The Impact of Educational Materials on Collegiate Student-Athletes’ Knowledge of Sports Related Concussions

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To the Dean of the Graduate School:

We are submitting a thesis written by Ryan Johnson entitled The Impact of Educational Materials on Collegiate Student-Athletes’ Knowledge of Sports Related Concussions. We recommend acceptance in partial fulfillment of the requirements for the degree of Master of Science in Sport and Fitness Administration.
Abstract

The purpose of this study was to investigate the effectiveness of three different types of concussion education materials for collegiate athletes and to evaluate knowledge transfer. Three different types of educational materials were used to educate the athlete. The athlete completed a pretest, completed an educational module, and then completed a posttest. Two weeks later the athlete completed a retention test. A total of 51 subjects participated in the study. The subjects were evaluated on a pretest, posttest, and retention test. Data were analyzed based on an independent t-test to compare pretest scores between athletes who have been previously concussed and athletes who have not been previously concussed. There were no significant results. Data were analyzed based on a one-way ANOVA to compare posttest scores between educational groups as well as retention test scores between educational groups. There were no significant results found. Descriptive statistics and frequencies were used to analyze self-reported knowledge rating and whether or not the athlete had received previous concussion education material.
Dedication

I would like to dedicate this thesis to my family. Especially to my loving parents, Darbi and Michael Johnson, Who have always had words of encouragement and Supported me more than anyone
Thank You

“The price of success is hard work, Dedication to the job at hand, And the determination That whether we win or lose, We have applied the best of ourselves to the task at hand” -Vince Lombardi
Acknowledgements

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Chapter 1

Recent concussion research has created increased attention from athletic trainers and health care professionals around the world. This devastating injury can result in severe long-term consequences and even death if the appropriate care is not provided (Sarmiento, Mitchko, Klein, & Wong, 2010). Any athlete can experience a concussion while participating in sports, however, participation in contact sports such as football, soccer, basketball, and even wrestling creates greater risk (Harmon et al., 2013). The recent attention to this injury has brought awareness to a variety of organizations for the need to provide concussion education. The recent issues of concussions and the impact they could have on the athlete have resulted in the development of new policies for health care professionals, rule changes, coaching strategies, and new laws to create the optimal environment for the safety of athletes.

A concussion is defined as “a complex pathophysiological process affecting the brain, induced by biomechanical forces” (McCrory et al., 2013, p. e2). Each year there are approximately 1.6 to 3.8 million sport-reported concussions. Researchers believe the number is much higher due to unreported cases (Langlois, Rutland-Brown, & Wald, 2006). Most concussion education research currently focuses on coaches, parents, and health care professionals. However, athletes also need to learn about the signs and symptoms of concussions and the long-term effects of concussion on health and well-being. Education for the athlete about signs, symptoms, and common misconceptions
could create a reason for the athlete, or teammate, to come forward with their symptoms, potentially saving a life.

The high standard of care for safety of the athlete is the main concern. In fact, there have been settlements of players suing for long-term effects of concussions in the National Football League (National Football League, 2013). Additionally, there have been lawsuits in the National Collegiate Athletic Association (NCAA) with former student athletes, claiming that the institution failed to educate players about the risks of concussions (Singer, 2013). These lawsuits could have been avoided with proper education and awareness of concussions. Another issue of constant concern within leagues, organizations, team members, and medical professionals is to make sure concussion awareness is taking place. Legislation in all 50 states and the District of Columbia has been passed regarding the management of traumatic brain injury in sports for youth and/or high school football (National Conference of State Legislatures [NCSL], 2014). This was an important success for concussion awareness and policies.

While increased awareness among coaches, parents, and healthcare providers has been important in the concussion management arena, there could still be improvement among all sports organizations. Additionally, athletes must be educated on concussion recognition and management to make them personally aware of the associated risks if they ignore the proper way to handle a concussion. In order to ensure adequate education, sports organizations need information about the best strategies to use in providing concussion information to players.
Statement of the Problem

The purposes of this study were to investigate the effectiveness of three different types of concussion education materials for collegiate athletes, to evaluate knowledge transfer, and to evaluate retention of information over a period of time.

Research Hypotheses

There will be a significant difference between the posttest scores of collegiate athletes that complete the online educational module compared to the posttest scores of collegiate athletes that read handouts or watch a video.

There will be a significant difference between pretest scores of collegiate athletes with previous concussion(s) compared to pretest scores of collegiate athletes with no history of previous concussions.

There will be a difference between retention test scores of collegiate athletes that complete the online educational material module compared to the retention test scores of collegiate athletes that read handouts or watch a video.

Delimitations

1. Participants must be between the ages of eighteen and twenty-five.
2. Participants must participate in athletics at a Division I institution.
3. Participants must complete the retention test two weeks after the posttest, within a standard deviation of one day.
4. Participants must not have sustained a concussion in the three months, prior to the pretest, or receive a concussion during the duration of the study.
5. Participants must not be majoring in athletic training.
Limitations

1. The sample size may be small due to limited access to collegiate athletes.
2. The ratio of male to female participants may not be 1:1 due to limited participation from male subjects.
3. The number of participants who return for the retention test within the time given.
4. Results may be varied due to a participant’s motivation toward a specific learning style.
5. Results may be varied because some collegiate athlete’s primary language is not English.

Definition of Terms

**Athletic Trainer.** “Athletic Trainers (ATs) are health care professionals who collaborate with physicians. The services provided by ATs comprise prevention, emergency care, clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions. Typical patients and clients served by athletic trainers include recreational, amateur, and professional athletes.” (National Athletic Trainers’ Association, 2013, p. 1).

**Athletic Training.** “Is practiced by athletic trainers, health care professionals who collaborate with physicians to optimize activity and participation of patients and clients. Athletic training encompasses the prevention, diagnosis, and intervention of emergency, acute, and chronic medical conditions involving impairment, functional limitations, and disabilities” (National Athletic Trainers’ Association, 2013, p. 1).
**Collegiate Athlete.** Operationally defined as any NCAA Division I student athlete that is between the ages eighteen to twenty-five.

**Concussion.** “A complex pathophysiological process affecting the brain, induced by biomechanical forces” (McCrory et al., 2013).

**Concussion Education.** Operationally defined as any educational material used to educate the collegiate athlete about concussions including modules, handouts, and videos.

**Handout Materials.** Operationally defined as the written documents used for concussion education of collegiate athletes. Handout material consists of three documents including; NCAA “Approach to Concussions”, partnered NCAA and CDC “Concussion A Fact Sheet For Student-Athletes”, and the CDC “Facts about Concussion and Brain Injury”.

**Knowledge Transfer.** “The exchange, synthesis and ethically-sound application of knowledge within a complex system of interactions … through improved health, more effective services and products, and strengthened healthcare system” (Provvidenza et al., 2013, p. 2).

**Online Module.** Operationally defined as the “Brain 101: ORCAS School-wide Concussion Management” module used for concussion education in athletes.

**Posttest.** Operationally defined as the test participants will take immediately after a session of concussion education material.

**Pretest.** Operationally defined as the test participants will take prior to a session of concussion education material.
**Retention test.** Operationally defined as the test participants will take two weeks after the posttest within a standard deviation of one day.

**Video.** Operationally defined as the NATA’s “Concussions in Football” used for information material of concussions.
Chapter 2

Review of Literature

Introduction

A concussion is a brain injury and is defined as “a complex pathophysiological process affecting the brain, induced by biomechanical forces” (McCrory et al., 2013). There have been approximately 1.6 to 3.8 million sports and recreation-related traumatic brain injuries reported in the United States each year. However, many researchers believe those numbers to be much higher due to under-reporting from young athletes (Glang, Koester, Beaver, Clay, & McLaughlin, 2010). Concussions have been a popular topic in sports media. Educational awareness about concussions has also been increasing over time to educate coaches, parents, athletes, and health care professionals. While most educational material has been directed towards coaches and parents, the athlete also has a very important role in the recognition of a concussion. Self-reported symptoms are recognized as more obvious ways to assess a concussion (Guskiewicz et al., 2004). There have been improvements to increase awareness for athletes, coaches, and medical staff (Broglio et al., 2010). With this in mind, educating athletes about concussion signs and symptoms, as well as other aspects of what they may experience can be important to ensure proper concussion management and recovery.

Concussion Definition: Recognition of Signs and Symptoms

The definition of a concussion can vary and there are more than forty-two consensus-based definitions of a concussion (National Collegiate Athletic Association [NCAA], 2014). The complexity of the definition of a concussion has been widely
discussed by healthcare professionals around the world. The National Athletic Trainers’ Association (NATA) position statement defines a concussion as a “trauma-induced alteration in mental status that may or may not involve a loss of consciousness” (Broglio et al., 2014). Within the position statement, the NATA also recognized the definition provided by the International Concussion in Sport Group. The in-depth definition from the International Concussion in Sport Group is as follows in its entirety:

Concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include:

1. Concussion may be caused either by a direct blow to the head, face, neck, or elsewhere on the body with an “impulsive” force transmitted to the head.

2. Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously. However, in some cases, symptoms and sign may evolve over a number of minutes to hours.

3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.

4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However, it is important to
note that in some cases symptoms may be prolonged (McCrory et al., 2013, pp. 250).

While some use the term mild traumatic brain injury in place of the term concussion, the International Concussion in Sport Group recognizes that concussion is a specific category of traumatic brain injury. The terms should not be used interchangeably. It is important to understand the definition of a concussion as a basis for recognition of the signs and symptoms that may present during an injury. Signs and symptoms vary based on a variety of domains including somatic, cognitive, emotional, physical, behavioral, reaction time, and sleep disturbances (McCrory et al., 2013). Based on these aspects of clinical domains, the Sport Concussion Assessment Tool Third Edition (SCAT3), was developed to incorporate a comprehensive list. Symptoms are rated from a scale of 0-6 with 0 being none at all and 6 being most severe. It is important to recognize any of these symptoms after a suspected concussion. While some researchers have described 27 symptoms (Guskiewicz et al., 2004), the SCAT3 utilizes a list of 22 symptoms. The 22 symptoms are as follows: headache, “pressure in head”, neck pain, nausea or vomiting, dizziness, blurred vision, balance problems, sensitivity to light, sensitivity to noise, feeling slowed down, feeling like “in a fog”, “don’t feel right”, difficulty concentrating, difficulty remembering, fatigue or low energy, confusion, drowsiness, trouble falling asleep, more emotional, irritability, sadness, and nervous or anxious (Sport Concussion Assessment Tool 3, 2013). Symptoms are always based on an individual basis and athletes may not present with all symptoms. While there are some cases that have prolonged symptoms, eighty to ninety percent of all sport participants
have resolved symptoms within seven to ten days of their injury (King, Brughelli, Hume & Gissane, 2014). Once recognition of a concussion occurs and any signs or symptoms are noted, the athlete must be medically evaluated by a health care professional.

**Concussion Management and Return to Play Protocol**

Both the NCAA and the NATA have developed protocols aimed at effective management of sport related concussion (Broglio et al., 2014). These management plans serve as models to athletic trainers and should be implemented when an athlete receives a concussion. The implementation of these plans also provides instructions on how to educate coaches, athletes, and parents. However, the instructions let the institution decide how to implement an educational program to teach the athletes about signs and symptoms of a concussion. Athletes are not always willing to report their signs and symptoms as “researchers have documented athletes’ lack of willingness to report concussions to medical personnel” (Broglio et al., 2014, p. 248).

The concussion management plan must be a team effort between the coaches, athletes, and medical personnel. The concussion management position statement by the NATA also states that coaches have a responsibility to recognize signs and symptoms of a concussion. Improving the familiarity of coaches with specific signs and symptoms of a concussion and when they should report these signs and symptoms to an athletic trainer is a key component to the concussion management plan. The sport related concussion information in the NCAA Sports Medicine Handbook provides specific procedures to follow as return to play is implemented. The concussion management guidelines include specifications on pre-participation screening, recognition and diagnosis of concussion,
post-concussion management, return to activity, return to play, and return to academics. It is very important to follow this protocol as a medical professional. It has been edited and developed as more recent evidence-based research has become available.

There are areas of improvement that have been made and the concussion management plans that are in place have improved over time. With updated evidence-based research there will be a continued process to update concussion education protocols, information, and educational strategies that should be a part of the concussion management plan.

The concussion management plan is a very important process in making sure the safety of the athlete is the main priority. Athletic trainers have a responsibility to recognize, treat, manage, and educate about concussions. The concussion management plan is an in-depth process and must be followed if there is a suspected concussion.

Upon the notice of a significant blow to the head or body where there is a suspected concussion, the athletic trainer should perform an on-field evaluation to check the status of an athlete. Inspection of the athlete should include recognition of any life threatening injuries. If no such injuries exist, the athlete should be evaluated for a concussion. Questions such as “Are you OK?” and “Can you go?” are not supported by the NATA position statement of sport related concussion management and should not be used (Broglio et al., 2014). If there is recognition of amnesia, any signs or symptoms, or any suspicion of a concussion the athlete should be removed from play and receive further evaluation.
The athletic trainer should assess cranial nerve function, from a clinical perspective. If any of the cranial nerves are not responding, the athlete should be taken to the emergency room for further evaluation. If the cranial nerves are functioning, the athlete should undergo concussion tests that are compared to their baseline test. The SCAT3, or similar assessment, should be used to evaluate cognitive, physical, balance, coordination, memory, and symptom severity. Upon completion of the SCAT3, the athlete should perform an online neuropsychological test such as the ImPACT test. The online test should also be compared to a baseline assessment. This test should be performed within 24 hours of the initial concussion recognition. The combined results of on-field evaluation, sideline assessments, symptom checklists, balance testing, and neuropsychological testing allow for an accurate diagnosis of concussion. (Schatz & Sandel, 2012).

After the concussion tests, the athletic trainer should provide the concussed athlete with home care instructions. Additionally, a responsible adult who is available to monitor the athlete should also be provided with home care instructions. The athletic trainer should educate the athlete and responsible adult on pertinent information including information about red flags, signs and symptoms, and medication. If symptoms severely deteriorate or any red flags are recognized, the responsible adult should call 911 first, and then contact the staff athletic trainer. The patient does not typically have to be awakened periodically throughout the night, however, that is at the athletic trainer’s discretion. In some instances, the athletic trainer might recommend nighttime waking. Such instances include if the athlete experienced a loss of consciousness, had prolonged
periods of memory loss, or received significant symptoms before going to bed (Broglio et al., 2014). The responsible adult should receive specific instructions from the athletic trainer. The athlete should also receive instruction that they should not participate in any physical activity, weight sessions, practices, or games.

A relatively recent aspect of the recovery process following concussion is the implementation of cognitive rest. Cognitive rest requires patients to avoid stressing the brain with mental activities including watching television or movies, computer activities, video games, reading, and other activities that require concentration. Research addressing cognitive rest has yielded mixed results regarding the need to provide a period free from such mental stress (Gibson, Nigrovic, O’Brien, & Meehan, 2013; McGrath, 2010). The most recent NATA position statement on concussion management (Broglio et al., 2014) recommends a period of cognitive rest. In the collegiate setting, a period of cognitive rest would require cooperation by professors.

The athletic trainer should also have the athlete examined by a physician with a background in sport related concussion. The athletic trainer should be in regular contact with the physician and provide updates to the team physician throughout the return to play process. The athletic trainer should conduct a daily clinician-interviewed checklist based on the 22 symptom scale from the SCAT3. The athlete must be asymptomatic to begin the return to play process.

Once the athlete is symptom free for twenty-four hours, the return to play protocol may begin. There should be a twenty-four hour period between each stage of the return to play process. If there is decreased performance or any symptoms return, the athlete
should stop activity. The athlete should rest for twenty-four hours and then start the last stage at which they were asymptomatic. Stage 1 is the period from asymptomatic results until the first day of activity. Stage 2 consists of light exercise that is less than seventy percent of the age-predicted max heart rate. Stage 3 includes individual non-contact sport-specific activities. Stage 4 involves non-contact sport-specific activities with other teammates. In stage 5 unrestricted training, including weight sessions, and full contact practice is allowed. In stage 6 the athlete will return to play upon clearance from a physician. There may also be a need to reassess and perform neuropsychological testing at a period designated by the athletic trainer and physician (Broglio et al., 2014). These guidelines are based on the NATA position statement for management of sport related concussion and the NCAA guidelines on sport related concussion from the *Sports Medicine Handbook*.

**Concussion Education Strategies**

Educating athletes regarding the short-term and long-term consequences of concussions can protect the athlete and make them aware of the risks and challenges that they may face. Since signs and symptoms of concussions can vary and can include up to 27 total symptoms, athletes may not always recognize a concussion (Guskiewicz et al., 2004). Education regarding the recovery process, the importance of consultation with a health care professional, the need for rest, and the steps of the return to play protocol are important.

While past educational materials have targeted coaches, parents, and health care professionals, athletes have a critical role in recognizing concussions in themselves or
their teammates. The athlete should be able to recognize that they have signs and symptoms of a concussion and self-report to an athletic trainer or coach. Such self-recognition is especially important in sports like soccer where a concussion could occur in play and the athlete could continue without the proper medical attention. Since the rules of soccer do not allow medical personnel on the field without recognition from the referee, athletes must know to report symptoms to the referee. Similarly, education may make athletes more likely to notice a teammate with signs and symptoms of a concussion.

Researchers evaluated information made available to the public by the Centers for Disease Control (CDC). Since effective education is more likely if the information is widely available, the CDC has worked diligently to disseminate concussion information. A questionnaire was mailed out to high school coaches regarding the information received from the CDC tool kit. A focus group was established with coaches from a variety of different sports. The survey had results showing that 90 percent of the coaches had used at least one piece of information from the tool kit material. One-third of the coaches reported that they learned something new about concussions by using the CDC material (Sarmiento, Mitchko, Klein, & Wong, 2010). The information that the coaches received also provided an opportunity for them to educate other coaches, parents, and athletes about concussions.

In addition to the tool kit to educate coaches, the CDC also has other education tools. A variety of concussion education materials was delivered to coaches in “Heads Up: Concussion In High School Sports” (Covassin, Elbin, & Sarmiento, 2012). Six months after receiving the educational materials, the coaches were asked to complete a
survey about the information. Respondents indicated that the most useful pieces of information were the fact sheet for coaches and the magnet, which provided concussion education information. Seventy-five percent of the coaches had not received any prior informational material regarding concussions (Covassin, Elbin, & Sarmiento, 2012). Results showed that over sixty percent of coaches viewed concussions as a serious injury after reviewing the educational material that was provided. The researchers determined that even a small amount of informational material could improve the knowledge of coaches regarding concussion.

Handouts and informational tools, such as fact sheets, can provide a coach with basic skills to recognize a concussion and refer the athlete for the proper care that is needed. Other educational materials include online training such as the ACTive online module program. The information used in an online training program can be more interactive than reading a fact sheet. Other aspects of online training include easy access and cost-effectiveness. The ACTive training module involves three short modules providing information about concussions. Content in the ACTive online module was based on recommendations from the NATA and the International Conference on Concussion in Sport (Glang et al., 2010). A study about the ACTive online module utilized a pretest and posttest and included a control group that did not complete the concussion-training module. The effectiveness of ACTive was measured with a symptom scale in yes or no form, general knowledge with true/false answers, common misconceptions about concussion, and five scenario questions based on self-efficacy and behaviors. Significant results were found on all five-outcome measurements.
Although previous studies have shown effectiveness in the education of coaches regarding concussion, researchers are always looking for better educational strategies. Video games are another way to educate youth athletes and researchers looked at game content and whether it had an effect on knowledge. Participants were actively involved in a game that was specific to youth hockey players. A correct response moved the puck toward the computer goal and an incorrect response moved the puck toward the participants’ goal (Goodman, Bradley, Paras, Williamson, Bizzochi, 2006). The computer game was set up based on a series of concussion symptoms. The experimental group showed significant improvement over the control group. The study had a different concept and used incentives of scoring goals with a game to complete the quiz. This study did show improvements, although it was only based on a symptom scale and did not include other informational materials. It was also designed for young children and the complexity level of the study was very low.

Research into the education of athletes’ knowledge of a concussion and the variety of different ways that they receive information about concussions is useful in guiding educational efforts. While there are specific guidelines from the NCAA about concussion management protocols and the return to play process, there are not specific guidelines regarding what information the athletes receive about concussions. The type of education can vary from lectures, email, videos, and handouts. A study was completed that reviewed the type of information that was given to athletes and whether or not they recalled that they actually received the information. There was a low recall rate of handouts via email with less than twenty-six percent that acknowledged they had
received the information. There was a varied range of thirty-one to seventy-six percent with the athletes who received the handouts directly. The percentage of athletes receiving information in the locker room had a recall of twenty-six percent. The teams that received a lecture had a varied range from twenty-eight to eighty-three percent. The highest percentage of recall included a team that received information from a video with a ninety-two percent recall rate (Kroshus, Daneshvar, Baugh, Nowinski, & Cantu, 2014). The study recommended the NCAA should mandate a specific list of acceptable ways for athletes to be given concussion education information. A lecture and a video presentation at the beginning of the school year in a sport-specific setting was suggested as preferable rather than simply providing the team with a handout that might not even be read.

Another study reviewed an online module program presented to secondary school students. The subjects were evaluated with pre and posttest scores of concussion education material when compared with a control group (Echlin et al., 2014). The questions were consistent with that of the 2012 Zurich Consensus Statement, an international conference on concussion in sport. The study did show significant results for improvement in both the control group and the experimental group. However, the change was more significant within the treatment group (Echlin et al., 2014).

The concussion education portion of the concussion management protocol lacks specificity and this could result in athletes failing to recognize the seriousness of the injury. The only instructions regarding education state that the institution should provide “NCAA concussion fact sheets or other applicable educational material annually to student-athletes, coaches, team physicians, athletic trainers, and athletic directors.”
(NCAA, 2014). It also states that both parties should sign and acknowledge receiving the concussion educational material. That small section of the NCAA Sports Medicine Handbook under sport-related concussion should be revised and more in depth with the advice of the NATA and well-known professionals about concussion education. While there is plenty of educational material available about concussions, there are also different ways and strategies to implement this part of the concussion management plan, including videos, emails, handouts, and online modules. Medical professionals of organizations who look out for the safety of the players must have an understanding that the bare minimum covered under legislation is becoming unacceptable. For example, an institution that simply sends out an email and/or lecture to student athletes about concussion education has a recall rate of twenty-six percent or less. However, a sport-specific video along with a lecture and a handout had a recall rate of ninety-two percent (Kroshus et al., 2014). The mindset of just creating and implementing a program because it has to be done is unacceptable. The program and educational model used by each institution should be an in-depth process and updated as more research is presented. The individuals implementing the presentation of the sport-related concussion program should be kept up to date and informed about the most current protocol.

While athletic trainers have a variety of educational and treatment concerns in addition to concussions, the best way to provide concussion education must be a priority. The use of a video has been shown to have impact on the education of the athlete (Kroshus et al., 2014) and a video could be implemented into the pre-participation physical process. The idea of concussion education being a part of pre-participation
physical could be implemented to incoming collegiate freshman. Student athletes should receive updates with information and concussion education throughout their collegiate career. A recent study investigating the implementation of the educational aspect of concussion management plans found that ninety-three percent of respondents acknowledged that their school had a concussion management plan (Baugh et al., 2014). Athletic trainers reported the greatest improvement was needed in coach education, staffing in sports medicine departments, and athlete education. While coaches reported the greatest improvement was needed in athlete education and coach education; some coaches did not report any areas needing improvement (Baugh et al., 2014).

Knowledge Transfer, Learning Styles, and Retention of Concussion Information

While research has been done into the effectiveness of various concussion education programs within the framework of short-term recall of information (Covassin, Elbin, & Sarmiento, 2012; Kroshus et al., 2014), there is no information in the literature regarding retention of material for longer periods of time. It seems logical that determining longer term retention of concussion information is an important piece of the concussion education discussion. Principles of knowledge transfer have been reviewed to determine how to improve both delivery and retention of concussion information (Provvidenza & Johnston, 2009). Knowledge transfer is defined as the “The exchange, synthesis and ethically-sound application of knowledge within a complex system of interactions … through improved health, more effective services and products, and strengthened healthcare system” (Provvidenza et al., 2013, p. 2). The pace at which new
information about concussions has become available in the past few years makes it imperative that sports organizations utilize every possible tool in the education of athletes. The application of principles of knowledge transfer encourages the use of strategies other than traditional face-to-face and printed material, including social media and peer-assisted learning (Provvidenza et al., 2013).

Recent litigation by three former college football players against the NCAA claiming that “the institution failed to educate players and disclose the risks of concussions” (Singer, 2013, p.1) could have been avoided if proper education with emphasis on retention had been provided to the athletes. In fact, the NCAA has mandated concussion education for athletes at its member institutions since 2010. Institutions must have a concussion management plan and athletes must sign a statement that they will report all injuries and illnesses to the medical staff (National Collegiate Athletic Association [NCAA], 2014). Mandating that some type of information be provided is a good start, but the NCAA does not provide members with guidelines regarding which educational materials are most effective. Providing education is an important first step, but providing education that the athlete will retain is critical.

Provvidenza and Johnston (2009) noted that athletes have varied abilities to learn and that they employ a variety of learning styles. Dunn (2013) determined that only five percent of the athletic population prefers reading and writing as a learning style. Dunn noted that other strategies to facilitate learning in athletes with auditory, visual, and kinesthetic learning styles are critical in order to enhance knowledge. While most of the research on learning styles in athletes has investigated response to coaching styles,
inferences can be made about athlete learning on more general topics (Stevens-Smith & Cadorette, 2012). Since knowledge transfer and knowledge retention are critical issues within concussion education, the selection of strategies that are the most effective at meeting athlete learning styles must be a priority (Provvidenza & Johnston, 2009).

While selecting educational strategies that meet athletes’ learning styles is imperative, another key factor to consider is attention span. Some studies suggest that there is only a ten to fifteen minute span of attention during lectures (McKeachie & Svinicki, 2006). While this estimate of attention span has long been accepted by educators, other research found wide variation in attention span and suggested that many students are capable of maintaining concentration for longer periods of time (Wilson & Korn, 2007). In planning concussion education, health care providers should be aware of the attention span capabilities of the participants in their program.

**Conclusion**

While most studies to date have explored improvement of concussion knowledge among coaches, there is a strong case to educate the athlete, especially at the collegiate level because of the high intensity of the sport. Improved student athlete education, could decrease failure to report signs and symptoms that a concussed athlete might display (Register-Mihalak et al., 2013). Education is growing for all categories of personnel related with sports. Improved methods of education for athletes has potential to enhance athlete recognition of concussion and, ultimately, provide an optimal environment for athlete safety.
Chapter 3

Methods and Procedures

Concussion education is an important consideration for any person involved in sports. Athletic organizations should inform athletes, coaches, and healthcare providers of the signs and symptoms, possible risks, and management protocols for concussion. Effective concussion education programs could reduce the number of under-reported signs and symptoms by athletes and, potentially, save lives (Mansell et al., 2010). The purposes of this study were to investigate the effectiveness of three different types of concussion education materials for collegiate athletes, to evaluate knowledge transfer, and to evaluate retention of information over a period of time. The following the research hypotheses were examined:

1. There will be a significant difference between the posttest scores of collegiate athletes that complete the online educational module compared to the posttest scores of collegiate athletes that read handouts or watch a video.

2. There will be a significant difference between pretest scores of collegiate athletes with previous concussion(s) compared to pretest scores of collegiate athletes with no history of previous concussions.

3. There will be a difference between retention test scores of collegiate athletes that complete the online educational material module compared to the retention test scores of collegiate athletes that read handouts or watch a video.
Participants

Fifty-seven student athletes volunteered for the study. Three of the 18 previously concussed athletes were eliminated. Three of the 39 non-previously concussed athletes were also eliminated. This resulted in a total of 51 participants. Group one, which received the handouts, consisted of 12 non-previously concussed athletes and 5 previously concussed athletes for a total of 17. Group 2, which watched the video, had 14 non-previously concussed athletes and 6 previously concussed athletes for a total of 20. Group 3, which received the online module, had 10 non-previously concussed athletes and 4 previously concussed for a total of 14. All subjects were Division I college athletes between the ages of eighteen and twenty-five. Athletes were from a variety of contact and non-contact sports that included men’s and women’s soccer, men’s and women’s tennis, volleyball, women’s lacrosse, softball, and baseball. Football was not included since the university in which the study was conducted does not have a football program. There was a male to female ratio of 8:43, respectively.

Context of the Setting

Classrooms in a public university were the setting for the study. Each classroom was monitored and considered a quiet environment. The group that received the handouts read them in complete silence. The group that watched the video was in a classroom setup with audio that played through the speaker. The subjects who received the online module sat in front of individual computers and wore headphones to listen to the video and instructions. All pretests, posttests, and retention tests were conducted in the same classroom. Before any data were collected or subjects were recruited for the study an IRB
(Appendix A) was submitted to the public university and, upon approval, the study was performed. Each participant was required to sign an informed consent form (Appendix E) prior to the beginning of the study. The participant was instructed to keep one copy for their records and the other copy was kept on file by the primary researcher.

**Research Design**

The research data collected were based on a quasi-experimental design. The independent variable was the type of educational material utilized. Independent variables included the use of CDC and NCAA concussion information handouts (Appendix H), the NATA video, “Concussions in Football” (Appendix I), and ORCAS: Brain 101 The Concussion Playbook (Appendix J), which is an interactive computer module. The dependent variables were test scores of a pretest, a posttest, and a retention test. All of these tests included the same questions that were based on information collected collaboratively from all three types of concussion education. All education delivery was approximately the same time length, approximately 15 minutes. The statistical program SPSS was used to collect and analyze the data completed in the study.

Instruments included handouts and printed material from the CDC and NCAA, the NATA concussion video, “Concussions in Football”, and a computer module “ORCAS: Brain 101 The Concussion Playbook”. The questions on the pretest, posttest, and retention test were analyzed based on an expert review panel of five athletic trainers, one physician, and information from a previous study on concussion education. A health questionnaire based on information from selected sources including the SCAT3 was completed by each subject.
Validity

The concussion education tests were the same questions for the pretest, posttest, and the retention test. However, the order of the questions differed between the pretest, posttest, and retention test. All answers could be found in each of the three educational materials used in the study. Each question provided content validity from an expert panel which included: five athletic trainers and one physician certified in sports related concussion. The questions used are from sportsconcussionlibrary.com established by Echlin (2011).

Reliability

The test used to measure subject concussion knowledge was adapted from the instrument utilized by Echlin (2001). The instrument has been used in several investigations by Echlin and his colleagues (Echlin et al., 2014).

Procedures

The primary researcher submitted an IRB application (Appendix A) to the public university and received approval to conduct the study. The athletic director gave permission for the primary researcher to contact coaches regarding the study. The head coach of each specific sport was contacted via email to receive permission and a time to talk with their team (Appendix B). Once there was a time designated for that sport, the researcher met with the team and described the study via a script (Appendix C). The athletes were instructed to write down their email and names to be contacted at a later date with further instructions. The athletes that signed up received an email with an appointment time to come to the designated classroom to complete the study. Upon
arrival at the classroom, each subject was provided with a pre-numbered folder and seated with their assigned group. Group assignment was made by random selection. The folder contained two copies of the informed consent form, the health questionnaire, and the pretest. The primary researcher utilized a script (Appendix D) and provided instructions about completing the informed consent form (Appendix E). Participants were instructed to sign both copies of the informed consent document and to keep one for their own records while leaving one copy in the folder for the researcher. After the informed consent forms were signed and dated, the subjects completed the health questionnaire provided by the researcher (Appendix F). The subjects were then instructed to take out the pretest and close their folder (Appendix G). The researcher instructed the participants to use the number on their folder as the identification number in the blank labeled “for researcher use”. The subjects were instructed when they were done to place the pretest on top of their folder and wait patiently and quietly. There was a maximum time limit of 15 minutes, which no subject exceeded. Once all pretests were completed, the researcher escorted group 1 and group 3 to different classrooms to complete the study. Group 2 was instructed to wait in the original classroom. Once all of the groups were in their assigned classrooms, the groups were immediately presented with instructions on how to perform the concussion education material. Group 1 received informational handouts (Appendix H) and had fifteen minutes to review the material. Group 2 watched a video (Appendix I). During the symptoms portion, the video was paused for thirty seconds to let the athlete review the material. Group 3 received instructions to watch the video at the beginning of the online module and then proceeded to complete the module (Appendix J).
Headphones were provided for subjects in group three. When groups 1 and 2 completed viewing the educational material, they were escorted back to the original classroom and all subjects took the posttest (Appendix G). Upon completion of the posttest, each subject was provided with instructions to schedule a meeting time to complete the retention test two weeks after the initial meeting. All retention tests were taken two weeks after the date of the initial meeting within a standard deviation of one day (Appendix G). The researcher reminded each subject via email the day before the retention test. All subjects took the retention test in a similar classroom as that used for the pretest and posttest. The pretest, posttest, and the retention tests all had the same questions regarding concussions although the order of the questions were changed from pretest, posttest, and retention test to decrease the familiarity of the test. All data collected were stored in a double-locked area. The information was kept in a folder with a coded label, in which the participants could not be directly identified. The data for the study were also stored on a computer and only the subject code was entered with the data collected.
Chapter 4

Results

Data collected from 51 subjects, were analyzed. The handout group consisted of 12 non-previously concussed athletes and 5 previously concussed athletes for a total of 17; the video group had 14 non-previously concussed athletes and 6 previously concussed athletes for a total of 20; and the online module group had 10 non-previously concussed athletes and 4 previously concussed for a total of 14. Of those 51 subjects, 70.59% stated they had no previous concussion history and 29.41% stated that they had received a previous concussion.

The statistical analysis was performed utilizing the Statistical Package for the Social Sciences (SPSS, 2013). The researcher analyzed the effects of a variety of concussion education materials with a one-way ANOVA test. The independent t-test was used to determine the differences between pretests of athletes who had received previous concussions compared to those who have not received previous concussions. Descriptive and frequency statistics were performed for some of the questionnaire responses of the subjects. The purposes of this study were to investigate the effectiveness of three different types of concussion education materials for collegiate athletes, evaluate knowledge transfer, and to evaluate retention of material over a period of time.
**Difference of Posttest Scores**

There will be a significant difference between the posttest scores of collegiate athletes that complete the online educational module compared to the posttest scores of collegiate athletes that read handouts or watch a video.

The posttest means of athletes who received an online module education compared with athletes who received handouts or a video education material were compared using a one-way ANOVA. No significant difference was found ($F(2,48) = .623, p > .05$). The athletes from the three different concussion educational materials did not differ significantly. Students who received the handouts had a mean score of 94.71 ($sd = 6.24$). Students who received the video had a mean score of 96.75 ($sd = 4.94$). Students who received the online module had a mean score of 95.00 ($sd = 7.07$).

**Difference Between Pretest Scores**

There will be a significant difference between pretest scores of collegiate athletes with previous concussion(s) compared to pretest scores of collegiate athletes with no history of previous concussions.

An independent-samples $t$ test was calculated comparing the mean pretest score of participants who have received a previous concussion to the mean pretest score of participants who have not received a previous concussion. No significant difference was found ($t(49) = .053, p > .05$). The mean of the participants who had received a previous concussion ($m = 93.33, sd = 10.12$) was not significantly different from the mean of participants who had not received a previous concussion ($m = 93.47, sd = 7.82$).
Difference of Retention Test Scores

There will be a difference between retention test scores of collegiate athletes that complete the online educational material module compared to the retention test scores of collegiate athletes that read handouts or watch a video.

The retention test means of athletes who received an online module education compared with athletes who received handouts or a video education material were compared using a one-way ANOVA. No significant difference was found ($F(2,48) = .301, p > .05$). The athletes from the three different concussion educational materials did not differ significantly. Students who received the handouts had a mean score of 95.00 ($sd = 5.59$). Students who received the video had a mean score of 96.75 ($sd = 5.45$). Students who received the online module had a mean score of 95.00 ($sd = 12.09$).

Descriptive and Frequency Statistics

The means of each test based on the type of education were evaluated and reported. While the previous results did not show a significant difference ($p > .05$), there is a trend of improvements from pretest to posttest scores as well as retention test scores remaining relatively the same as the posttest.
Figure 1. Mean Values for Each Test Based on Type of Education
Included as a part of the descriptive statistics are the self-reported knowledge of concussion rankings of participants who had received a previous concussion and those participants who had not received a previous concussion.

Table 1

*Descriptive Statistics for Self-Reported Knowledge Ranking of Concussion*

<table>
<thead>
<tr>
<th>Concussion History</th>
<th>Knowledge Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N$</td>
</tr>
<tr>
<td>No Previous Concussion</td>
<td>35</td>
</tr>
<tr>
<td>Previously Concussed</td>
<td>15</td>
</tr>
<tr>
<td>All Subjects</td>
<td>50</td>
</tr>
</tbody>
</table>

While there was no significance for the descriptive statistics shown ($p > .05$), it could be noted that participants who had been previously concussed reported a higher mean than that of participants who had no previous concussion. There was one participant, in the non-previously concussed group, who did not complete this portion of the study. All subjects regardless of concussion history were also included. Figure 2 represents all participants regardless of concussion history. There was a normal distribution curve associated with the self-reported knowledge ranking score.
Frequency statistics and percentages were reported for participants based on whether or not they had received previous education material before the start of the research. The mean knowledge ranking of athletes who had received a previous concussion was \( m = 6.17 \). The mean knowledge ranking of athletes who had not received a previous concussion was \( m = 4.97 \). As figure 2 shows in the graph above the average knowledge ranking for all subjects was \( m = 5.33 \).

Figure 2. Frequency of Knowledge Ranking Between All Subjects.
Table 2

*Frequencies of Self-Reported Acknowledgement of Concussion Education Material*

<table>
<thead>
<tr>
<th>Concussion History</th>
<th>f</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Previous Concussion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No previous concussion material</td>
<td>21</td>
<td>58.3</td>
</tr>
<tr>
<td>Received previous concussion material</td>
<td>15</td>
<td>41.7</td>
</tr>
<tr>
<td>Previously Concussed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No previous concussion material</td>
<td>7</td>
<td>46.7</td>
</tr>
<tr>
<td>Received previous concussion material</td>
<td>8</td>
<td>53.3</td>
</tr>
<tr>
<td>All Subjects Together</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No previous concussion material</td>
<td>28</td>
<td>54.9</td>
</tr>
<tr>
<td>Received previous concussion material</td>
<td>23</td>
<td>45.1</td>
</tr>
</tbody>
</table>

There was a higher percentage (58.3%) of participants who had no previous concussion that reported they had not received previous concussion material. This may be due to the limited sample size of athletes who had no previous concussion and stated that they had not received previous concussion material (46.7%). When looking at all participants together due to the limited sample size there is a greater percentage of athletes who reported they had not received any previous concussion material (54.9%).
Figure 3. Number of Athletes That Self-Reported Whether They Had Not Received Previous Education Material v. They Had Received Previous Education Material.
Chapter 5

Discussion

Based on the review of literature, concussion education appeared to be effective when educating coaches, parents, and healthcare professionals based on when they receive educational handouts for concussions (Covassin, Elbin, & Sarmiento, 2012; Sarmiento, Mitchko, Klein, & Wong, 2010). In the current study, the data failed to show a difference in effectiveness of different educational models. In fact, none of the educational modules demonstrated significance when the pretests, posttests, and retention tests were compared with each group. While there was a slight trend in the improvement of pretest to posttest results in all groups, these results were not significant enough to show a statistically significant level of effectiveness.

The results found there was no significant evidence in the difference between the posttest scores of the online module compared to the other groups. While there was a trend that the groups did improve from pretest to posttest, this did not support statistical significance. There were no significant findings of the difference of pretest results between previously concussed athletes and non-previously concussed athletes. There were no significant results found for the retention test scores of the online module compared with the other groups. While none of these results were found to be statistically significant there were some descriptive results found in the study that could have an impact on future studies and how to approach the education of concussions.

There was a non-significant trend that previously concussed athletes had a higher mean average of self-reported concussion knowledge ($M = 6.17$) than that of athletes who
have not been previously concussed ($M = 4.97$). Athletes who have been previously concussed must complete the recovery protocol and are educated in much more detail than those who have not been previously concussed. This trend shows that athletes who have been concussed feel more educated on concussions.

Another interesting descriptive statistic that must be addressed is the number of athletes that reported they had received prior concussion education material. Only 45.1% of athletes reported they had received prior educational material. All of the athletes in this study had received a concussion information handout as a part of a pre-participation packet, which they were required to complete. They all signed an acknowledgement form regarding concussion education prior to competition. This number should have been 100%. The low acknowledgment of the information that was given to them was shocking. There must be something done to make sure the athletes are retaining the information they receive. Of those 45.1% of athletes who reported they had received prior educational material, most did not list the pre-participation packet. Some common answers regarding the source of concussion information were from classes, through the athletic trainer, through the concussion testing, or through high school education. The athletes that reported they had received a prior concussion did have higher results in reporting they had received concussion information (53.3%). Compared to athletes who have not received a concussion and received concussion information (41.7%).

This could provide information in a future study of the retention of concussion education information received similar to that of the study with hockey teams and the different type of education that players received at the beginning of the season (Kroshus
et al., 2014). While the current study looked at the importance of the type of educational material, it would be important to make sure the athletes are retaining the information. This could potentially result in athletes receiving multiple types of educational material rather than just one option.

Within the study completed, a higher number of participants in the different groups could have potentially resulted in significance. In addition, the pretest, posttest, and retention test used seemed to have very similar scores. While there was a small improvement trend of the pretest to posttest results, the pretest scores were already high. A higher difficulty level of the concussion education test could result in better improvement scores based on educational material. While the test could have been more difficult, it was also satisfying that the athletes did receive a rather high pretest score. This at least shows a trend that athletes are competent in the basic knowledge of a concussion.

More research needs to be conducted in regards to the type of education the athletes receive. While knowledge transfer suggests that different learners learn in different ways, it is difficult to incorporate an educational module that includes multiple type of educational strategies. It is difficult to prove that one educational module is the best technique because of the difference in individual learning styles. This may result in a study consisting of multiple educational strategies performed when compared with athletes who just received one type of education strategy.

The clinical implications of when athletes receive the information could be of importance as well. It could be clinically acceptable to include concussion education with
a pre participation physical exam for incoming freshman and returning athletes and to provide information before the start of the competition season. It is also important to note that everyone must be on board when it comes to the safety of the athlete. This includes the athletic trainer, the team physician, coaches, athletes, strength and conditioning professionals, professors, and academic advisors. Communication can be very important to provide the best care possible to the athlete, especially when everyone is knowledgeable about the process.

There were multiple limitations in this study. First, there was limited participation among teams and no basketball or football athletes were involved in this study. Future research including non-contact sports and contact sports could be helpful. There were also a limited number of male participants in the study. Future research comparing male and female participants could help guide educational strategies. Other limitations such as participant’s motivation toward the study, the athlete’s primary language, and athletes with attention deficit disorder or attention deficit hyperactivity disorder may have played a role in significance and future studies should acknowledge these factors.

In conclusion, the purpose of this study was to investigate the effectiveness of three different types of concussion education materials for collegiate athletes, to evaluate knowledge transfer, and to evaluate retention of information over a period of time. While the results were not significant in favor of one educational material over another, more research needs to be conducted to improve the retention of knowledge about concussion information.
**References**


Cusimano, M. D., Chipman, M., Donnelly, P., & Hutchinson, M. G. (2014). Effectiveness of an educational video on concussion knowledge in minor league
hockey players: a cluster randomised controlled trial. *British Journal of Sports Medicine, 48*, 141-146. doi: 10.1136/bjsports-2012-091660


Appendix A – IRB Form

Revised 11/06/2013

Winthrop University

REQUEST FOR REVIEW OF RESEARCH INVOLVING HUMAN SUBJECTS
Institutional Review Board

INSTRUCTIONS

1. Always secure the most recent version of this form from the website. Failure to use the most recent version could result in the protocol being returned to you.

2. The form may be completed on-line and then printed out in order to obtain necessary signatures.

3. Ensure that all items are completed on the Request for Review form.

4. You must attach to the Request for Review form all related materials such as:
   - ☑ Informed Consent, Parental Permission and/or Subject Assent forms
   - ☑ Copies of recruitment materials, including emails, flyers, letters, etc
   - □ Copies of surveys to be used in the study
   - ☑ Copies of interview questions to be used in the study
   - □ Debriefing Form
   - ☑ Copies of all other materials to be used in the study, such as pictures, videos, website URL’s, etc

SUBMISSION

You may submit this Request for Review either electronically or in paper copy form, but you do not have to submit both electronically and on paper.

1. Electronic Submission – You will need to print out the form in order to obtain all appropriate signatures. Then prepare an electronic file, combining a scanned copy of the Signed Request for Review and all related materials into one .pdf file. Arrange this file in the order shown in the check list above. Do not include this instruction page in your .pdf file. Electronic files not arranged in accordance with the check list above will be returned to you for correction. Send the electronic copy to Teresa Justice, Director of SPAR at justicef@winthrop.edu

OR

2. Paper Copy – Submit a paper copy of the Signed Request for Review form and attachments to the SPAR Office at Rm 142 or Rm. 149 McLaurin Bldg.
Winthrop University

REQUEST FOR REVIEW OF RESEARCH INVOLVING HUMAN SUBJECTS
Institutional Review Board

RESEARCHER OF RECORD: Ryan Johnson
COLLEGE/DEPARTMENT: Winthrop University
PHONE NUMBER: HOME: N/A WORK: [Redacted]
EMAIL: johnsonr40@winthrop.edu CELL PHONE: [Redacted]
ADDRESS: [Redacted]

CO-RESEARCHERS: Dr. Alice McLaine
FACULTY ADVISOR: Dr. Alice McLaine
ADVISOR PHONE: HOME: 803-323-2177
EMAIL: mclainea@winthrop.edu CELL PHONE: [Redacted]
ADDRESS: [Redacted]

STATUS: ☐ Faculty or Staff
☐ (If a student, complete faculty advisor section)
☒ Graduate Student
☐ Undergraduate Student

TITLE OF RESEARCH: The impact of educational materials on collegiate student athletes knowledge of sports related concussions.

DATES OF THE RESEARCH PROJECT:
Approval Requested for Start Date: 10/13/2014 (The requested start date should be at least 2 weeks after the next scheduled meeting of the IRB)
End Date: 10/13/2015 (Maximum of one year; must be renewed annually)

IS THIS RESEARCH BEING FUNDED BY RESEARCH GRANT?
☐ YES, Sponsor: [Redacted]
☒ Funding Applied for; Sponsor: [Redacted]
☐ NO

☐ Yes ☐ No Is this activity being carried out by student as a classroom assignment to be reviewed by the faculty member.

☐ Yes ☐ No Will the information gathered or developed in this activity be used in a presentation or publication outside of the classroom?
If you checked yes to both questions above, please explain how the information will be used outside of the classroom: For a thesis presentation to fulfill the completion of a master's degree and could be published or presented at a professional conference.

INDICATE THE TYPES OF MEMBERS OF THE RESEARCH TEAM WHO WILL HAVE DIRECT CONTACT WITH HUMAN SUBJECTS:
☒ FACULTY MEMBER
☐ STAFF MEMBER
☐ UNDERGRADUATE STUDENT
A. BRIEFLY DESCRIBE THE PURPOSE OF THE RESEARCH IN NON-TECHNICAL LANGUAGE: The purpose of this research is to compare different educational materials. Then to investigate the effectiveness of three different types of concussion education materials for collegiate athletes and evaluate the knowledge as well as the retention of information over a period of time.

B. DESCRIBE RESEARCH PROTOCOL OR METHODOLOGY TO BE USED: This study consists of five different sections. First, the subject will be asked to fill out an informed consent form and brief questionnaire. Second, the subject will be asked to complete a test with their current knowledge of concussions. Third, after the test is complete the subject will be assigned to complete an educational portion of the study. This will be handout information, a video, or an online module. Fourth, after completing the assigned task the subject will then be asked to complete another test. After the completion of the second test the subject will then be asked to return at a time with the researcher two weeks from the date of the first session. Fifth, upon arrival of the second session the subject will be asked to complete a final test. The subjects tests scores on all tests will be recorded and analyzed.

EXPLAIN BRIEFLY BUT COMPLETELY WHAT TASKS OR ACTIVITIES THE SUBJECTS IN THIS RESEARCH WILL BE DOING [IF A SURVEY/QUESTIONNAIRE IS TO BE USED, STATE HOW MANY QUESTIONS WILL BE ASKED AND THE EXPECTED TIME TO COMPLETE THE SURVEY]: This research will involve two sessions. The first session the subject will complete a questionnaire of 13 questions and then take a pretest of 20 questions. Immediately after the subject will then review handout materials, watch a video, or complete an online module. Then a posttest of 20 questions will be completed by the subject. The subject will then schedule a time for the second session with the researcher. The first session will last about forty-five minutes. The second session the subject will come to complete a retention test of 20 questions. The second session will take about fifteen minutes.

DESCRIBE SUBJECTS FOR THIS RESEARCH, INCLUDING A STATEMENT OF WHO WILL BE RECRUITED AND THE ANTICIPATED POPULATION SIZE: Student athletes at Winthrop University will be recruited for this research. A population size of 90 athletes with 30 athletes in each group and about an even ratio of male to female participants would be preferred.

DO YOUR SUBJECTS INCLUDE ANY OF THE FOLLOWING:

- Yes ☐ No Infants and children younger than 7 years?
- Yes ☐ No Institutionalized mentally impaired people?
- Yes ☐ No Students enrolled in your own classes?
- Yes ☐ No Students enrolled at Winthrop University?
- Yes ☐ No Prisoners?
- Yes ☐ No Other special populations? Specify:

DESCRIBE HOW SUBJECTS WILL BE RECRUITED FOR THIS RESEARCH: The subjects will be recruited through their athletic teams. There will be flyers about the research, emails to coaches, I will personally approach the teams and ask for participants and give them handouts to contact me.

HOW WILL YOU ASSURE THAT PARTICIPATION OF THE SUBJECTS IS VOLUNTARY? I will include that this research is completely voluntary and the subject may remove themselves from the study without consequences at any time. The subject's may also request their test scores and see if their knowledge improved based on the educational material they were given.

CAN THE HUMAN SUBJECT BE DIRECTLY IDENTIFIED BY: (For any responses of “yes” indicate in the space provided how the subject’s privacy will be protected.)

- Yes ☒ No Name on Response form: Their name will appear on the questionnaire but their identity will be coded in their file and locked with access only by the researcher.
- Yes ☐ No Photograph:
50

Revised 07/05/2013

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☐ Yes ☒ No Television/VCR/DVD tapes:
☐ Yes ☒ No Audiotape:
☐ Yes ☒ No Coded Research Forms:
☐ Yes ☒ No Detailed Biographical Data:
☒ Yes ☒ No Informed Consent, Assent or Parental Permission forms: Their name will appear on the informed consent form but their identity will be coded in their file and locked with access only by the researcher.
☐ Yes ☒ No Other:

8b. If you checked yes to any item in 8a; then:
☐ Yes ☒ No Will personally identifiable data be shared with others outside of this research team? If you checked yes, please explain.

9. The researcher shall make every possible attempt to maintain confidentiality of the research and the human subjects. If for some reason, the responses, information, or observations of the subject became known to persons other than the researchers, could this information potentially place the subject at risk of:
☐ Yes ☒ No Damage to his/her financial standing?
☐ Yes ☒ No Damage to his/her present or future employability?
☐ Yes ☒ No Criminal or civil liability?
☐ Yes ☒ No Psychological/emotional problems?

Explain any “yes” answers and steps that have been taken to minimize risk:

10. Are any of the techniques listed below involved in the research?
☐ Yes ☒ No Invasive medical procedures?
☐ Yes ☒ No Non-invasive medical procedures?
☐ Yes ☒ No Strenuous exercise?
☐ Yes ☒ No Other physical testing

Explain any “yes” answers and steps that have been taken to minimize risk:

11a. Describe how legally effective informed consent will be obtained and attach a copy of the consent form. If minors are to be used as research subjects, describe procedures used to gain consent of their parent(s), guardian(s), or legal representative(s). Legally effective informed consent will be obtained through a document which will explain the whole process that the subject will go through during the research and will be signed and dated by each participant. One copy will remain in their file and they will receive one copy to keep for their records.

11b. Waiver of signed informed consent requirement

To request a waiver of a signed informed consent, complete the following:

☐ The only record linking the subject and the research would be the consent document, and the principal risk will be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject’s wishes will govern. Section 46.117(c)1

☐ The research presents no more than minimal risk of harm to the subjects, and involves no procedures, for which written consent is normally required outside of the research context. Section 46.117(c)2

☐ The research or demonstration project is to be conducted by or subject to the approval of state or local government officials and is designed to study, evaluate, or
otherwise examine (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under these programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs; and the research could not practicably be carried out without the waiver or alteration. Section 46.116(c)

☐ The research involves no more than minimal risk to the subjects, the waiver will not adversely affect the rights and welfare of the subjects, the research could not practicably be carried out without the waiver, and whenever appropriate, the subjects will be provided with additional pertinent information after participation. Section 46.116(d)

In cases where the documentation requirement is waived, the IRB may require the investigator to provide subjects with a written statement regarding the research.

12. STORAGE AND DISPOSAL OF DATA AND OTHER RESEARCH MATERIALS:

A. How and where will the data and other research material be stored until no longer needed? Data will be stored in a file cabinet behind locked doors. Other data will be stored on a portable flash drive in which only the researcher will have access to. All information on the portable flash drive will be coded and the subject will not be directly identified by that information.

B. When will the disposal of data and research materials take place? Disposal of the data and research materials will take place three years after the completion of the research.

At a minimum, investigators must maintain research records for at least three (3) years after completion of the research. All records must be accessible for inspection and copying by authorized representatives of the IRB, any federal department or agency supporting the research, and sponsor, if any. (Source: 45CFR46.115) If the Principal Investigator is a student, then the faculty advisor will be responsible for the record retention. If you are a member of a professional association or society, you may be required by their practices to keep records longer than 3 years.

C. How will data and research materials be disposed? Data on the portable flash drive will be deleted and other information in the file will be shredded.

13. INDICATE ON THE CHECK LIST BELOW, ANY DOCUMENTS THAT APPLY TO YOUR RESEARCH AND ATTACH TO THIS PROTOCOL A COPY OF THE APPLICABLE DOCUMENT.

☑ SURVEY INSTRUMENT AND/OR INTERVIEW QUESTIONNAIRE
☐ INFORMED CONSENT AGREEMENT
☐ PARENTAL OR Guardian PERMISSION FOR A MINOR CHILD TO PARTICIPATE IN A RESEARCH STUDY
☐ ASSENT TO PARTICIPATE IN A RESEARCH STUDY (AGES 7-14 YEARS)
☐ ASSENT TO PARTICIPATE IN A RESEARCH STUDY (AGES 15 - 17 YEARS)
☑ COPIES OF ANY OTHER MAIL TO BE DELIVERED TO RESPONDENTS OR SUBJECTS (E.G. COVER LETTERS, Scripts OF VERBAL INSTRUCTIONS, ETC.

14. ☐ Yes ☑ No DO YOU CONSIDER THIS RESEARCH EXEMPT FROM REVIEW BY THE HUMAN SUBJECTS COMMITTEE? IF YES, Please check the reason for exemption from the list below:

a. ☐ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (a) research on regular and special education instructional strategies; or (b) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods [45CFR46(b)(1)]

b. ☐ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement) survey procedures, interview procedures or observation of public behavior, unless (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (b) any disclosure of the human subjects’ responses outside the research could reasonably place the subject at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability or reputation. [45CFR46(b)(2)]

Research involving children (subjects that have not attained the age of 18 years) is not exempt under this category unless the research involves only the observation of public behavior and the researchers do not participate or impact the
activities being observed. [45CFR46.401(b)]

c. ☐ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior if (a) the human subjects are elected or appointed public officials or candidates for public office; or (b) federal statute(s) without exemption that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter. [45CFR46(b)(3)]

d. ☐ Research involving the collection study of existing data, documents, records, pathological specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. [45CFR46(b)(4)]

e. ☐ Research and demonstration projects which are conducted by or subject to the approval of a Federal department or agency heads, and which are designed to study, evaluate, or otherwise examine: (a) public benefit or service programs of Federal programs; (b) procedures for obtaining benefits or services under those Federal programs; (c) possible changes in methods or alternatives to those Federal programs or procedures; or (d) possible changes in methods or levels of payment for benefits or services under those Federal programs. [45CFR46(b)(5)]

f. ☐ Taste and food quality evaluation and consumer acceptance studies, (a) if wholesome foods without additives are consumed; or (b) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture. [45CFR46(b)(6)]

Certifications

By my signature below, I certify that each of the named co-researchers has accepted his/her role in this study. I agree to not begin any research activity on this study until written approval by the IRB has been received. I agree to a continuing exchange of information with the Institutional Review Board (IRB). I agree to obtain IRB approval before making any changes or additions to the project. I will provide progress reports at least annually, or as requested. I agree to report promptly to the IRB all unanticipated problems or serious adverse events involving risk to human subjects. A copy of the informed consent will be given to each subject and the signed original will be retained in my files, unless a waiver of a signed informed consent has been granted.

I further certify that I have successfully completed the following Human Subjects Training Course:
☐ CITI – Biomedical Research Investigator
☒ CITI – Social and Behavioral Research Investigator
☐ CITI – Undergraduate Researcher
☐ CITI – IRB Member

Signature of Researcher ___________________________ Date __________

By my signature below, I certify that I have reviewed this research study and agree to counsel the student researcher in all aspects of the research study.

I further certify that I have successfully completed the following Human Subjects Training Course:
☐ CITI – Biomedical Research Investigator
☒ CITI – Social and Behavioral Research Investigator
☐ CITI – IRB Member

Signature of Faculty Advisor ___________________________ Date __________

Approval by Department Chair of Researcher of Record

(Dean, if Chair is the Researcher or if Chair is otherwise unable to review.)

I have reviewed this research study. I believe the research is sound, that the study design and methods are adequate to achieve the study goals, and that there are appropriate resources (financial and otherwise) available to the researcher. I support the study, and hereby submit it for further review by the IRB.

Signature ___________________________ Date __________
Note: Do not use personal home addresses and phone numbers on Informed Consent, Assent, Parental Permission or Debriefing statements.
Appendix B – Coach Script

Hello Coach (Name),

This is in regards to an opportunity for your student athletes to provide research data for my thesis on concussion education. If I could please talk to your team for just a few minutes before the start of your practice or whenever you may provide time. They will receive 1 credit of study hall hours for their participation. Thank you for your time and if you can please email me back at rjwuresearch@gmail.com.

Thank You,

Ryan Johnson, ATC, LAT
Graduate Assistant Athletic Trainer
Winthrop University
Softball
Johnsonr40@winthrop.edu
O: 803.323.2129 Ext. 6630

Confidentiality Notice: This message is intended for the use of the individual to which it is addressed and may contain information that is confidential. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution, or copying of this communication is strictly prohibited. If you receive this communication in error, please notify us by reply mail and delete the original message.
Appendix C – Recruiting Script

Hello,

I am here to talk to you about my research on concussion education. This will provide an opportunity for you to learn about concussions in a variety of different ways. It will consist of 2 appointments. One of which will last about 30-45 minutes and the second about 15 minutes two weeks later. It would be greatly appreciated if you can volunteer your time and busy schedule to participate in my research. You will also get one hour of study hall credit for your participation. If you are interested please email me and come receive a handout.

Thank you for your time
Appendix D – Researcher Script

Script for Researcher

Call Roll by sheet– hand out folders according to the subject number and have groups already organized ready to go.

Hello,

Thank you so much for your participation in this study! It is greatly appreciated and this is a great opportunity for you to be involved in.

Please take your folder and open it. First you will see the informed consent form. There are two copies of this. One is yours to keep for your records that you must take with you upon the completion of today’s appointment. The other is the copy that will stay in your folder. (Go over informed consent form ask them to sign and date both copies).

Upon signatures of informed consent if they approve go over the Health Questionnaire. Does anyone not want to participate in this study? Fill this form out honestly and to the best of your knowledge please.

Next is the pretest. Please take the pretest out and close your folder. You do not need to put your name on the pretest. It should be labeled concussion education pretest. There should be 20 questions. After you have completed the pretest please put your test on top of your folder and wait patiently and quietly. Are there any questions?

Alright please go with your assigned group. Group 1 with (name), Group 2 with (name), Group 3 with (name), Group 3 please bring your headphones with you. Does anyone not have headphones? You can leave your belongings in this room it will be monitored.

Please respect your supervisor during this time. You are not allowed to talk with the other
participants. Please go through your assigned educational activity with the best of your ability.

Online Module – Please take this handout and go to the link provided (http://brain101.orcasinc.com/5000/). Please put in your headphones and play the video first. Go through the assigned online module at your own pace but remember you have 15 minutes including the time of the video. After your time is up your supervisor will instruct you to log out and escort you back to the room to complete the study. Does anyone have any questions?

Handouts – Please take these handouts. You should have three different pages. Please do not write on these handouts. You may read them in any order at your own pace. You will have 15 minutes total to read all three handouts. After your time is up your supervisor will instruct you to stop and escort you back to the room to complete the study. Does anyone have any questions?

Video – Please watch this video as a group. This video does say concussions in football; however it applies to all sports, not just football. Please pay attention to the best of your ability. After the video is complete you will be ask to complete the study. Does anyone have any questions?

Alright everyone,

Please have a seat. The same seat you were in before. The posttest will be passed out and you will complete the test. The test should be labeled concussion education posttest.
There should be 20 questions. Upon completion of the posttest please place your test inside your folder and wait patiently and quietly. Are there any questions?

(Once everyone is done)

Alright please take one of the informed consent forms with you. Thank you for your participation in this study. You have one more appointment to complete the study; this appointment will take approximately 15 minutes. For those of you who need the study hall credit hour, you must attend the second appointment to receive the credit. There are sign-up sheets for individual times during the day and group appointments at night. There are two sheets for the day appointments you only need to sign one of them. This will be Monday November 17th, Tuesday the 18th, or Wednesday the 19th. If you absolutely do not find a time good for you write your name and email on the sheets labeled no times work. You only need to sign up for one time slot. Only do this option if you seriously cannot find a time listed. You will receive an email as a reminder to come in for your appointment the day before. Please sign up (group 1) (group 2) (group 3).

Once again I thank you for your participation and look forward to seeing you one more time!

Please grab a cookie or a piece of candy for your participation on your way out.
Appendix E – IRB Consent Form

Winthrop University
Informed Consent Agreement

Researcher: Ryan Johnson
Researcher’s Winthrop Position: Graduate Student

Title of Study: The impact of educational materials on collegiate student athletes knowledge of sports related concussions.

You are invited to take part in a research study. Before you decide to be a part of this study, you need to understand the risks and benefits. This consent form provides information about the research study. I will be available to answer your questions and provide further explanations. If you take part in this research study, you will be asked to sign this consent form. Your decision to take part in this study is voluntary. You are free to choose whether or not you will take part in the study. If you should decide to participate, you may withdraw from the study at any time.

Purpose of the research study:
To investigate the effectiveness of three different types of concussion education materials for collegiate athletes and evaluate the knowledge as well as the retention of information over a period of time.

Procedures or methods to be used in the study:
This study consists of five different sections. First, you will be asked to fill out a brief questionnaire. Second, you will be asked to complete a test with your current knowledge of concussions. Third, after the test is complete you will be assigned to complete an educational portion of the study. Fourth, after completing the assigned task you will then be asked to complete another test. After the completion of the second test you will then be asked to schedule a time with the researcher two weeks from the date of the first session. Fifth, upon arrival of the second session you will be asked to complete a final test.

Possible Risks/Benefits Associated with Participating in Study:
There are minimal to no risks associated from the participation in this study. The minimal risks would consist of a breech of confidentiality of your coded information. There will be no direct benefit to you for your participation in this study. However we hope that the information obtained from this study may increase your knowledge of concussions and provide you with valuable information to be used in the future.
Possible Costs/Compensation Associated with Participating in Study:
There are no costs to you for your participation in this study. There will be a time commitment with your participation in your study. You will have your first session which will last about forty five minutes and then two weeks later you will have a second session that will last about 15 minutes. There is no monetary compensation to you for your participation in this study. However, you will receive one hour credit towards study hall upon completion of both sessions.

Number of questions in the survey/questionnaire and anticipated time to complete the survey/questionnaire: The questionnaire will consist of 13 questions. Each test will consist of 20 questions.

Right to withdraw from the study:
Your participation in this study is voluntary. If at any time you feel the need to withdraw from this study you may choose to do so. You may stop your participation in the study at any time without consequences and/or without reason. This will not affect the relationship you have with the researcher.

Privacy of records or other data collected in the study:
The privacy of records will be protected by a locked area and only accessed by the researcher. The information to be used in the study will be kept on a portable hardrive and computer. The information used on the hardrive and computer will be specially coded and you will be unidentifiable and only the researcher will have access to that information.

Questions – contact information:
If you have any questions about this study, you may contact me using my Winthrop email account: johnsonr40@winthrop.edu
Or through my faculty advisor:
Address: 1162 Eden Terrace Dr. Rock Hill, SC 29730, Room #25
Winthrop Coliseum
Work Phone: 803-323-2177 Email: mclainea@winthrop.edu

You may also contact:
Teresa Justice, Director 803-323-2460 justicet@winthrop.edu
Sponsored Programs and Research
Winthrop University
Rock Hill, SC 29733
Signatures:

By signing this consent agreement, you agree that you have read this informed consent agreement, you understand what is involved, and you agree to take part in this study. You will receive a copy of this consent form.

<table>
<thead>
<tr>
<th>Signature of Participant</th>
<th>Date</th>
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<tbody>
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<table>
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<tr>
<th>Signature of Researcher</th>
<th>Date</th>
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</table>
Appendix F

Health Questionnaire

Name: __________________________ Date: __________________________

E-mail: ____________________________________________________________

Sport: _____________________________________________________________

Gender: Male or Female

Years of education completed: _______________________________________

How many concussions do you think you have had in the past?_______________

When was the most recent concussion? ________________________________

Have you ever been hospitalized or had medical imaging done for a head injury? Y or N

Have you ever been diagnosed with headaches or migraines? Y or N

Do you have a learning disability, dyslexia, ADD/ADHD? Y or N

Have you ever received prior concussion education material? Y or N

If yes, please explain: ________________________________________________

Rate your knowledge of concussions (1-10, 1 the worst, 10 the best): ___________
Appendix G

Concussion Education Test

1. A concussion is
   a) A serious brain injury
   b) A superficial brain injury with neither short nor long term consequences
   c) A serious brain injury that can cause temporary and/or permanent impairment
   d) Not always associated with loss of consciousness
   e) a and b
   f) a, c, and d
   g) All of the above

2. The brain never moves within the skull
   a) True
   b) False

3. A player who suffers a concussion
   a) Will usually recover if appropriate diagnosis, treatment, and return to play protocol are implemented
   b) Must be examined by a physician as concussions are a medical diagnosis
   c) Can be identified as such by an athletic trainer or coach, but must still be medically examined, diagnosed and cleared before being allowed to return to play.
   d) May take longer to recover than another individual who suffers a concussion. Recovery time is unique to each individual.
   e) All of the above

4. A player suspected of suffering a concussion is not allowed to return to play until he/she has been medically evaluated and cleared.
   a) True
   b) False

5. A concussion is caused by
   a) A blow to the head, neck, face, jaw or body
   b) Brain movement within the skull, which may tear small vessels and neural fibers, or disrupt the brain’s neurochemical balance
   c) A blow to the body from any angle that results in a whiplash-like or rotational movement of the brain within the skull
   d) All of the above
6. A suspected concussion can be identified by a teammate, coach, athletic trainer, team official or parent when a player reports
   a) Headache or dizziness
   b) Feeling dazed or seeing stars
   c) Sensitivity to light or ringing in the ears
   d) Unusual tiredness or persistent fatigue
   e) Any of the above

7. During the playoffs, a player is suspected of suffering his second concussion of the season. His parents, coaches and teammates ask the player if he will be able to continue. The player should
   a) Return to play immediately because it is the playoffs
   b) Return to play as soon as possible, because it usually takes less time to recover from a second concussion after you have already had one
   c) Return to play immediately because there are never any long term effects of multiple concussions
   d) a, b, and c
   e) none of the above

8. Which of the following statements concerning concussion is true?
   a) Concussion can cause an unusual change in emotions, personality or behavior in an individual
   b) Depression and anger are common manifestations of a concussion, especially when the symptoms persist
   c) A supportive informed environment and helping the injured athlete to maintain a positive attitude can assist with the healing process
   d) All of the above

9. A player that admits to feeling “dinged”, “stunned”, “seeing stars” or that they had their “bell rung” should be medically evaluated for a concussion before being cleared to return to play.
   a) True
   b) False

10. A player with a suspected concussion should
    a) Continue as long as his/her symptoms do not get worse
    b) Be removed from the game, monitored for any change in signs and symptoms and evaluated by a physician as soon as possible
    c) Return to play if the coach says that he/she thinks that the player is okay
    d) a and c
    e) none of the above
11. An individual with a suspected concussion should not receive any medication (i.e. pain, dizziness medication) before he/she is medically evaluated.
   a) True
   b) False

12. A concussed player can be identified by a teammate, team official, or parent when a player exhibits the following behavior:
   a) Vomiting
   b) Irritability or unusual change in emotions, personality, or behavior
   c) Confusion and disorientation
   d) Poor balance or coordination
   e) Slow/slurred speech
   f) Delayed response to questions
   g) Vacant stare, poor concentration and/or attention
   h) Decreased playing ability or poorer playing performance
   i) Any of the above

13. An athlete that has been diagnosed with a concussion and is symptomatic should be allowed to play video games and/or participate in school testing.
   a) True
   b) False

14. A concussion can result in either temporary or permanent injury to the brain
   a) True
   b) False

15. The symptoms of a concussion always occur immediately after the player has had a blow to the head or a hard hit from behind
   a) True
   b) False

16. Second impact syndrome
   a) Is the swelling of the brain that occurs as a result of trauma sustained before the brain has recovered from a recent concussion
   b) Is not a serious medical diagnosis
   c) Can result in permanent disability or death
   d) Results from a lack of awareness about the proper identification and treatment of a concussion
   e) a, c, and d
   f) all of the above

17. A concussion can occur without a direct blow to the head
   a) True
   b) False
18. The injured player, the coach, or athletic trainer is able to make the return to play decision after a concussion
   a) True
   b) False

19. Post-concussion syndrome symptoms include
   a) Headaches
   b) Memory or concentration impairment
   c) Dizziness, fatigue, or phonophobia (a morbid fear of sounds including your own voices)
   d) Irritability or photophobia (excessive sensitivity to light and the aversion to sunlight)
   e) Any of the above

20. After a player has sustained a concussion and been evaluated by a physician, which of the following statements is true about the recovery process
   a) The injured athlete should maintain mental (i.e. no school and video games) and physical rest until all symptoms have cleared
   b) The asymptomatic athlete should progress through the stages of return to play from light aerobic exercise to full contact practice. A physician re-evaluation should occur before the full contact practice stage. There should be a minimum of 24 hours (or longer) between each stage, and the athlete should return to stage one if symptoms recur
   c) If the athlete becomes symptomatic while completing the active return to play progression, he/she should stop training and consult a physician
   d) The athlete who has suffered a concussion should expect to be ready to play in exactly seven days
   e) a, b, and c
   f) all of the above
Appendix H – Handouts

Concussion Fact Sheet

WHAT IS A CONCUSSION?
A concussion is a brain injury that:
• Is caused by a blow to the head or body.
- From contact with another player, hitting a hard surface such as the ground, ice or floor, or being hit by a piece of equipment such as a bat, lacrosse stick or field hockey ball.
• Can change the way your brain normally works.
• Can range from mild to severe.
• Present itself differently for each athlete.
• Can occur during practice or competition in ANY sport.
• Can happen even if you do not lose consciousness.

HOW CAN I PREVENT A CONCUSSION?
Basic steps you can take to protect yourself from concussion:
• Do not initiate contact with your head or helmet. You can still get a concussion if you are wearing a helmet.
• Avoid striking an opponent in the head. Undercutting, flying elbows, stepping on a head, checking an unprotected opponent, and sticks to the head all cause concussion.
• Follow your athletics department’s rules for safety and the rules of the sport.
• Practice and perfect the skills of the sport.
• Practice good sportsmanship at all times.

WHAT ARE THE SYMPTOMS OF A CONCUSSION?
You can’t see a concussion, but you might notice some of the symptoms right away. Other symptoms can show up hours or days after the injury. Concussion symptoms include:
• Amnesia
• Confusion
• Headache
• Loss of Consciousness
• Balance problems or dizziness
• Double or blurry vision
• Sensitivity to light or noise.
• Nausea (feeling that you might vomit)
• Feeling sluggish, foggy or groggy.
• Feeling unusually irritable.
• Concentration or memory problems (forgetting game plays, facts, meeting times)
• Slowed reaction time.

Exercise or activities that involve a lot of concentration, such as studying, working on the computer, or playing video games may cause concussion symptoms (such as headache or tiredness) to appear or get worse.

WHAT SHOULD I DO IF I THINK I HAVE A CONCUSSION?
Don’t hide it. Tell your athletic trainer and coach. Never ignore a blow to the head. Also, tell your athletic trainer and coach if one of your teammates might have a concussion. Sports have injury timeouts and player substitutions so that you can get checked out.
Report it. Do not return to participation in a game, practice or other activity with symptoms. The sooner you get checked out, the sooner you may be able to return to play.
Get checked out. Your team physician, athletic trainer, or health care professional can tell you if you have had a concussion and when you are cleared to return to play. A concussion can affect your ability to perform everyday activities, your reaction time, balance, sleep and classroom performance.
Take time to recover. If you have had a concussion, your brain needs time to heal. While your brain is still healing, you are much more likely to have a repeat concussion. In rare cases, repeat concussions can cause permanent brain damage, and even death. Severe brain injury can change your whole life.

SECONDARY IMPACT SYNDROME
This occurs when an individual sustains a second, often minor, blow to the head before the initial symptoms of a concussion are resolved. The resulting loss of auto regulation of the brain’s blood supply could result in vascular enlargement and herniation of the lower brain, resulting in death. There is approximately a 50% mortality rate associated with secondary impact syndrome.

IT’S BETTER TO MISS ONE GAME THAN THE WHOLE SEASON.
What is a concussion? A concussion is an injury to the brain caused by a direct or indirect blow to the head. It results in your brain not working as it should. The concussion may or may not cause you to black out or pass out. It can happen from a fall, a hit to the head, or a hit to the body that causes your head and your brain to move quickly back and forth.

How do I know if I have a concussion? There are many signs and symptoms that you may have after a concussion. A concussion can affect your thinking, the way your body feels, your mood, or your sleep. Here is what to look for the following symptoms:

<table>
<thead>
<tr>
<th>Thinking</th>
<th>Physical</th>
<th>Emotional/Mood</th>
<th>Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty thinking clearly</td>
<td>Headache</td>
<td>Irritability-things</td>
<td>Sleeping more</td>
</tr>
<tr>
<td>Taking longer to figure things out</td>
<td>Fuzzy or blurry vision</td>
<td>bother you more easily</td>
<td>than usual</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>Feeling sick to your stomach/queasy</td>
<td>Sadness</td>
<td>Sleeping less than usual</td>
</tr>
<tr>
<td>Difficulty remembering new information</td>
<td>Vomiting/throwing up Dizziness</td>
<td>Being more moody</td>
<td>Trouble falling asleep</td>
</tr>
<tr>
<td></td>
<td>Balance problems Sensitivity to noise or light</td>
<td>Feeling nervous or worried</td>
<td>Feeling tired</td>
</tr>
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</tbody>
</table>

Table is adapted from the Centers for Disease Control and Prevention (http://www.cdc.gov/concussion/).

What should I do if I think I have a concussion? If you are having any of the signs or symptoms listed above, you should tell your parents, coach, athletic trainer, or school nurse, so you can get the help you need. If a parent notices these symptoms, he or she should inform the school nurse or athletic trainer.

When should I be particularly concerned? If you have a headache that gets worse over time, you are unable to control your body, you throw up repeatedly or feel more and more sick to your stomach, or your words are coming out funny or slurred, let an adult such as your parent, coach, or teacher know right away, so you can get the help you need before things get any worse.

What are some of the problems that may affect me after a concussion? You may have trouble in some of your classes at school or even with activities at home. If you continue to play or return to play too early after a concussion, you may have long-term trouble remembering things or paying attention, headaches may last a long time, or personality changes can occur. Once you have a concussion, you are more likely to have another concussion.

How do I know when it's OK to return to physical activity and my sport after a concussion? After telling your coach, your parents, and any available medical personnel that you think you have a concussion, you will probably be seen by a doctor trained in helping people with concussions. Your school and your parents can help you decide who is best to treat you and help to make the decision on when you should return to activity, play, and practice. Your school has a policy in place on how to treat concussions. You should not return to play or practice on the same day as your suspected concussion occurred.

You should not begin the return-to-play progression until all symptoms are gone, both at rest and during and after activity. Symptoms indicate that your brain has not yet recovered from the concussion and needs more rest.
Concussion Management Plan

Concussions are common injuries resulting from contact sports and most athletes, when diagnosed and treated appropriately, recover fully. Occasionally, a blow to the head can tear a blood vessel in your brain causing a bleed. Student-athletes may not exhibit signs and symptoms of this medical emergency until 24-48 hours post-injury and must be monitored closely within that time frame. You should not stay alone in your dorm or apartment. After reading this sheet, give it to your roommate, parent, or caregiver who will be observing you for the next 48 hours. Caregivers should check on the athlete for signs of life every 2-3 hours throughout the night.

**Rest is key to recovery.** You should not be participating in any sport or physical activity beyond walking to class. You should refrain from watching tv, listening to music, playing video games, reading small print or staring at a computer. It is important to limit activities that require a lot of thinking or concentration. If you need to study or do homework, you should take frequent breaks to avoid making your symptoms worse. If being in the weight room or standing outside in the sun makes your symptoms worse, you will be excused from these activities. If a physician deems it necessary, you may also be excused from classes for a short time.

**It is OK to:**  
- Take acetaminophen (Tylenol) for headaches  
- Use ice packs on head or neck for comfort  
- Sleep  

**You should:**  
- Eat a regular, healthy diet  
- Drink lots of water  
- Go to class

**There is NO need to:**  
- Check eyes with flashlights  
- Wake up every hour  
- Stay in bed

**You SHOULD NOT:**  
- Drink alcohol  
- Take illegal drugs  
- Use aspirin or ibuprofen for headaches

**RED FLAGS:** Go to the emergency room immediately if you suddenly experience any of the following:

- Decrease in level of consciousness  
- Decrease or irregularity of respirations or pulse  
- Increasing confusion  
- Headache that WORSENS  
- Slurred speech  
- Inability to awaken athlete  
- Changes in personality, irritability or loss of memory  
- Weakness or numbness in arms or legs  
- Seizures or convulsions  
- Repeated vomiting  
- Unequal, unreactive or dilated pupils
Appendix I – NATA Video Concussion in Football

https://vimeo.com/15026404
Appendix J – Online Module Link

http://brain101.orcasinc.com/5000/