learning Assessment and School Survey (CLASS) to measure post-injury academic experiences, including concern for the injury’s effect on school learning and performance, new or exacerbated post-concussion academic problems, and perceived impact on academic performance. Results indicated that the actively symptomatic students and parents reported higher levels of concern for the impact of concussion on school performance and more school-related problems than students from the recovered group. In addition, more severe post-concussion symptoms were associated with greater school-related problems and worse academic effects.

Another study conducted by Wasserman, Bazarian, Mapstone, Block, and van Wijngaarden (2016) also examined self-reported academic difficulties. The study utilized

telephone interviews to obtain data on self-reported academic dysfunction on 70 students who had sustained concussion. The group was also compared with 108 students who had sustained extremity injuries within the same time frame. The purpose of the study was to determine whether concussed students experience greater academic dysfunction. An academic self-report measure was developed for the study, and was based off anecdotal reports from a concussion clinic, case reports, and qualitative literature. The survey was administered at 1 week and 1 month post-injury for both groups. Findings indicated that individuals who sustained concussion reported greater levels of academic dysfunction than students who had sustained upper extremity injuries at the 1 week survey. However, at 1 month post-injury, there was no differences in self report between the two groups, suggesting that in some cases perceived academic difficulties may affect the student more in the acute stage of the injury.

Other studies have focused on objective measures of academic performance following concussion. A study conducted by Russell et al. (2016) examined the relationship between concussion and academic performance among high school students in Canada utilizing a retrospective population based study. The purpose of the study was to determine if academic performance was lower in the academic calendar year where a concussion was sustained as compared to the previous year when there was no history of concussion. Results indicated a drop in grade point average from one year to the next regardless of concussion status, suggesting that a concussion may not necessarily result in changes in grade point average, or academic outcome measures.

Knowledge of Concussion

Facilitating a student's return to learn following a concussion is considered a multidisciplinary process that requires communication and a shared effort in order to

successfully transition the student back to school (McGrath et al., 2010; Sady et al., 2012). However, many school personnel often feel challenged in their ability to contribute to the return to learn process due to lack of knowledge and confidence (Dreer et al; Heyer, Weber, Rose, Perkins, & Schimttauer, 2015; Wing et al., 2015). According to Dreer et al. (2016), teachers are key contributors to the return to learn process, as they are the primary educator and oversee academic tasks that require cognitive exertion. The perspectives of the role of the teacher was studied by Dreer et al. (2016). A cross-sectional survey was administered to a total of 130 participants with the purpose of examining teacher knowledge and classroom management of concussions. Results indicated that teachers across all grade levels were fairly knowledgeable about concussion symptoms as indicated by their response to survey questions directly focused on measuring teacher knowledge. However, teachers reported feeling less confident about their abilities to recognize concussion symptoms with less than 5% of respondents reporting that they feel extremely confident, and only 17.7 % reporting that they feel very confident. In addition, less than half of the surveyed teachers reported that they received concussion information or training as part of their job, and that most of this education was obtained from fact sheets or handouts. In a study conducted by Williams, Jody, Langdon, McMillan, & Buckley (2015), the perceived knowledge of secondary school athletic trainers (SSATs) was examined. Results indicated that most SSATs believed they should be part of the academic-support team, following concussion but had limited knowledge of academic accommodations. Additionally, results indicated that years of experience and employment, specifically being employed a secondary school influenced an SSAT's familiarity with academic accommodations.

A study conducted by Wing et al. (2016) examined school nurses' perception of barriers to implementing return to learn protocols, specifically examined barriers related to perceptions of

inadequate training or knowledge. Respondents reported barriers which included inadequate communication with the referring provider (73%), inadequate concussion training (38%), and insufficient time to care for a student who has sustained a concussion (30%). Wing et al. (2016) noted that a lack of consistency of recommendations among physicians makes it difficult to implement academic accommodations and to communicate them clearly to the rest of the school community.

At the administrative level, Heyer et al. (2015) examined high school principals' self-reported resources, knowledge, and practices regarding the management of students with concussion and looked specifically at perceived knowledge of concussion. A cross-sectional survey was administered to 695 public high school principals in the state of Ohio, and results indicate that perceived knowledge levels may be higher at the administrative level, as high school principals rated concussion perceived knowledge levels on average 7.4, on a scale of 1-10. Findings also indicated that respondents to the survey who experienced concussion education were more likely to recommend educational tools for faculty not directly involved in sports.

Pediatricians are main contributors to the return to learn process following a concussion as they are often first to see a student following an injury and will frequently provide initial care instructions. However, despite the integral role of the pediatrician in concussion care, some pediatricians report decreased application of consensus guidelines in practice (Carl & Kinsella, 2010). One study conducted by Carl and Kinsella (2010) determined that although pediatricians were found to be knowledgeable regarding concussion, only 14.6% of general pediatrician respondents reported that they applied concussion consensus guidelines in their practice, which include guidelines for rest, graduated return to play, and return to learn (Carl & Kinsella, 2010).

In addition to pediatricians, emergency department physicians often see individuals who have sustained concussions for initial care and management (Mitchell, Hildenbrand, & Pietz, 2016). However, despite clinical experience seeing concussion patients, a recent study suggests that similar to pediatricians, emergency department physicians may also have areas for continued knowledge growth with regards to concussion management (Mitchell et al., 2016). In a study conducted by Mitchell et al. (2016), a 32-question cross sectional electronic survey was utilized to evaluate emergency department physician knowledge of sport related concussion as well as physician practice patterns including return to play. According to survey results, 64% of participants were aware of return to play guidelines while only 38% provided instructions on these guidelines for return to play at discharge. The only factor predictive of concussion knowledge was concussion training since residency, suggesting that focused education, with an emphasis on expected symptom duration, could improve emergency department knowledge and practice patterns regarding concussion and return to play guidelines (Mitchell et al., 2016).

Concussion knowledge levels of allied health professionals were examined in a study conducted by Salisbury, Kolessar, Callendar, and Bennett (2017), which also found variability in knowledge regarding concussion management practices within rehabilitation professionals. In this study, a two-part concussion knowledge survey was administered to rehabilitation professionals from different disciplines to determine knowledge levels regarding concussion and concussion management. Although many participants responded correctly to diagnosis of concussion, there was less consistency in responses related to best care practices, typical recovery from concussion, and long-term effects from concussion including chronic traumatic encephalopathy. Profession, years of experience, or experience working with concussion were not associated with better scores. The only factor associated with better knowledge scores was

participation in specific concussion training. In summary, there is variability in knowledge levels of concussion management and the process of return to learn following concussion, which has implications for the need for formal concussion training programs, continuing education, and possibly the need for concussion to be embedded in professional curriculums.

Compliance with Concussion Guidelines and Recommendations

According to recent literature, there is variability in knowledge levels regarding concussion diagnosis and management in both health care and educational settings, suggesting a need for further education and training in concussion best practices (Carl & Kinsella, 2014; Dreer et al., 2016; Graff & Caperell, 2016; Mitchell et al., 2016; Wing et al., 2016). In addition, some studies have suggested that along with variability in concussion knowledge, there is variability in application of recommendations consistent with current concussion consensus guidelines (Carl et al., 2014; Mitchell et al., 2016). A recent study conducted by Baugh et al., (2015) utilized an electronic survey to coaches, sports medicine clinicians, and compliance administrators of 1066 NCAA institutions. The purpose of the study was to determine participants' report of whether institutions had concussion management plans in place and if these concussion management plans were compliant with current NCAA recommendations. Results of the study indicate that 82.1% of participating institutions had all respondents indicate a concussion management plan was in place, while 15.2% of schools had some respondents indicate a concussion management plan was in place. 70.8 % of participating institutions reported adherence to the NCAA's athlete concussion education mandate. However, institution-level adherence to specific components of that plan was reported at a lower rate than only having a concussion management plan present. One component of the concussion management plan that respondents reported decreased compliance with was annual concussion education for athletes

(Baugh et al., 2015). Findings of this study suggest that although institutions may have concussion management plans in place, there is variability in compliance with all elements of the concussion management plan as recommended by the NCAA. These results have similarities with other studies that have found variability in practitioner's applications of recommended concussion consensus statement guidelines (Carl & Kinsella, 2014; Mitchell et al., 2016). Thus, further investigation may be warranted to determine what factors may contribute to decreased compliance with recommended concussion best practice guidelines.

Concussion Education

Since there is variability in existing knowledge levels of concussion amongst educational professionals, health care professionals, athletes, and coaches, concussion education programs are gradually being developed throughout the literature (Carl & Kinsella, 2014; Dreer et al., 2016; Heyer et al., 2015; Wing et al., 2016). Providenza et al. (2009) further underscore the importance of concussion education, suggesting that the enhancement of concussion education is essential for all populations. The importance of concussion education is also emphasized in the most recent international consensus statement on management of sport related concussion (McCrory et al., 2017), which recommends that athletes, referees, administrators, parents, coaches and healthcare providers receive education in detection of concussion and principles of safe return to play. Many studies are focused on concussion education programs for athletes and coaches with recent studies focusing on educational programs for teachers and education professionals.

Concussion Education for Athletes

There has been a significant focus of literature on concussion education for athletes in order to educate athletes on the potential dangers of collision sports, the symptoms of

concussion, and the importance of disclosing symptoms. Research on concussion education has been conducted at the primary school, high school, and collegiate level, with varying results depending on the format of the education.

A study conducted by Bagley et al., (2012) examined the effectiveness of an interactive concussion curriculum for student- athletes aged 9-18 which focused on recognition and appropriate responses to concussions. The program, entitled the Sports Legacy Institute Community Educators (SLICE) program provided interactive demonstrations, discussion, and case studies of athletes focused on recognition of concussion and appropriate responses. The program was delivered by medical students and/or volunteers to a total of 636 students. Participants completed a pre-education and post-education quiz with results indicating significant improvements in concussion knowledge for all ages and genders. Results of the study suggest that this particular method of education may be effective for improving knowledge levels in the youth athlete population.

A study conducted by Caron, Bloom, Falcao, and Sweet (2017) examined the effects of a concussion education program delivered specifically to high school students. The program was comprised of four interactive oral presentations and was developed in line with principles of knowledge transfer, with an emphasis on meeting the learning needs of all participants. The study utilized a mixed method design to analyze the effects of the concussion program on participants' knowledge and attitudes regarding concussion. The Rosenbaum Concussion Knowledge and Attitudes Survey- Student Version (RoCKAS-ST; Rosenbaum & Arnett, 2010) was utilized to measure student knowledge and attitudes regarding concussion at three points in time. The qualitative portion of the study utilized focus groups to allow students to express narratives perspectives on their experiences with the concussion education program. Results of

the study indicate participants' post-education knowledge scores were higher than their pre-education scores. Analysis of data collected from the focus groups indicates that student-athletes said they acquired concussion knowledge about the role of protective equipment, concussions symptoms, and with regards to concussion attitudes that they plan to avoid potentially dangerous collisions during games. The results of this study suggest the efficacy of a concussion education program for high school athletes and further emphasizes the potential benefits of application of the theory of knowledge transfer to development of educational materials.

Within the college population, the NCAA mandates concussion education, but does not specify the particular content or how the information should be delivered (Kroshus, Daneshvar, Baugh, Nowinski, & Cantu, 2013). In order to better understand the efficacy of existing college concussion education programs, a study conducted by Kroshus et al., (2013) utilized a prospective cohort design, to evaluate scores on a concussion knowledge assessment following institution specific concussion education. Participants included one hundred forty-six athletes from 6 male collegiate ice hockey teams in one Division 1 conference. The purpose of the study was to assess concussion education programs, specifically examining content, delivery and the effectiveness in changing concussion reporting behaviors. The study utilized the RoCKAS-ST to assess concussion knowledge and attitude levels before and after completion of concussion education programs. The study also assessed the format of the concussion education. Results of the study indicated that concussion education did not significantly improve concussion knowledge or attitude levels in student athletes. The format of the concussion education programs varied with delivery methods including lecture, handout provided via email or hardcopy, or video presentation. Participants reported remembering information most easily following content delivered via video. Results of this study suggest that further consideration

may be required to develop effective educational materials and that one area of focus may be to consider the format of the education.

Concussion Education for Athletic Coaches

Since athletic coaches have the potential to play an integral role in symptom identification and concussion safety, effective concussion education for coaches is of particular importance (Kroshus, et al., 2016; Rivara, et al., 2014). A study conducted by Kroshus et al., (2016) examined the number of United States college coaches who receive annual concussion education, specifically examining the format of their education. The study also aimed to determine whether coaches who received institutional concussion education had greater knowledge about concussions. Respondents were 1818 coaches from 755 institutions. The participants were asked whether they receive educational information about concussions from their school on an annual basis and to report on the content in which the information was delivered. Approximately two thirds of respondents indicated that they receive concussion education from their institution, but there was variability in how the information was delivered. Coaches who received education were able to more accurately answer questions related to concussion safety scenarios such as when it is safe to return to play following a concussive injury. Results of the study suggest the importance of concussion education for coaches and highlight existing issues with the variability and consistency in which this information is delivered.

Another study conducted by Rivara et al. (2015) examined concussion education in high school coaches, specifically looking at the incidence of sports-related concussions in high school athletes in the state of Washington. The study also examined the proportion of athletes with concussive symptoms who did not report their injury and continued to play while symptomatic,

and well as the effect of concussion education for coaches and whether coaches who received education were more likely to be aware of an athlete's concussive symptoms. Coaches were asked to complete a questionnaire, including demographics, attendance of athletic trainers during games, and requirement for concussion education at their respective institutions. Results indicated that age, sex, level of education, coaching experience and certification, and the presence of an athletic trainer at the school did not significantly differ for players whose coaches were aware/not aware of their concussions. Of the identified concussed athletes, 40 percent reported that their coach was not aware of their concussion, and the proportion did not vary by sport. Both coaches that were aware of the athlete's concussion and coaches who were not aware of the athlete's concussion reported institutionally mandated concussion education training. However, there was variability in the format of the training, with suggestion that a video with quiz may be less effective formats. Overall, the study highlights the importance of concussion education, but suggests that the format may affect the coach's ability to apply information effectively to identify students with concussion.

Concussion Education for Teachers

Although educators have the potential to facilitate return to learn following concussive injuries, there appears to be less focus in the literature on concussion education for teachers. A study conducted by Carzoo, Young, Pommering, and Cuff (2015) examined the effect of a didactic educational presentation on the knowledge, attitudes, and beliefs of secondary school educators regarding concussion. 80 school districts were contacted to participate in the study, with a total of 400 subjects participating in the study. Participants attended a 60 minute didactic presentation on concussion and completed a pre- and post-knowledge assessment. The instrument utilized for the study was developed by the researchers and piloted on educators prior

to administration. The material for the presentation was developed based on recent consensus guidelines and the Centers for Disease Control and Prevention “Heads Up to Schools” fact sheets (Carzoo et al., 2015). Results of the study indicated that improvement in knowledge levels immediately following the presentation, thus suggesting that a didactic presentation may improve immediate knowledge levels of educators. In addition, the study found that there were no differences in baseline knowledge of coaches versus non-coaches, those with prior concussion education/training versus those who did not have training, and those with experience managing students with concussion in the classroom versus those without experience. These results suggest that despite prior training or experience with concussion, many educators may still benefit from concussion education.

A study conducted by Kasamatsu, Valovich, McLeod, Register-Mihalik, and Welch-Bacon (2017) further supports the importance of concussion education for teachers. The purpose of this study was to examine teachers’ perceptions of and experiences with implementing academic accommodations post-concussion. Participants were emailed to request their completion of the Beliefs, Attitudes, and Knowledge of Pediatric Athletes with Concussion (BAKPAC) survey, which assesses knowledge levels of concussion and perceptions of concussion and academic accommodations. Results of the study indicated that most teachers recognize that concussions affect academic performance, and many have provided academic accommodations within their classrooms. The study also found that participation in formalized concussion education was associated with greater familiarity with academic accommodations and an increased rate of recommendations for academic accommodations (Kasamatsu et al., 2017).

Return to Learn Protocols

Although there is varying information regarding the impact of concussion on academic performance, a significant body of literature supports an individualized return to learn program that meets the unique needs of the individual. However, many schools still do not have concussion protocols in place, particularly return to learn.

Prevalence of Existing Return to Learn Protocols

To date, there are a small number of studies that have examined the prevalence of concussion protocols (Sady et al., 2012; Kerr et al., 2015; Heyer et al., 2012). In a study conducted by Sady et al. (2011) 49 parents of children who had sustained concussions were surveyed. Of those surveyed, 24 % reported that they were aware of a written plan for concussion management at their child's school, while the remaining participants reported that they were unaware of any existing concussion management protocol. In addition, most parents indicated that their child needed some type of accommodations when returning to school. The study was limited to a small group of participants and did not necessarily indicate the distribution of schools that the participants' children attended. Another study conducted by Kerr et al. (2015) examined the prevalence of general concussion-related protocols at the collegiate level. A survey was constructed and administered to 1113 NCAA institutions. Participants were given a survey that gathered data about each institution, and whether each institution had a university concussion protocol in place. The study found that only 63.3 % of the 327 responding NCAA institutions had a return to learn policy in place following a concussion. In addition, only 3.1 % of responding institutions involved academic support in the management of concussed athletes. The study did not provide further detail on a specific protocol for return to school following a concussive injury.

Types of Existing Return to Learn Protocols

Throughout the literature, there are different types of return to learn protocols that have been developed throughout the United States and Canada. Published return to learn data consists of very specific protocols, such as the Reduce-Educate-Accommodate-Adjust-Pace (REAP) protocol as established by Kirelik and McAvoy (2016), as well as general guidelines and recommendations. Most of the protocols are based on existing expert consensus on return to learn with little empirical data to support why or exactly how the approach may be effective. The most common themes that have emerged throughout the literature are return to learn procedures that emphasize a graduated approach (Master et al. 2012; Popoli et al., 2014), an individualized approach (Baker et al., 2014; Kirelik & McaVoy, 2016; Popoli et al, 2014; Sady et al., 2011; Santiago, 2016), and a team-oriented approach.

Step/Graduated Approach

Master et al. (2012) propose a six-step plan that emphasizes a slow and gradual return to full participation in school that mirrors protocols designed for return to play. According to Master et al. (2012), just as there is increasing evidence of the importance of physical as well as cognitive rest in the acute management of concussion, there is also increasing evidence that children and adolescents benefit from a controlled, gradual return to learn approach, rather than an attempt to return to a full school load immediately after cognitive rest has resulted in symptom abatement (p. 3).

Master et al. (2012) propose that this approach has been developed for individuals who follow a typical recovery pattern with symptoms that are alleviated with cognitive and physical rest. The first step of the protocol is complete cognitive rest with no school work, video games, or computer use with the goal of minimizing symptoms and allowing the individual to recover

from the initial injury. The next stage of the plan allows the individual to participate in cognitive activity in short intervals (15-20 minutes) at sub-system threshold level. The third stage calls for a return to structured homework for longer intervals (20-30 minutes). The next three stages focus on gradual return to school beginning with part time, followed by full day return with accommodations, and lastly, resumption of full cognitive workload including test-taking and all essential work. In addition to the gradual approach to return to learn, the authors emphasize the importance of educating patients and families in recognition of symptoms.

Individualized approach

Since the clinical presentation of concussion and corresponding symptoms vary so significantly, Baker et al. (2014) argued that a one size fits all graduated return to learn protocol may not be sufficient to meet the unique needs of all students. Alternatively, Baker and colleagues proposed a return to learn procedure that integrates both a graduated and individualized approach. The approach proposed three phases for return to learn with an emphasis on prevention of symptom exacerbation. The approach called for initial general recommendations, followed by the implementation of more specific recommendations depending on the individualized needs of the student. The approach emphasized the use of specific accommodations based on the student's symptoms, and provides examples of academic accommodations that may help the student to cope with these symptoms. In addition, this protocol emphasized the importance of a team-oriented with regular meetings in order to reassess the student's progress and update the return to learn plan based on the needs of the student.

Kirelik and McaVoy (2016) discussed a return to learn protocol that provides general guidelines for return to learn, allowing for a more individualized approach that meets the needs of each student. The protocol is entitled "remove/reduce/educate/accommodate/pace." or REAP.

Remove refers to removal from all physical activity including physical education class, sports, and other extracurricular activities. Reduce refers to the reduction of stimulation in the home, specifically the use of screens, and to the reduction of cognitive demands at school. Educate refers to education of the student and teachers on the impact of cognitive exertion on post-concussive symptoms and neurological recovery. Next, adjust-accommodate refers to adjustment of both home and school activities depending on the severity of the student's symptoms. Last, pace refers to gradually returning the student to physical exertion following the the Fifth International Consensus Statement return to sport steps (McCrorry et al., 2017). This protocol strongly emphasizes the importance of team collaboration and education throughout the return to learn process. The protocol also proposes a method for increasing collaboration between schools and medical professionals. This component of the protocol is referred to as Emergency Department REAP (ED-REAP), and begins when the individual is seen in the emergency room. ED-REAP promotes collaboration between the emergency department personnel and school personnel by communicating that the individual has sustained a concussion to the Center for Concussion within the hospital who subsequently delivers the message to the school (after obtaining release). Ultimately, the goal is to streamline the communication process in order to provide the appropriate accommodations and level of cognitive stimulation necessary for the student.

Individualized/Gradual Approach

Santiago (2016) also emphasized a gradual, but individualized approach to return to learn. She highlights the importance of acknowledging the unique presentation of each individual's set of symptoms and trajectory of recovery. In addition, she emphasized the importance of being aware that many symptoms and struggles the student may experience are not

always outwardly apparent, which may lead teachers and school administrators to be dismissive of the student's need for accommodations or excusal from school or other assignments.

Therefore, she argued that the role of the pediatrician is often to advocate for students who are returning to school following a concussion.

Sady et al. (2011) proposed an approach that provides an overview of steps required to develop and implement a concussion protocol in school. This approach emphasized the importance of education and the establishment of policies and procedures, as well as a team oriented, individualized approach. The steps included “1) establishing policies and procedures, 2) educating school personnel, and 3) implementing the plans for students who sustain concussions” (p. 707). Sady et al. (2011) proposed the significance of concussion policies is to ensure that concussions are identified early and managed effectively, an action plan must be in place before the start of the school year based on the policies and procedures. All appropriate school and athletic staff should know about the plan and be trained to implement it (p. 707)

With regards to education of school personnel, Sady et al. (2011) recommended that education should include information about concussions and the potential effects to the individual, as well as education on the role of the of each professional in management of concussion when the injury occurs. Furthermore, it is suggested that if educators were more informed of the negative effects of return to activity too soon, it would be more likely that concussion would be better managed from the beginning. Lastly, with regard to concussion intervention/management plan, including return to school, Sady et al. (2011) proposed general recommendations for a concussion management plan focused on a graduated approach that is dependent on the student's tolerance and experience of symptoms. In addition, Sady et al. (2011) recommended the implementation of accommodations included excused absence from class, rest periods during

school, extension of assignment deadlines, postponement or staggering of tests, excuse from specific tests and assignments, extended test-taking time, and accommodation for light and sound sensitivity.

Another example of an individualized/gradual approach is proposed by Popoli et al. (2014). This approach emphasizes a return to academics that utilizes an algorithm to determine what types of intervention are indicated depending on the individual's symptoms and how much time has elapsed since the concussion. Appropriate recognition and treatment of concussion is imperative for symptom relief and prevention of functional disruptions in a patient's life. The policy follows a graduated approach to return to learn, while also emphasizing individualized intervention as needed. The proposed policy provides a specific protocol for different stages following the concussion including the acute period (0-13 days post-injury), the sub-chronic stage (14-28 days) and the chronic stage (28 days+). For the acute period, the protocol calls for time off as needed and the provision of a letter of academic accommodation from the physician, but with the ultimate goal of returning the student to school as soon as possible. As emphasized by Popoli (2014), "we recommend early intervention, with the goal of returning patients to the school environment without provoking symptoms" (p. 219). Within the acute period, the protocol recommends a student support team meeting, which is a meeting between teachers and administrators to determine the need for possible additional assistance within the school setting. In the sub-chronic stage, the approach calls for updates to the letter of academic accommodations as needed, careful attention to student progress, and for another student support team meeting to discuss the current needs of the student. Popoli et al. (2014) propose the importance of carefully observing student progress, and updating academic accommodations as needed, as this sub-chronic time period can be viewed as "critical in preventing progression to long-term academic

repercussions.” At this stage more extensive accommodations may be implemented such as a 504 plan or IEP. Lastly, at the chronic stage, if the student is still experiencing symptoms, it is suggested that the student be referred for a more aggressive, multidisciplinary approach which may include psychology, sports psychology, and psychiatry. This is a novel approach in that it emphasizes specific timeframes for the implementation of specific recommendations that are dependent on the individual’s symptoms.

Return to Learn/Return to Play Combined Approach

Mcgrath (2010) proposes a model that deals with both athletic and educational concerns for the injured student athlete as they transition back to school and school related activities. The five step process includes the following: 1) Concussion Education, which focuses on educating the student athlete, parents, and school personnel who will be involved in the process of facilitating the student’s return to school, 2) Pre-injury cognitive testing, such as Impact (Lowell, 2006), 3) Post-injury testing including both cognitive and physical assessments 4) Academic support including both the implementation of accommodations and the monitoring of symptoms from school personnel, and 5) Return to Play, once symptoms have resolved and once the individual is cleared by the team physician and athletic trainer. In addition, the approach emphasizes the role of the athletic trainer in monitoring the student’s participation in both athletics and academics and facilitating the implementation of academic accommodations as necessary during recovery. Specific examples of academic accommodations provided include excused absence from class, rest period during the day, extension of assignment of deadlines, postponement or staggering of tests, excuse from specific tests and assignments, extended test taking time, accommodation for oversensitivity to light and/or noise, use of reader for test taking/assignments, and use of a note taker or scribe during class. Lastly, the approach

emphasizes the importance of a team-oriented approach to the implementation of academic accommodations. McGrath emphasizes the importance of a team role, suggesting that a team of school personnel from within the athletic department as well as guidance counselors, school nurses, social workers, psychologists, teachers, and parents can work collaboratively to minimize the effect of concussion on academic performance.

Since children are returning to different daily activities than adults and may have different trajectories for recovery, Purcell (2012) suggests specific recommendations to consider when evaluating or managing the child who has sustained a sport-related concussion in Canada. The emphasis is on a comprehensive approach that encompasses both return to learn and return to play, and also highlights the importance of prevention of further concussions.

Recommendations specific to returning to school include cognitive and physical rest until post-concussion symptoms have resolved. In addition, recommendations also propose that all provinces and territories require associations and school boards to have a written concussion policy that covers concussion identification and management, and that the policy follows guidelines recommended by the Canadian Pediatric Association. Although this article is comprised of recommendations rather than a specific policy or protocol, it does provide clear examples of guidelines that could be mandated in the future, such as the implementation of legislation that requires all schools to have a written policy on concussion recognition and management.

Similar to Purcell (2012), Demateo et al. (2015) emphasize an approach that encompasses both return to learn and return to play. They propose a novel protocol that blends both an individualized symptom based approach as well as a graduated return to all activity. Demateo et al. (2015) developed this protocol following an extensive review of the research on existing

return to learn protocols. In order to develop the protocol, focus groups were conducted with physicians and other health care professionals to first establish the need for a protocol specifically for children/youth, followed by the recruitment of health care professionals, school representatives, parents, and children to be part of the protocol. Next, a protocol development group was formed which consisted of a research team, pediatric neurosurgeons, a pediatrician, and two occupational therapists. The research question was “What is the existing evidence to guide return to activity including sport and school for children and youth who have sustained a concussion (DeMatteo et al., 2015, p.784)?” The results informed the development of a highly specific protocol that emphasizes the importance of a graduated return that incorporates a period of rest for both return to play and return to learn. The stages of the return to learn protocol include: 1) Brain rest/no school which calls for one week of cognitive rest, followed by return to school once the child is symptom free. The protocol also recommends return to school if symptoms persist longer than two weeks to prevent depression. 2) Get ready to go back, which recommends light symptom limited cognitive activity; 3) Back to school with accommodations as needed; 4) Nearly normal routine, with the child transitioning almost completely back to school, but with modifications such as only one test per week, or a slightly modified schedule; and 5) Full return to school without modifications (DeMatteo et al., 2015).

Return to Learn Protocols Specific to Student Populations

Although there are different protocols established for return to school following concussion, there is limited information available on protocols that are specific to certain student populations, including grade school, high school, and college students. However, protocols specific to school populations may be valuable, as they could be individualized to meet the unique developmental and academic needs of each age group. Although the majority of existing

protocols appear to be tailored to K-12 students, there are studies that have explored concussion return to learn protocols specific to high school and college students (Glang et al., 2015; Hall et al., 2015).

High School Students

Glang et al. (2015) examined the effectiveness of a web-based concussion education program developed specifically for high school students, teachers, athletic staff, and parents. The web based program emphasized strategies for supporting students within the classroom and provided guidelines for development of concussion management teams. In addition, the student educational material was specifically designed to be ‘teen friendly’ (Glang et al., 2015). Results of the study indicated that there was a significant difference between the control and experimental groups’ athlete and parental knowledge of effective concussion management practices.

College Students

For the college student in particular, there may be specific academic challenges to consider when constructing a return to learn protocol. Hall et al. (2015), suggest the importance of considering the unique academic experience of the college student including less in class time, more out of class work, and a rigorous schedule, particularly for the collegiate athlete. Hall and colleagues proposed recommendations for graduated return to school activity including an initial period of complete cognitive rest, followed by gradual return to full academic class schedule while symptoms are managed. In addition, they suggest that student return to school following concussion should be a team process, with involvement of several professional including academic support services, coaches, athletic trainers, neuropsychologists, and the college provost

or chancellor. The role of rehabilitation professionals in providing vestibular, physical, and psychological therapies is also emphasized in the return to learn process.

Published guidelines for concussion management including return to learn in the college student have been developed by the National Collegiate Athletic Association (NCAA) (2016). The NCAA currently mandates that participating institutions provide annual education on the signs and symptoms of concussion to student athletes and implements a process that ensures that athletes who display signs of concussion are immediately removed from play and evaluated by medical staff. In addition, the NCAA mandates that institutions ensure athletes are removed from play for at least one day, and that the institution implements a policy that requires medical clearance before an athlete can return to play.

The NCAA provides guidelines for return to learn in the collegiate athlete, with many recommendations consistent with existing return to learn protocols. For example, recommendations include a graduated return that is individualized to the student, and includes a multi-disciplinary team that includes physicians, athletic trainers, student disability counselors, psychologists, and school administrators which is consistent with many existing protocols. To facilitate gradual return and incorporation of cognitive rest, the NCAA (2016) recommends that if a student cannot tolerate light cognitive activity, the student should first engage in complete cognitive rest and remain at home or at the residence hall. When light cognitive activity becomes tolerable, the NCAA (2016) recommends a graduated return to a full academic schedule. For those athletes who present with post-concussive symptoms that persist longer than two weeks, the NCAA (2016) recommends an individualized approach to academic accommodations. For students who experience more prolonged symptoms such as headaches, dizziness, and visual complaints, the NCAA (2016) recommends a comprehensive

neuropsychological assessment to determine if further modifications and possibly rehabilitation services are warranted.

Currently, there is existing literature that highlights the unique academic challenges of the high school, or adolescent student, as well as the college student. The NCAA has established recommendations for return to learn in the collegiate athlete, which are consistent with many of the existing return to learn protocols in other education literature. One area that appears to be less consistent with existing return to learn protocols in the NCAA recommendations is the type of education provided to coaches and athletic staff. Although the NCAA recommends that a concussion handout be administered to coaches and athletic staff, the NCAA does not outline specific recommendations for additional formats for education and training. Furthermore, other than the NCAA, there are limited additional publications that discuss specific return to learn procedures for college students. In addition, there is limited information on how these protocols should be disseminated to faculty, coaches, and students, suggesting that further research may be warranted in concussion knowledge transfer.

Conclusion

Concussion is becoming more widely recognized as a growing health concern. Parents, teachers, and coaches are all becoming more aware of the importance of recognizing the signs of concussion and preventing re-injury by carefully monitoring when athletes return to play. Children, adolescents, and young adults who participate in sports may have difficulty transitioning back to all activities, which may include both athletics and school related activities. Although there are varying research findings indicating the optimal amount of cognitive rest following concussive injuries, the literature suggests that a gradual return to activity that is individualized to the student and his or her clinical presentation and academic needs may be

most optimal (Halstead, 2013; Rose et al., 2015). Most existing return to learn protocols apply principles of gradual return to activity within the school setting. However, there is less emphasis on recommendations for return to learn for college students.

Although a team approach to return to learn protocol is emphasized (Sady et al., 2011), many individuals report feeling less than adequately prepared or knowledgeable to effectively facilitate return to learn for individuals who have sustained concussion, thus suggesting the need for further concussion education (Dreer et al., 2016, Wing et al., 2016). In addition, both the importance of concussion education and the need for methods to improve concussion education are emphasized by the most recent consensus statement of management on sport related concussion. (McCrory et al., 2017). The theory of knowledge transfer and exchange suggests that educational methods or dissemination of information should utilize the most optimal method of delivery that is based on the learner's needs (Reardon, et al., 2006, as cited by Provvidenza, 2009). Currently there is limited literature that examines the perceived knowledge levels of college faculty regarding concussion or methods to deliver concussion education to college faculty members.

CHAPTER THREE

METHODOLOGY

Returning to school following a concussion can be challenging for many students, and developing return to learn protocols that help to facilitate this process continue to emerge throughout the literature. One theme that is apparent throughout the literature is the importance of a team-oriented approach, with support provided from multiple disciplines (Sady et al., 2011). However, various researchers have reported that school personnel often feel less than competent and lack the knowledge to provide adequate support (Dreer et al., 2016; Wing et al., 2016). This study was designed to determine the effects of a faculty concussion-training program on faculty knowledge and attitudes regarding concussion and return to learn within a Division II college. A mixed method design utilizing survey and interview was utilized for this study in order to determine the impact of a training program on participant knowledge related to concussion. Pre-tests and post-tests were utilized to measure faculty knowledge and attitudes regarding concussion and return to learn in college students. The instrument that was used to assess knowledge and attitudes regarding concussion was a modified version of the Rosenbaum Concussion Knowledge and Attitude Survey (RoCKAS) (Rosenbaum & Arnett, 2010). A small sample of participants (n=5) were extracted from the main sample and completed a semi-structured interview to obtain richer data related to perceived knowledge and attitudes toward concussion. This study was grounded in the theory of knowledge transfer and exchange, which is focused on education and dissemination of research knowledge (Mitton et al., 2007). Thus, the theoretical framework aligned with the selected methodology of a pre-measure and post-measure of concussion knowledge, following a faculty concussion-training program.

Research Questions

- What is the effect of an educational training module on college faculty's knowledge and attitudes toward concussion and return to learn?
- How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice?

Setting

The study took place in a college in New York that is a Division II member of the National Collegiate Athletic Association (NCAA, 2016). The school offers over 90 different academic programs, within five main schools, including schools of Arts and Science, Architecture and Design, Education and Interdisciplinary Studies, Computer Science and Engineering, Management, and Health Professions (NYIT Academics, 2017). In addition, the college offers a comprehensive athletic program with multiple sports, including men's lacrosse, women's lacrosse, men's soccer, and women's soccer, which are sports that have been associated with increased rates of concussion (Marar, McIlvain, Fields, & Comstock, 2012). The school currently has an athletic director who oversees athletic activities as well as a team physician that oversees the medical care of student athletes and is associated with the school's center for Sports Medicine. The Center for Sports Medicine provides comprehensive medical services for athletes, including various services for athletes who have sustained concussions. Services for athletes related to concussion include baseline assessment, sideline assessment, follow up care, medical care, and support services including counseling, academic accommodations, and physical and occupational therapies. Since lacrosse and soccer have been associated with increased rates of concussion (Marar et al., 2012), students participating in these sports have the potential to sustain a concussion during their college careers. Furthermore, students may also face challenges when

returning to the classroom, following a concussive injury. To date there has been no faculty training implemented on the topic of concussion to help facilitate this process. The institutional setting where the study took place currently employs 316 faculty members that are members of a diverse group of academic departments and schools, and are spread across different campuses. The primary investigator of the study is a current faculty member at the institution, and as a result had access to other faculty members who were recruited for the study via email and telephone directories. The faculty member also had access to the director of the center for sports medicine, who helped with the logistical details of arranging the educational program for faculty.

Participants

Full time faculty members employed from different academic departments within one Division II college were recruited for participation in the study. Faculty members were recruited from all schools within the institution, including Schools of Arts and Sciences, Architecture and Design, Health Professions, Education and Interdisciplinary Studies, Management, Engineering and Computer Science, and Medicine. Convenience sampling was utilized for selection of participants, as the faculty that were involved in the study were accessible and readily available (Creswell, 2012).

Participants were recruited through email invitations sent directly to all faculty members utilizing the online directory. The email was also sent to school deans and administrative assistants who were asked to disseminate the email to faculty members. The email provided information about the protocol and the training, including content, date, and time. Faculty were asked to voluntarily participate in the program. Interested volunteers were asked to RSVP via email to the primary investigator and participants were recorded in a spreadsheet. Prior to participating in the study, each participant read and indicated informed consent and willingness

to participate in the voluntary study. The informed consent form, which can be found in Appendix D, is in accordance with the University of New England Human Subject Review Board.

Participants may not represent all faculty members at the institution, but information gathered from this sample will still generate valuable data. In addition, since the qualitative component of the study included a small sub-set of participants within one academic institution, the study also employed a purposeful sampling approach, which seeks to gather data from a select group of participants in order to elicit detailed, rich information (Creswell, 2012).

For the qualitative portion of data collection, five voluntary participants of the original sample were recruited to participate in a semi-structured interview. Prior to participating in the interview, each participant read and indicated a separate informed consent and willingness to participate in the voluntary study. The informed consent form, which can be found in Appendix E, is in accordance with the University of New England Human Subject Review Board.

Data Collection

Procedures

Faculty within a Division II college were recruited through email blasts and flyers posted throughout the campus. Participants will contact the primary investigator via email to confirm participation. Prior to the date of the educational seminar, participants will be provided a reminder of date, location and time and an overview of what the presentation will include. On the day of the seminar, participants were asked to provide informed consent. Once informed consent was obtained, participants completed a pre-test measure of concussion knowledge (n=30), using a modified version of the RoCKAS (Rosenbaum & Arnett, 2010). Subjects participated in a 45 minute educational program on concussion and return to learn. The

presentation consisted of Powerpoint slides, videos, and discussion questions, to ensure that the training was as interactive as possible. Content included an overview of concussion and associated symptoms, as well as information about post-concussion syndrome and the implications for return to learn and was administered by the primary investigator.

Upon completion of the educational presentation, participants were asked to complete a post-test measure of concussion knowledge. Data was coded and analyzed using SPSS software. A sub-set of subjects were voluntarily recruited to complete the qualitative phase of the study (n=5). These subjects participated in a semi-structured interview to gather richer, more in depth data related to attitudes and perceptions of concussion and return to learn. The interviews took approximately 15-20 minutes to complete. The interviews were then recorded, while the interviewer took notes. The interviews were then transcribed, using a transcription service, and then coded for emerging themes.

Research Design

A mixed method design was utilized for this study, consisting of a quantitative pre- and post-assessment of concussion knowledge and qualitative semi-structured interviews, utilizing both open and closed ended questions. According to Creswell (2012), utilization of a mixed method design may be indicated when further information may be warranted to expand and elaborate on initial research findings from one design alone. Morse and Niehau (2009) further highlight the advantages of utilizing a mixed method design in order to explore different aspects of the same phenomenon. Morse and Niehau (2009) suggest that the qualitative component may be effective in capturing narrative experiences while the quantitative component can be used to measure specific dimensions of the experience. Quantitative pre-assessment and post-assessment of concussion knowledge provided information about whether education impacts

faculty knowledge, while qualitative interview guides provided further information about how the education impacts faculty knowledge as well as attitudes toward concussion and returning to school.

Tools

The tool utilized for this study was an adapted version of the Rosenbaum Concussion Knowledge and Attitude Survey (RoCKAS). The RoCKAS is a tool that was developed to assess knowledge and attitudes regarding concussion. It has been validated for assessing concussion knowledge in high school students and also demonstrates good reliability (Rosenbaum & Arnett, 2010). In other studies it has also been utilized to assess concussion knowledge levels in health care professionals, college students (Boettscher et al., 2014) and professional athletes (Williams et al., 2016), thus indicating its applicability to other populations. The RoCKAS is considered an effective tool for evaluating concussion knowledge including etiology, course, and symptoms associated with concussion (Rosebaum & Arnett, 2010). In addition, it is utilized for evaluating attitudes about concussion reporting and management (Rosenbaum & Arnett, 2010). The survey is composed of five sections, with three sections designed to measure concussion knowledge and two sections designed to measure attitudes regarding concussion. The sum of scores on Sections 1, 2, and 5 form the Concussion Knowledge Index (CKI). Scores on the CKI range from 0–25, with higher scores indicating greater knowledge levels.

Consent was obtained from the developers of RoCKAS to modify and utilize the instrument. Modifications included the addition of ten questions specific to return to learn and academics, and the potential impact of post-concussive symptoms on academic participation and performance.

Data Analyses

Quantitative data was statistically analyzed both descriptively and inferentially. All analyses will be performed using the Statistical Package for the Social Sciences (SPSS, v. 17.0; Polar Engineering and Consulting, Chicago). Participants' Concussion Knowledge Index (CKI) and Concussion Attitude Index (CAI) scores were determined according to the modified RoCKAS-ST answer key. Pre-test and post-test scores were compared using a paired *t* test.

Qualitative data was analyzed descriptively by extracting themes from transcripts of recorded interviews. A preliminary exploratory analysis was first conducted to gather general information about the data and to prepare for coding (Creswell, 2012). Coding is described as a short word or phrase that symbolically captures the essence of a portion of written or visual data (Saldana, 2009). Specifically, In-vivo coding was used to code information data according to participant responses and specific wording (Creswell, 2012). Saldana (2009) emphasizes the applicability of in vivo coding for smaller scale studies, suggesting that in vivo coding offers a safe and secure approach to data analysis. The qualitative portion of this study sought to understand the faculty's perceptions of concussion following an educational presentation. Thus, since the qualitative portion was on the smaller scale, in vivo coding aligned well with the sample for the study. In addition, utilization of in vivo coding aligned well with the proposed study by allowing the researcher to extract codes related to participant responses.

After initial codes were established, further analysis focused on reducing codes to major themes found throughout the data, which is considered the next level of data analysis within qualitative research (Saldana, 2009).

Participant Rights

Participation in this study was completely voluntary and participants were informed that they may decide not to participate or leave the study at any time. There was minimal risk associated with participation in this study. All participants were asked to complete informed consent prior to participation in the study. Pre-test and post-tests were coded to protect participant privacy. The informed consent forms, which can be found in Appendices D and E are in accordance with the University of New England Human Subject Review Board for the protection of Human Subjects.

The principal investigator was the only person reviewing the survey and interview data to ensure the anonymity of the setting and participants, as well as to provide uniform collection procedures. Participants were coded by number (i.e. Participant 1, Participant 2, etc.) to protect their anonymity and maintain organization of the data. The data, including transcriptions, were kept on only one personal home computer, password-protected and accessed only by the principal investigator, with a back-up hard-drive system on-site and off-site. Participants were made aware that written transcriptions and interpretations of the data would be available to the participants, and recordings were destroyed upon completion of the study.

Results were summarized based on the sample's responses. Identifying information was removed from the investigator's computer and will not be accessible for future study uses.

Limitations

Limitations for the study include the small sample size, as well as the specificity of the study taking place within one Division II school. Faculty participants in this study may not necessarily be representative of all college faculty members at this institution as faculty members were primarily from the School of Health Professions. In addition, the college faculty at this

institution may not be representative of college faculty at other institutions, particularly those working in Division I and Division III colleges, or colleges in other geographic locations. In addition, since the program was voluntary, there is the potential for bias, as participants may have volunteered to attend the program due to a prior interest or familiarity with the topic of concussion and academic performance. Furthermore, since the qualitative portion of the study was a sub-group of the original sample, the sub-group may not have been representative of the entire sample. Overall, despite the limitations, data obtained from this study may be used to develop further studies that examine the effects of faculty training protocols in larger sample sizes in different college settings.

Conclusion

Despite a growing awareness of concussion, it has been suggested that concussion knowledge is still varied, and in some cases may be considered less than adequate, particularly for school personnel (Dreer et al., 2016; Wing et al., (2015). However, there is limited literature that examines how concussion knowledge should be disseminated in the school, specifically in the college setting. The conceptual framework for this study is based on the theory of knowledge transfer and exchange, which focuses on the dissemination of research knowledge and translation to policy development and clinical decision making (Mitton et al., 2007). The study sought to examine the effects of a faculty training module on faculty knowledge and awareness of concussion and implications for education. The study employed a mixed method design in order to gather comprehensive data on the impact of the training module on faculty knowledge and attitudes regarding concussion education. The quantitative portion of the study utilized a pre-test and post-test knowledge assessment utilizing the RoCKAS, which is an instrument designed to assess concussion knowledge (Rosenbaum & Arnett, 2010). A sub-set of

participants were extracted from the original sample to participate in the qualitative portion of the study. In the qualitative component of the study, participants took part in a semi-structured interview to gather information related to individual narrative experiences (Morse and Niehau 2009). In summary, the methodology for the study aligned with the study's conceptual framework, as the study sought to gather information on the effects of concussion knowledge dissemination. This study provided valuable data on the effects of concussion education and may lay the foundation for further concussion education and policy development.

CHAPTER 4

RESULTS

The purpose of this study was to determine the effects of a faculty concussion return to learn educational program on faculty knowledge and attitudes regarding concussion and the effect on learning and return to school. The study aimed to answer the following research questions.

- 1) What is the effect of an educational training module on college faculty's knowledge and attitudes toward concussion and return to learn?
- 2) How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice?

The study utilized a mixed method design to gather both quantitative and qualitative data. Subjects participated in a forty-five minute training session on concussion and the effects on academic performance. For the quantitative portion of the study, participants completed a pre-test and post-test using a modified version of the RoCKAS. The qualitative component of the study was conducted utilizing individual interviews to gather information about participants' experience with the training and their perceived knowledge and attitudes toward concussion and learning.

Sixteen faculty members participated in the training, with representation primarily from the School of Health Professions and 1 faculty member from the School of Computer Science and Engineering. The training took place on May 15th, 2018, with all participants completing both pre- and post-tests. Five faculty members participated in the qualitative portion of the study and data was collected from May 16th, 2018 to June 20th, 2018. Demographic information

including years of teaching experience, school, and department for both the quantitative and qualitative portions of the study are listed in Table 4.1.

Quantitative data was entered into the Statistical Package for the Social Sciences (SPSS, v. 17.0; Polar Engineering and Consulting, Chicago) and analyzed using a paired *t* test to determine if there was a statistically significant difference on the RoCKAS Concussion Knowledge Assessment following the educational seminar. For the qualitative portion of the study, transcripts of individual interviews were coded and analyzed for emerging themes. Interviews took place with 5 participants over a 4-week period. Each interview lasted 15 to 20 minutes. Upon completion of the interviews, five primary themes emerged from the data, which include 1) Limited concussion knowledge prior to training 2) Perceived reports of increased explicit knowledge 3) Participants felt that faculty should be more aware or attentive to students. 4) Participants report that faculty can facilitate return to learn by utilizing or recommending academic accommodations 5) Reports of limited awareness of institutional resources. This chapter summarizes the results of both quantitative and qualitative data analysis. In this chapter, results of the data will be presented as follows: 1) Demographics of participants 2) Quantitative data 3) Qualitative data. Discussion and implications will be presented in detail in Chapter 5.

Demographics

The demographics of each participant are listed in Table 4.1. Participants were primarily from the School of Health Professions with one participant from the School of Engineering and Computer Science. Within the School of Health Professions, all departments were represented including, Interdisciplinary Health Sciences, Physician's Assistant, Nursing, Physical Therapy, and Occupational Therapy. The years of experience in academia ranged from 4 years to 36 years.

Table 4.1 Demographics of Participants

Participant	Years of Experience	Department	School
1	>10	Occupational therapy	School of Health Professions
2	10	Occupational therapy	School of Health Professions
3	8	Occupational therapy	School of Health Professions
4	36	Interdisciplinary health sciences	School of Health Professions
5	9	Occupational therapy	School of Health Professions
6	10	Nursing	School of Health Professions
7	5	Physician assistant	School of Health Professions
8	4	Occupational therapy	School of Health Professions
9	8	Occupational therapy	School of Health Professions
10	10	Nursing	School of Health Professions
11	6	Engineering and Computer Science	School of Engineering and Computer Science
12	22	Physical therapy	School of Health Professions
13	6	Physical therapy	School of Health Professions
14	10	Physical therapy	School of Health Professions
15	>11	Physician assistant	School of Health Professions
16	12	Physician assistant	School of Health Professions

Quantitative Data Results

Quantitative data was collected utilizing a pre-test and post-test to gather data on participants' knowledge of concussion before and after a formal training in concussion. A paired *t* test was conducted to compare concussion knowledge in the pre-RoCKAS score and post-RoCKAS score. There was a significant difference in the scores for pre-RoCKAS total score ($M = 79.38$, $SD = 8.8$) and post-RoCKAS total score ($M = 90.63$, $SD = 6.92$); $t(15) = -4.07$, $p = .001$. These results suggest that the concussion training may have resulted in improved faculty knowledge following completion of the program as evidenced by improved scores on post-tests.

Table 4.2 Pre-Test and Post-Test Scores of RoCKAS

	Pre-test	Post-test
1	76.67%	90.00%
2	66.67%	100.00%
3	73.33%	80.00%
4	80.00%	93.00%
5	90.00%	97.00%
6	80.00%	73.33%
7	83.33%	93.33%
8	93.33%	96.67%
9	80.00%	90.00%
10	70.00%	90.00%
11	76.67%	90.00%
12	76.67%	100.00%
13	66.67%	93.33%
14	96.67%	90.00%
15	73.33%	86.67%
16	86.67%	86.67%
Total	16	16
Mean	79.38%	90.63%

There were two participants who performed worse on the post-test than the pre-test, but these appear to be outliers. The worsening in performance could have been due to the format of the training or could be due to other extraneous factors related to participants' engagement and overall attention to the presentation.

Qualitative Data Results

Results of quantitative analysis indicate that participants gained knowledge of concussion as noted by improved post-test scores following completion of the training program. A mixed method design was utilized to gather richer, more indepth data about participants' perceived knowledge before and after the program, as well as data related to attitudes regarding concussion. The qualitative component of this study was focused on answering the research question: How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice?

Structural coding was initially utilized to determine common themes that were specific to interview guide questions. According to Saldana (2009), structural coding can be appropriate for analyzing interview transcripts. The coding process was an iterative process, with first order

coding utilizing primarily the structural coding process, whereas second order coding utilized in vivo coding to extract key themes that were specific to the interviewee's language. Upon completion of data analysis, four main themes were extracted from the study. 1) Limited concussion knowledge prior to training 2) Perceived reports of increased explicit knowledge 3) Perceived reports of the importance of faculty awareness 4) Participants report that faculty can facilitate return to learn by utilizing or recommending academic accommodations 5) Reports of limited awareness of institutional concussion policies/procedures. The following is a summary of the findings with examples to support each finding. Figure 4-1 provides an overview of themes extracted from transcripts with specific quotations obtained from interview transcripts have been utilized to further illustrate each of the themes.

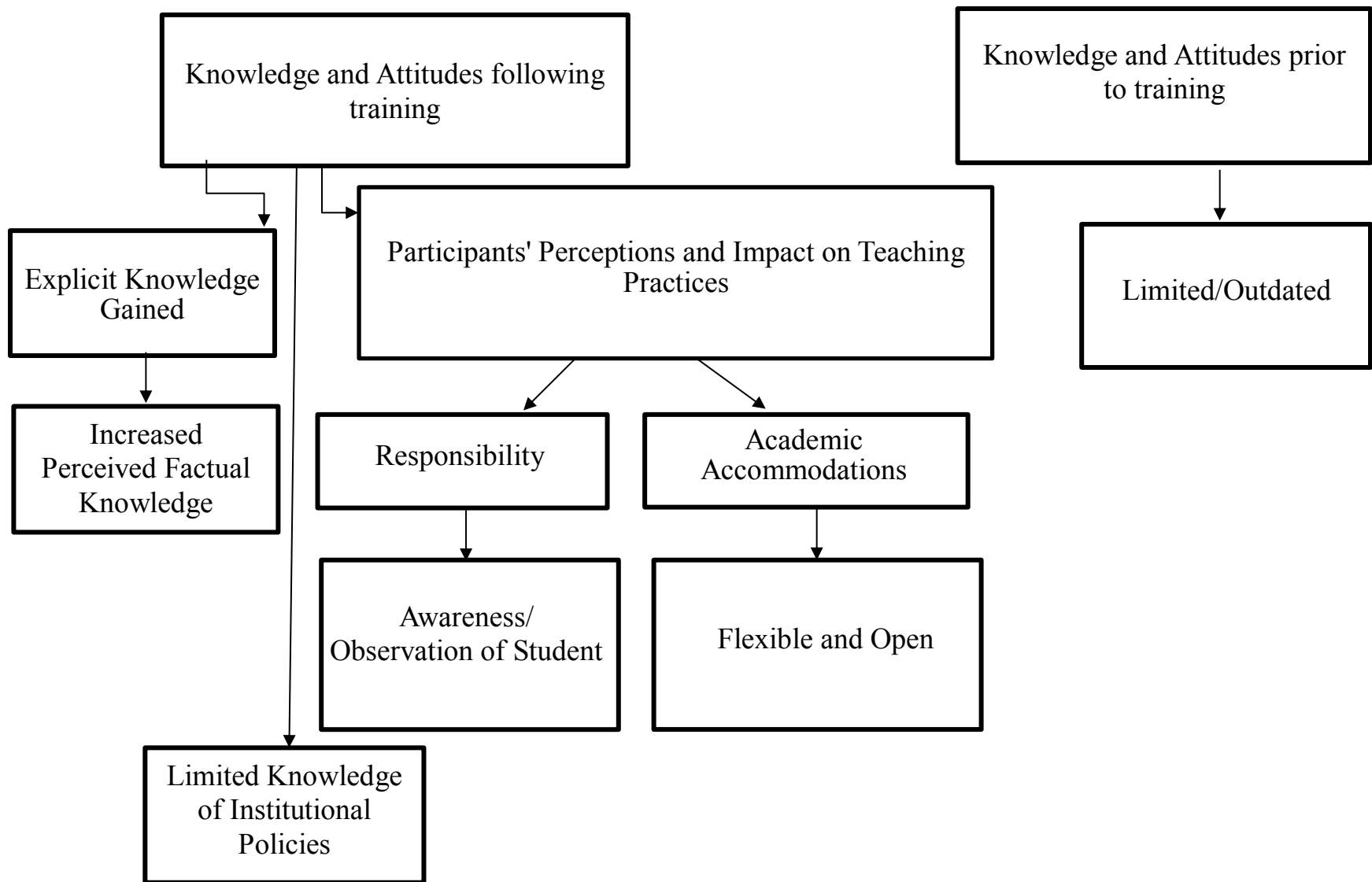


Figure 4.1: Qualitative Themes

Finding #1: Participants reported limited or outdated knowledge prior to attending training.

Although all the participants in the qualitative portion of data collection had experience working and teaching in the field of health care, 5/5 of participants report that their knowledge of concussion prior to attending the training was limited to some capacity, or not completely up to date. All participants reported that, although they had some concussion knowledge prior to attending the training, this knowledge was outdated or limited in some way, in contrast to having no knowledge at all.

The first participant referred specifically to her knowledge of concussion as it relates to the collegiate athlete, stating that she felt that she specifically did not have updated knowledge in this particular area.

“And I'm not up to date with it, particularly at the collegiate level, as far as our students are concerned.” (Interviewee #1)

The second participant reported that she had heard about concussion frequently within her community in the context of her own children, but did not feel that she possessed much knowledge of concussion.

I would say I really didn't have any knowledge about concussion, other than my experience as a parent that if your kids get hit on the head, don't let them go to sleep is basically the big thing that I always heard whether is myth or not, I don't know. I just know from community level child supports that there has been a lot of talk in the community about concussion and training and having concussion protocols during those events. My knowledge is min to none. (Interviewee #2)

One participant even reported a history and background in sports medicine, but reported that his knowledge of concussion prior to the training may have been outdated.

I've my doctorate in exercise physiology, so I know my way around the sports medicine field very well. We've had students who through college, high school have been hit on the head. Some I've sent to hospital because they were injured. There's been an advance in the treatment of concussion and diagnosis mainly. So I'm a little bit out of touch because I don't deal with specifically with that, but even up to last year I was teaching courses in sports (Interviewee #4)

Finding #2: Participants reported that they felt their factual knowledge increased upon completion of the training.

Following the completion of the training, respondents reported that they felt that their explicit knowledge improved, which was consistent with the quantitative findings. Participants remarked on their ability to recall certain facts more easily after completing the training and being able to improve scores on the post-test. The first participant remarked specifically on her improved knowledge and awareness of specific research in the area of concussion.

“I think what I learned from that seminar first, is the new research, a lot of the new research, as well as what we can do on the campus.” (Interview #1)

The second participant commented on how the training helped to clarify some of her existing knowledge while also providing new information that she was not aware of.

“I definitely think it at least solidified what I did know, and it gives me some knowledge about things maybe I really had no idea.” (Interview #2)

The third participant remarked that he felt he gained the knowledge to be able to correctly answer the factual questions and the pre-test and post- test.

“Well, from pre-test to post-test, I certainly guessed my way through the pretest part. And then as you're going along and trying to remember things, because I knew you're going to ask me again, right? So, I remember[ed].” (Interview #3)

I would say it's improved. There were some specific things that I clarified and you know, you question some of the questions in the pre-test and at the end of the pre-test... you went through your methodological approach to give us the information and I enjoyed the presentation-it was very thorough. And when it was over, I did my second test and felt that I maybe answered some questions that would have been a little more fuzzy, little unclear-and I thought I cleared those up (Interview #4)

The fifth participant discussed how her factual knowledge improved, and included specific examples of areas where her knowledge increased.

Interviewer: “Do you feel that your concussion – knowledge of concussion changed after attending this seminar?”

Interviewee: “Yes.”

Interviewer: “How so?”

Interviewee:

I understand that concussion can occur without a direct blow to the head, which I wasn't aware of. And I also now understand that a person doesn't need to restrict all activities; the treatment protocol is completely different than what I had thought prior (Interview #5)

Finding #3: Participants reported that they felt that faculty should be more aware or attentive to students following the training.

In addition to the theme that participants reported that their knowledge improved, many of the participants also commented on how they felt their knowledge changed and how this might impact their teaching practices. Many of the participants commented on how they would feel more inclined to monitor or observe their students for potential signs of concussion, particularly if they knew they were engaged in sports. In addition, many of the participants also commented on how they felt faculty should be attentive and aware of student's needs and potential changes in behavior, as students may be facing other medical or critical issues other than concussion. The first participant discussed how she felt more aware and that putting concussion symptoms in the context of academics was enlightening.

Interviewer: "How has your knowledge after changed attending the training?"

Interviewee:

I think how it has changed too...I think is just showing the *awareness* and realizing you might have heard a lot of the concussion and you know how to treat a patient with a concussion, but really putting it all together with the school work and I guess all the symptoms...and when you put the constellation of symptoms together with the stress of school, I think – I think that's definitely eye-opening. (Interview #1)

This participant elaborated on this further stating that in addition to greater awareness, she expressed her perception that faculty should have empathy, or the appreciation for the student experience following concussion.

"I think they [faculty] need to have empathy for their students in the sense that like they're trying – they're doing their best but some – they really can't do it. They are disabled "at that point in time."

One participant stated that following the training she would be more inclined to suspect a possible concussion if there was changes in student behavior or performance.

I think it was interesting from a teaching perspective that I would want to know if a student had had an issue or concussion, been diagnosed with a concussion or any type, even if it wasn't called a concussion. Was there any incident that involves something to do with head trauma in some way? Because I think as an educator in the classroom I might *keep an eye on that person more*. Because there might be some signs and symptoms that could be subtle that could be there. I don't want to look at that student as someone who maybe just slacking off... or not give that some consideration. (Interview #2)

One faculty member expressed that not only did she feel that being attentive to students was important, but that she also felt that faculty members have some responsibility for students' well-being.

I still think as faculty members, even in a college setting, we have a responsibility to those students. I understand [we] are not their parents. But we do have a responsibility about their welfare and safety when they are in our buildings and our environment and our classrooms. Just having some basic awareness, what potential you might see in someone that has sustained something like that, is important from a perspective that you have some responsibility for that student. (Interview #2)

Participant four expressed a similar sentiment in that he felt that he valued that faculty should be aware of changes in behavior, regardless of whether a concussion was suspected.

"I think in general teachers should be aware of changes in behavior in students anyway."
(Interview #4)

I would definitely think the word concussion would pop up into my mind if I saw changes in the student. I tend to watch students anyway, maybe because I'm a healthcare provider but if I wasn't, I think it would now put in the forefront of my brain that there may be something to this. There may be something to why this student is acting this way and concussion can be one of them. Maybe this is an athlete. (Interview #2)

Another participant also expressed that she felt that faculty members should be alert and aware of possible signs and symptoms consistent with concussion.

“So, I think for what I took away from that is to *be alert* as faculty member. First of all, what my responsibilities are and also be alert to some of the signs and symptoms that you are talking about.”

The fifth participant further elaborated on this, emphasizing that faculty can facilitate return to learn if they are aware, or understand how concussion symptoms may present in different students.

Interviewer: “In what ways do you think they can support or facilitate the student returning to school?”

Interviewee: “I think one, just if they – if they have a clear understanding on how a concussion can manifest and understand that it's – individualized that not everyone concussion looks like the next concussion.”

Other participants emphasized the importance of generally being aware and attentive of student needs.

“... I think all faculty should be more attentive to people's individual needs.”

“I agree with that; the faculty really need to be knowledgeable of their students if possible.”

Other faculty members further elaborated that awareness of students does not necessarily need to be just specific to concussion, but stated that they felt faculty members should be aware of changes in behavior that could be due to issues with mental health or other pre-existing condition in combination with concussion.

Even I will go further to say, even if a student who maybe did have some of those issues and now there's changes is in those issues. You take a student that's already had some issues, for example, with depression or maybe had ADHD and already has accommodations and things like that, even in a college environment. Now couple with that head injury that could make those worse, change how they are reacting to those issues in the first place. I kind of think to know that as an educator (Interview #2)

One participant spoke of this specifically in context of students who may have mental health issues that could potentially result in tragic results, such as suicide.

I've heard of a student that took her own life for whatever [reason]. So, that didn't come out of nowhere, I don't believe one day, she woke up and said and I think I'm going to drown myself, I mean, it doesn't work that way. So I think we could have assessed a student who continues to manifest very strange behaviors, head injury or not. (Interview #3)

Finding 4: Participants report that faculty can facilitate return to learn by utilizing or recommending academic accommodations.

When asked how faculty might facilitate return to learn following concussion, many of the respondents commented on the utilization or recommendation of academic accommodations.

You could potentially put transient accommodations in place for that student. I have done that to students who have wrist sprains. Why wouldn't I do for a concussed student? I think it brings another level... (Interview #2)

Interviewer: "And that probably relates more to whatever protocol we have on campus here. And that kind of moves into the next question in terms of in what ways do you think faculty members can help facilitate on concussed students return to school? What is it that potentially a faculty member could do?"

Interviewee: "I think that they need to be open to the accommodations and flexible with the schedule". (Interview #1)

The fourth participant discussed in detail how he would recommend or provide academic accommodations and that he, similar to the first participant would be flexible, as opposed to rigid with accommodations.

If the concussion is diagnosed and it's truly a concussion, then all the symptoms would be there. I think we have to give time for the healing process to occur. And there's the initial post-concussion management and I think if it comes back to the professor either through self-disclosure of the student or from another source like a medical or health professional who was diagnosed and tell the professor... Then we need to accommodate that. You know it could be that the assignment is due that day and the student couldn't get to it because it was an issue on the sports field, the day before... and then how much could I accommodate. Some people might be rigid and say, no you've got to take the test, and you've got to do the paper due today. I'm not that way I would bend over backwards to help the student, making sure that everyone felt that it was fair. (Interview #4)

Finding #5 Participants reported that they were not clear on what information the institution was providing for return to learn following concussion.

When asked about how the institution was facilitating return to learn following concussion or specific procedures for concussion, participants reported that they were not clear on the institution's policies or procedures for concussion.

Interviewer: "Exactly...How does this institution provide support to help facilitate the process of returning a student to school following a concussion?"

Interviewee: "I think we are working on a protocol. I don't know really-other than that-other than prescribe accommodation, I don't know." (Interview #1)

Interviewer: "To your knowledge are you necessarily aware of what this institution is doing for return to learn?"

Interviewee: "I couldn't tell you in the slightest." (Interview #2)

Interviewer: "In this institution, are you aware of any of the support, or policies, or procedures that we have in place for concussion, or resources that we have for concussion?"

Interviewee: "No. Just with the few things that you had mentioned in your presentation: referring them to the academic health center or also to the office of accessibility, with those, so other than that, no." (Interview #3)

Interviewer: "Were you aware of any of the specific concussion policy and procedures and services prior to the seminar?"

Interviewee: "No. Just because of my affiliation with you I knew that was a special interest with you...Other than that I didn't know anything about policies on campus." (Interview #4)

CONCLUSION

This chapter presented both quantitative and qualitative data that were uncovered during this mixed method study. The study was designed to answer the following research questions:

- What is the effect of an educational training module on college faculty's knowledge and attitudes toward concussion and return to learn?
- How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice?

The quantitative results suggest that the education training module was effective in improving faculty knowledge of concussion, as indicated by improvement on post-test RoCKAS scores following the training. The qualitative portion of the study was designed to gather more in depth data related to faculty's attitudes toward concussion and to determine how the training impacted faculty's perception of concussion and return to learn, and how this may affect future teaching practices. Individual interviews were analyzed to uncover information about participants' perceptions of concussion, the impact on academic performance in the college setting, and how this may impact their teaching practices. Overall, faculty reported having some, but limited knowledge prior to the training, and felt that the training improved explicit knowledge of concussion. Faculty also reported that following the training, they felt more inclined to be attentive to the needs of students, which may include looking out for signs of concussion, and that they would be willing to implement or adhere to recommendations for academic accommodations. Lastly, faculty reported that they did not receive specific information from the school about the school's policies and procedures for concussion and return to learn.

CHAPTER 5

DISCUSSION

The purpose of this mixed method study was to examine the effects of a faculty concussion return to learn educational program on faculty knowledge and attitudes regarding concussion and the effect on learning and return to school. The study was designed to determine if a faculty training module improved faculty knowledge and to gather information about faculty beliefs about concussion, return to learn, and the role of faculty following the completion of the training. Since there is limited information available about how college educators should be trained in concussion, this study was designed to provide a foundation for future trainings related to concussion for college faculty members. This study was designed according to the 2 primary research questions: 1) What is the effect of an educational training module on college faculty's knowledge and attitudes toward concussion and return to learn? 2) How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice?

This chapter provides an overview of the methodology, data analysis, and results of the study. Results of the study will be connected to existing literature to develop a greater understanding of how concussion education programs may be designed and implemented for college faculty members. Current themes within the literature will be examined including existing concussion education programs, existing faculty training programs and will be compared and contrasted with the results of this study.

This study utilized a mixed method design to collect both quantitative and qualitative data on the effects of faculty participation in a concussion training program. Quantitative data collection consisted of a pre-test and post-test of concussion knowledge related to academics

using a modified version of the RoCKAS. Qualitative data collection consisted of interviews on faculty's perception of concussion and how they felt their knowledge changed following completion of the program. Participants in the quantitative study consisted of 16 faculty members, from 2 schools within the institution, and participants in the qualitative portion of the study consisted of faculty members from the School of Health Professions.

Quantitative Results

Quantitative data was analyzed using a *t* test to determine if scores on the RoCKAS concussion knowledge assessment improved significantly from pretest to post-test. The findings indicate that there was a significant difference in the scores for pre-RoCKAS total score ($M = 79.38$, $SD = 8.8$) and post-RoCKAS total score ($M = 90.63$, $SD = 6.92$); $t(15) = -4.07$, $p = .001$. The results of this data analysis suggest that the program was effective in improving faculty knowledge of concussion.

Improvements in concussion knowledge suggest the efficacy of the program in improving specific factual knowledge related to concussion and academic performance. Improved knowledge levels suggest that the program may have been designed in a manner that meets the unique needs of the specified target audience, which were college faculty instructors. Targeted training that is customized to a specific group is consistent with themes related to knowledge transfer which suggests that, the methods of teaching or disseminating should choose the optimal method of delivery, based on the learner's needs (Reardon, et al., 2006, as cited by Provvidenza, 2009). In this case, the participants in the program were college faculty members who were familiar with didactic lectures, and able to attend to a forty-five minute training that consisted of power point slides, discussion questions, and videos to illustrate specific content. In addition, if faculty members were interested in the content, they may have been more motivated to

participate and attend to the material. The results of this study are consistent with the results of another study that utilized a short didactic presentation on concussion recognition and academic management for secondary school teachers. This study also found improvements in short-term knowledge related to concussion and academic knowledge (Carzoo et al., 2015).

Although this format for delivery was effective, it may not necessarily be practical for training larger groups of faculty members. Thus, a video recording or online interactive presentation may offer similar benefits with less time and space constraints, and potentially be more pragmatic. A study conducted by Graff and Caperell (2016) found that an online training in concussion and classroom management was effective in improving concussion knowledge of high school educators. Although there is limited literature focused on concussion training for college faculty, online trainings have been found to be effective in improving college faculty awareness of mental health issues in students (Albright, Goldman, & Shockley, 2013).

It should be noted that two participants' scores decreased from pre-test to post-test. These are likely outliers, but there may have been certain factors contributed to a worsening in scores. For example, these participants may have been less engaged or interested, particularly since the training took place close to the end of the academic year, when faculty members have to attend to multiple other academic duties such as grading and preparing for graduation.

Qualitative Results

Qualitative analysis was conducted utilizing thematic coding with an emphasis on structural coding, as responses to specific interview questions were examined for specific themes. Further analysis was conducted utilizing in vivo coding, exploring the content of the interviewee's responses and specific wording. These themes are presented with specific examples from transcripts in the prior chapter.

Finding #1: Participants reported limited or outdated knowledge prior to attending training:

The participants in the qualitative portion of the study reported some, but minimal experience with concussion prior to attending the lecture. Participants reported that after attending the seminar, they realized that the knowledge they possessed prior to the training was likely outdated. This was surprising, given that all the participants had experience working and teaching in the field of health care. Given the complexity of concussion and the rapidly evolving literature, it may be possible that faculty's prior knowledge of concussion may not have been current. Therefore, even if faculty had received formal concussion training in the past, the knowledge attained may have been outdated. Other research has found that even with prior training in concussion, educators did not display greater knowledge levels as compared to those who did not receive training (Carzoo, et al., 2013), which may suggest that concussion trainings need to be up to date in order to effectively develop concussion knowledge in educators.

Although there are limited studies examining concussion knowledge of only college faculty, there have been limited studies to date that have examined concussion knowledge in educators at other levels. A study conducted by Dreer et al. (2016) surveyed one hundred thirty educators ranging from preschool to college and found that respondents appeared to have decreased confidence in their ability to recognize symptoms and behaviors, and only fifty percent of respondents reported that they were aware of the emotional symptoms of concussion. Furthermore, only half of respondents reported that concussion may result in difficulty returning to school (Dreer et al., 2016). In contrast, another study conducted by Kasamatsu et al. (2017) found that the majority of surveyed teachers strongly agreed that concussion can affect a student's academic performance. However, in this study, many of the participants had received

formalized concussion training. Thus, it appears that concussion knowledge may vary for teachers at different levels and depending on the type of training they have received. Given the complexity and evolving science related to concussion, educator concussion trainings should be continually updated and revised according to emerging literature.

Finding #2: Participants reported that they felt their factual knowledge increased upon completion of the training

The quantitative results indicate that post-test scores on the RoCKAS concussion knowledge assessment improved, suggesting increased concussion knowledge following the training. Analysis of the qualitative data indicates that not only did scores improve, but participants reported that they *felt* as though their knowledge improved following the training. One participant remarked specifically on her perception that knowledge and awareness of specific research related to concussion improved after attending the training.

“I think what I learned from that seminar first, is the new research, a lot of the new research, as well as what we can do on the campus.” (Interview #1)

Although perceived knowledge is not necessarily synonymous with actual knowledge, it appears that the quantitative finding of improved scores on the RoCKAS concussion knowledge assessment is consistent with participants’ belief that their knowledge explicitly improved. Furthermore, the participant described above not only stated that she felt that her knowledge improved, but also felt that she could actively utilize the knowledge.

Finding #3: Participants reported that they felt that faculty should be more aware or attentive to students following the training.

The purpose of this study was not only to determine if the training improved concussion knowledge, but also to examine how the training affected faculty knowledge and attitudes toward

concussion. Many of the participants commented on how they would feel more inclined to monitor or observe their students for potential signs of concussion, particularly if they knew they were engaged in sports. When asked how their knowledge changed, many of the participants talked about how after attending the training, they were more aware of the types of symptoms to observe for. One participant expressed how she might be more inclined to suspect a concussion after attending the training.

I think it was interesting from a teaching perspective that I would want to know if a student had had an issue or concussion, been diagnosed with a concussion or any type, even if it wasn't called a concussion. Was there any incident that involves something to do with head trauma in some way?

In other research, concussion training has been found to improve educators' ability to recognize symptoms (Carzoo et al., 2015), and to improve awareness of academic accommodations. (Graff & Caperell, 2016). This study offers a unique perspective in that it also gathers information about faculty's ability to recognize concussion symptoms, but also how the faculty member's actions or teaching practices may change based on recognition of concussion symptoms.

Participant number two explains how after the training, she may be more inclined to observe for the symptoms that were discussed in the lecture.

Because I think as an educator in the classroom I might *keep an eye on that person more*. Because there might be some signs and symptoms that could be subtle that could be there. I don't want to look at that student as someone who maybe just slacking off... or not give that some consideration. (Interview #2)

Faculty members also discussed the importance of being generally aware and attentive to student needs, particularly since students may have other issues related to mental health or medical

issues. Participant #2 further suggests that perhaps it is the responsibility of faculty members to look out for the well-being of students.

I still think as faculty members, even in a college setting, we have a responsibility to those students. I understand we are not their parents. But we do have a responsibility for their welfare and safety when they are in our buildings and our environment, and our classrooms. Just having some basic awareness, what potentially you might see in someone that has sustained something like that, is important from a perspective- that you have some responsibility for that student.

Participant number three further elaborates on this, suggesting that faculty should be more mindful of changes in student behavior that could be related to mental illness or emotional disturbances.

I've heard of a student that took her own life for whatever [reason]. So, that didn't come out of nowhere, I don't believe one day, she woke up and said and I think I'm going to drown myself, I mean, it doesn't work that way. So I think we could have assessed a student who continues to manifest very strange behaviors, head injury or not. (Interview #3)

This may be of heightened concern, given the increase in school violence in recent years and rising concerns related to student mental health, and bullying. Mental health is college students appears to be a growing concern as there has been an increase in the number of college students diagnosed with mental illness (Eisenberg, Downs, Golberstein, & Zivin, 2017). In addition, there has been an increase in college students seeking mental health services (Eisenberg et al., 2017).

Mental health in college students appear to be of growing concern with a few mental health training programs now available for faculty (Albright et al., 2013). However, these are

generally not required and are not present in all institutions of higher education. Although this study was focused on concussion training for college faculty, mental health issues are a pertinent concern for individuals who have sustained concussions, as depression and anxiety are common following concussion, and are also associated with persistent symptoms, or post-concussion syndrome (Nathan, Finkbeiner, Max, Longman & Debert, 2016). Thus, neurological and psychiatric problems are not always mutually exclusive, and a condition or presentation that appears to be psychiatric, may also have a neurologic cause, such as the case with post-concussion syndrome. Since collegiate athletes engaged in contact sports are susceptible to concussion (Zuckerman et al., 2015), it seems possible that if concerns with mental health emerged, one might question whether the behavior was related to a neurologic cause, such as a concussion. College instructors may be in a unique position to recognize changes in behavior that could be due to a concussion, as symptoms may worsen with academic or cognitive challenges (Brown et al., 2014). However, only with adequate training and resources will college faculty be able to recognize symptoms of concussion and refer to appropriate resources. As a result, when developing faculty-training programs for student wellness, institutions of higher education may want to consider developing educational material that is focused on both psychological and neurological issues, such as concussion that may arise within college students.

Finding #4: Participants report that faculty can facilitate return to learn by utilizing or recommending academic accommodations.

In addition to observing changes in student behavior or performance, faculty report that another way that they can facilitate the process of returning to learn following concussion is to implement or be open to academic accommodations. In addition, faculty also discussed how

educators could also be more flexible for students who have recently sustained a concussion.

One participant specifically stated:

“I think that they need to be open to the accommodations and flexible with the schedule.”

Although faculty’s belief that accommodations may be appropriate for concussion was not formally assessed prior to the training, it is possible that the training provided the information to make faculty more familiar with the potential importance of accommodations for a student who has sustained a concussion. This recommendation has also been found in the literature with a recent study conducted by Kasamatsu et al. (2017) that found that educators who had received formalized concussion education training had greater familiarity with academic accommodations and were found to more frequently recommend academic accommodations for adolescents following a concussion.

Most colleges will provide academic accommodations if the student has proper verification documenting a disability or medical issue. The policy of the study site is as that the institution will provide “reasonable accommodations for students who are otherwise qualified but have disabilities, in accordance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973.” However, faculty need to be aware of the available resources on campus for accommodations and aware of providers who can write recommendations, such as a physician or psychologist. The training in this study included a discussion of on campus resources including the Office of Accessibility and the Sports Medicine Center on campus. An important component of future trainings or concussion educational programs for college faculty should may include resources on campus as well as details of the school’s concussion policy, if one exists.

In addition to being aware of accommodations, faculty need to be open to implementing accommodations. Although the participants of this study were open to implementation of accommodations, other faculty may be less open to recommendations for academic accommodations. A study conducted by Wright and Meyer (2017) found that instructors felt they were better able to meet student's accommodations needs if the student provided more self-disclosure about why the accommodation was necessary. The authors of this study suggest that if students understand how self-disclosure may enhance instructor's confidence in ability to implement accommodations, they may provide more details to the instructor about why accommodations are necessary. (Wright & Meyer, 2017). Thus, if a faculty member is well informed about concussion and the effect on academic performance, they may better be able to implement academic accommodations, if the student were to disclose details of his/her condition.

Finding #5 Participants reported that they were not clear on what information the institution was providing for return to learn following concussion.

Participants discussed how they were not aware of existing institutional policies related to concussion. Some of the participants reported that they were aware of the Office of Accessibility, but were less aware of what the institutional policies on concussion were. Although the presenter at the training explained that a concussion policy was being developed, the faculty acknowledged that they did not know the specific details of that policy.

Interviewer: "In this institution, are you aware of any of the support, or policies, or procedures that we have in place for concussion, or resources that we [institution] have for concussion?"

Interviewee: "No. Just with the few things that you had mentioned in your presentation: referring them to the academic health center or also to the office of accessibility, with those, so other than that, no." (Interview #3)

As discussed above, faculty members reportedly recognized academic accommodations as an important component of returning to school following concussion, and as a result, would benefit from training that provides information and resources to faculty on how best to ensure that students receive necessary services. In addition, trainings should likely include information on existing protocols for concussion, with specific emphasis on the return to learn protocol. The NCAA has recently mandated that all participating institutions implement a concussion protocol including a return to learn protocol. However, the concussion policy does not require faculty training. Since faculty are likely to be involved in the process of return to learn following a concussion, it appears that faculty should be at minimum, informed of the institution's concussion policy.

Implications

The purpose of this study was to examine the effects of a faculty concussion return to learn educational program on faculty knowledge and attitudes regarding concussion and the effect on learning and return to school. Results of this study indicate that a forty-five minute didactic lecture may be effective in improving concussion knowledge of college faculty members. However, a formal training may not always be practical for college faculty members with busy schedules and other commitments. As a result, online or recorded trainings may be another feasible means in which to deliver concussion education. Findings of this study indicate that individuals may have some knowledge of concussion, but this information may be outdated. Thus, concussion-training programs should be offered regularly and should be continually updated to reflect the most recent research.

Another finding of this study indicates that faculty were not given information from the institution on all the resources available on the school's concussion protocol. Colleges may want

to ensure that a concussion protocol is in place, provide information to all faculty on the existing protocol, include detailed information on the schools' concussion policy, and available resources on campus, such as an office of accessibility, or student counseling and wellness. Lastly, colleges may want to consider including concussion education as part of a larger training in student wellness and mental health given the emotional issues that may also be present in students who have sustained concussion.

Recommendations for Future Research

Results of this study indicate that a formal didactic lecture may be effective in improving concussion knowledge in college faculty and may serve as a foundation for the development of further concussion trainings. Future research should include larger sample of faculty members, with diverse teaching experience. In addition, further research should include multiple sites, with a variety of different colleges, including community colleges and colleges from all NCAA Divisions. Lastly, it may be helpful to develop multiple methods of concussion training, such as online trainings, or video recordings and deliver these to separate groups to determine which method might be effective and pragmatic.

Conclusion

Concussion and the long terms effects of repetitive head injury have become an increasing area of concern with the media and within healthcare (Ahmed & Hall, 2016; Kerr et al., 2015). Although much of the literature has focused on return to sport following concussion, there has been less focus on return to learn following concussion (Master et al., 2012). Specifically, there has been less emphasis on return to learn for the college student who has sustained a concussion. However, return to learn following concussion for the college student may require a unique approach since the college student may face different challenges from the

elementary or high school student. For example, college coursework requires a more autonomous approach with less time in traditional classrooms (Hall et al., 2015). In addition, the typical college student's experience is often influenced by various other variables including sleep disturbance, alcohol use, and changes in family and friend relationships (Hall et al., 2015). Since concussion can also result in sleep disturbances (Matthias & Alvaro, 2012) and emotional issues, the college student who has sustained a concussion may subsequently face an exacerbation of these symptoms. The purpose of this study was to determine the effects of a faculty concussion return to learn educational program on faculty knowledge and attitudes regarding concussion and the effect on learning and return to school. The study aimed to answer the following research questions: 1) What is the effect of an educational training module on college faculty's knowledge and attitudes toward concussion and return to learn? 2) How does an educational training module impact faculty's perception of the effect of concussion on learning and the implications for teaching practice? Results of this study indicate that a concussion training module for college faculty utilizing a didactic lecture may be effective in improving faculty concussion knowledge levels. Further analysis of the results suggests that concussion education should be current and should incorporate institutional policies and resources that are accessible to college faculty. Faculty participants also discussed the importance of faculty being attentive to the behaviors and needs of college students. Participants expressed that students may also present with other emotional or learning issues in addition to concussion, and suggested that college faculty should be alert for sudden changes in behavior. Consequently, concussion education may be part of larger initiative to promote faculty awareness of college student mental health and overall wellness. Future development of college faculty concussion education may consider

including concussion education as part of a larger educational initiative focused on overall student health and wellbeing.

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APPENDIX A

Recruitment Email

Dear Faculty,

I am currently a faculty member within the School of Health Professions completing my doctoral dissertation. I am studying the effects of a faculty training program on knowledge levels regarding *concussion and the effects on academic performance and school participation*.

I am recruiting currently employed faculty members without prior concussion training to attend a one hour educational session on concussion and the effects on academics and school participation on **5/15/2018 12:30-1:50** in **Rockerfeller Auditorium**. This is completely voluntary and you may attend the training without participating in the study.

Lunch will be provided.

Participants will be asked to complete a brief knowledge assessment of concussion knowledge before and after the training session. This should take no more than 10 minutes to complete. Upon completion, a group of 4-5 participants will be recruited to complete a follow up interview to discuss experiences with the educational program. This interview is completely voluntary and you may decide not to participate or leave the study at any time.

I thank you in advance for your participation and support.

If you are able to attend, please RSVP cfinn02@nyit.edu by 5/1/2018.

Christina Finn

Participant # _____

1

APPENDIX B

Modified RoCKAS Concussion Knowledge Assessment Tool

What School do you work in?	
What Department do you work in?	
How many years have you been working as a college instructor?	

Participant # _____

RoCKAS-ST

1

RoCKAS-ST (modified)

SECTION 1

DIRECTIONS: Please read the following statements and circle TRUE or FALSE for each question.

1	There is a possible risk of death if a second concussion occurs before the first one has healed.	TRUE	FALSE
2	People who have had one concussion are more likely to have another concussion.	TRUE	FALSE
3	In order to be diagnosed with a concussion, you have to be knocked out.	TRUE	FALSE
4	A concussion can only occur if there is a direct hit to the head.	TRUE	FALSE
5	Being knocked unconscious always causes permanent damage to the brain.	TRUE	FALSE
6	Symptoms of a concussion can last for several weeks.	TRUE	FALSE
7	Sometimes a second concussion can help a person remember things that were forgotten after the first concussion.	TRUE	FALSE
8	After a concussion occurs, brain imaging (e.g., CAT Scan, MRI, X-Ray, etc.) typically shows visible physical damage (e.g., bruise, blood clot) to the brain.	TRUE	FALSE
9	If you receive one concussion and you have never had a concussion before, you will become less intelligent.	TRUE	FALSE
10	After 14 days, symptoms of a concussion are usually completely gone.	TRUE	FALSE
11	After a concussion, people can forget who they are and not recognize others but be perfect in every other way.	TRUE	FALSE
12	Concussions can sometimes lead to emotional disruptions.	TRUE	FALSE
13	An athlete who gets knocked out after getting a concussion is experiencing a coma.	TRUE	FALSE
14	There is rarely a risk to long-term health and well-being from multiple concussions.	TRUE	FALSE
15	All individuals who have sustained concussion should rest from all cognitive activity for up to 72 hours following the initial injury.	TRUE	FALSE
16	Students must be symptom free to return to school and athletics following a concussion.	TRUE	FALSE
17	Children and adolescents may take up 4 weeks to recover from a concussion	TRUE	FALSE

Participant # _____

RoCKAS-ST

1

18	All individuals who have sustained concussion should completely abstain from all cognitive activity while still symptomatic.	TRUE	FALSE
19	Students recovering from a single concussion will likely require academic accommodations.	TRUE	FALSE
20	Cognitive effort such as taking an exam may result in an increase in symptoms following a concussion.	TRUE	FALSE
21	Students who have sustained a concussion may have blurry vision and trouble reading small print due to problems with accommodation.	TRUE	FALSE
22	Students who have sustained concussion may have difficulty reading due to impairments in near focus or divergence.	TRUE	FALSE
23	Individuals with a prior history of learning disability may have more prolonged concussion symptoms.	TRUE	FALSE

APPENDIX C

Semi-Structured Interview Guide

- Can you describe your position at the university?
- Please describe your knowledge of concussion prior to attending this seminar?
- What, if any personal experience with concussion do you have involving yourself or a person close to you?
- How has your knowledge of concussion changed after attending this seminar?
- What is it that you would say you learned from the seminar?
- What do you feel that college faculty should understand about concussion? Why?
- How do you feel that concussion may impact a student's academic performance?
- Do you have experience working with a student who has been diagnosed with concussion? Can you share that experience?
- In what ways do you think faculty members can help facilitate a concussed student's return to school?
- How does this institution provide support to help facilitate the process of returning a student to school following a concussion?

APPENDIX D

CONSENT FOR PARTICIPATION IN RESEARCH

Project Title: Effects of a Faculty Training Program on Knowledge and Awareness of Student Concussion and Academic Performance

Principal Investigator(s): *Christina Finn MS OTR/L Graduate Student, University of New England; Assistant Professor, New York Institute of Technology.*

Introduction:

General requirement language:

- Please read this form. You may also request that the form is read to you. The purpose of this form is to provide you with information about this research study, and if you choose to participate, document your decision.
- You are encouraged to ask any questions that you may have about this study, now, during or after the project is complete. Your participation is voluntary and you may leave the study at any time.

Why is this study being conducted?

The purpose of this study is to examine the effects of a faculty concussion training program on faculty knowledge about concussion. Specifically, this research study will examine if and how faculty education increases faculty knowledge levels of concussion and students' return to learning.

Who is being asked to participate in this study?

- Participants for the study are full time college faculty members at the New York Institute of Technology and approximately 30 participants will be recruited for the study.
- Exclusion Criteria
 - Prior training or education in concussion and the impact of concussion on academics/return to learn

What will I be asked to do?

- You will be asked to first complete a pre-test assessment of your knowledge regarding concussion and academics/return to school utilizing an adapted version of a tool called the RoCKAS which assesses knowledge related to concussion.
- You will then participate in a one hour training session which will take place during the institution's common free hour
- Lunch will be provided
- Upon completion of the program, you will be asked to complete a post-test assessment of your knowledge regarding concussion and academic/return to school with the RoCKAS.

What are the possible risks of taking part in this study?

- The possible risks of participation are minimal.
- There is a one hour commitment for the program.
- Should you become uncomfortable you are free to end your participation at any time.

What are the possible benefits of taking part in this study?

- There are no direct benefits to you for participating in this study. Others may benefit from your participation in this training, including students who have sustained concussion, and the entire institution.

What will it cost me?

- There are no costs associated with participation in this study.
- While lunch is provided, there is no compensation for participating in the study.

How will my privacy be protected?

- Pre- and post-test assessments will be completely anonymous

- The results of the study will be written up for a graduate dissertation and may be considered for submission for publication.
- Participants' names are not associated with the study in any way.

How will my data be kept confidential?

- The pre- and post-knowledge assessments are designed to be anonymous which means that no one can link the data you provide to you, or identify you as a participant.
- The principal investigator will be the only person to reviewing the assessment data to ensure the anonymity of the setting and participants, as well as to provide uniform collection procedures.
- Participants will be coded by number (i.e. Participant 1, Participant 2, etc.) to protect their anonymity and maintain organization of the data.
- The data will be kept on only one personal home computer, password-protected and accessed only by the principal investigator, with a back-up hard-drive system on-site and off-site. Results will be summarized based on the sample's responses. Identifying information will be removed from the investigator's computer after a period of seven years and destroyed. Please note that regulatory agencies, and the Institutional Review Board may review the research records.
- A copy of your signed consent form will be maintained by the principal investigator for at least 7 years after the project is complete before it is destroyed. The consent forms will be stored in a secure location in the researcher's home.
- Participants may request data from the current study by contacting the primary investigator, Christina Finn at cfinn02@nyit.edu

What are my rights as a research participant?

General requirement language:

- Your participation is voluntary. Your decision to participate will have no impact on your current or future relations with the New York Institute of Technology. *Your decision to participate will not impact your relationship with your employer.*

- You may skip or refuse to answer any question for any reason, however this would remove your survey from the study. You may end your participation at any time.
- If you choose not to participate, there is no penalty to you.

What other options do I have?

Optional language:

- You may choose not to participate.

Whom may I contact with questions?

General requirement language:

- The researcher conducting this study is Christina Finn, for questions or more information concerning this research you may contact her at 516-661-3515 and cfinn5@une.edu or Ella Benson at ebenson2@une.edu

Will I receive a copy of this consent form?

General requirement language:

- You will be given a copy of this consent form.
-

Participant's Statement

I understand the above description of this research and the risks and benefits associated with my participation as a research subject. I agree to take part in the research and do so voluntarily.

Participant's signature or
Legally authorized representative

Date

Printed name

Researcher's Statement

The participant named above had sufficient time to consider the information, had an opportunity to ask questions, and voluntarily agreed to be in this study.

Researcher's signature

Date

Printed name

APPENDIX E

CONSENT FOR PARTICIPATION IN RESEARCH (Interview)

Project Title: Effects of a Faculty Training Program on Knowledge and Awareness of Student Concussion and Academic Performance

Principal Investigator(s): *Christina Finn MS OTR/L Graduate Student, University of New England; Assistant Professor, New York Institute of Technology.*

Introduction:

General requirement language:

- Please read this form. You may also request that the form is read to you. The purpose of this form is to provide you with information about this research study, and if you choose to participate, document your decision.
- You are encouraged to ask any questions that you may have about this study, now, during or after the project is complete. Your participation is voluntary and you may leave the study at any time.

Why is this study being conducted?

The purpose of this study is to examine the effects of a faculty concussion training program on faculty knowledge about concussion. Specifically, this research study will examine if and how faculty education increases faculty knowledge levels of concussion and students' return to learning.

Who is being asked to participate in this study?

- Participants for the study are full time college faculty members at the New York Institute of Technology
- 5 participants will be recruited for participation in the interview portion of this study
- Exclusion Criteria
 - Prior training or education in concussion and the impact of concussion on academics/return to learn

What will I be asked to do?

- You will be asked to first complete a pre-test assessment of your knowledge regarding concussion and academics/return to school utilizing an adapted version of a tool called the RoCKAS which assesses knowledge related to concussion.
- You will then participate in a one hour training session which will take place during the institution's common free hour
- Lunch will be provided
- Upon completion of the program, you will be asked to complete a post-test assessment of your knowledge regarding concussion and academic/return to school with the RoCKAS.
- Following the completion of the post-test, you will participate in a 30 minute interview, where you will discuss your experience with the educational program. The interviewer will be taking notes and the interview will be recorded.

What are the possible risks of taking part in this study?

- There are minimal risks associated with participation in this study
- There is a one hour and a half commitment for the program.
- Should you become uncomfortable you are free to end your participation at any time.

What are the possible benefits of taking part in this study?

- There are no direct benefits to you for participating in this study. Others may benefit from your participation in this training, including students who have sustained concussion, and the entire institution.

What will it cost me?

- There are no costs associated with participation in this study.
- While lunch is provided, there is no compensation for participating in the study.

How will my privacy be protected?

- The results of the study will be written up for a graduate dissertation and may be considered for submission for publication.
- Participants' names are not associated with the study in any way.

How will my data be kept confidential?

- The principal investigator will be the only person to reviewing the assessment data to ensure the anonymity of the setting and participants, as well as to provide uniform collection procedures.
- Participants will be coded by number (i.e. Participant 1, Participant 2, etc.) to protect their anonymity and maintain organization of the data.
- The data, including transcriptions will be kept on only one personal home computer, password-protected and accessed only by the principal investigator, with a back-up hard-drive system on-site and off-site. Written transcriptions and interpretations of the data will be made available to the participants and recordings will be destroyed upon completion of the study. Results will be summarized based on the sample's responses. Identifying information will be removed from the investigator's computer after a period of seven years and destroyed. Please note that regulatory agencies, and the Institutional Review Board may review the research records.
- A copy of your signed consent form will be maintained by the principal investigator for at least 7 years after the project is complete before it is destroyed. The consent forms will be stored in a secure location in the researcher's home.
- Participants may request data from the current study by contacting the primary investigator, Christina Finn at cfinn02@nyit.edu

What are my rights as a research participant?

General requirement language:

- Your participation is voluntary. Your decision to participate will have no impact on your current or future relations with the New York Institute of Technology. *Your decision to participate will not impact your relationship with your employer.*
- You may skip or refuse to answer any question for any reason, however this would remove your survey from the study. You may end your participation at any time.
- If you choose not to participate, there is no penalty to you.

What other options do I have?

Optional language:

- You may choose not to participate.

Whom may I contact with questions?

General requirement language:

- The researcher conducting this study is Christina Finn, for questions or more information concerning this research you may contact her at 516-661-3515 and cfinn5@une.edu or Ella Benson at ebenson2@une.edu

Will I receive a copy of this consent form?

General requirement language:

You will be given a copy of this consent form.

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Participant's Statement

I understand the above description of this research and the risks and benefits associated with my participation as a research subject. I agree to take part in the research and do so voluntarily.

Participant's signature or
Legally authorized representative

Date

Printed name

Researcher's Statement

The participant named above had sufficient time to consider the information, had an opportunity to ask questions, and voluntarily agreed to be in this study.

Researcher's signature

Date

Printed name