THE EFFECT OF PROFESSIONAL DEVELOPMENT ON TEACHER KNOWLEDGE OF CONCUSSIONS AND CLASSROOM SUPPORT OF CONCUSSED STUDENTS

by

Susan Teeter Hawkins

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University

2019

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ABSTRACT

Concussions have received significant media attention in recent years. Although research has focused on the knowledge and perceptions of parents, athletes, and coaches regarding sports-related concussions, little attention has been given to discovering what teachers know about concussions and the correct concussion protocol for the classroom, even though concussions affect academic performance. The purpose of this applied study was to understand further the problem of deficiency in teacher knowledge of sports-related concussions, including symptoms, academic adjustments needed, and how to design appropriate professional development to address this problem. This study incorporated a mixed methods design to examine the effect of concussion education professional development on classroom teachers' knowledge of concussions in general and the appropriate academic adjustments for students who have a sports-related concussion. The quantitative portion of the study included a pretest-posttest control group design. Secondary school teachers from an educational region in one southern state were invited to participate, and 33 completed the study. Through a customized website, all participants took a pretest, after which they were randomly assigned to either a control group (no professional development) or treatment group (professional development in the form of an online video and handout). Participants then took the posttest to determine whether the professional development had a statistically significant effect on concussion-related knowledge. For the qualitative portion of the study, individual interviews were conducted with eight of the participants after they watched a video about concussions. These interviews were used to determine the extent of perceived knowledge of symptoms and academic adjustments, and findings guided recommendations for a professional development plan that can be implemented in schools.

Keywords: academic adjustments, professional development, sports-related concussion

Acknowledgments

I want to thank Beverly Gambill for the support, critique, and constant encouragement as this process unfolded. Thank you also to Nathan Dyer, my IT guru, for creating the website used for testing. Finally, thank you to Dawn Herring—the editor to beat all editors!

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List of Abbreviations

Adenosine Triphosphate (ATP)

Analysis of Covariance (ANCOVA)

Analysis of Variance (ANOVA)

Athletic Trainer (AT)

Beliefs, Attitudes, and Knowledge Following Pediatric Athlete Concussions among Athletic Trainers Employed in the Secondary School Setting (BAKPAC-AT)

Beliefs, Attitudes, and Knowledge of Pediatric Athletes with Concussion–Teacher Version (BAKPAC-TEACH)

Centers for Disease Control and Prevention (CDC)

Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT)

Individualized Education Plan (IEP)

Institutional Review Board (IRB)

Mild Traumatic Brain Injury (mTBI)

National Athletic Trainers Association (NATA)

National Collegiate Athletic Association (NCAA)

Online Professional Development (OPD)

Professional Development (PD)

Return to Learn (RTL)

Return to Play (RTP)

Sport Concussion Assessment Tool (SCAT)

Sports-Related Concussion (SRC)

Statistical Package for Social Sciences (SPSS)

CHAPTER ONE: INTRODUCTION

Overview

Concussions have received significant media attention in recent years. Researchers have sought to determine the level of knowledge on, beliefs about, and perceptions of sports-related concussions (SRCs) among parents, athletes, and coaches. However, what teachers know about concussions and the correct concussion protocol for the classroom has received limited attention, even though a concussion affects academic performance (Russell et al., 2016). This study examined the effect of concussion education professional development (PD) for classroom teachers on their knowledge of concussions in general and appropriate academic adjustments for students who have an SRC. This introductory chapter provides an overview of the historical and theoretical background associated with the topic of this study. Descriptions of the problem, purpose, and significance of the study are included, along with the research questions and important definitions.

Background

Concussions are injuries to the brain. Classified as mild traumatic brain injuries (mTBIs), these injuries occur by either a direct blow to the head or the sudden deceleration of the head, causing trauma to the cerebrum (Saffary, Chin, & Cantu, 2012). With the number of Americans diagnosed with a concussion increasing, most significantly in adolescents (Maier, 2016), these injuries, which used to be considered simple “bumps on the head” or “bell-ringers” (National Athletic Trainers Association [NATA], 2017), are receiving national attention.

As of 2012, four international symposiums on concussions had been held to establish international standards and ways of disseminating information to invested parties. In 2001, representatives of the International Ice Hockey Federation, the Federation Internationale de

Football Association Medical Assessment and Research Center, and the International Olympic Committee Medical Commission came together in Vienna, Austria, to discuss the problem of concussions among ice hockey players, soccer players, and other athletes. The Vienna symposium highlighted the need for safety improvements and the effects suffered by athletes who have sustained a concussion (Aubry et al., 2002). In 2004, a second conference held in Prague, Czech Republic, developed sideline evaluations, created a sport concussion assessment tool (SCAT), updated classifications of concussions, and expanded representation to include trauma surgeons and sport psychologists (McCrory et al., 2005). It was not until a third conference in Zurich in 2008 that experts added information regarding pediatric and adolescent athletes. During this symposium, the term *cognitive rest* was coined, and recommendations were presented (McCrory et al., 2009).

The fourth symposium, held in 2012 in Zurich, included a push toward improving education on concussions for 15- to 19-year-old student athletes and their parents through outreach programs (McCrory et al., 2013). The risk of concussions in the school-aged population is greatest in the 15- to 19-year-old age group, and males are at higher risk than females (Duff & Adamczyk, 2009). This risk is associated with the adolescent brain's immaturity and vulnerability to injury (Adirim, 2007). Importantly, these symposiums established a process of continued education concerning concussions. However, this educational improvement did not mention educators—only that school activities may need to be modified.

Many times, concussions are not recognized and appropriately treated. When this happens, recovery is delayed, and academic performance may suffer. Diagnosing concussions and creating a return to play (RTP) protocol is based on monitoring the symptoms and administering cognitive assessment with either a paper-pencil test or computerized testing

(Reider, 2009). Adirim (2007) stated that diagnosis relies on clinical symptoms and/or self-reporting. Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) is the tool that many healthcare providers use to diagnose concussions. They then re-administer the test for post-concussive RTP criteria in conjunction with a balance test. Based on the results of ImPACT and the difference between the baseline score and post-concussive score, certified athletic trainers (ATs) can make a reasonable RTP decision. With the information gleaned from ImPACT testing and assessed clinical symptoms, a more accurate RTP protocol can be designed and implemented (Elbin, Schatz, & Covassin, 2011).

As part of RTP protocol, healthcare professionals monitor symptoms the student athlete exhibits either physically or verbally. Symptoms of an SRC include dizziness, headaches, and a general "foggy feeling." After the initial injury, other post-concussive symptoms may appear as emotional disturbances or forgetfulness (Centers for Disease Control and Prevention [CDC], 2015a). According to Majerske et al. (2008), post-concussive activity level (raising the heart rate through exercise), age, and sex of the athletes affect neurocognitive performance. Younger adolescents show deficits in verbal and visual memory.

After an initial concussion, student athletes of any age may be predisposed to incurring another concussion, but the research is inconclusive. For instance, results of one study showed that student athletes who were diagnosed with an mTBI were at risk of future concussions (Guskiewicz & Mihalik, 2010), and Moser and Schatz (2001) found that lingering effects appeared on general cognitive measures and attention. Moreover, Schatz, Moser, Covassin, and Karpf (2011) suggested that young student athletes with a history of multiple concussions may show subtle cognitive effects, possibly indicating future concussion issues. In contrast, Iverson, Brooks, Lovell, and Collins (2006) examined athletes using ImPACT and detected no

measurable effects regarding baseline levels and post-concussion levels among those who reported one to two previous concussions.

Not only do concussions affect a student athlete's physical ability to return to pre-injury status, they can also severely affect the cognitive learning abilities within the educational setting when the student returns to the classroom, including difficulties with test taking and keeping up with assignments (Bergeron, 2010; McLeod & Register-Mihalik, 2011). Nonetheless, most concussion research focuses on RTP recommendations; there is limited research about the effects of concussions on return to learn (RTL) management (DeMatteo et al., 2015). RTL management includes identifying risk factors for poor academic performance as well as recommending accommodations to help the concussed athlete (Russell et al., 2016), and educators should be cognizant that student athletes suffering from a concussion will need modifications within the classroom (McGrath, 2010).

Providing a team of professionals who have the student athlete's best interests in mind creates an environment where academic and athletic variables mesh into a nurturing, productive protocol for the concussed student. As a student returns to the classroom, the school nurse, in conjunction with the certified AT, can observe and track symptoms and help teachers modify the classroom experience for the student (McGrath, 2010; Rains & Robinson, 2010) until it has been clinically determined that the student athlete has returned to pre-injury cognitive status. The ability to return to the educational setting after a concussion requires more than just informing the student athlete's teachers. Lights, sounds, and general thinking will exacerbate symptoms—requiring cognitive rest before RTP should even be considered (Logan, 2009). The effects of external forces have the potential to become evident in a student athlete, but the classroom

teacher may not understand what has happened to the student athlete or may misconstrue the behavior as misbehavior instead of a symptom of an SRC.

While research on concussion education has primarily focused on coaches and ATs, teacher education about concussions is important and requires further investigation (Graff & Caperell, 2016). Resources such as the CDC's (n.d.) *Returning to School After a Concussion: A Fact Sheet for School Professionals* and the *Concussion Management and Return to Learn* video (Evans, 2014) have been developed to aid educators. These resources can be used as a means of PD to help teachers maintain competency within the classroom by providing them with the information they need to effectively assist concussed student athletes with RTL management.

Since new policies of concussion management now include returning to the classroom, how teachers learn so they may better serve concussed students also becomes important. Professional development, either online or face-to-face, allows teachers to learn new material or review policy. Piaget's (1954) constructivism theory of cognition is often used as a theoretical framework for PD opportunities because it allows educators to construct new knowledge based on prior knowledge. This prior knowledge becomes the backdrop used to create new understandings. This theory relies on the learner being an active participant—he or she must "actively engage in the meaning-making" (Ültanir, 2012, p. 196). The theoretical framework discussed by Olivares (2002), which combines constructivism with communication and transfer of knowledge, can also be applied to teacher PD. Teachers need opportunities to interact with meaningful material, such as online resources, tutorials, and videos. Through meaningful resources, the learners (classroom teachers) can then apply (transfer) the new knowledge to their classrooms as they interact with student athletes who have been concussed.

In the case of concussion education for teachers, prior knowledge may come from personal experience, movies, or television news/sports reports. This knowledge allows teachers an avenue to create for themselves new knowledge connections they can use in the classroom to help concussed students with RTL management. Educating teachers on concussions is not centered on signs and symptoms of concussions but rather on illustrating how the teacher can modify the academic setting to allow the concussed student athlete the opportunity to stay current in the classroom. Through PD, teachers can use constructivist ideals to help prepare them for a student who has been diagnosed with an SRC. These ideals include teachers (a) constructing their own knowledge; (b) developing schemata individualized to the teacher; (c) creating meaning between what they know (prior knowledge) with what they need to know; and (d) creating schemata to help them confront student issues of concussion (Olivares, 2002).

Problem Statement

Several studies have examined parents, coaches, and athletes' basic knowledge of concussions, including signs and symptoms, treatment, and RTP considerations (Asante-Bio, 2011; McCoy, 2011; Register-Mihalik, 2010). However, there is limited empirical evidence pertaining to teacher knowledge of SRCs and RTL protocol. Studies tend to involve other school personnel, such as principals, school nurses, and school psychologists, but this population does not always have daily contact with the concussed student athlete. Moreover, one might assume that the student athlete's healthcare provider would have the background needed to help with RTL protocol, but while physician concussion knowledge has improved regarding RTP (Chrisman, Schiff, & Rivara, 2011), most do not have the background needed to effectively manage the RTL aspect of concussion management (Purcell, Harvey, & Seabrook, 2016). Katz-DeLong (2014) suggested that although educators have increased their knowledge of

concussions, more education is needed. His study discussed a New Jersey Department of Education program designed to "develop and enforce . . . brain injury prevention and safety training . . . for all school personnel" (p. 4). During the acute phase of injury, school personnel should be alerted to the injury and allow the athlete to gradually return to an academic schedule; moreover, the student athlete should be monitored for two to three months after the concussive event. Katz-Delong suggested that improving knowledge about concussions may occur via workshops and continued education. In line with the 2010 development of *Heads Up*, a CDC training initiative, McGrath (2010) proposed increasing communication with teachers and school counselors to determine the proper procedure for a student's return to the classroom following a concussion. Importantly, the use of modifications can support student success in classroom performance if symptoms are visible and even after the student becomes asymptomatic (McGrath, 2010). These modifications may include additional assistance to overcome the academic problems associated with medically related absences and modified assignments. However, modifications are not effective if school personnel do not understand what concussions are and how to effectively assist students within the classroom (McGrath, 2010). In many cases, once a teacher has been informed that a student has suffered a concussion, he or she does not know the appropriate modifications to implement as part of RTL concussion protocol (Baker et al., 2014; Maerlender, Lictenstein, Parent-Nicols, Higgins, & Reisher, 2019; McGrath, 2010; Moon, 2013; Raikes & Smart, 2015). The problem is teachers may not fully understand basic concussion symptoms and the appropriate academic adjustments required for students with SRCs.

Purpose Statement

The purpose of this applied study was to further understand the problem of lack of teacher knowledge of concussion symptoms and academic adjustments for classroom teachers. A mixed methods design that included a quasi-experimental, pretest-posttest control group examined the effect of PD on teachers' knowledge of concussions in general and the appropriate academic adjustments for student athletes with an SRC, and an explanatory sequential qualitative design that included interviews with teachers was employed to formulate a solution to address the problem. Through the use of PD, teachers' knowledge of concussions and appropriate academic adjustments was tested. The use or disuse of PD for the study was the *independent variable* because the researcher manipulated whether a participant was given an opportunity to take the PD (Fan, 2010). This was done to investigate if there is a difference in teacher knowledge of concussions and academic accommodations used to help sports-related concussed students. This measured knowledge was classified as the dependent variable. In the *Gall Encyclopedia of Psychology*, the *dependent variable* is defined as the variable that changes in response to the independent variable (Dependent Variable, 2016).

Research Questions

Central Question: How can teachers better understand SRC symptoms and academic adjustments needed by concussed students?

Sub-question 1: What activities need to be offered to help teachers better understand symptoms and implement academic adjustments?

Sub-question 2: What resources need to be utilized?

Sub-question 3: How can training influence teacher strategies with concussed students?

Significance of the Study

Concussions are defined as a clinical syndrome—a change in brain function—that may be the result of a force or trauma. Changes in mental status, level of consciousness, and cognitive functions are often seen, but for the classroom teacher, the lack of physical signs and symptoms of concussions makes it difficult to fully understand the severity of such injuries (Graff & Caperell, 2016). Research has shown that academic performance is affected by concussion symptoms (Russell et al., 2016), which include mood disturbances, sleep disturbances, and attention and concentration issues. These symptoms can create difficulties in the classroom with test taking and keeping up with assignments (Bergeron, 2010; McLeod & Register-Mihalik, 2011).

Teachers often instruct students who have suffered SRCs during athletic and leisure activities. Occasionally, the teacher is unaware of these concussions and perceives affected students as being lazy or uncooperative, when in fact, they cannot function at full cognitive capacity due to the mTBI (Piebes, Gourley, & Valovich McLeod, 2009). Even when teachers are aware of a concussion, they are often unsure of how it affects classroom behavior, their academic responsibility to assist the student, and whether academic adjustments would benefit the concussed student. Concussion education for all parties involved in a student's academic life is important for helping students maintain academic performance after an SRC, and modifications in the classroom will enable educators to support student athletes (Halstead et al., 2013). Nonetheless, in all states with concussion legislation, there are still gaps in the education of nonathletic personnel. Larger-scale PD, including online tutorials, is one way to help educate all stakeholders (Halstead et al., 2013). By providing meaningful and relevant PD based on an understanding of concussions and classroom management as the cornerstone of concussion

instruction, school districts can implement a team-based approach to arm teachers with necessary tools to help students based upon individual symptoms (Zirkel & Brown, 2015).

Most research on concussion education to date has focused on coaches and ATs; thus, classroom teacher understanding of concussions requires further investigation (Graff & Caperell, 2016). One study that has focused on teacher education (Kasamatsu, Valovich McLeod, Register-Mihalik, & Welch Bacon, 2017b) noted that since teachers are stakeholders in a student's successful return to the classroom after a concussion, concussion education for teachers can enable them to recognize the academic adjustments needed. Similar studies focused on measuring school nurse and AT knowledge of academic accommodations for student athletes found that academic accommodations are warranted within an RTL protocol (Weber, Welch, Parsons, & McLeod, 2015; Williams, Welch, Parsons, & McLeod, 2015). Since teachers are the primary educators implementing the academic adjustments in the classroom, providing effective PD to help them understand concussions and the necessary academic adjustments can be critical for student success. Concussions can be neither prevented nor eliminated in high school sports (Mannix, Meehan, & Pascual-Leone, 2016), so educating teachers about both concussion basics and RTL protocols may hold long-term value. This study extended the Kasamatsu et al. (2017b) study by examining whether online resources developed to specifically aid educators in RTL management influence teacher knowledge of concussions and appropriate academic adjustments for concussed students.

Definitions

Terms pertinent to this study are the following:

1. *Academic accommodations/adjustments*—modifications to help individuals access curriculum and maintain equitable education opportunities (Sady, Vaughan, & Gioia, 2011).
2. *Certified athletic trainer*—healthcare professional who works with physicians to recognize, treat, and rehabilitate people with both sports-related and work-related injuries (NATA, n.d.).
3. *Cognitive rest*—type of rest for concussed individuals that includes no school attendance, no homework or schoolwork, no reading, no video games, no texting, and no computer time—essentially no activity that may trigger symptoms of a concussion (Logan, 2009; Master, Giola, Leddy, & Grady, 2012).
4. *Concussion (mild traumatic brain injury)*—pathophysiological process that affects the brain due to biomechanical forces. Types of forces include a direct blow to the head or a force that causes the brain to decelerate quickly and forcefully (McCrory et al., 2009; McGuire & McCambridge, 2011).
5. *Concussion management team*—team consisting of a teacher, counselor, administrator, and certified AT (if available, or school nurse) to determine the modifications needed by a concussed student (McGrath, 2010).

Summary

When a student athlete is injured and suffers a concussion, it is important that all individuals involved in the athlete's educational environment understand possible symptoms the student athlete may exhibit and academic adjustments classroom teachers may need to make to

ensure the student does not suffer academically in the classroom. Classroom teachers often do not understand SRC symptoms and effective academic adjustments. This applied study sought to understand this lack of knowledge in teachers in order to inform the development of a useful plan for helping teachers gain the necessary understanding of concussion symptoms and academic adjustments to contribute to the academic success of concussed students.

CHAPTER TWO: LITERATURE REVIEW

Overview

In 1929, Martland coined the term *punch drunk* to describe those boxers who were struck in the head and began to stagger as if inebriated. Historically, besides punch drunk, concussions have been called *bell-ringers* and *dings* among those working in sports professions. A key difference between traumatic brain injuries and mTBIs occurring in sports (i.e., SRCs) is the possibility of repeated mTBIs during an athlete's season, athletic year, or athletic career (Giza & Hovda, 2014). This chapter includes a discussion of the theoretical framework of PD, as well as a review of the literature on concussions, RTP and RTL protocols, and concussion education for teachers.

Theoretical Framework

Cognitivism became a learning theory in the 1960s. Cognitive learning theory describes how a student's thought/learning processes change with age and considers different mechanisms that could make this change possible (Ormrod, 2012). A type of cognitive learning theory, constructivism, proposes that before understanding can be used by a person, knowledge must be constructed (Piaget, 1954). Learners do not passively sit and take in information; they must actively organize and make connections with that information. These connections then allow the learner to construct the knowledge instead of simply acquiring it from the observable world.

Constructivism involves people taking in information from the world and then constructing the meaning needed to acquire the necessary knowledge (Wilson, 2010). Phillips (1995) stated, "Human knowledge—whether it be the bodies of public knowledge known as the various disciplines, or the cognitive structures of individual knowers or learners—is constructed" (p. 5). According to Wilson (2010), Piaget hypothesized that knowledge is not the result of

simply recording observations, but that structuring these observations constructs knowledge of a given subject. Along with learning, engagement of the learner into inquiring and completing activities can give meaning, resulting in a construction of knowledge. Likewise, Gopnik and Wellman (2012) discussed how adults structure ideas of the world, but these ordered thoughts only occur from fragments of knowledge taken in from the world and then ordered within the adult brain. Over time, adults take the concrete and create coherent and abstract representations with which to answer questions and solve problems.

Cognitive load theory is similar to constructivism. In cognitive load theory, learning occurs when a learner processes visual and verbal information attained through media, organizes it, and creates models to guide instruction. Through the use of media-enhanced instructional materials, knowledge can become part of long-term memory for recall and problem-solving (Tasir & Pin, 2012). Professional development built upon these two theories is more effective for teachers; specifically, by tailoring PD to the level needed by the student (in this case a teacher), higher standards can be met successfully (Burke & Mancuso, 2012), whether during a face-to-face PD opportunity or an online session.

In today's economy, many schools have limited resources, so the professional teacher often searches for online professional development (OPD) workshops. Erickson, Noonan, and McCall (2012) found that OPD can counteract challenges by connecting educators virtually with colleagues across the country. Through these opportunities, teachers can learn, discuss, and then implement ideas garnered from these online sessions.

Eun (2011) provided a Vygotskian theory for PD. Eun described PD using Vygotsky's developmental theory that "all higher mental processes originated as actual relations between human individuals" (p. 320) and that those who are considered new to certain material need a

mentor/facilitator to support the development of new ideas and concepts. For any PD workshop to be successful, teachers must be equipped with the skills and knowledge to subsequently address needed changes for their students. If the teachers are successful, their students will have either an attitude change or improved learning or both. Desimone (2011) determined that successful PD involves four aspects: (a) teachers experience PD; (b) teacher knowledge and skills are increased, and changes are often seen in attitudes, beliefs, or both; (c) teachers then incorporate the new knowledge, skills, attitudes, and beliefs into their content; and (d) these incorporations increase student learning. Eun's (2011) Vygotskian theory supports PD, whether online or face-to-face, when an educator takes what he or she has learned and internalizes the skills/knowledge presented.

Piaget (1954) proposed that adult learners are at a certain stage of cognitive development—formal operational. At this stage, students older than 12 can reason deductively and with abstract thought (Ghazi, Khan, Shahzada, & Ullah, 2014). Similar to a classroom learning environment, PD requires that all participants be active learners and that teachers think about how what they are learning can be used in the classroom setting. Some participants may find handouts beneficial, while others find videos or face-to-face instruction favorable. One author of adult education, M. S. Knowles (1980), held that skills should be taught through the actual implementation of those skills. Teaching uses PD as on-the-job training; thus, PD on SRCs allows teachers to establish a knowledge base from which to draw regarding SRCs and RTL protocols.

Related Literature

This section discusses the literature related to concussions, specifically to concussions occurring in student athletes. Topics covered include concussion definition, pathology, signs and

symptoms, and knowledge; classroom management of SRCs, including RTP and RTL recommendations; and concussion-related training for teachers.

Concussions

Concussions are defined as a clinical syndrome that involves a change in brain function. This change may be the result of a force or trauma. Changes in mental status, level of consciousness, and/or cognitive functions are often seen (Graff & Caperell, 2016). Concussions frequently occur during athletic events such as football and soccer. The more contact-oriented a sport, the greater the incidence of concussions. Bergeron (2010) described concussions as functional injuries rather than structural injuries of the brain. The brain is "jostled" and normal function is compromised. With this functional injury comes symptoms such as headaches, nausea, cognitive fogginess, and sensitivity to light and noises, with or without loss of consciousness (Lee & Perriello, 2010). This injury is one that cannot be seen outwardly and can be challenging to diagnose, yet concussions are considered a pressing issue in sports medicine today (Adirim, 2007).

Basic pathology. Concussions are injuries to the brain causing cellular dysfunction, including shifts in the natural order of ions (Ca^{2+}, Na^{+}, K^{+}), changes in cellular metabolism (increased adenosine triphosphate [ATP] needs), and a decrease in neurotransmission (Giza & Hovda, 2014). The damage attributed to concussions is associated with a disturbance in brain physiology, not anatomy. As calcium ions replace potassium ions, depolarization occurs. This calcium/potassium exchange prevents the needed uptake of glucose cells within the brain (Giza & Hovda, 2001, 2014). Thus, a person experiencing a concussion will often have a glazed-over look. Once glucose uptake is restored due to activation of ion pumps to balance ions, the eyes begin to focus again. Magnesium levels also decrease for several days after injury. Since

magnesium is important for ATP synthesis and maintenance of cellular membrane potential, patients may continue to feel lethargic (Giza & Hovda, 2014; Iverson, Echemendia, LaMarre, Brooks, & Gaetz, 2012). Due to increased ATP demand of cells, concussion symptoms may be persistent, thus creating the need for cognitive rest—that is, the conservation of ATP (Brown et al., 2014). Table 1 provides an overview of the pathophysiology and acute symptoms of mTBIs.

Table 1

TBI Pathophysiology and Acute Symptoms

Post-TBI pathophysiology	Acute symptoms/clinical correlate
Ionic flux	Migraine headache, photophobia, phonophobia
Energy crisis	Vulnerability to second injury
Axonal injury	Impaired cognition, slowed processing, slowed reaction time
Impaired neurotransmission	Impaired cognition, slowed processing, slowed reaction time
Protease activation, altered cytoskeletal proteins, cell death	Chronic atrophy, development of persistent impairments

Note. Source: Giza and Hovda (2014).

Carson et al. (2014) suggested that the impact force that causes a concussion has a more significant effect in children than in adults; thus, in a comparison of similar impact force, the poorly developed cervical musculature, in combination with the increased head-to-neck ratio in children, results in greater injury to the child's brain. Giza and Hovda (2014) also suggested that the comparatively unbalanced amount of myelination between adolescent and adult brains could explain why younger athletes have more cognitive issues and longer recovery times than adult

athletes. During the acute post-concussive stage, there is also an increased demand for energy due to a change in cerebral blood flow. Electroencephalography and event-related potential studies have shown short- and long-term deficits following concussions. Each measures electric voltage from neurons within the brain. Concussions cause both structural and functional damage. Neurons can be structurally damaged, causing functional issues with cognitive behaviors and executive functions (Ford, 2019).

It is believed that the most acute post-concussive symptoms of headaches and emotional upheaval occur due to the pathology of SRCs (Brown et al., 2014). It is important that the athlete not RTP the day of the injury; however, the student is still required to attend school and maintain classroom attendance/behavior. Unfortunately, the duration of changes in chemical neurometabolic pathways ranges from several days to weeks, so the possibility of depleted mental acuity as well as physical duress exhibited by concussed students in the classroom after injury can linger. This period of instability is indefinite, though most concussions resolve within 3 weeks if there is no cognitive overexertion during this period (Zirkel & Brown, 2015).

Signs and symptoms of SRCs. A study by Guskiewicz and Valovich McLeod (2011) reported that SRC signs observed by caregivers (parents, ATs, friends) included the following: dazed appearance; staring, vacant expression; confusion; mistakes on the field; disorientation about game, position, score, and opponent; inappropriate/wide range of emotions; poor coordination/clumsy; answering slowly or incorrectly; loss of consciousness; change in behavior/personality; and inability to recall events before injury and/or after injury. Signs reported by athletes included headaches; nausea/vomiting; poor balance/dizziness; blurred vision/double vision; light sensitivity; foggy, hazy, “out of it” feeling; change in sleep patterns

(length, timing, quality); poor concentration/short-term memory; being irritable, emotional, sad; memory problems; and concentration and/or memory problems.

Several of these concussion-related symptoms are assessed by symptom scales and balance testing. These somatic symptoms include headaches, dizziness, photophobia, and phonophobia (Carson et al., 2014; Russell et al., 2016). Headaches are the most common (94%) SRC symptom; however, headaches can also be common in sports without being triggered by trauma (Seifert, 2019). In 2017, the National Collegiate Athletic Association (NCAA) developed the Headache Task Force to study headaches in collegiate athletics. Of those who reported headaches (58.6% of n = 834), 26.7% stated they had migraine-type headaches, showing that not all headaches are due to concussion or are post-traumatic (Seifert, 2019). If athletes have a history of migraines, they may be at risk for prolonged recovery post-concussion, and a patient with headaches from concussions will also show greater deficits in neurocognitive testing (Seifert, 2019). Although athletes may experience the same types of symptoms, the recovery time for children will be longer than for adults. This recovery time is not only for symptom resolution but also neurocognitive recovery, with high school athletes taking twice as long to recover (10-14 days) as college and professional athletes (3-7 days; Carson et al., 2014; Russell et al., 2016). Rest, both cognitive and physical, is a key concussion management protocol for all age groups (Carson et al., 2014; Marar, McIlvain, Fields, & Comstock, 2012). Cognitive rest involves avoiding activities that require attention and concentration and may include avoiding computers, text messaging, video games, or reading. Physical rest includes avoiding any activity that may exacerbate concussion symptoms. After acute symptoms resolve, a graded return to activity should commence to ensure that symptoms do not reemerge once physical activity is introduced. Gupta, Summerville, and Senter (2019) suggested rest for the

first 24-48 hours may be recommended; however, if prolonged, rest may be detrimental to the recovery of SRC.

With any symptoms experienced by a student athlete, the student's ability to return to school may be impacted because of neurocognitive deficits, such as slowed information processing, difficulty forming new memory, and inability to concentrate. The best-practice recommendation for concussion management is rest until all symptoms resolve, followed by implementation of a graded program of exertion before complete return to activity. Moreover, a gradual return to learning is now recommended with a gradual RTP (Gupta et al., 2019). In students, scholastic activities may need to be limited or adapted while symptoms persist (McCrory et al., 2013), along with treatment of sleep disorders, headaches, vestibular-ocular issues, and neck pain (Gupta et al., 2019).

Concussion symptoms have also been categorized into profiles/domains: vestibular, ocular, anxiety/mood, cervical, post-traumatic migraine, and cognitive/fatigue (Collins, 2019; Gupta et al., 2019). Concussion symptoms often overlap these profiles/domains and can magnify other risk factors such as ADHD, stress, motion sickness, learning disabilities, migraines, depression, sleep problems, and vision problems (Collins, 2019). Vision problems may not simply be seeing double or fuzzy images. These problems may also include eye strain, headache, light sensitivity, dizziness and nausea, reduced visual memory, visual motion sensitivity, and uncomfortable feelings in crowded settings (Miller, 2019). For recovery, Collins (2019) suggested a match between active treatments to profiles. These active treatments involve exercise in all profiles except ocular. Moreover, symptoms in the profiles/domains can often have a negative impact on returning to sports and school. Each symptom needs to be addressed and each domain involvement needs to be recognized and treated (Gupta et al., 2019). Because

patients present different symptoms and have different risk factors, they must be managed differently, especially if there are co-occurring profiles. These co-occurring profiles include ocular -> cognitive/fatigue; migraine -> vestibular; vestibular -> migraine; and anxiety/mood -> migraine (Collins, 2019).

Knowledge about concussions. Student athletes suffering from SRCs may recognize the symptoms but refuse to admit they have them. This reluctance may be a direct result of their knowledge and attitude about the seriousness of concussions, and they may have developed that knowledge/attitude through parents, coaches, and teachers who are undereducated on the topic of concussions.

According to the 2010 National Poll on Children's Health, of parents whose children (12 to 17 years old) played sports, only 8% reported having heard a lot about the risks of repeated concussions, while 36% reported not having heard/read anything about concussions (C.S. Mott Children's Hospital, 2010). Regarding safety, Asante-Bio (2011) found that while many parents have some knowledge about concussions and concussion safety, mothers are more likely to push for concussion safety, while fathers tend to have more general knowledge about concussions. The student athlete whose parent (gender not being a consideration) has more knowledge and a positive attitude about the seriousness of concussions will be more likely to view safety policies as necessary (Asante-Bio, 2011).

Coaches' overall knowledge about concussions is also lacking. In a study of 126 coaches by O'Donoghue, Onate, Van Lunen, and Peterson (2009), the researchers found that 84% demonstrated only a moderate knowledge of SRCs. These coaches knew how to recognize concussions, but they did not necessarily understand management of concussions. Those coaches who attended a workshop on management of SRCs benefited from information

presented. The workshop provided information on prevention, recognition, and management of concussions. Through increased awareness, coaches could then work with certified ATs to create policies for athletic teams.

Teacher knowledge is perhaps the most lacking. McCoy (2011), in a study on teacher knowledge and misconceptions on concussions, found that educators often underestimate the impact concussions can have on students in the classroom, especially with learning new concepts, memory usage, and emotional control. Another study found that teachers may understand symptoms, but they do not truly understand what the student athlete needs in terms of modifications within the classroom and the unique challenges concussion management creates (Duff & Adamczyk, 2009).

Concussion Management in Schools

Williams, Welch, Weber, Parsons, and Valovich McLeod (2014) highlighted the potential for an increase in the rate of sports injuries due to an increase in sports participation. As of 2012, approximately 9-13% of injuries sustained in high school sports were SRCs, and for every 10,000 athlete exposures, roughly 2.5 concussions occurred (Marar et al., 2012). In a small study of 120 high school football players, Kilgore (2013) found that although 70% of these student athletes had been previously taught about concussions, they were still unwilling to report symptoms experienced during practice or games. Ninety-one percent of those surveyed believed that playing with a concussion is permissible. Due to such beliefs, many injuries have gone unreported, causing statistical reports to likely underrepresent the frequency of SRCs (Guskiewicz & Valovich McLeod, 2011).

The risk of concussions in the school-aged population is greatest in the 15- to 19-year-old age group, and males are at higher risk than females (Duff & Adamczyk, 2009), even though

girls have a higher concussion rate (Bergeron, 2010). Researchers have postulated that this increased risk in the school-aged group is due to the immature brain being more vulnerable to injury (Adirim, 2007; Guskiewicz & Valovich McLeod, 2011). Sim, Terryberry-Spohr, and Wilson (2008) concluded that because of the immaturity of the brain, high school athletes demonstrate prolonged memory dysfunction compared to college athletes. In general, 80-90% of concussion symptoms are resolved within 7-10 days. However, due to their developing brains being more susceptible to injury (Raikes & Smart, 2015), children and adolescents may experience symptoms for a longer period—around three weeks (McAvoy, 2012; McCrory et al., 2013). Some concussed student athletes may even have symptoms that persist months after the initial injury (Sim et al., 2008). Guskiewicz and Valovich McLeod (2011) also noted that evidence exists showing children and adolescents take longer to recover, which underscores the need for a conservative approach to management and return to physical and cognitive activities.

In the first days of a concussion, physical and cognitive rest is the standard care. Logan (2009) explained that this rest is to help athletes return to all aspects of daily life, not just play. Cognitive rest includes modified assignments and no test taking, including standardized tests. True achievement may not be noted during this rest period. Majerske et al. (2008) found that the post-concussive activity level, age, and sex of student athletes affected neurocognitive performance, especially with younger adolescents showing deficits in verbal and visual memory.

The Second International Conference on Concussion in Sport in Prague formally recommended physical rest during the first several days after a concussive event (Brown et al., 2014). The Fourth Consensus Statement recommended both physical and cognitive rest immediately after a concussion (McCrory et al., 2013). The CDC (2013) has recommended cognitive and physical rest for the initial 24-48 hours following a concussion; however, there are

no randomized studies to support this statement. Researchers (Taubman, Rosen, McHugh, Grady, & Elci, 2016) have found a significant relationship between immediate cognitive and physical rest, quicker recovery, and decreased risk of prolonged symptomatic recovery. Management of concussions at home may include blocking time with certain activities. These blocks include quiet time with no screen time, school work, and noncontact free time that the student can enjoy (this could include screen time). As symptoms begin to abate, allowed time for school work and free time may increase (McCrory et al., 2017). Patients with delayed cognitive and physical rest have a higher risk of prolonged recovery. Reasons for delayed rest include the following: (a) patient is unaware he or she has sustained a concussion; (b) patient ignores symptoms so he or she does not miss school or athletic events; and (c) patient has received misinformation from his or her healthcare provider prescribing rest for only 1 or 2 days and then being cleared to return to activity with no regard to being symptomatic or not. Once cleared by a qualified healthcare provider, the student athlete can begin a graduated RTP protocol (Howell et al., 2016).

For athletes who have sustained previous concussions, conflicting research shows cognitive discrepancies may or may not have cumulative effects. Moser and Schatz (2001) observed that enduring effects appeared on general cognitive measures and attention. Guskiewicz and Mihalik (2010) also concluded that previous concussions increased the risk of future concussions and that outcomes after a concussion were influenced by age and learning disabilities. However, Iverson et al. (2006), who examined athletes using the ImPACT concussion instrument, found a very small, undetectable cumulative effect.

Researchers agree that students returning to school after a concussion need extra support (McGrath, 2010; Zirkel & Brown, 2015). Creating a team of professionals who have the

athlete's best interests in mind and who will work together to mesh academic and athletic variables into an RTP and RTL protocol designed specifically for that student is ideal. To help with academics, the student's needs within the classroom must be considered, and the school nurse should work in conjunction with the AT to observe and track symptoms to help teachers modify the classroom experience for the student (McGrath, 2010; Rains & Robinson, 2010). School nurses need to be cognizant of concussion symptoms and understand when post-concussion symptoms reach a level that affects classroom performance (Zirkel & Brown, 2015). McAvoy (2012) suggested that a student athlete is not truly symptom-free if he or she is receiving concussion-related modifications.

RTP recommendations. In today's athletic departments, diagnosing concussions and creating an RTP protocol is based on monitoring the symptoms and performing cognitive assessment with either a paper-pencil test or computerized test (Reider, 2009). Adirim (2007) stated that diagnosis relies on clinical symptoms and/or self-reporting. Once a concussion is diagnosed (especially in the emergency department), follow-up must occur.

Currently, physicians recommend restrictions on mental and physical activity following an SRC. The 2008 consensus RTP guidance provided a very specific six-step protocol for increasing a patient's level of physical activity: (1) no activity, (2) light aerobic exercise, (3) sport-specific exercise, (4) noncontact training drills, (5) full-contact practice, and (6) RTP (McCrory et al., 2009). As illustrated in Table 2, the CDC (2015b) has also recommended a step-by-step approach to RTP.

Table 2

Step-by-Step Approach to RTP

Step	Activity (1 step/day maximum)[a]
1	Back to school—Even if only on adapted schedule, student must be back in school before beginning RTP protocol.
2	Light aerobic activity—May only be walking the halls or a lap or two. Goal is to increase heart rate.
3	Moderate activity—Examples include riding a bike, jogging, walking. Goal is to increase heart rate as body is also moving more.
4	Heavy, noncontact activity—Examples include running/sprinting, weight lifting, sport-specific (but noncontact) drills. Goal is to increase heart rate as athlete begins to complete sport-specific movements.
5	Practice with full contact.
6	Return to competition.

Note. Source: CDC (2015b).
[a] If no symptoms: move to next step next day; symptoms: delay this step another day. This will be rule for protocol.

With a step-wise approach to RTP, the chance for recurrence of symptoms is often eliminated (O'Brien, Howell, Pepin, & Meehan, 2017). Each step is to be completed only if the athlete presents as asymptomatic and continues to be asymptomatic through workout. With high school student athletes, this may take up to 30 days, especially if previously concussed (D'Lauro et al., 2018; O'Brien et al., 2017).

In many states, before concussed athletes can RTP, they must follow RTP guidelines designed to keep the student athlete safe by requiring a minimum of seven days of noncontact after symptoms have subsided. However, neurocognitive deficits are often present for longer durations in younger athletes. While memory deficits have been seen in high school football and

soccer players up to seven days after a concussion (McGuire & McCambridge, 2011), some athletes experience neurocognitive deficits lasting months and even years (Johnson & Syd, 2012). Bearing in mind these neurocognitive deficits, and in conjunction with returning to play, concussed athletes must also be given support to RTL successfully.

RTL recommendations. At the high school level, a doctor's note is typically given to all teachers indicating the diagnosis of a concussion. This diagnosis presents problems when those not in the medical profession view concussions as short-term and use phrases such as *ding* or *bell ringer*. Moreover, students often do not exhibit visible signs and are frequently considered not injured as a result (Lee & Perriello, 2010). For the classroom teacher, the lack of physical signs and symptoms makes it difficult to fully understand the severity of the injury. Many times, the only symptoms a teacher may witness are factors affecting learning, such as aversion to bright lights, smartboards, and loud noises (Graff & Caperell, 2016). Educators must be cognizant that student athletes suffering from mTBIs may need modifications within the classroom (McGrath, 2010).

According to Zirkel and Brown (2015), the goal during recovery of concussions is to reduce cognitive demands that exacerbate concussion symptoms through deliberate RTL protocol; a student's daily schedule should be minimally disrupted by balancing school responsibilities with academic adjustments so as not to exacerbate symptoms (Duquette, 2019). The return to school protocol must support recovery while preventing a student from falling too far behind. However, accommodations should be created to minimize the effects of concussion symptoms upon learning. Returning to school too early or without proper adjustments can lead to a decrease in school performance, increase in symptoms, and increase in frustration and anxiety (Duquette, 2019). RTL protocols should be implemented through a team-based approach

with accommodations that can and will be adjusted based upon symptom reoccurrence. School districts should provide meaningful and relevant PD, with the understanding of concussions and classroom management as the cornerstone of such instruction. During concussion recovery, each day a child's learning is affected by concussion symptoms is a day that should be governed by protocols that have the child's recovery in mind.

Concussed students may need modifications within their classes due to clinical symptoms such as mood disturbances, sleep disturbances, and attention and concentration issues that may cause difficulty with test taking and keeping up with assignments (Bergeron, 2010; McLeod & Register-Mihalik, 2011). According to Dachtyl and Morales (2017), the delayed effects of concussions may include symptoms such as headaches, nausea, dizziness, balance problems, light sensitivity, sound sensitivity, and neck pain. Sleep may also be affected in terms of drowsiness, troubled sleep, too much sleep, or too little sleep. Emotional disturbances may vary—from being very emotional to showing little or no emotion; in general, the emotions displayed are atypical for the concussed. Cognitively, disturbances may include trouble concentrating, recall difficulty, slower processing, and attention difficulties. The State University of New York Upstate Medical University (n.d.) noted several examples of how concussion symptoms manifest in students in the classroom: getting tired, being bothered by fluorescent lights, being easily distracted, being unable to recall facts, and taking longer to complete tasks. Each of these symptoms plays a part in the academic performance of the student. For all concussions, the literature is consistent in modification suggestions: allowing students extended time, a quiet room, preferential seating, and the option to wear sunglasses (Dreer, Crowley, Cash, O'Neill, & Cox, 2017; Duff & Adamczyk, 2009; Gillooly, 2016).

Because concussions typically resolve within three weeks of injury, most adjustments to the school environment can be made in the individual classroom setting without the need for a formalized written plan such as a 504 plan or individualized education plan (IEP). School personnel should be made aware that fluorescent lighting, loud noises, and even simply concentrating on a task can elicit headaches in concussed students, so they should be allowed to take breaks in a quiet area when needed. Dizziness and lightheadedness are also common and can be provoked by standing quickly, walking in a crowd, or even viewing motion on a screen or in person. Students with a concussion should be allowed to close their eyes or put their heads down on the desk, if necessary, and should be permitted to avoid crowded hallways and to move slowly from one place to another (Gillooly, 2016; Moon, 2013). Common vision symptoms include blurred or double vision. Other frequent symptoms and practical solutions include the following:

- Sensitivity to light—allow students to wear a hat with a brim or sunglasses, turn off or dim room lights, dim video screens, or forgo movies.
- Sensitivity to noise—allow students to be excused from the lunchroom, recess, shop, or other noisy activities and areas.
- Trouble concentrating, remembering, absorbing new material, and focusing in the classroom—postpone testing, especially standardized testing, until after the student has recovered from the concussion (Moon, 2013).

Learning to read symptoms of a concussion enables a student athlete and teacher to regulate the return to learning. McGrath (n.d.) recommended that due to metabolic changes that occur as a result of a brain injury, monitoring symptoms is a good measure of recovery. If an activity exacerbates or causes certain symptoms to return, the activity should be stopped until no

symptoms are observable, which is why cognitive rest is so important. This type of rest requires a student athlete to refrain from cognitively demanding activities such as reading, working on the computer, and writing long assignments (Logan, 2009).

Carson et al. (2014) noted that the cognitive effects of concussions include decreased learning and memory, decreased attention, slowed processing speed, and decreased reaction time. Anxiety and nervousness, which may be a direct result of a concussion but may also be a secondary result of a student's concern about falling behind in school, may further impair cognitive function. A student who is concerned about keeping up with his or her studies may not comply with advice regarding cognitive rest and may exacerbate symptoms by persisting with school attendance and completing assignments. Communication among academic personnel, as well as education of all personnel, is vital to ensure that all parties are aware of the student's progress and the accommodations necessary to facilitate the student's recovery (Carson et al., 2014).

Recommendations for academic adjustments post-injury are similar to an educational 504 plan. These suggestions include academic support, excused absences, rest periods, extensions on assignments, postponement of tests, extended time for assignments and tests, accommodations for light/noise sensitivity, excused absences from sports/physical education classes, a reader for assignments/tests, use of a note taker, and preferential seating (Duff & Adamczyk, 2009; McGrath, n.d., 2010). Master et al. (2012) suggested that a student recovering from a concussion be monitored by having him or her complete homework at home until no symptoms occur before allowing him or her to return to schoolwork in the classroom. Master et al. described this method as beneficial based on the comfort and controlled environment found in the home as opposed to the stringent nature of the classroom. With some students, the reentry to school may

take several days to weeks. During this time, communication with the teachers, nurses, and principals is important to keep the student from falling too far behind.

Baker et al. (2014) also posed guiding principles for returning to the classroom following an SRC. For instance, reinjury and overexertion during recovery should be avoided. In addition, after the initial diagnosis has been made, a limited period of complete rest (physical and mental) is recommended. This period of mental (cognitive) rest is designed to help shorten recovery time and reduce risk for persistent symptoms. As symptoms improve, increasing cognitive activity while staying below the individual's symptom threshold is recommended to maintain academic progress and concussion recovery. Activities should be paced by limiting cognitive exertion and including rest breaks before reaching the symptom threshold. By recognizing that a student's cognitive function—including slowed processing, trouble concentrating, memory problems, and limited mental stamina—may be impaired, educators can alleviate the anxiety many students feel upon returning to learning after a concussion (Baker et al., 2014). It is important to note that in a recent study, the complete physical rest recommended by Baker et al. (2014) was replaced with graded physical exertion to raise the heart rate but not exacerbate symptoms (Broglio, Collins, Williams, Mucha, & Kontos, 2015). Table 3 lists specific classroom scenarios demonstrating possible concussion symptoms warranting student accommodations. The symptom being displayed and appropriate academic adjustments are included.

Table 3

Concussion Symptoms and Academic Adjustments

Scenario	Concussion symptom	Academic adjustment
Student sitting in class covers eyes and lays down head.	Sensitivity to light and noise	• Allow student to wear sunglasses or lower lights. • Allow student to move to quieter area.
After second block, student comes to classes with heavy eyes and obvious fatigue.	Fatigue	• Change daily schedule: allow student to come in late (after lunch) and leave early (at lunch) on alternate days so as not to miss too many classes.
Student complains of headache and feels he/she cannot see well.	Vision problems and headaches	• Allow student to take breaks during longer classes or heavy curricular days.
Student sits in class and states, "I just feel in a fog most days, and when I sit to read my English assignment, I have to reread the section at least three times because I forget what I read."	Trouble with concentration, memory, feeling "in a fog" and "slowed down"	• Allow extra time on reading assignments. • Give student a copy of notes. • Allow extra time or modify other assignments.
Student sits for end-of-course exam/SAT/ACT.	NA	• Student should not take any high-stake test during symptomatic time.

Note. Sources: Duff and Adamczyk (2009); McGrath (n.d., 2010); Sports Concussion Institute (n.d.).

Managing the negative effects of a concussion that impact a child's ability to learn in school requires a cooperative approach between the child, parents, teachers, and medical staff. Athletic trainers are often the most qualified in the school to manage the RTL process. They are

not, however, the most qualified in terms of providing services; those with special education training can meet this need (Dachtyl & Morales, 2017). Kasamatsu, Cleary, Bennett, Howard, and McLeod (2016) showed that 44% of ATs reported having a written RTL plan for concussed students; however, 49.3% of ATs indicated that they never/seldom talked with teachers following a student's concussion diagnosis. Participants who did not recommend a gradual return to learning most often attributed it to the lack of school professionals' understanding of concussions, lack of school support, and limited time to monitor academic progress. Although most ATs reported that they recommended a gradual return to learning after a concussion, more than half did not include a description of a gradual RTL protocol within the school/district written concussion management plan. It was beyond the scope of the study to investigate the underpinnings of school professionals' concussion knowledge; however, a pattern emerged from ATs' description of school professionals' lack of knowledge or understanding of the connection between concussions and academic concerns. The lack of support for academic accommodations may stem from educators not understanding that concussions are a type of hidden injury—one not seen with the naked eye.

Heightened awareness of this invisible injury has led to legislative initiatives, educational policies, and sports rule changes to provide better safety measures for athletes. Programs like the CDC's Heads Up, Colorado's Reduce, Educate, Accommodate, Pace (REAP), and Brain 101 could be the catalysts to bridge the gap between health and academic supports provided after a concussion. Basic concussion education can be provided to school professionals in the form of an online tutorial or fact sheet presented at a monthly faculty meeting (Halstead et al., 2013). However, little is known about whether schools have a formalized concussion management plan,

the inclusion of a gradual RTL protocol within the plan, the effectiveness of concussion education, or if teachers support RTL protocol implementation in the classroom.

Concussion Education for Teachers

Valovich McLeod, Schwartz, and Bay (2007) and Providenza (2009) noted that education on concussions is paramount to helping student athletes recover and not suffer long-term problems. Because a concussed student athlete often shows no outward signs of being injured, many educators (teachers and administrators), along with the student's peers, may have difficulty understanding the injury (Halstead et al., 2013). As students return to the classroom after a concussion, teachers and administrators must understand the impact concussions have on the daily academic requirements students face. Best practice suggests that being proactive will benefit those students returning to class after a concussion (Dachtyl & Morales, 2017).

Most research and education initiatives regarding SRCs have been targeted toward athletes, parents, coaches, and healthcare providers (Halstead et al., 2013). Although all 50 states have some form of concussion management and education legislation (Blackwell, Robinson, Proctor, & Taylor, 2016), one group of critical educational stakeholders is often left out—teachers. In fact, little research pertains to concussion education for teachers, and although educators have increased their knowledge of concussions, more education is needed (Graff & Caperell, 2016; Katz-DeLong, 2014).

Teachers often instruct students who have suffered SRCs during athletic and leisure activities, and teacher concussion knowledge and knowledge of appropriate academic accommodations can affect student concussion outcomes (Dreer et al., 2017). For example, if the teacher is uneducated about concussions, he or she may perceive affected students as being lazy or uncooperative, when in fact, they cannot function at full cognitive capacity due to the

injury (Piebes et al., 2009). Even when teachers are aware of a concussion, they are often unsure of how it affects classroom behavior, their academic responsibility to assist the student, and whether academic adjustments can benefit the concussed student. Barriers to implementation of academic adjustments include identifying appropriate accommodation to address specific signs or symptoms, communication with parents and school professionals, and management of individual implementation of accommodations (Sarmiento, Donnell, Bell, & Hoffman, 2018). Although school professionals may know and understand signs and symptoms, they also need to be made aware of students who have concussions and their need for academic adjustments in a timely manner (Sarmiento et al., 2018). Concussion education for all parties involved in a student's academic life is important for helping students maintain academic performance after an SRC, and modifications in the classroom will enable educators to support student athletes (Halstead et al., 2013). Large-scale PD, including online tutorials, is one way to help educate all stakeholders (Halstead et al., 2013). By providing meaningful and relevant PD based on an understanding of concussions and classroom management as the cornerstone of concussion instruction, school districts can implement a team-based approach to arm teachers with necessary tools to help students based upon individual symptoms (Zirkel & Brown, 2015).

Studies focused on measuring school nurse and AT knowledge of academic accommodations for student athletes found that academic accommodations are warranted within an RTL protocol (Weber et al., 2015; Williams et al., 2015). One of the few studies that has focused on teacher education (Kasamatsu et al., 2017b) noted that since teachers are stakeholders in a student's successful return to the classroom after a concussion, concussion education for teachers can enable them to recognize the academic adjustments needed. Moreover, studies by Dreer et al. (2017) and Kasamatsu et al. (2017b) reported that investigating teacher knowledge of

concussions and providing formal education to teachers was associated with an increased knowledge of appropriate accommodations needed to support concussed student athletes. Those same studies found that without any PD, teachers can recognize the more common concussion symptoms and management strategies; however, in those studies, teachers demonstrated a desire for more training and information (Dreer et al., 2017), and teachers who had noticed a decline in academic performance were more inclined to recommend academic accommodations (Kasamatsu et al., 2017b).

Researchers agree that education of all stakeholders will benefit students as they recover from a concussion (Halstead et al., 2013). Materials such as CDC's (n.d.) *Returning to School After a Concussion: A Fact Sheet for School Professionals* and the *Concussion Management and Return to Learn* video (Evans, 2014) have been developed to provide such training. Nonetheless, more research is needed to determine whether resources developed to specifically aid educators in RTL management influence teacher knowledge of concussions and appropriate academic adjustments for concussed students; if such resources can be proven effective, schools will be more likely to utilize them for PD.

Summary

This chapter included a discussion of the theoretical framework often used for PD—constructivist theory—which served as a basis for this study. Piaget's (1954) constructivism theory of cognition is often used as a theoretical framework for PD opportunities because it allows educators to construct new knowledge based on prior knowledge. This prior knowledge becomes the backdrop used to create new understandings. Through PD, teachers can use constructivist ideals to help prepare them to support a student who has been diagnosed with an SRC. The chapter also contained a review of the literature related to concussions, specifically as

it applies to student athletes. Topics covered included the definition, pathology, signs and symptoms, and knowledge of a concussion; classroom management of SRCs, including RTP and RTL recommendations; and concussion-related training for teachers. As discussed, there are currently no clear RTL guidelines for student athletes who have sustained a concussion. Further research is needed to determine how to best implement a management plan for post-concussion student athletes. Along with RTP progression, it is imperative for the student athlete to follow an RTL protocol, including accommodations in academics after an SRC (Williams et al., 2014). A lack of clear protocols can result in varied approaches and attitudes toward the classroom management of concussions by educators.

Researchers (e.g., Duff & Adamczyk, 2009; Halstead et al., 2013; McGrath, n.d., 2010) have suggested modifications for the classroom and noted the importance of educating teachers on implementing those modifications. However, the effectiveness of these suggestions has not been studied. More training of teachers on the topic of concussions and RTL protocols, as well as follow-up research on training effectiveness, is needed. This study attempted to address this need by assessing the effectiveness of concussion education as part of PD for classroom teachers. The methods for this proposed study are presented in Chapter 3.

CHAPTER THREE: METHODS

Overview

The purpose of this applied study was to examine the effect of concussion education PD on classroom teachers' knowledge of concussions in general and the appropriate academic adjustments for students who have an SRC. This chapter covers the quantitative and qualitative methods used to complete this study. Topics include study design, research questions, participants and setting, procedures, and data analysis.

Design

The researcher used a mixed methods research design for this applied study. The mixed methods design had the potential to provide a better understanding of the problem of teacher knowledge of concussion symptoms and academic adjustments. Mixed methods was chosen as the preferred design to gain better insight into not only teachers' knowledge of concussion symptoms and necessary academic adjustments but also which PD activities teachers may find beneficial in helping to increase such knowledge. Closed-ended data in the form of pretest and posttest questions were used for the quantitative portion of the study, while open-ended interview questions were used to gather data for the qualitative portion, following Creswell and Creswell (2018).

For quantitative measurements, a quasi-experimental, pretest-posttest control group research design was used. Gall, Gall, and Borg (2007) noted that if a study can be conducted with a single group design, a control group design will be more fitting since it incorporates two groups, with one designated as a control group. Gall et al. further explained that if there are extraneous variables that bring about change in the pretest and posttest, they will be seen in the control group since posttest changes in the experimental group (beyond any change seen in the

control group) will allow the researcher to attribute changes to the treatment. This design was chosen to provide a strong basis for inferring a causal relationship between PD provided and teacher knowledge of concussions and appropriate academic adjustments needed (Indiana University Bloomington, n.d.).

In the pretest-posttest control group design, the experimental and control groups received identical experiences except for the treatment given to the experimental group, as suggested by Gall et al. (2007). Through this design, changes between the pretest and posttest were analyzed to determine if the change was brought about by the treatment. Gall et al. indicated that if the pretest-posttest control group method is performed correctly, all threats to internal validity—including history, maturation, testing, instrumentation, statistical regression, differential selection, experimental mortality, and selection-maturation interaction—will be controlled and threats to external validity will be minimized.

Teachers participating in the study were assigned to random groups to help increase equivalence between groups (Gall et al., 2007). Moreover, random assignments allowed each participant to have an equal chance of being in the treatment group. This process ensured uniformity between the different groups (control versus treatment; Gall et al., 2007). Professional development presented to teachers was the independent variable of this study, while teacher knowledge of concussions in general and knowledge of academic adjustments used for concussed student athletes were the dependent variables.

For the qualitative measurements, an explanatory sequential design was used. This step was completed after quantitative measures were analyzed. Explanatory sequential design was chosen because both quantitative and qualitative data were used in separate instances and at different times. Quantitative data were insignificant; therefore, qualitative data were used to

further investigate the problem and help determine future research, as suggested by Creswell and Creswell (2018). The participating teachers were interviewed about their knowledge of concussion symptoms and academic adjustments for concussed athletes. Each question was designed to allow teachers to express their opinions regarding concussion education and activities that may benefit them. Upon completion of interviews, transcripts were coded for themes.

Research Questions

Central Question: How can teachers better understand SRC symptoms and academic adjustments needed by concussed students.

Sub-question 1: What activities need to be offered to help teachers better understand symptoms and implement academic adjustments?

Sub-question 2: What resources need to be utilized?

Sub-question 3: How can training influence teacher strategies with concussed students?

Participants and Setting

The participants for the quantitative pretest-posttest control group portion of the study were drawn from a convenience sample pool of secondary school teachers in a southern state. Superintendents from each local educational agency were contacted via email. Superintendents either granted approval for their teachers to be invited, gave permission for the researcher to contact the local educational agency's human resources, or denied approval. If approval was granted for the researcher to contact human resources, then the researcher did so and asked for a list of principals to contact. The principals were then contacted and asked to forward an invitation to participate to classroom teachers. Participants were invited during spring/summer 2018 and were certified classroom teachers within the secondary school setting. Selection for

this study did not depend upon age, ethnicity, or gender. The sample size was $N = 33$, with a control group ($n = 13$) and experimental group ($n = 20$). Due to unexpected drops, all teachers did not take both the pretest and posttest; therefore, final sample sizes included control pretest ($n = 6$) and control posttest ($n = 7$) along with experimental pretest ($n = 13$) and experimental posttest ($n = 7$). The sample consisted of teachers employed in urban ($n = 3$), suburban ($n = 2$), and rural ($n = 28$) school systems.

The sample used for this study was randomly assigned to either the control group (no PD) or the treatment group (exposed to the CDC's [n.d.] *Returning to School After a Concussion: A Fact Sheet for School Professionals* and Evans' [2014] *Concussion Management and Return to Learn* video). Random assignment was completed via a customized website that implemented the following protocol:

> Individuals are assigned to groups on a near-random basis which uses the millisecond the client machine loads the webpage as a seed for the random number generation. The site uses a simple modulus function to determine whether the random value is even or not, and places participants into groups based on the result. This value is stored as a cookie on the client machine for two weeks. The web server does not know this value until after the submission process, in which the participant enters the value so that the researcher can know which group they were in based on the number being even or odd. Participants are asked to provide the number on each survey, and the number is clearly made visible to them at the top of the web page that is generated on the client side using JavaScript. It is not expected that a client must complete both surveys in one sitting, but there is an expectation they will use the same device to complete the process (because cookies are stored on the client side and no identifiable information is ever stored on the server until

after a submission is complete). (Nathan Dyer, personal communication, March 18, 2018)

Since the website was customized for random assignment, it was coded to determine samples. The sample needed for analysis of covariance (ANCOVA), according to Gall et al. (2007), was at least 166 participants for a medium effect size, with a statistical power of 0.7 at the 0.05 alpha level. Once the study was closed, it was determined that the number of participants (33) was not large enough. An applied dissertation using a mixed methods design was then determined by the university as being the best fit for this study.

For the qualitative portion of the study, eight teachers were selected for follow-up interviews. The eight teachers chosen to participate in the interviews were from the researcher's school. During participant section, the researcher sought to keep gender equitable (four females and four males). Participants were not chosen based on subject matter taught (three science, one math, one special education, two technology/media, one computer science/technology). Those chosen for the interviews were emailed a link to the training video along with the informed consent document. They were asked to watch the video prior to being interviewed, even if they had watched it during the quantitative portion of the study. The goal was to ensure that all interviewees had viewed the video since some of them may have been part of the control group. Individual interviews were then held at a location within the school.

The Researcher's Role

In this applied study, a pretest-posttest quantitative design was used first, and then an explanatory sequential qualitative design was employed. The researcher selected eight teachers for the qualitative portion of the study. These teachers were chosen from the researcher's school. Each teacher chosen had been known by the researcher for at least 5 years. Six of the teachers

were classroom teachers (three male and three female), and the other two (one male, one female) were media/technology specialists. At this school, the researcher had been both a classroom teacher and the AT. Due to the proximity of the researcher to the participants, researcher bias could have become problematic. Many of the teachers interviewed had received information on specific students who had suffered from an SRC in the past. Interview questions were created to allow the participants an opportunity to express their own perceptions and understanding about concussion symptoms and academic adjustments, rather than the information the researcher may have presented in the past. These teachers were in direct contact with many of the same students in their respective subjects but may not have witnessed the same symptoms or known if any of the students were concussed. Questions were designed to be answered based upon teacher knowledge and not on specific students or student behaviors.

Procedures

This study was conducted using both quantitative and qualitative procedures. The researcher acquired approval through Liberty University's Institutional Review Board (IRB) via application for the use of human participants in the study (see Appendix A). Required permissions were secured from school superintendents of districts within the counties of the proposed educational region, which included 13 counties (see Appendix B). Once superintendent approval was granted, invitations were emailed to teachers in the educational district's high schools during the spring/summer of 2018 (see Appendix C). Within the email, those interested in participating were asked to read and complete an informed consent form (see Appendix D) prior to the start of the study.

Quantitative Data Collection Procedures

Quantitative data were collected using a survey. One survey instrument—the *Beliefs, Attitudes, and Knowledge of Pediatric Athletes with Concussion–Teacher Version* (BAKPAC-TEACH; Welch Bacon, Register-Mihalik, Kasamatsu, & Valovich McLeod, 2017)—was used in this study (see Appendix E). The purpose of this instrument is to measure the knowledge of concussions and knowledge of appropriate academic adjustments for concussed student athletes after teachers have completed PD. This instrument was adapted by researchers from a previously validated survey—the *Beliefs, Attitudes, and Knowledge Following Pediatric Athlete Concussions among Athletic Trainers Employed in the Secondary School Setting* (BAKPAC-AT)—created by Williams et al. (2015). BAKPAC-AT was designed to examine the beliefs, attitudes, and knowledge of athletic trainers due to the lack of such instruments (Williams et al., 2015). Questions from the National Sports Safety in Secondary Schools Benchmark study (Valovich McLeod et al., 2013) and information from content experts were used.

BAKPAC-AT consists of three sections: (a) concussion management and care, (b) concussion referral, and (c) academic accommodations. Demographic (gender, level of education, and school type) questions are also asked. BAKPAC-AT focuses on academic accommodations and includes 18 questions in various formats (binary [yes, no], multiple choice, open-ended, Likert scale; Williams et al., 2015). Each section includes questions on beliefs and attitudes of ATs, their perceived role, and the academic support of team members. Understanding of 504 and IEPs is also assessed (Williams et al., 2015). BAKPAC-AT was reviewed by three concussion experts: a neuropsychologist, a pediatric primary-care sports medicine physician, and a concussion researcher. They collectively reviewed the survey for content validity and comprehensiveness. Feedback was requested, and changes were made.

Once content was deemed valid, the instrument was tested for further content validity (Williams et al., 2015).

Along with the development of BAKPAC-AT, a school nurse version (BAKPAC-SN) was also developed (Weber et al., 2015). BAKPAC-SN contains four sections, including collaboration with ATs, concussion management and care practices, concussion referral, and academic accommodations (Weber et al., 2015). Content and face validity for the school nurse version was completed by the National Association of School Nurses (Weber et al., 2015).

The instrument to be used in this study (BAKPAC-TEACH) was piloted (with four items modified) by three teachers for comprehensiveness (Kasamatsu et al., 2017b). The finished instrument consists of four sections: (a) concussion knowledge, (b) communication with ATs and school nurses, (c) concussion referral and collaboration, and (d) academic accommodations. Each survey was disseminated to population sizes of 3,286 secondary school ATs, 1,246 school nurses, and 5,877 secondary school teachers. Importantly, BAKPAC-TEACH has already been used in different studies, specifically Ha, Kasamatsu, Valovich McLeod, Register-Mihalik, and Welch Bacon (2017) and Kasamatsu, Valovich McLeod, Register-Mihalik, and Welch Bacon (2017a). These two studies used the instrument to measure prior knowledge of ATs and teacher knowledge concerning protocol for students who have received a concussion.

The BAKPAC-TEACH instrument was used to gather data from secondary school teachers about their knowledge of concussions and knowledge of appropriate academic adjustments for student athletes with SRCs and includes 81 questions in various forms (as previously noted) developed to focus on specific areas of knowledge. Of the 81 questions, 40 are multiple choice; five are open-ended; four are true/false; and 32 are Likert-scale type, with values (depending on the question) of *not important/knowledgeable/confident at all*, *minimally*

important/knowledgeable/confident, *moderately important/knowledgeable/confident*, *extremely important/knowledgeable/confident*, and *strongly disagree, disagree, agree,* and *strongly agree*.

For scoring purposes (pretest and posttest), there are four sections, and each was scored differently. Section 1, Secondary School Teacher Concussion Knowledge, contains 17 questions with correct answers, and another 14 questions framed to assess confidence level. Section 2, Secondary School Teacher Collaboration, and Section 3, Secondary School Teacher Perceptions of Academic Accommodations, contain questions pertaining to communication and academic accommodations that were scored based upon the given Likert scale. Finally, Section 4, Secondary School Teacher Demographics, was scored based upon provided answers.

All participants were asked via email to complete the survey twice, both as a pretest and posttest, with no alternate forms used. The instrument took approximately 15 minutes to complete, and scoring was done by the researcher. Written permission to use the BAKPAC-TEACH survey was granted to the researcher by the lead author of the survey (see Appendix F).

A web interface was set up for the study (see Appendix G). This interface was specifically developed to house all needed materials (pretest, PD, and posttest) within the site itself. This process allowed for ease of navigation by participants. The link to this interface was part of the email invitation.

An anonymous ID number was generated for each participant completing the survey. This ID was needed for each test the participant completed; however, no personal information was collected unless the participant wished to be entered in a gift card drawing. When a potential participant decided to participate and submitted his or her informed consent form, he or she was directed to the pretest. All participants took the pretest. On the pretest screen, the participant recorded his or her ID number for test tracking. Once the pretest was completed and

submitted, the web interface randomly assigned participants to either the control or experimental group. Those assigned to the control group immediately took the posttest, their participation in the study was noted, and their session closed. Those assigned to the experimental group were directed to the PD section, beginning with the Evans (2014) video *Concussion Management and Return to Learn* (Appendix H). Once that video ended, the CDC's (n.d.) *Returning to School After a Concussion: A Fact Sheet for School Professionals* (Appendix I) opened. After the participant completed these two PD sessions, the posttest was administered. Once the posttest was submitted, the participant of the treatment group was thanked, and the session ended. Time to complete the entire study for participants was approximately 30 minutes for the control group and approximately 45 minutes for the experimental group.

Data (survey answers) from each participant were collected through the website after the study closed. Data were generated into a .csv file complete with ID numbers. These data were then uploaded into the Statistical Package for Social Sciences (SPSS) software; any coding was completed prior to SPSS upload.

Qualitative Data Collection Procedures

Qualitative data were collected through face-to-face semi-structured interviews in a location at the researcher's school. Interviews are the most common strategy for collecting qualitative data (Dicicco-Bloom & Crabtree, 2006; Jamshed, 2014). Each interview contained eight prewritten questions and one final question that asked, "Would you like to contribute anything I have not addressed?" The prewritten questions preserved teacher time and helped keep the interview focused (Jamshed, 2014). Interviews occurred after data from the quantitative portion of the study were analyzed. Participating teachers were asked to watch the same video used in the quantitative portion prior to being asked the interview questions. Interviews took

place in either the teacher's classroom or the media center. Each participant was asked to choose a fictitious name to be used during the interview and subsequent analysis. Interviews were recorded and transcribed using both a handheld recorder and dictation/transcription phone application (Otter, Version 2.0.5.331).

The semi-structured data collection occurred once during the spring semester, for a duration of about 30 minutes per interview, as suggested by Jamshed (2014). Through these interviews, participants helped make sense of the problem (Dicicco-Bloom & Crabtree, 2006) of PD for teachers by addressing Sub-questions 1-3 so that more effective and efficient concussion education can be developed.

The interview questions (see Appendix J) were as follows:

1. What professional development for concussions have you completed?
    a. *If participant answers they have completed professional development*: Do you feel you have had enough training to become familiar with symptoms of concussions?
    b. *If participant answers they have not completed professional development*: Do you feel you understand the symptoms of concussions?

Regarding Question 1, Halstead et al. (2013) noted that educators and peers may have difficulty recognizing the signs and symptoms of concussions. This question established whether the participants had in fact received any concussion education in the past. By analyzing the responses to this question, the study's central question could be answered because the more information teachers have, the better their understanding of concussions.

2. After completing professional development, do you think you understand the symptoms of concussions? Why or why not?

3. What kinds of professional development activities would help your understanding of concussions?

Question 2 and 3 helped answer Sub-questions 1 and 2 about activities to offer teachers and resources needed. Through concussion education, teachers may help student recovery and decrease long-term problems (Valovich McLeod et al., 2007; Providenza, 2009). Dachtyl and Morales (2017) suggested that instructors being proactive will benefit students returning to school after a concussion.

4. What kinds of professional development activities would help your understanding of the academic accommodations concussed students need?

Question 4 asked participants about academic accommodations and activities that would aid in their understanding of the needs of concussed students. This interview question also helped answer Sub-questions 1 and 2. The purpose of this question was to have teachers begin to think of the concussed athlete as a student and consider how to help him or her maintain academic performance. Halstead et al. (2013) and Zirkel and Brown (2015) discussed PD to help educators understand modifications that can be implemented into the school system. The responses to this question can guide future development of PD.

5. What will help you feel more comfortable in supporting students with concussions?

Question 5 is a personal question that measured the comfort level of instructors when dealing with concussed students. This question addressed all three sub-questions. Evans (2014) created the video used in the study as an online training for educators, which may help with teacher comfort level.

6. When you are told a student has a concussion, does this affect how you treat them in the classroom?

7. Does your treatment of them change if they are struggling?
8. Does your treatment of them change if they are honor students?

The final questions helped answer each sub-question probing how instructors treat concussed athletes in general and how treatment might change based upon previous level of student achievement. Kasamatsu et al. (2017a) determined that for students to be successful when they return from a concussion, teachers need to recognize the academic adjustments required.

Data Analysis

Quantitative Data Analysis Procedure

Collected quantitative data were analyzed using an ANCOVA, with the pretest scores serving as a covariate because this study contained two groups formed by the researcher, with only one group receiving treatment—PD—and the groups being randomly assigned using a random-assignment web interface specifically designed for the study, as outlined by Warner (2013).

SPSS was used to analyze the data. To ensure the covariate (pretest) was not influenced by the treatment, the covariate was measured prior to treatment (Warner, 2013). Two measures were assessed: increase of concussion knowledge and increase of knowledge of appropriate academic adjustments for concussed student athletes. The SPSS general linear model was used for the ANCOVA for effect size and parameter estimates, with a significance level of 0.05 and confidence interval of 95% (Warner, 2013).

The researcher used the ANCOVA to determine if there was a statistical difference between the independent variable (coded 1 = *no professional development/control*, 2 = *professional development in the form of video and CDC handout*) and the dependent variables:

knowledge of concussions and knowledge of appropriate academic adjustments for concussed student athletes. The ANCOVA was the most appropriate statistical technique for this study because it allowed the researcher to control for initial differences between groups prior to comparison of within-group and between-group variance, as discussed by Gall et al. (2007). As part of the ANCOVA, several steps were used to analyze the data: (1) calculation of pretest-posttest control group descriptive statistics, including mean scores for pretests and posttests for each group; (2) test for statistical significance in the mean scores (ANCOVA helped adjust the posttest scores between treatment and control groups); and (3) examination of adjusted scores through SPSS (Gall et al., 2007).

Assumption testing using SPSS included adjusted means, data screening through examination of histograms looking for normal shape and no extreme outliers, examination of scatter plots, evaluation of homogeneity of variance assumption, and assessment of degree to which the covariate is confounded using a one-way analysis of variance (ANOVA; Warner, 2013). The alpha level for this study was set at 0.05, with an effect size calculated by the difference in means of the pretest of the control group and treatment group divided by the standard deviation.

Qualitative Data Analysis Procedures

Parallel mixed analysis, the most-used analysis procedure in mixed methods study design, was used in this study, as delineated by Bickman and Rog (2009). Based on Creswell and Creswell's (2018) outline, the following steps were conducted. Interviews were transcribed to organize and prepare the data. The data were skimmed to identify general ideas and trends. Coding was then completed by categorizing and labeling sentences and phrases. Descriptions

and themes were generated (as discussed further in Chapter 4), with quotations from participants serving as evidence. Finally, a narrative was developed to explain the findings.

During coding, expected codes, such as training, examples, and strategies, were seen. Unanticipated codes also were generated and are discussed in Chapter 4. Coding was completed by hand since the participant pool that was interviewed (n = 8) was small.

Summary

Chapter 3 provided an explanation of procedures used in this applied study on concussion education for teachers. Quantitative data were taken from online surveys, and qualitative data were gathered from interviews. Each type of data was analyzed with the intent of informing the formulation of a plan for future PD that may benefit teachers and others working with student athletes.

CHAPTER FOUR: FINDINGS

Overview

This chapter presents the findings of this mixed methods study designed to better understand teachers' knowledge of concussions and appropriate academic adjustments. Data were collected over a period of 4 weeks and then analyzed based on the research questions presented in Chapter 1. A review of the descriptive statistics from the quantitative pretest-posttest control group portion of the study and statistical testing using ANCOVA is first presented in this chapter. The chapter then includes qualitative results based upon interviews conducted as part of the explanatory sequential study.

Results

A pretest-posttest control group study was performed to assess whether PD produced an increase in concussion symptom knowledge and academic accommodation knowledge on posttest surveys. The experimental group was given a PD fact sheet and video, while the control group received no intervention. Both groups were surveyed with an identical pretest and posttest. Participants were assigned randomly; however, the pretest for this study was used as a covariate. The dependent variables were the posttest scores on knowledge of concussion symptoms and knowledge of appropriate academic adjustments.

Semi-structured interviews were also conducted with teachers from the researcher's school. Responses to the interview questions revealed several themes that were not illuminated in the pretest/posttest portion of the study.

Central Question

The central question for this study was, "How can teachers better understand SRC symptoms and academic adjustments needed by concussed students?"

After having been administered PD in the form of an online video, participant teachers who were interviewed stated they did not understand the various symptoms of concussions until after watching the video. Based upon descriptive statistics and the one-way ANOVA, those who participated in the pretest/posttest also showed they may not have understood symptoms.

The researcher obtained data in this study from a custom-built website used to survey participants with a pretest, direct the experimental group to the intervention, and finally survey the participants again with a posttest. The website opened on September 1, 2018, and closed on October 15, 2018. Teachers from 25 local education agencies were invited to participate, and 33 surveys were completed. The descriptive statistics (Table 4) show the number of participants for each survey, posttest means (out of 42 for concussion symptom knowledge; out of 17 for academic adjustment knowledge), and the standard deviation.

Table 4

Descriptive Statistics

	CPrK	CPrAA	CPoK	CPoAA	ExpPrK	ExpPrAA	ExpPoK	ExpPoAA
N Valid	6	6	7	7	13	13	7	7
N Missing	7	7	6	6	0	0	6	6
Mean	33.67	11.50	32.29	9.71	34.08	9.46	31.14	8.14
Median	36.00	11.50	37.00	10.00	34.00	8.00	33.00	7.00
Mode	41	6[a]	11[a]	7[a]	40	17	39	0[a]
SD	8.066	3.728	10.579	3.988	6.934	5.995	9.191	5.984

[a] Multiple modes exist. The smallest value is shown.

Note. CPrK = control pretest knowledge of concussion symptoms, CPrAA = control pretest academic accommodations, CPoK = control posttest knowledge of concussion symptoms, CPoAA = control posttest academic accommodations, ExpPrK = experimental pretest knowledge of concussion symptoms, ExpPrAA = experimental pretest academic accommodations, ExpPoK = experimental posttest knowledge of concussion symptoms, ExpPoAA = experimental posttest academic accommodations, SD = standard deviation.

When the one-way ANOVA was completed for each pairing, the following was found: the control group posttest for knowledge of concussion symptoms showed strong evidence that

even with PD, there was no significant difference in knowledge of teachers: $F(4,1) = 34.13$, $p = .13$. Tables 5 through 8 display the results.

Table 5

Control Group Posttest Case Processing Summary Results for Concussion Symptom Knowledge

	Included		Excluded		Total	
	N	Percent	*N*	Percent	*N*	Percent
CPoK + CPrK	6	46.2%	7	53.8%	13	100.0%

Table 6

Control Group Posttest Report Results for Concussion Symptom Knowledge

CPoK CPrK	Mean	*N*	Std. deviation
23	11.00	1	-
25	26.00	1	-
33	41.00	1	-
39	38.00	1	-
41	35.50	2	2.121
Total	31.17	6	11.125

Table 7

Control Group Posttest ANOVA Results for Concussion Symptom Knowledge

		Sum of squares	*df*	Mean square	*F*	Sig.
CPoK+ CPrK	Between Groups (Combined)	614.333	4	153.583	34.130	.128
Within Groups		4.500	1	4.500		
Total		618.833	5			

Table 8

Control Group Posttest Measures of Association Results for Concussion Symptom Knowledge

	Eta	Eta squared
CPoK + CPrK	.996	.993

The control posttest on academic adjustment knowledge did not yield statistics due to too few cases.

The experimental group posttest knowledge of concussion symptom scores showed weak evidence that PD had a bearing on teacher knowledge: $F(5,1) = .36$, $p = .83$ (see Tables 9 through 12).

Table 9

Experimental Group Posttest Case Processing Summary Results for Concussion Symptom Knowledge

	Included		Excluded		Total	
	N	Percent	*N*	Percent	*N*	Percent
ExpPoK + ExpPrK	7	53.8%	6	46.2%	13	100.0%

Table 10

Experimental Group Posttest Report Results for Concussion Symptom Knowledge

ExpPoK ExpPrK	Mean	*N*	Std. deviation
25	33.00	1	-
28	39.00	1	-
34	18.00	1	-
38	39.00	1	-
40	31.50	2	13.435
41	26.00	1	-
Total	31.14	7	9.191

Table 11

Experimental Group Posttest ANOVA Results for Concussion Symptom Knowledge

		Sum of squares	*df*	Mean square	*F*	Sig.
ExpPoK + ExpPrK	Between Groups (Combined)	326.357	5	65.271	.362	.843
Within Groups		180.500	1	180.500		
Total		506.857	6			

Table 12

Experimental Group Posttest Measures of Association Results for Concussion Symptom Knowledge

	Eta	Eta squared
ExpPoK + ExpPrK	.802	.644

The experimental group posttest academic adjustment knowledge results also showed weak evidence that PD had a bearing on teacher knowledge: $F(5,1) = .51$, $p = .78$ (see Tables 13 through 16).

Table 13

Experimental Group Posttest Case Processing Summary Results for Academic Adjustment Knowledge

	Included		Excluded		Total	
	N	Percent	*N*	Percent	*N*	Percent
ExpPoAA + ExpPrAA	7	53.8%	6	46.2%	13	100.0%

Table 14

Experimental Group Posttest Report Results for Academic Adjustment Knowledge

ExpPoAA ExpPrAA	Mean	*N*	Std. deviation
0	8.00	1	-
6	9.50	2	7.778
8	7.00	1	-
13	.00	1	-
15	17.00	1	-
17	6.00	1	-
Total	8.14	7	5.984

Table 15

Experimental Group Posttest ANOVA Results for Academic Adjustment Knowledge

		Sum of squares	*df*	Mean square	*F*	Sig.
ExpPoAA + ExpPrAA	Between Groups (Combined)	154.357	5	30.871	.510	.780
Within Groups		60.500	1	60.500		
Total		214.857	6			

Table 16

Experimental Group Posttest Measures of Association Results for Academic Adjustment Knowledge

	Eta	Eta squared
ExpPoAA + ExpPrAA	.848	.718

The results of the one-way ANOVA were unexpected; however, during interviews, one participant reported, “Based on [the] video, [I] feel [I] better understand symptoms even though I have watched videos, [completed] readings, and taken quizzes.” This improvement seemed to be

a thread throughout the responses of those interviewed. Of the eight interviewees, only two reported ever having any type of concussion education training.

Each of the teachers interviewed was asked to watch the video previously used in the posttest portion of the study. No statistical testing was done on the video; however, comments such as "video [was] concise, appropriate [and the] flow was good" and "the video covered symptoms" and "was clear, concise and easy to follow—[and would be a] good video for teaching" indicated to the researcher that the video should be considered for future use.

Sub-Question 1

Sub-question 1 was, "What activities need to be offered to help teachers better understand symptoms and implement academic adjustments?" The semi-structured interviews conducted with teachers from the researcher's school revealed activities that would help teachers better understand symptoms of concussions and know when the implementation of academic adjustments is necessary. Themes uncovered in the qualitative analysis for Sub-question 1 were related to increasing PD opportunities and types of PD.

Increasing professional development. Increasing PD opportunities quickly became a theme for each of the teachers interviewed. Each year, the faculty must go over certain trainings before students return to the classroom. These teachers felt opportunities should be available "at beginning of [the] year, but also at other times of the year too" because "routine refreshing at certain times of the year [is necessary because] we tend to forget, and when you hear a kid throw up, a concussion is not your first thought." Other responses, such as "PD periodically, not a one-time deal" and "training throughout the year," indicated that more PD would allow these teachers further opportunities to hear up-to-date research on symptoms and academic adjustments.

Types of training needed/wanted. Teachers do not want to rely on simple handouts to learn more about concussions. One participant remarked, "Face-to-face training" with students and nurses so that teachers "hear about real experiences [since] each situation is different makes it more real." These trainings need to include examples "to make more personal," to help teachers understand "how someone gets a concussion," and to learn more about "how to help with specific examples of academic adjustments." Ideally, development should come "with instructions and activities" to create "solid instructional practices."

Sub-Question 2

Sub-question 2 was, "What resources would need to be utilized?" The semi-structured interviews highlighted resources teachers feel need to be utilized to further their understanding of concussion symptoms and academic adjustments. Themes uncovered in the qualitative analysis related to Sub-question 2 included two main types of resources to utilize: technological resources and human resources.

Technological resources. To help teachers become more comfortable with both symptoms of concussions and academic adjustments for the classroom, one interviewee suggested "example videos with strategies that are easy to use" in order to allow teachers to work at their own pace. Another suggested "examples with written action plans to have some information across the board" could be helpful. A different idea for trainings suggested by one participant was the "use of a computer screen [set] to show perception of what a concussed student sees to show why modifications are important."

Human resources. One participant said hearing from "former concussed students to get feedback on what helps and what does not help" would allow teachers to better understand how students feel about their recovery. Another mentioned that having "presentations with symptoms

acted out" would allow teachers to see "different scenarios" and "see scenarios face-to-face with students due to [the] unique nature of concussions." As one participant noted, utilizing these human resources would benefit teachers in knowing "what to look for and what to back off on as far as class modifications."

Sub-Question 3

Sub-question 3 was, "How can training influence teacher strategies with concussed students?" Those interviewed did not verbalize strategies for teachers of concussed students; instead, themes that were uncovered during the interviews involved student behaviors that may influence a teacher's treatment of a concussed student, such as student motivation, student coping skills, and how the teacher responds to the student.

When a student has been concussed and returns to school, sometimes a teacher may not immediately begin academic adjustments because, as one participant noted, "Some students don't want to tell [they have a concussion] especially if they do not want to miss school/sport event." However, once a teacher finds out a student needs accommodations, he or she will readily accommodate the student. One participant said she would "be more accommodating to students; if they were struggling before [I will] help them even more; if they are honors students . . . [the] same . . . whatever is asked I will try to help."

Interestingly, the interviews revealed that there may be some discrepancy with how teachers accommodate concussed student athletes. One interviewee confessed, "My behavior would be based on when [the] student received the concussion," and then reasoned, "If [they are] working to potential [I] understand, but if [they are] slackers due to their own actions [it would] be more difficult to modify." One felt that it "comes down to motivation versus medical needs for academic adjustments" and "treatment of struggling may be poor choices on their part. If I

know it is medical, then the struggle may be due to medical." Ultimately, all teachers interviewed noted that they would "give ample time for assignments," would "keep a closer eye in class, [by] watching for symptoms," and would recognize that students "may need remediation or even absences to get caught up."

The teachers interviewed were asked about differences in their treatment of honors students and struggling students, and coping skills were mentioned and became a final theme. One participant remarked, "Students have different coping mechanisms based on whether they are struggling or honors." Sometimes these differences are based upon those who have been previously identified as needing additional classroom modifications. As one participant noted,

> Differences will be based on academic adjustments needed but [I will try] to keep as normal as possible. If struggling [I may] need to hold an IEP meeting to decide what happened before [the concussion] and if an IEP puts a different spin. With honors [it] doesn't matter.

The inference behind this statement appears to be based upon the idea that, as one participant stated, "Honors [students], I assume, have better coping skills, but there may be danger in that they are not supported enough because they do have coping skills," which then begs a new question posed by another interviewed teacher: "Should students decide about academic adjustments, or should they be forced to use them?" These responses illustrate the subjective array of teacher treatment of students with concussions, providing strong evidence that adequate professional training on how to correctly recognize concussion symptoms and make appropriate academic adjustments for students is needed.

Discussion

Constructivism assists individuals in creating meaning of topics with available information. For those in education, it stands to reason that meaning can be accomplished through PD activities. Educators often attend conferences to become more knowledgeable in areas when working with students. One such topic in today's classroom is that of concussions.

The teachers in this applied study have not had as much PD on concussion education as they have had in other areas. To support teachers in the area of concussion education, a handout and video were used as PD. During the quantitative phase of this study, invitations were sent out to teachers to take part in the study. Due to poor return, an additional eight classroom teachers were interviewed as part of the qualitative portion. Only one indicated being a coach, and of the eight, only two had previous PD about concussions. For those interviewed, understanding symptoms and RTL ideas was accomplished through the use of Mike Evan's (2014) *Concussion Management and Return to Learn.*

In the quantitative stage, there were no questions pertaining to what activities would help teachers with concussion management and RTL protocols. Those participants in the qualitative stage suggested more training throughout the year through the use of videos, examples, discussions with students, and handouts. These training activities can establish PD beneficial to both teachers and concussed students.

In Chapter 2, concussion education was discussed as being lacking among classroom teachers. Although the data from the online surveys in this study were not significant, those interviewed agreed that more education can provide teachers with a better understanding of symptoms they may see in classrooms and can introduce appropriate academic adjustments teachers can make to benefit their students. This study extends previous research by highlighting

a lack of teacher education and lack of suitable PD. The researcher's state has mandated that each school system create PD on concussion education and classroom adjustments for their county, but in the researcher's county, this development includes only receiving a fact sheet. The teachers interviewed all suggested that more training needs to be done, and such training needs to be continuous and ongoing. Based on the lack of suitable teacher education in this county, the topic may need to be explored in other surrounding counties.

Summary

Through the use of mixed methods, the results of this study revealed that suitable teacher education about concussion symptoms and academic adjustments is lacking in several areas. Based on the quantitative survey results, teachers benefitted from PD—although the benefit proved minimal. The lack of quality knowledge on concussions and academic adjustments was substantiated in the qualitative interviews with teachers, who indicated that increased and varied PD using technological and human resources could make a difference in the current inconsistent teacher responses to concussed students.

CHAPTER FIVE: CONCLUSIONS

Overview

This final chapter explores the ramifications of the results of this study regarding the efficacy of PD on teacher knowledge of concussion symptoms and academic adjustments needed for concussed athletes within the scope of each research question. Implications for further use in education are addressed, and the researcher discusses the limitations of this study and recommendations for future research.

Restatement of the Problem

Teacher understanding of concussion symptoms and academic adjustments was studied to determine if increased PD would advance knowledge and benefit teachers in the classroom. The deficiency in teacher knowledge of concussion symptoms and academic adjustments was considered in this mixed methods design.

Proposed Solution

Based on information gathered during semi-structured interviews, PD that is intentionally planned throughout the year and incorporates different forms and utilizes various resources will allow teachers to become more comfortable with concussed students returning to the classroom. Creation of ongoing, relevant PD for all teachers will address the need for improved teacher education, as discussed in Chapter 2. By creating PD for particular sports to address how concussions may occur in that season's events, a review of symptoms, academic adjustments to use, scenarios from YouTube clips, and a student panel, teachers may begin to feel more comfortable when informed that a concussed student is in their classroom. During the interviews of teachers in this study, they all agreed the video used would benefit teachers with its concise, clear information. Teachers also suggested a panel of formerly concussed students. The panel

may include former students or students who have received concussions during the season (past or present) to describe the types of care given, the benefits they received from the care, and any negative results.

Proposing ongoing PD for teachers will address gaps in the literature pertaining to students returning to learning after a concussion. As part of the concussion management team, a teacher with knowledge of symptoms and academic adjustments can provide a concussed student needed academic support during recovery. With planned ongoing PD, teachers will also benefit from new research and best practices as specified by researchers in the field.

Resources Needed

For the suggested ongoing PD, resources needed include continued access to Mike Evan's (2014) video *Concussion Management and Return to Learn* and students willing to sit on a student panel of concussed and previously concussed athletes. University researchers in the area who are working with concussed student athletes may need to be contacted for continued review of best practices for academic adjustments and review of symptoms of concussions.

Funds Needed

A potential barrier to ongoing PD includes insufficient funding to develop the PD training. To create ongoing PD, grants can be written. Grants often require follow-up, and someone will need to be responsible for writing and implementing the grant. Monies may also be available through area hospitals. A school liaison might be needed to facilitate collaboration with hospitals or other outside organizations to write grants jointly. Goals of the school and hospitals would have to be aligned.

Roles and Responsibilities

Roles needed are minimal since the primary role can be filled by the researcher as a component of her extended research. To help teachers maximize their understanding of concussion symptoms and academic adjustments needed, it is recommended that continuing education credit be given to teachers who attend quarterly PD. This PD will need a point person well versed in concussions, such as the athletic trainer (if available) or school/county nurse. The PD would be given during each sporting season to include fall, winter, and spring sports. The PD will address one concern of teachers interviewed: knowledge on how concussions occur.

Timeline

This PD training could easily be implemented into a high school during the upcoming fall semester. However, superintendent and principal approval would be needed. In the researcher's home state, there are already governmental statutes in place requiring annual updates on concussion training.

The timeline includes the following steps: (1) identify and create a student panel during preseason; (2) contact parents for permission, if needed; (3) create scenarios from YouTube clips for each season showing athletes receiving concussions (universities may be able to help); and (4) create an agenda for each season to include YouTube clips, the video from this current study, a handout of symptoms, the academic adjustments for a teacher plan book (this may also be electronic), and a student panel for teachers to question about how they can help (will need a moderator).

Solution Implications

Developing ongoing PD for teachers will allow for better understanding of concussion symptoms and academic adjustments needed. However, teachers may not understand the

benefits of attending more training. Through better communication and the use of former students, some teachers may begin to see the benefit. In the state this research was performed, policy makers have initiated an annual review of concussion symptoms and RTL policies. By utilizing different training formats and up-to-date research, local districts may support ongoing PD.

Evaluation Plan

To evaluate the proposed solution and to allow teachers continuing education credit, an assessment for evaluation will need to be created. This evaluation will allow teachers and other stakeholders the opportunity to evaluate the benefits of PD. This evaluation can then be used to modify upcoming PD. The solutions proposed by this study will be ongoing so that up-to-date research is reflected in the training formats. As new information is released, the training will need to reflect these changes, which may require creating new videos, updating handouts, or eliminating information. As ongoing PD continues to increase teacher comfort in knowledge of symptoms and appropriate academic adjustments, determination of best practices to use for teachers will be considered. Ideas may include (a) considering lighting changes in the classroom to relieve headache symptoms; (b) making headache symptoms a part of a 504/IEP if there is a family history; (c) determining whether to change a student athlete's academic involvement if he or she presents, after concussion, with post-traumatic headache 504; and (d) increasing rural schools' involvement to help increase training for teachers, counselors, and nurses in mTBIs.

Summary

This mixed methods study was designed to determine the efficacy of PD on teacher knowledge of concussion symptoms and appropriate academic adjustments. Based primarily on findings revealed through the use of semi-structured interviews, it was determined that teacher

education should be continual throughout the school year rather than relying on handouts provided at the beginning of the year. Further, utilizing technology and human resources in the form of student input and use of up-to-date information to create ongoing PD may benefit all stakeholders: Teachers will become more comfortable with a concussed student, and students will be allowed to recover from their SRC with minimal interruption in the classroom, confident in the knowledge that their teacher understands their symptoms and knows how to adjust their academic environment.

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APPENDIX A: IRB APPLICATION

LIBERTY UNIVERSITY.
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APPLICATION FOR THE USE OF HUMAN RESEARCH PARTICIPANTS

IRB APPLICATION #: *(To be assigned by the IRB)*

I. APPLICATION INSTRUCTIONS

1. Complete each section of this form, using the gray form fields (use the tab key).
2. If you have questions, hover over the blue (?), or refer to the IRB Application Instructions for additional clarification.
3. Review the IRB Application Checklist.
4. Email the completed application, with the following supporting documents (as separate word documents) to irb@liberty.edu:
    a. Consent Forms, Permission Letters, Recruitment Materials
    b. Surveys, Questionnaires, Interview Questions, Focus Group Questions
5. If you plan to use a specific Liberty University department or population for your study, you will need to obtain permission from the appropriate department chair/dean. Submit documentation of permission (email or letter) to the IRB along with this application and check the indicated box below verifying that you have done so.
6. **Submit one signed copy of the signature page (available on the IRB website) to any of the following:**
    a. Email: As a scanned document to irb@liberty.edu
    b. Fax: 434-522-0506
    c. Mail: IRB 1971 University Blvd. Lynchburg, VA 24515
    d. In Person: Green Hall, Suite 1887
7. Once received, applications are processed on a first-come, first-served basis.
8. Preliminary review may take up to 3 weeks.
9. Most applications will require 3 sets of revisions.
10. The entire process may take between 1 and 2 months.
11. *We cannot accept applications in formats other than Microsoft Word. Please do not send us One Drive files, Pdfs, Google Docs, or Html applications.* ***Exception:*** *Signature pages, proprietary instruments, and documentation of permission may be submitted as pdfs.*

Note: Applications and supporting documents with the following problems will be returned immediately for revisions:

1. Grammar, spelling, or punctuation errors
2. Lack of professionalism
3. Lack of consistency or clarity
4. Incomplete applications

Failure to minimize these errors **will** cause delays in your processing time

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II. BASIC PROTOCOL INFORMATION

1. STUDY/THESIS/DISSERTATION TITLE (?)
Title: DOES PROFESSIONAL DEVELOPMENT INCREASE TEACHER KNOWLEDGE OF CONCUSSIONS AND KNOWLEDGE OF CLASSROOM SUPPORT OF CONCUSSED STUDENTS?

2. PRINCIPAL INVESTIGATOR & PROTOCOL INFORMATION (?)	
Principal Investigator *(person conducting the research):* Susan Teeter Hawkins	
Professional Title *(Student, Professor, etc.):* student	
School/Department *(School of Education, LUCOM, etc.):* School of Education	
Phone: 828-260-1832	LU Email: sthawkins2@liberty.edu
Check all that apply:	
☐ Faculty	☒ Online Graduate Student
☐ Staff	☐ Residential Undergraduate Student
☐ Residential Graduate Student	☐ Online Undergraduate Student
This research is for:	
☐ Class Project	☐ Master's Thesis
☐ Scholarly Project (DNP Program)	☒ Doctoral Dissertation
☐ Faculty Research	☐ Other:
If applicable, indicate whether you have defended and passed your dissertation proposal:	
☐ N/A ☐ No *(Provide your defense date):* ☒ Yes *(Proceed to Associated Personnel Information)*	

3. ASSOCIATED PERSONNEL INFORMATION (?)	
Co-Researcher(s):	
School/Department:	
Phone:	LU/Other Email:
Faculty Chair/Mentor(s): Dr. Vance Pickard	
School/Department: Department of Health Professions	
Phone: 434-592-3762	LU/Other Email: vpickard@liberty.edu
Non-Key Personnel *(Reader, Assistant, etc.):* Judy Sandlin	
School/Department: School or Education/Dept. of Sports Management	
Phone:	LU/Other Email:
Consultant(s) *(required for Ed.D Candidates)*: Dr. Lisa Foster	
School/Department: School of Education	
Phone: 434-582-7912	LU/Other Email: afoster@liberty.edu

4. USE OF LIBERTY UNIVERSITY PARTICIPANTS (?)	
Do you intend to use LU students, staff, or faculty as participants *OR* LU students, staff, or faculty data in your study? ☒ No *(Proceed to Funding Source)* ☐ Yes *(Complete the section below)*	
# of Participants/Data Sets:	**Department:**
Class(es)/Year(s):	**Department Chair:**

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Obtaining permission to utilize LU participants *(check the appropriate box below):*
SINGLE DEPARTMENT/GROUP: If you are including faculty, students, or staff from a single department or group, you must obtain permission from the appropriate Dean, Department Chair, or Coach and submit a signed letter or date/time stamped email to the IRB indicating approval to use students from that department or group. **You may submit your application without having obtained this permission**; however, the IRB will not approve your study until proof of permission has been received.
☐ I have obtained permission from the appropriate Dean/Department Chair/Coach, and attached the necessary documentation to this application.
☐ I have sought permission and will submit documentation to the IRB once it has been provided to me by the appropriate Dean/Department Chair/Coach.
MULTIPLE DEPARTMENTS/GROUPS: If you are including faculty, students, or staff from multiple departments or groups (i.e., all sophomores or LU Online), **the IRB will need to seek administrative approval on your behalf.**
☐ I am requesting that the IRB seek administrative approval on my behalf.

5. FUNDING SOURCE (?)
Is your research funded? ☒ No *(Proceed to Study Dates)* ☐ Yes *(Complete the section below)*
Grant Name/Funding Source/Number:
Funding Period (Month & Year):

6. STUDY DATES (?)
When will you perform your study? *(Approximate dates for collection/analysis):* **Start** *(Month/Year)*: June 2018 **Finish** *(Month/Year)*: July 2018

7. COMPLETION OF REQUIRED CITI RESEARCH ETHICS TRAINING (?)
List Course Name(s) *(Social and Behavioral Researchers, etc.)*: Cultural Competence in Research Belmont Report and CITI Course Introduction Assessing Risk Informed Consent Privacy and Confidentiality Liberty University Research and HIPAA Privacy Protections
Date(s) of Completion: April 19, 2018

III. OTHER STUDY MATERIALS AND CONSIDERATIONS

8. STUDY MATERIALS LIST (?)	
Please indicate whether your proposed study will include any of the following:	
Recording/photography of participants *(voice, video, or images)*?	☐ Yes ☒ No
Participant compensation *(gift cards, meals, extra credit, etc.)*?	☒ Yes ☐ No
Advertising for participants *(flyers, TV/Radio advertisements)*?	☐ Yes ☒ No

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More than minimal psychological stress?	☐ Yes ☒ No
Confidential data collection *(participant identities known but not revealed)*?	☐ Yes ☒ No
Anonymous data collection *(participant identities not known)*?	☒ Yes ☐ No
Extra costs to the participants *(tests, hospitalization, etc.)*?	☐ Yes ☒ No
The inclusion of pregnant women (*for medical studies*)?	☐ Yes ☒ No
More than minimal risk?*	☐ Yes ☒ No
Alcohol consumption?	☐ Yes ☒ No
Protected Health Information *(from health practitioners/institutions)*?	☐ Yes ☒ No
VO_2 Max Exercise?	☐ Yes ☒ No
Pilot study procedures *(which will be published/included in data analysis)*?	☐ Yes ☒ No
Please indicate whether your proposed study will include the use of blood:	
Use of blood?	☐ Yes ☐ No
Total amount of blood:	
Blood draws over time period *(days)*:	
Please indicate whether your proposed study will include any of the following materials:	
The use of rDNA or biohazardous material?	☐ Yes ☒ No
The use of human tissue or cell lines?	☐ Yes ☒ No
Fluids that could mask the presence of blood *(including urine/feces)*?	☐ Yes ☒ No
Use of radiation or radioisotopes?	☐ Yes ☒ No
Note: Minimal risk *is defined as "the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in everyday life or during the performance of routine physical or physiological examinations or tests. [45 CFR 46.102(i)]. If you are unsure if your study qualifies as minimal risk, contact the IRB.*	

9. INVESTIGATIONAL METHODS (?)
Please indicate whether your proposed study will include any of the following:
The use of an Investigational New Drug (IND) or an Approved Drug for an Unapproved Use? ☒ No ☐ Yes *(Provide the drug name, IND number, and company):*
The use of an Investigational Medical Device or an Approved Medical Device for an Unapproved Use? ☒ No ☐ Yes *(Provide the device name, IDE number, and company):*

IV. PURPOSE

10. PURPOSE OF RESEARCH (?)
Write an original, brief, non-technical description of the purpose of your research. Include in your description your research hypothesis/question, a narrative that explains the major constructs of your study, and how the data will advance your research hypothesis or question. This section should be easy to read for someone not familiar with your academic discipline: The purpose of this research is to determine if online professional development provided for teachers will increase their knowledge of sport related concussions and classroom modifications students need.

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V. PARTICIPANT INCLUSION/EXCLUSION CRITERIA

11. STUDY POPULATION (?)
Provide the inclusion criteria for the participant population *(gender, age range, ethnic background, health status, occupation, employer, etc.)*: Public school teachers from District 7 counties in North Carolina
Provide a rationale for selecting the above population: This population is a convience population as my county is part of this LEA region. This population will also help determine if online professional development helps a teacher's response to sport related concussions in the high schol classroom.
Are you related to any of your participants? ☒ No ☐ Yes *(Explain)*:
Indicate who will be excluded from your study population *(e.g., persons under 18 years of age)*: no individual will be excluded
If applicable, provide rationale for involving any special populations *(e.g., children, ethnic groups, mentally disabled, low socio-economic status, prisoners)*:
Provide the maximum number of participants you plan to enroll for each participant population and justify the sample size *(You will not be approved to enroll a number greater than the number listed. If at a later time it becomes apparent that you need to increase your sample size, submit a Change in Protocol Form and wait for approval to proceed)*: minimum of 166 total (83 experimental group; 83 control group
ANSWER THE FOLLOWING QUESTION ONLY IF YOU ARE CONDUCTING A PROTOCOL WITH NIH, FEDERAL, OR STATE FUNDING:
Researchers sometimes believe their particular project is not appropriate for certain types of participants. These may include, for example, women, minorities, and children. If you believe your project should not include one or more of these groups, please provide your justification for their exclusion. Your justification will be reviewed according to the applicable NIH, federal, or state guidelines:

12. TYPES OF PARTICIPANTS (?)	
Who will be the focus of your study? *(Check all that apply)*	
☒ Normal Participants (Age 18-65)	☐ Pregnant Women
☐ Minors (Under Age 18)	☐ Fetuses
☐ Over Age 65	☐ Cognitively Disabled
☐ University Students	☐ Physically Disabled
☐ Active-Duty Military Personnel	☐ Participants Incapable of Giving Consent

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☐ Discharged/Retired Military Personnel	☐ Prisoners or Institutional Individuals
☐ Inpatients	☐ Specific Ethnic/Racial Group(s)
☐ Outpatients	☐ Other potentially elevated risk populations
☐ Patient Controls	☐ Participant(s) related to the researcher
Note: Only check the boxes if the participants will be the focus (for example, ONLY military or ONLY students). If they just happen to be a part of the broad group you are studying, you only need to check "Normal Participants." Some studies may require that you check multiple boxes (e.g., Korean males, aged 65+).	

VI. RECRUITMENT OF PARTICIPANTS

13. CONTACTING PARTICIPANTS (?)

Describe in detail how you will contact participants regarding this study *(include the method(s) used—email, phone call, social media, snowball sampling, etc.)*: participants will be contacted via email. Email addresses will be collected from Human Resource departments once permission is gained from LEA superintendents.These addresses will be collected and housed on the password protected school system server.

14. SUBMISSION OF RECRUITMENT MATERIALS (?)

Submit a copy of all recruitment letters, scripts, emails, flyers, advertisements, or social media posts you plan to use to recruit participants for your study as separate Word documents with your application. Recruitment templates are available on the IRB website.

Check the appropriate box:

☒ All of the necessary recruitment materials will be submitted with my application.

☐ My study strictly uses **archival** data, so recruitment materials are not required.

15. LOCATION OF RECRUITMENT (?)

Describe the location, setting, and timing of recruitment: Recruitment location will be at the discretion of the participant. As this is an online, survey study, setting will also be at the participants' discretion. Recruitment will take place immediately following IRB approval. Superintendent permission has been requested as permitted by Liberty IRB. Timing will be June 1, 2018 - July 1, 2018.

16. SCREENING PROCEDURES (?)

Describe any screening procedures you will use when recruiting your participants *(i.e., screening survey, database query, verbal confirmation, etc.)*: Participant screening will include demongraphic questions to determine those included in the study. This will take place after surveys have been administered.

17. CONFLICTS OF INTEREST (?)

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Do you have a position of grading or professional authority over the participants *(e.g., Are you the participants' teacher, principal, or supervisor?)*?

☒ No *(Proceed to Procedures)*

☐ Yes *(Explain what safeguards are in place to reduce the likelihood of compromising the integrity of the research, e.g., addressing the conflicts in the consent process and/or emphasizing the pre-existing relationship will not be impacted by participation in the research.):*

Do you have any financial conflicts of interest to disclose *(e.g., Do you or an immediate family member receive income or other payments, own investments in, or have a relationship with a non-profit organization that could benefit from this research?)***?**

☒ No *(Proceed to Procedures)*

☐ Yes *(State the funding source/financial conflict and then explain what safeguards are in place to reduce the likelihood of compromising the integrity of the research.):*

VII. RESEARCH PROCEDURES

18. PROCEDURES (?)

Write an original, non-technical, step by step, description of what your participants will be asked to do during your study and data collection process. If you have multiple participant groups, *(ex: parents, teachers, and students)* or control groups and experimental groups, please specify which group you are asking to complete which task(s). **You do not need to list signing/reading consent as a step:**

Step/Task/Procedure	Time (Approx.)	Participant Group(s) *(All, Group A, Group B, Control Group, Experimental Group, etc.)*
1. Receive email invitation	5minutes	All
2. If willing to participate: click link provided	30 sec	All
3. Proceed to pretest	15 min	All
4. Based upon assignment either take posttest or complete professional developm then posttes	30 min	Control group - posttes Experimental group - professional development then posttest
5.		
6.		
7.		
8.		

19. SUBMISSION OF DATA COLLECTION INSTRUMENTS/MATERIALS (?)

Submit a copy of all instruments, surveys, interviews questions, outlines, observation checklists, prompts, etc. that you plan to use to collect data for your study as separate Word documents with your application. Pdfs are **ONLY** acceptable for proprietary instruments.

Check the appropriate box:

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☒ All of the necessary data collection instruments will be submitted with my application.
☐ My study strictly uses **archival** data, so data collection instruments are not required.

20. STUDY LOCATION (?)

Please describe the location(s)/site(s) in which the study will be conducted. Be specific *(include city, state, school/district, clinic, etc.)*: This study will be conducted in the Northwest region of North Carolina including county LEAs within the following counties:
Alexander
Alleghany
Ashe
Avery
Burke
Caldwell
Catawba (including Hickory City and Newton-Conover)
McDowell
Mitchell
Watauga
Wilkes
Yancey

*Note: **For School of Education research**, investigators must submit documentation of permission from each research site to the IRB prior to receiving approval. If your study involves K-12 schools, district-level approval is acceptable. If your study involves colleges or universities, you may also need to seek IRB approval from those institutions. You may seek permission prior to submitting your IRB application, however, **do not** begin recruiting participants. If you find that you need a conditional approval letter from the IRB in order to obtain permission, one can be provided to you once all revisions have been received and are accepted.*

VIII. DATA ANALYSIS

21. NUMBER OF PARTICIPANTS/DATA SETS (?)

Estimate the number of participants to be enrolled or data sets to be collected: minimum 166 total (83-control; 83-experimental)

22. ANALYSIS METHODS (?)

Describe *how* the data will be analyzed and what will be done with the data and the resulting analysis, including any plans for future publication or presentation: Data analyzed will include survey answers. These answers will be used to assess the effectivness of the online tutorial and will be used in future presentations at athletic training and educational conferences

IX. PARENTAL/GUARDIAN CONSENT

23. PARENTAL/GUARDIAN CONSENT REQUIREMENTS (?)

Does your study require parental/guardian consent? *(If your participants are under 18, parental/guardian consent is required in most cases.)*
☒ No *(Proceed to Child Assent)*
☐ Yes *(Answer the following question)*

Does your study entail greater than minimal risk without the potential for benefits to the participant?

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☒ No
☐ Yes *(Consent of both parents is required)*

X. ASSENT FROM CHILDREN

24. CHILD ASSENT (?)

Is assent required for your study? *(Assent is required unless the child is not capable due to age, psychological state, or sedation OR the research holds out the prospect of a direct benefit that is only available within the context of the research.)*
☒ No *(Proceed to Consent Procedures)*
☐ Yes

Note: If the parental consent process (full or part) is waived (See XIII below) assent may be also. See the IRB's informed consent page for more information.

XI. PROCESS OF OBTAINING INFORMED CONSENT

25. CONSENT PROCEDURES (?)

Describe in detail *how and when* you will provide consent information *(If applicable, include how you will obtain consent from participants and/or parents/guardians and/or child assent.)*: Consent will be obtained by providing the informed consent as the first page of the website. If the potential participant decides to participate, they will be instructed to read the infomed consent, no signature will be required as their consent will be recognized as inclusion in the study.

XII. USE OF DECEPTION

26. DECEPTION (?)

Are there any aspects of the study kept secret from the participants *(e.g., the full purpose of the study)***?**
☒ No
☐ Yes *(describe the deception involved and the debriefing procedures)*:

Is deception used in the study procedures?
☒ No
☐ Yes *(describe the deception involved and the debriefing procedures)*:

Note: Submit a post-experiment debriefing statement and consent form offering participants the option of having their data destroyed. A debriefing template is available on our website.

XIII. WAIVER OF INFORMED CONSENT OR MODIFICATION OF REQUIRED ELEMENTS IN THE INFORMED CONSENT PROCESS

27. WAIVER OF INFORMED CONSENT ELEMENTS (?) ☒ **N/A**

Please indicate why you are requesting a waiver of consent *(If your reason does not appear as an option, please check N/A. If your reason appears in the drop-down list, complete the below questions in this section)*: Click to select an option.

Does the research pose no more than minimal risk to participants *(i.e., no more risk than that of everyday activities)***?**
☐ No, *the study is greater than minimal risk.*
☐ Yes, *the study is minimal risk.*

Will the waiver have no adverse effects on participant rights and welfare?
☐ No, *the waiver will have adverse effects on participant rights and welfare.*

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☐ Yes, *the waiver will not adversely affect participant rights and welfare.*
Would the research be impracticable without the waiver? ☐ No, *there are other ways of performing the research without the waiver.* ☐ Yes, *not having a waiver would make the study unrealistic. (Explain):*
Will participant debriefing occur *(i.e., will the true purpose and/or deceptive procedures used in the study be reported to participants at a later date)***?** ☐ No, *participants will not be debriefed.* ☐ Yes, *participants will be debriefed.*
Note: A waiver or modification of some or all of the required elements of informed consent is sometimes used in research involving deception, archival data, or specific minimal risk procedures.

XIV. WAIVER OF THE REQUIREMENT FOR PARTICIPANTS TO SIGN THE INFORMED CONSENT DOCUMENT

28. WAIVER OF SIGNED CONSENT (?) ☐ N/A
Please indicate why you are requesting a waiver of signatures *(If your reason does not appear as an option, please check N/A. If your reason appears in the drop-down list, complete the below questions in this section)*: Click to select an option.
Would a signed consent form be the only record linking the participant to the research? ☐ No, *there are other records/study questions linking the participants to the study.* ☒ Yes, *only the signed form would link the participant to the study.*
Does a breach of confidentiality constitute the principal risk to participants? ☐ No, *there are other risks involved greater than a breach of confidentiality.* ☒ Yes, *the main risk is a breach of confidentiality.*
Does the research pose no more than minimal risk to participants *(i.e., no more risk than that of everyday activities)***?** ☐ No, *the study is greater than minimal risk.* ☒ Yes, *the study is minimal risk.*
Does the research include any activities that would require signed consent in a non-research context *(e.g., liability waivers)***?** ☒ No, *there are not any study related activities that would normally require signed consent* ☐ Yes, *there are study related activities that would normally require signed consent*
Will you provide the participants with a written statement about the research *(i.e., an information sheet that contains all of the elements of an informed consent form but without the signature lines)***?** ☐ No, *participants will not receive written information about the research.* ☒ Yes, *participants will receive written information about the research.*
Note: A waiver of signed consent is sometimes used in anonymous surveys or research involving secondary data. This does not eliminate the need for a consent document, but it eliminates the need to obtain participant signatures.

XV. CHECKLIST OF INFORMED CONSENT/ASSENT

29. STATEMENT (?)
Submit a copy of all informed consent/assent documents as separate Word documents with your application. Informed consent/assent templates are available on our website. Additional information regarding consent is also available on our website.

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Check the appropriate box:
☒ All of the necessary consent/assent documents will be submitted with my application.
☐ My study strictly uses **archival** data, so consent documents are not required.

XVI. PARTICIPANT PRIVACY, DATA SECURITY, & MEDIA USE

30. PRIVACY (?)

Describe what steps you will take to protect the privacy of your participants *(e.g., If you plan to interview participants, will you conduct your interviews in a setting where others cannot easily overhear?)*: Participant emails will be kept in a password protected email system (averyschools.net). During the study, participants will receive a unique id number. this number will not be associated with any personal information.

Note: Privacy refers to persons and their interest in controlling access to their information.

31. DATA SECURITY (?)

How will you keep your data secure *(i.e., password-locked computer, locked desk, locked filing cabinet, etc.)***?**: Data will be kept secure on a password-locked computer

Who will have access to the data *(i.e., the researcher and faculty mentor/chair, only the researcher, etc.)***?**: Access to the data will be the researcher and faculty chair only.

Will you destroy the data once the three-year retention period required by federal regulations expires?

☐ No
☒ Yes *(Explain how the data will be destroyed):* Email addresses and data will be cleared from averyschools.net as per averyschools protocol.

Note: All research-related data must be stored for a minimum of three years after the end date of the study, as required by federal regulations.

32. ARCHIVAL DATA (SECONDARY DATA) (?)

Is all or part of the data archival *(i.e., previously collected for another purpose)***?**

☒ No *(Proceed to Non-Archival Data)*
☐ Yes *(Answer the questions below)*

Is the archival data publicly accessible?

☐ No *(Explain how you will obtain access to this data)*:
☐ Yes *(Indicate where the data is accessible from, i.e., a website, etc.)*:

Will you receive the raw data stripped of identifying information *(e.g., names, addresses, phone numbers, email addresses, social security numbers, medical records, birth dates, etc.)***?**:

☐ No *(Describe what data will remain identifiable and why this information will not be removed)*:
☐ Yes *(Describe who will link and/or strip the data—this person should have regular access to the data and should be a neutral party not involved in the study)*:

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Can the names or identities of the participants be deduced from the raw data?
☐ No *(Place your initials in the box: I will not attempt to deduce the identity of the participants in this study)*:
☐ Yes *(Describe)*:

Please provide the list of data fields you intend to use for your analysis and/or provide the original instruments used in the study:

Note: If the archival data is not publicly available, submit proof of permission to access the data (i.e., school district letter or email). If you will receive data stripped of identifiers, this should be stated in the proof of permission.

33. NON-ARCHIVAL DATA (PRIMARY DATA) (?)

If you are using non-archival data, will the data be anonymous to you *(i.e., raw data does not contain identifying information and cannot be linked to an individual/organization by use of pseudonyms, codes, or other means)*? **Note:** For studies involving audio/video recording or photography, select "No"
☐ N/A: I will not use non-archival data *(data was previously collected, skip to Media)*
☒ No *(Complete the "No" section below)*
☐ Yes *(Complete the "Yes" section below)*

****COMPLETE THIS SECTION IF YOU ANSWERED "NO" TO QUESTION 31****

Can participant names or identities be deduced from the raw data?
☐ No
☐ Yes *(Describe)*:

Will a person be able to identify a subject based on other information in the raw data *(i.e., title, position, sex, etc.)***?**
☐ No
☐ Yes *(Describe)*:

Describe the process you will use to ensure the confidentiality of the participants during data collection and in any publication(s) *(i.e., you may be able to link individuals/organizations to identifiable data; however, you will use pseudonyms or a coding system to conceal their identities)*:

Do you plan to maintain a list or codebook linking pseudonyms or codes to participant identities?
☐ No
☐ Yes *(Please describe where this list/codebook will be stored and who will have access to the list/codebook. It should not be stored with the data.)*:

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****COMPLETE THIS SECTION IF YOU ANSWERED "YES" TO QUESTION 31****
Describe the process you will use to collect the data to ensure that it is anonymous: email addresses will be used for drawing of gift card; participants will not be identified when agreeing to participate as once they click the link their address will be masked as part of the program used to randomly select participants for each group
Place your initials in the box: I will not attempt to deduce the identity of the participants in this study: SktH
Note: If you plan to use participant data (i.e., photos, recordings, videos, drawings) for presentations beyond data analysis for the research study (e.g., classroom presentations, library archive, or conference presentations) you will need to provide a materials release form to the participant.

34. MEDIA USE (?)	
Will your participants be audio recorded?	☒ No ☐ Yes
Will your participants be video recorded?	☒ No ☐ Yes
Will your participants be photographed?	☒ No ☐ Yes
****COMPLETE THIS SECTION IF YOU ANSWERED "YES" TO ANY MEDIA USE****	
Include information regarding how participant data will be withdrawn if he or she chooses to leave the study*:	
Will your participants be audio recorded, video recorded, or photographed without their knowledge?** ☐ No ☐ Yes *(Describe the deception and debriefing procedures)*:	
**Note on Withdrawal: Add the heading "How to Withdraw from the Study" on the consent document and include a description of the procedures a participant must perform to be withdrawn.* ***Note on Deception: Attach a post-experiment debriefing statement and a post-deception consent form, offering the participants the option of having their recording/photograph destroyed and removed from the study.*	

XVII. PARTICIPANT COMPENSATION

35. COMPENSATION (?)
Will participants be compensated *(e.g., gift cards, raffle entry, reimbursement)***?** ☐ No *(Proceed to Risks)* ☒ Yes *(Describe)*: Participants will have the opportunity to be in a drawing for one of 20 Amazon gift cards ($25).

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Will compensation be pro-rated if the participant does not complete all aspects of the study?
☒ No
☐ Yes *(Describe)*:

Note: Certain states outlaw the use of lotteries, raffles, or drawings as a means to compensate or recruit research participants. Research compensation exceeding $600 per participant within a one-year period is considered income and will need to be filed on the participant's income tax returns. If your study is grant funded, Liberty University's Business Office policies might affect how you compensate participants. Contact the IRB for additional information.

XVIII. PARTICIPANT RISKS AND BENEFITS

36. RISKS (?)

Describe the risks to participants and any steps that will be taken to minimize those risks. *(Risks can be physical, psychological, economic, social, or legal. If the only potential risk is a breach in confidentiality if the data is lost or stolen, state that here)*: The only potential risk is a breach in confidentiality if the data is lost or stolen.

Will alternative procedures or treatments that might be advantageous to the participants be made available?
☒ No
☐ Yes *(Describe)*:

ANSWER THE FOLLOWING QUESTION ONLY IF YOUR STUDY IS CONSIDERED GREATER THAN MINIMAL RISK:

Describe provisions for ensuring necessary medical or professional intervention in the event of adverse effects to the participants *(e.g., proximity of the research location to medical facilities, or your ability to provide counseling referrals in the event of emotional distress)*:

37. BENEFITS (?)

Describe the possible direct benefits to the participants. *(If participants are not expected to receive direct benefits, please state "No direct benefits." Completing a survey or participating in an interview will not typically result in direct benefits to the participant.)*: No direct benefits

Describe any possible benefits to society: This study will benefit future teachers and possibly become a springboard for future concussion educaiton.

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Evaluate the risk-benefit ratio. *(Explain why you believe this study is worth doing, even with any identified risks.)*: Concussions have become an important issue in today's society. This study, centering around teacher education, may become a new avenue for concussion education and professional development for teachers.

APPENDIX B: SUPERINTENDENT PERMISSION LETTER AND APPROVAL FORM

Dear

I am Susan Hawkins, a teacher at Avery County High School. I am currently pursuing a Doctorate in Teaching and Learning from Liberty University. I am beginning my research and would like permission to survey your high school classroom teachers.

My research is centered on concussions and online professional development for teachers. I plan to deliver an online professional development video Concussion Management and Return to Learn, followed by a posttest.

I would like to begin this research as soon as I receive your permission and IRB approval. If I receive permission, may I contact your Human Resource officer to obtain email addresses for your high school teachers?

Thank you for your consideration and support for my research.

Sincerely,
Susan T. Hawkins

Susan Hawkins
Liberty University
Sthawkins2@liberty.edu

Dear Susan:

After careful review of your research proposal entitled RETURNING TO THE CLASSROOM: DOES PROFESSIONAL DEVELOPMENT HELP TEACHERS UNDERSTAND HOW TO HELP CONCUSSED STUDENTS? I have decided to grant you permission to access our teacher email list.

Check the following boxes, as applicable:

☐ Data will be provided to the researcher stripped of any identifying information.

☐ I/We are requesting a copy of the results upon study completion and/or publication.

Sincerely,

[Your Name]
[Your Title]
[Your Company/Organization]

APPENDIX C: TEACHER EMAIL INVITATION AND FOLLOW-UP

June 1, 2018

Dear Research Participant:

As a graduate student in the College of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree in teaching and learning. The purpose of my research is to determine the efficacy of online professional development on returning to the classroom after sports-related concussions and teacher understanding, and I am writing to invite you to participate in my study.

If you are a public school high school educator and are willing to participate, you will be asked to either complete a survey or watch an online video and complete a survey. It should take approximately 30 minutes for you to complete the procedure listed. Your participation will be completely anonymous, and no personal identifying information will be collected.

To participate, go to Concussions (link here) and click on the link provided.

A consent document is provided as the first page you will see after you click on the survey link. The consent document contains additional information about my research, but you do not need to sign and return it.

If you choose to participate, you will have a chance to win one of 20 Amazon gift cards ($25). Your email address will be requested if you choose to be included in the drawing.

Sincerely,

Susan T. Hawkins, MAEd
Doctoral Candidate
Liberty University

Dear Research Participant:

As a graduate student in the College of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree in teaching and learning. On January 1, an email was sent to you inviting you to participate in a research study. This follow-up email is being sent to remind you to follow this link if you would like to participate and have not already done so. The deadline for participation is June 30, 2018.

If you choose to participate, you will be asked to either watch a video and then complete a survey, or simply complete the survey without watching a video. It should take approximately 30 minutes for you to complete the procedure listed. Your participation will be completely anonymous, and no personal, identifying information will be required.

To participate, go to this link and click on the link provided.

A consent document is provided as the first page you will see after clicking on the survey link. The informed consent document contains additional information about my research. Please click on the survey link at the end of the informed consent document to indicate that you have read it and would like to take part in the survey.

If you choose to participate, your email address will be requested if you would like to be placed into a drawing for a chance to win one of 20 Amazon gift cards ($25).

Sincerely,

Susan T. Hawkins, MAEd
Doctoral Candidate
Liberty University

APPENDIX D: INFORMED CONSENT FORM

THE EFFECT OF PROFESSIONAL DEVELOPMENT ON TEACHER UNDERSTANDING OF SUPPORTING CONCUSSED STUDENTS

Susan T. Hawkins
Liberty University
School of Education

You are invited to be in a research study on online professional development and teacher knowledge of sports-related concussions. This study will attempt to answer if professional development helps teachers understand returning to learning after concussions. You were selected as a possible participant because you are a high school educator. Please read this form and ask any questions you may have before agreeing to be in the study.

Susan Hawkins, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to determine the efficacy of online professional development and teacher understanding of sports-related concussions for return to learn.

Procedures: If you agree to be in this study, I would ask you to do the following things:

1. Please follow the instructions at here: you will be sent to either a survey or a video and survey.
2. Please complete by June 30, 2018.

Risks: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Benefits: Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include a better understanding of whether professional development can increase understanding of returning to the classroom after a sports-related concussion.

Compensation: Participants will have the opportunity to enter a drawing for one of 20 Amazon gift cards ($25).

Confidentiality: The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- To protect privacy, a password protected database will be utilized.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted. Per federal regulations, data must be retained for three years upon completion of the study.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or to withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, please exit the survey and close your Internet browser. Your responses will not be recorded or included in the study.

Contacts and Questions: The researcher conducting this study is Susan T. Hawkins. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at 828-260-1832 or sthawkins2@liberty.edu. You may also contact the researcher's faculty advisor, Vance Pickard, at vpickard@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 1887, Lynchburg, VA 24515, or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

_____

Signature of Participant Date

_____

Signature of Investigator Date

The Liberty University Institutional
Review Board has approved
this document for use from
2/19/2019 to 2/18/2020
Protocol # 3371.021919

INFORMED CONSENT FORM

THE EFFECT OF PROFESSIONAL DEVELOPMENT ON TEACHER UNDERSTANDING OF SUPPORTING CONCUSSED STUDENTS

Susan T. Hawkins
Liberty University
School of Education

You are invited to be in a research study on online professional development and teacher knowledge of sports-related concussions. This study will attempt to determine whether professional development helps teachers understand how students return to learning after concussions. You were selected as a possible participant because you are a North Carolina public high school teacher. Please read this form and ask any questions you may have before agreeing to be in the study.

Susan Hawkins, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to determine the efficacy of online professional development and teacher understanding of sports-related concussion symptoms and classroom management for students' return to learning.

Procedures: If you agree to be in this study, you will be placed in either the control group or the treatment group. Your assignment will be determined at the website (pdconcussionstudy.online). Within the website you will be assigned a random number. Once you have accepted the invitation to become part of the study, you will enter your ID number and will either become part of the control group (complete survey) or the treatment group (complete survey and treatment). If you are selected for the control group, it should take you approximately 15 minutes to complete the survey. If you are selected for the treatment group, it should take you approximately 30 to 45 minutes to complete the survey and treatment mentioned above. This study also involves an interview. Interviews will take place after you have watched the professional development video, and should last no more that 10 – 15 minutes. This interview does not need to take place the same day you watch the video. During the interview, you will be recorded and your interview will be transcribed verbatim. Your interview will only be used to gather information related to the research questions.

Risks: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Benefits: Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society may include a better understanding of whether professional development can increase teacher understanding of how students return to the classroom after a sports-related concussion.

The Liberty University Institutional
Review Board has approved
this document for use from
2/19/2019 to 2/18/2020
Protocol # 3371.021919

Confidentiality: The records of this study will be kept private. Research records will be stored securely (including transcripts of interviews), and only the researcher will have access to the records.

- Participant responses will be confidential. You will be asked to provide a fictitious name during the interview to protect your identity.
- To protect privacy, a password protected database will be utilized.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted. Per federal regulations, data must be retained for three years upon completion of the study.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or to withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, please exit the survey and close your Internet browser. Your responses will not be recorded or included in the study. If you have been asked to participate in the interview portion of the study, you may withdraw at any time by contacting the researcher (contact information below).

Contacts and Questions: The researcher conducting this study is Susan T. Hawkins. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at 828-260-1832 or sthawkins2@liberty.edu. You may also contact the researcher's faculty advisor, Vance Pickard, at vpickard@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515, or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

☐ The researcher has my permission to audio-record me as part of my participation in this study.

Signature of Participant Date

Signature of Investigator Date

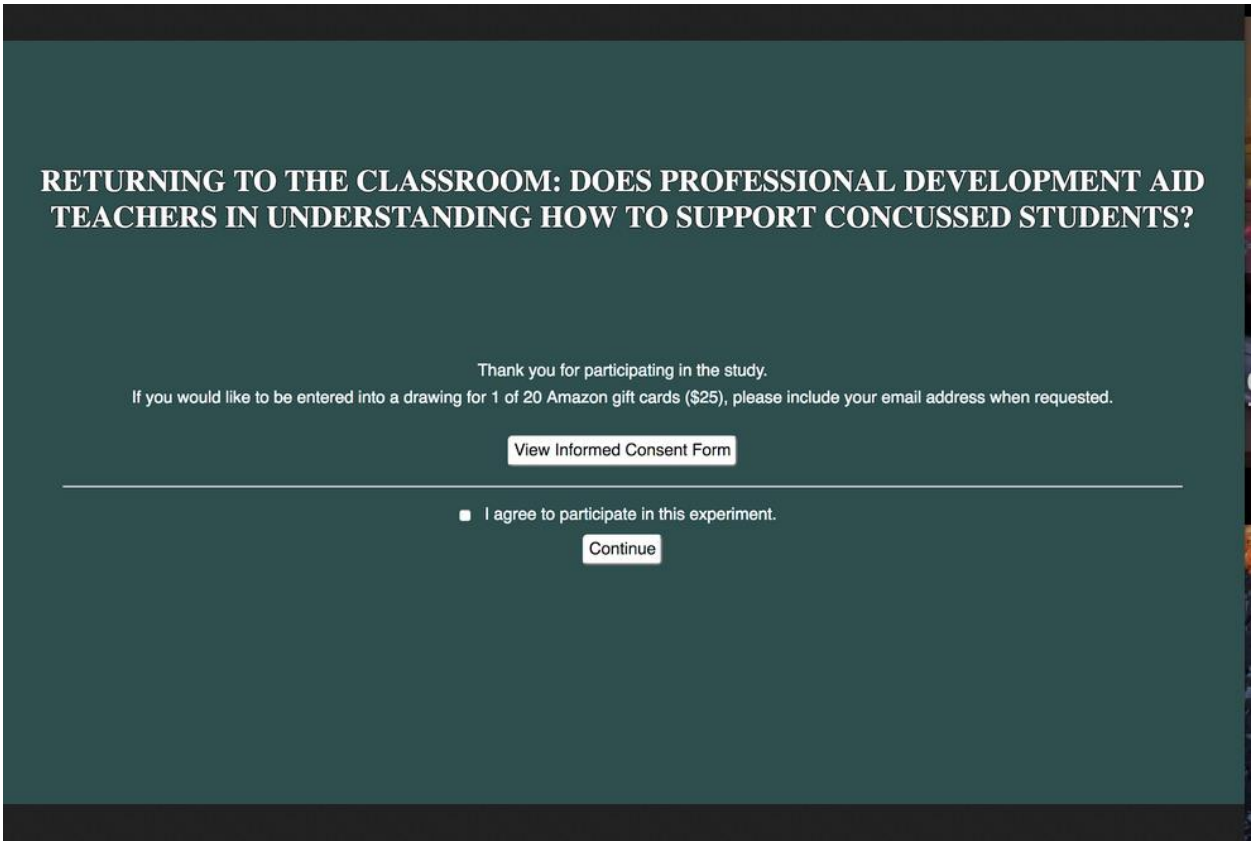
APPENDIX E: PRE/POST SURVEY

The survey has been removed to comply with copyright.

APPENDIX F: SURVEY PERMISSION EMAIL

If interested in the BAKPAC – TEACH, please contact Cailee Welch Bacon at cwelch@atsu.edu

APPENDIX G: STUDY WEBSITE SCREENSHOT



APPENDIX H: CONCUSSION VIDEO SCREENSHOT

APPENDIX I: CDC HEADS UP HANDOUT

Returning to School After a Concussion: A Fact Sheet for School Professionals

HEADS UP SCHOOLS

What is a Concussion?

A concussion is a type of traumatic brain injury (TBI) that results from a bump, blow, or jolt to the head (or by a hit to the body) that causes the head and brain to move rapidly back and forth. This sudden movement can cause the brain to bounce around or twist in the skull, stretching and damaging the brain cells and creating chemical changes in the brain.

While some research shows that the young brain can be resilient, it may also be more susceptible to the chemical changes that occur in the brain after a concussion. These changes can lead to a set of symptoms affecting the student's cognitive, physical, emotional, and sleep functions.

Concussions affect people differently. Most students will have symptoms that last for a few days or a week. A more serious concussion can last for weeks, months or even longer.

What role do I play in helping a student return to school after a concussion?

Each year hundreds of thousands of K-12 students sustain a concussion as a result of a fall, motor-vehicle crash, collision on the playground or sports field, or other activity. Most will recover quickly and fully. However, school professionals, like you, will often be challenged with helping return a student to school who may still be experiencing concussion symptoms—symptoms that can result in learning problems and poor academic performance.

Knowledge of a concussion's potential effects on a student, and appropriate management of the return-to-school process, is critical for helping students recover from a concussion.

That's where you come in. This fact sheet provides steps that school professionals can take to help facilitate a student's return to school and recovery after a concussion. It emphasizes the importance of a collaborative approach by a team that includes not only school professionals, but also the student's family and the health care professional(s) managing the medical aspects of the student's recovery.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

CDC

How can a concussion affect learning?

The effects of concussion on a student's return-to-school experience are unique to each student. In most cases, a concussion will not significantly limit a student's participation in school; however, in some cases, a concussion can affect multiple aspects of a student's ability to participate, learn, and perform well in school. In turn, the experience of learning and engaging in academic activities that require concentration can actually cause a student's concussion symptoms to reappear or worsen. Given this inter-relationship, and the way concussion effects can vary across students, academic adjustments need to be tailored to each student's specific circumstances.

What to Look for After a Concussion

When students return to school after a concussion, school professionals should watch for:

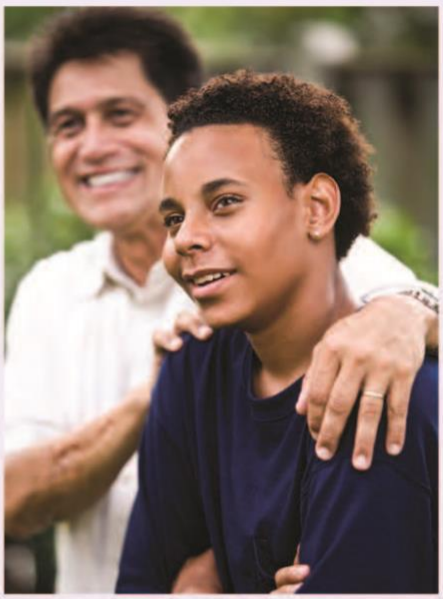
- Increased problems paying attention or concentrating
- Increased problems remembering or learning new information
- Longer time needed to complete tasks or assignments
- Difficulty organizing tasks or shifting between tasks
- Inappropriate or impulsive behavior during class
- Greater irritability
- Less ability to cope with stress
- More emotional than usual
- Fatigue
- Difficulties handling a stimulating school environment (lights, noise, etc.)
- Physical symptoms (headache, nausea, dizziness)

When is a student ready to return to school after a concussion?

A student with a concussion should be seen by a health care professional experienced in evaluating for concussion. A health care professional can make decisions about a student's readiness to return to school based on the number, type and severity of symptoms experienced by the student. The health care professional should also offer guidance about when it is safe for a student to return to school and appropriate levels of cognitive and physical activity. Once a health care professional has given permission for the student to return to the classroom, school professionals can help monitor him/her closely. With proper permission, school professionals can confer on their observations and share those observations with the family and other professionals involved in the student's recovery.

Who should be included as part of the team supporting the student?

Providing appropriate support for a student returning to school after a concussion requires a collaborative team approach. The team should include:



- **The student:** The affected student should be "in the loop," and encouraged to share his/her thoughts about how things are going, and symptoms he or she is experiencing. The student should receive feedback from the rest of the team that is appropriate to his/her age, level of understanding, and emotional status.
- **Parents/Guardians:** Parents and guardians need to understand what a concussion is, that medical attention is required, that most students will get better, the potential effects on school learning and performance, and the importance of following guidance from their student's health care provider in order to ensure the most rapid and complete recovery possible.
- **Other caregivers (i.e., sports coaches, after-school or day care providers):** People who care for or are responsible for a student after school hours can play an important role in monitoring participation in after-school activities and observing any changes in symptoms.
- **Physician and/or other health care professional:** Health care professionals involved in the student's diagnosis and recovery should provide an individualized plan for a student returning to school to help manage cognitive and physical exertion following a concussion. As a student recovers, health care professionals can help guide the gradual removal of academic adjustments or supports that may be instituted as part of the recovery process.
- **School nurse:** Periodic monitoring of the student's symptoms by the school nurse should continue as long as symptoms are present. The school nurse is also a resource for other school professionals who may have questions about their own observations and may also be an important liaison to parents or concussion experts within the community.

With proper permission, members of the school team should meet together on a regular basis to:

- Share observations and any new information obtained from the family or health care professional.
- Work with the family to develop an appropriate program and timeline to meet the student's needs and explain as necessary the reasons for the resulting plan.
- Continually reassess the student for symptoms and progress in healing. This information can help the team to make adjustments to the plan.

- **All teachers interacting with the student (including the physical education teacher):** Teachers can often help observe changes in a student, including symptoms that may be worsening. Teachers are also in a position to interact regularly with the student's parents, thereby providing a channel to obtain and share information with them about the student's progress and challenges.
- **School psychologist and/or school counselor:** School psychologists and/or school counselors can often help with identifying services and resources to help the student and parents or guardians and facilitate getting those services and resources for them, including a 504 Plan or IEP. School psychologists can also help assess a student's current functioning and his/her academic needs for full recovery.
- **Speech language pathologists:** Speech-language pathologists can help monitor or identify students with a concussion who are having trouble in the classroom, as well as changes in how a student is communicating or interacting with others. Speech-language pathology services may include testing, providing classroom strategies or modifications, and direct services to a student.
- **School principal or other school administrator:** The school principal or administrator should appoint the internal members of the team as well as a "case manager" to ensure adequate communication and coordination within the team. The administrator will also be responsible for approving any adjustments to the student's schedule and communicating policies on responding to students who have had a concussion (e.g., return to play policy).

If the student is an athlete, either inside or outside of school, the team should also include coaches and other athletic department staff (e.g., certified athletic trainer). Remember, a student with a concussion should NEVER return to sports, PE class, or other physical activity until a health care professional with experience in evaluating for concussion says the student is no longer experiencing symptoms and it is OK to return to play. Comprehensive information and training modules for athletic coaches and health care professionals are available from the ***Heads Up*** initiatives at www.cdc.gov/Concussion.

It is important to identify someone on this team who will function as a case manager, such as a school nurse, school psychologist, school counselor, speech pathologist, teacher or other identified school professional. This person will have the role of advocating for the student's needs and serve as the primary point of contact with the student, family, and all members of the team. A flexible set of materials to assist case managers and school professionals is available from the *Heads Up to Schools: Know Your Concussion ABCs* initiative at www.cdc.gov/Concussion.

How can understanding concussion symptoms help with identifying a student's individual needs?

A school professional can best support a student's return to school and recovery by understanding possible concussion effects and providing the student with needed accommodations and support. Understanding concussion symptoms can help the student and members of the team identify individual needs of the student, monitor changes, and with proper permission, take action when necessary. This will help facilitate a full recovery and discourage students from minimizing the symptoms due to embarrassment, shame, or pressure to return to activities.

SIGNS AND SYMPTOMS OF A CONCUSSION

SIGNS OBSERVED BY PARENTS OR GUARDIANS

- Appears dazed or stunned
- Is confused about events
- Answers questions slowly
- Repeats questions
- Can't recall events prior to the hit, bump, or fall
- Can't recall events after the hit, bump, or fall
- Loses consciousness (even briefly)
- Shows behavior or personality changes
- Forgets class schedule or assignments

SYMPTOMS REPORTED BY STUDENTS

Thinking/Remembering:
- Difficulty thinking clearly
- Difficulty concentrating or remembering
- Feeling more slowed down
- Feeling sluggish, hazy, foggy, or groggy

Physical:
- Headache or "pressure" in head
- Nausea or vomiting
- Balance problems or dizziness
- Fatigue or feeling tired
- Blurry or double vision
- Sensitivity to light or noise
- Numbness or tingling
- Does not "feel right"

Emotional:
- Irritable
- Sad
- More emotional than usual
- Nervous

Sleep*:
- Drowsy
- Sleeps less than usual
- Sleeps more than usual
- Has trouble falling asleep

**Only ask about sleep symptoms if the injury occurred on a prior day.*

Signs and symptoms of concussion generally show up soon after the injury. However, a concussion is an evolving injury. The full effect of the injury may not be noticeable at first and some symptoms may not show up for hours or days.

In the classroom, concussion symptoms may translate into a variety of challenges with learning. Cognitive symptoms may result in problems with speed of reading, difficulties doing multi-step math problems, problems maintaining consistent attention throughout the class, and/or distractibility. Students' complaints about physical symptoms such headache, fatigue or increased sensitivity to the lights in the classroom or the noise in the hallways and cafeteria may impair the effectiveness of their learning. Problems with emotional control can also be evident. The student can become more easily irritated or agitated or may feel overwhelmed and frustrated by their learning challenges. These different symptoms can impact the student's overall school performance.

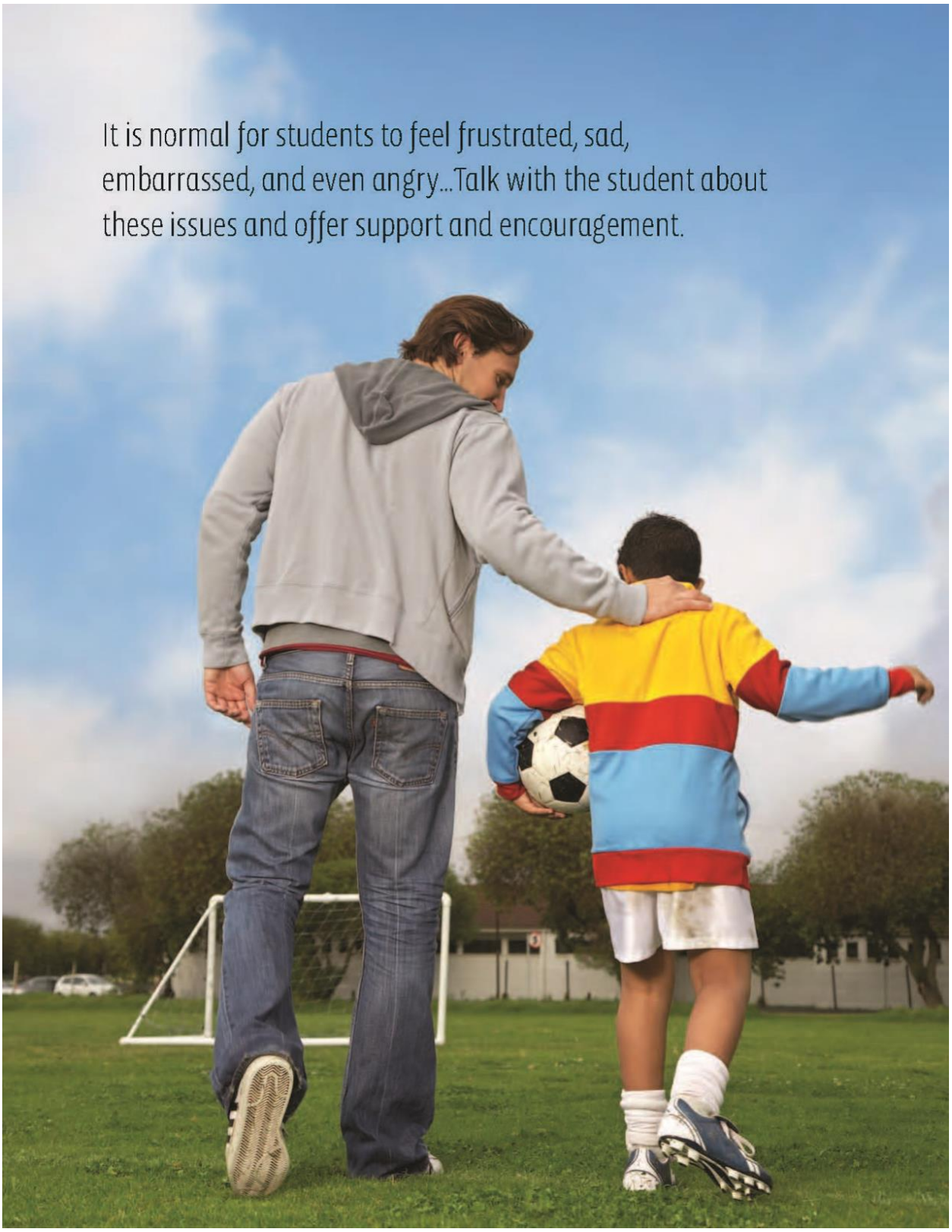
What roles do cognitive exertion and rest play in a student's recovery?

Resting after a concussion is *critical* because it helps the brain recover. Mental and cognitive exertion requires the br[redacted]

be included in the return to school management plan provided by the student's health care provider.

Cognitive rest may require a student to limit or refrain from activities, such as working on a computer, driving, watching television, studying for or taking an exam, using a cell phone, reading, playing video games, and text messaging or other activities that cause concussion symptoms to appear or worsen. Many students find limiting or completely avoiding cognitive activities difficult, because these activities are a routine part of their lives. Therefore, it is important to explain to students that ignoring concussion symptoms and trying to "tough it out" often makes symptoms worse and can make recovery take longer, sometimes for months.

Tolerance for cognitive activity increases as the student recovers, but the rate of recovery may vary from one student to another. For example, three days after their injury one student may be able to read for 30 minutes before experiencing fatigue, headache, and reduced concentration; whereas, another student may be able to tolerate only 10 minutes of this same activity three days following the injury. Thus regular monitoring of symptoms, including input from the student, is critical in any return-to-school plan.


It is normal for students to feel frustrated, sad,
embarrassed, and even angry...Talk with the student about
these issues and offer support and encouragement.

How can I help identify problems and needs?

Based on the identification of symptoms and an analysis of how the student responds to various activities, interventions that are tailored to the specific needs of the student can be identified and implemented.

To start, identify the types of symptoms the student is experiencing. Next, try to identify specific factors that may worsen the student's symptoms so steps can be taken to modify those factors. For example:

- Do some classes, subjects, or tasks appear to pose greater difficulty than others? (compared to pre-concussion performance)
- For each class, is there a specific time frame after which the student begins to appear unfocused or fatigued? (e.g., headaches worsen after 20 minutes)
- Is the student's ability to concentrate, read or work at normal speed related to the time of day? (e.g., the student has increasing difficulty concentrating as the day progresses)
- Are there specific things in the school or classroom environment that seem to distract the student?
- Are any behavioral problems linked to a specific event, setting (bright lights in the cafeteria or loud noises in the hallway), task, or other activity?

Importantly, if a student has a history of concussions, medical condition at the time of the current concussion (such as a history of migraines), or developmental disorders (such as learning disabilities and ADHD), it may take longer to recover from the concussion. Anxiety and depression may also prolong recovery and make it harder for the student to adjust to the symptoms of a concussion.

It is normal for students to feel frustrated, sad, embarrassed, and even angry because they cannot keep up with their schoolwork or participate in their regular activities, such as driving or sports. A student may also feel isolated from peers and social networks. Talk with the student about these issues and offer support and encouragement. In consultation with the student's heath care professional, and as the student's symptoms decrease, the extra help or support can be removed gradually.

Some Strategies for Addressing Concussion Symptoms at School

(Please note: these strategies will vary based on the student's age, level of understanding, and emotional status)

COGNITIVE

Concentrate first on general cognitive skills, such as flexible thinking and organization, rather than academic content.

Focus on what the student does well and expand the curriculum to more challenging content as concussion symptoms subside.

Adjust the student's schedule as needed to avoid fatigue: shorten day, time most challenging classes with time when student is most alert, allow for rest breaks, reduced course load.

Adjust the learning environment to reduce identified distractions or protect the student from irritations such as too-bright light or loud noises.

Use self-paced, computer-assisted, or audio learning systems for the student having reading comprehension problems.

Allow extra time for test/in-class assignment completion.

Help the student create a list of tasks and/or daily organizer.

Assign a peer to take notes for the student.

Allow the student to record classes.

Increase repetition in assignments to reinforce learning.

Break assignments down into smaller chunks and offer recognition cues.

Provide alternate methods for the student to demonstrate mastery, such as multiple-choice or allowing for spoken responses to questions rather than long essay responses.

BEHAVIORAL/SOCIAL/EMOTIONAL

If the student is frustrated with failure in one area, redirect him/her to other elements of the curriculum associated with success.

Provide reinforcement for positive behavior as well as for academic achievements.

Acknowledge and empathize with the student's sense of frustration, anger or emotional outburst: "I know it must be hard dealing with some things right now."

Provide structure and consistency; make sure all teachers are using the same strategies.

Remove a student from a problem situation, but avoid characterizing it as a punishment and keep it as brief as possible.

Establish a cooperative relationship with the student, engaging him/her in any decisions regarding schedule changes or task priority setting.

Involve the family in any behavior management plan.

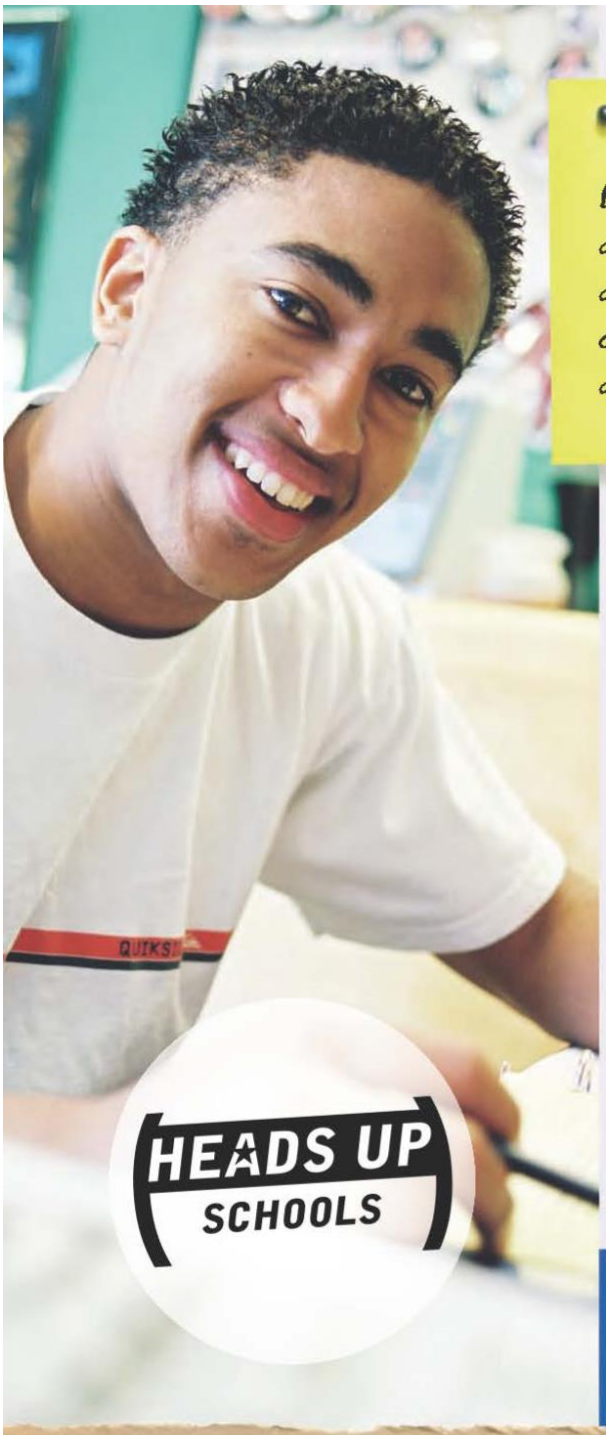
Set reasonable expectations.

Arrange preferential seating, such as moving the student away from the window (e.g. bright light), away from talkative peers, or closer to the teacher.

When symptoms persist: What types of formal support services are available?

For most students, only temporary, informal, academic adjustments are needed as they recover from a concussion. However, a variety of formal support services may be available to assist a student who is experiencing a prolonged recovery. These support services may vary widely among states and school districts. The type of support will differ depending on the specific needs of each student. Some of these support services may include:

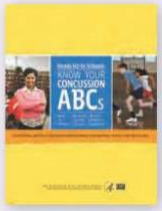
- **Response to Intervention Protocol (RTI):** An RTI may be used for students who need academic adjustments for an extended period and/or need to increase the level of a particular intervention. An RTI allows for a multi-step, targeted approach that school professionals can use to monitor a student's progress through increasing levels of an intervention. At each intervention level, a school professional assesses the students to determine whether additional instruction or support is needed.
- **504 Plan:** Students with persistent symptoms and who require assistance to be able to participate fully in school, may be candidates for a 504 plan. A 504 plan will describe modifications and accommodations to help a student return to pre-concussion performance levels. For example, a student recovering from a concussion might receive environmental adaptations, temporary curriculum modifications, and behavioral strategies.
- **Individualized Education Plan (IEP):** Students with certain classifications of disability that adversely impact educational performance may be eligible for an IEP. These students generally require significant help to access the curriculum. This help may include adjusting the student's workload, adjusting methods or pace of instruction, or allowing the student to work in an environment other than an inclusive classroom. The majority of students with a concussion will not require an IEP; however, a small percentage of students with more chronic cognitive or emotional disabilities may require this level of support.



HEADS UP SCHOOLS

Be sure to check with your national association or school district to learn about existing resources or policies on returning students to school after a concussion.

Materials for school professionals are available from the *Heads Up to Schools: Know Your Concussion ABCs* initiative at www.cdc.gov/Concussion.



Also, see *Heads Up to Clinicians: Addressing Concussion in Sports among Kids and Teens* online course for health care professionals with a free continuing education opportunity.

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To learn more about concussion and to order materials **FREE-OF-CHARGE,** go to **www.cdc.gov/Concussion** or call **1-800-CDC-INFO.**

APPENDIX J: INTERVIEW QUESTIONS

1. What professional development for concussions have you completed?
    a. If participant answers they have completed professional development: Do you feel you have had enough training to become familiar with symptoms of concussions?
    b. If participant answers they have not completed professional development: Do you feel you understand the symptoms of concussions?
2. After completing professional development, do you think you understand the symptoms of concussions? Why or why not?
3. What kinds of professional development activities would help your understanding of concussions?
4. What kinds of professional development activities would help your understanding of the academic accommodations concussed students need?
5. What will help you feel more comfortable in supporting students with concussions?
6. When you are told a student has a concussion, does this affect how you treat them in the classroom?
7. Does your treatment of them change if they are struggling?
8. Does your treatment of them change if they are honor students?