MOTIVATIONS FOR UNDER-REPORTING SUSPECTED CONCUSSIONS IN COLLEGIATE ATHLETICS

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MOTIVATIONS FOR UNDER-REPORTING SUSPECTED CONCUSSIONS IN COLLEGIATE ATHLETICS

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ABSTRACT

MOTIVATIONS FOR UNDER-REPORTING SUSPECTED CONCUSSIONS IN COLLEGIATE ATHLETICS

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Student athletes who have sustained concussions often fail to report signs and symptoms, thereby putting themselves at risk for delayed recovery and permanent impairment. The failure to alert coaches or teammates may occur for a variety of reasons. The present study examined the motivations behind refraining from reporting concussion symptoms among college athletes in high-risk sports enrolled at private Midwestern university. One hundred and ninety-three student athletes participating in high-risk sports, such as football and soccer, completed a multiple-choice survey inquiring if students report their suspected concussion symptoms and those of their teammates and the motivations behind refraining from reporting. Results indicated that approximately 38% - 45% of college athletes at the University did not report their suspected concussions during their collegiate athletic career and 50% of athletes did not report the suspected concussions of a teammate. In addition, results revealed that the top reason students
failed to report their suspected concussions was that they didn’t think it was serious enough. Suggestions are made for athletes, administrative athletic staff, and coaches to help insure that student athletes are aware of the seriousness of concussions, the signs and symptoms, and how to report suspected concussions appropriately.
To Connie and Kelly Bird

Thank you for supporting, pushing, and believing in me throughout my education.
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Reported teammates’ suspected concussions during the 2012-2013 athletic seasons...

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CHAPTER I
INTRODUCTION

Stories about sports-related concussions are grabbing news headlines across the country. Approximately 3.8 million recreation- and sport-related concussions occur in the United States each year (Halstead & Walter, 2010). An eleven-year study of twelve high-school sports found that every single sport has seen an increase in concussion rates (Lincoln et al., 2011). High-contact sports such as football, soccer, and ice hockey place student athletes at high risk for head injury; concussions are also seen in sports such as lacrosse, baseball, wrestling, basketball, field hockey, and cheerleading. While some individuals recover completely from concussions, these traumatic brain injuries can lead to transient or permanent neurocognitive deficits (Neumann, 2010). Thus, it is vital that the academic community examine outcomes for athletes who sustain concussions (including middle, secondary, and post-secondary student athletes) and determine the steps necessary for athletes to return to play.

Sports-related concussion research generally focuses on assessment, management, and prevention of athletic concussions. It is also important to evaluate student athletes’ reporting of concussion signs and symptoms. Such topics include whether athletes feel comfortable reporting their head injuries, whether they recognize and report teammates’ concussion signs and symptoms, and possible motivations for concealing concussions.
Failing to report concussions can lead to a variety of untreated symptoms for student athletes. These symptoms can include problems in the areas of physical activity, cognitive ability, emotional regulation, and sleep (Halstead & Walter, 2010). In addition, because concussions are not a visible injury, athletic and medical professionals heavily depend on the individual to self-report his or her concussion (Mainwaring, Hutchinson, Camper, & Richards, 2012). Therefore, it is imperative that research examine why student athletes are failing to report their concussions so the athletic community can take the necessary steps to addressing this problem.
Sports are an important American tradition. Many Americans love watching sports, playing sports, and seeing their children participate in athletics. However, potential injuries—such as concussions—in high contact sports are often minimized (Halstead & Walter, 2010). It is estimated that every year in the United States, 3.8 million recreation- and sport-related concussions are sustained (Halstead & Walter, 2010). Clearly, athletes of all ages need to be informed about the symptoms and serious consequences a concussion can have on their cognition, emotions, and behavior and the importance of immediately reporting concussion signs and symptoms.

Relevant articles were retrieved, reviewed, and summarized for an overall picture of what is happening in the United States schools regarding athletic concussions. The following topics will be explored in order to evaluate the current literature on reporting of concussions by college student athletes: (a) definition of concussion in sports, (b) problems related to concussions, (c) issues affecting outcomes of concussions, (d) immediate post-concussion assessment and cognitive testing (ImPACT; Covassin, Elbin, Stiller-Ostrowski, & Kontos, 2009), (e) concussion assessment, (f) concussion management (g) concussion prevention, (h) motivations for underreporting sports-related suspected concussions.
Definition of Concussion in Sports

Defined at the International Symposia on Concussion in Sport (CIS) in 2001 and modified in 2004 and 2008, a concussion is comprised of five major features (Halstead & Walter, 2010, p.598):

1. Concussion may be caused either by a direct blow to the head, face, or 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 neurological function that resolves spontaneously.
3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely affect a functional disturbance rather than a structural injury.
4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness (LOC). Resolution of the clinical and cognitive symptoms typically follows a sequential course; however, it is important to note that in a small percentage of cases, post-concussive symptoms may be prolonged.
5. No abnormality on standard structural neuroimaging studies is seen in concussion.

A new concussion occurs when the athlete has not previously sustained a concussion. A recurring concussion is diagnosed when an individual has previously sustained a concussion. An estimated 13.2% of high-school athletic concussions are recurring (Castile, Collins, Mcllvain, & Comstock, 2012). Castile et al (2012) found that this population, “had long symptom resolution times, were kept out of play longer, and reported loss of consciousness more frequently” (p. 603). Therefore, previously injured athletes are at high risk of long-term impairment and should be monitored closely.
Problems Related to Concussions

Various issues can arise in student athletes when a concussion is sustained. Newly concussed individuals commonly experience problems associated with academics, cognitive function, behavior, and emotions. More serious consequences that can arise include post-concussion syndrome, chronic traumatic encephalopathy, and second-impact syndrome, all of which are described below.

Symptoms. The symptoms an athlete can experience following a concussion vary upon the severity of the injury and the individual’s resilience. In general, there are four categories in which negative side effects from a concussion have been reported: physical, cognitive, emotional, and sleep (see Table 1). Table 1

Symptoms of a Concussion

<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive</th>
<th>Emotional</th>
<th>Sleep</th>
</tr>
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<tbody>
<tr>
<td>Headache</td>
<td>Feeling Mentally</td>
<td>Increased Irritability</td>
<td>Lethargy</td>
</tr>
<tr>
<td></td>
<td>“hazy”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea &amp;</td>
<td>Feeling Lethargic</td>
<td>Melancholy</td>
<td>Sleeping more or</td>
</tr>
<tr>
<td>Regurgitating</td>
<td></td>
<td></td>
<td>less than normal</td>
</tr>
<tr>
<td>Concerns</td>
<td>Trouble Focusing</td>
<td>Increased Emotions</td>
<td>Trouble falling</td>
</tr>
<tr>
<td>with Balance</td>
<td></td>
<td></td>
<td>asleep</td>
</tr>
<tr>
<td>Concerns</td>
<td>Trouble Retaining</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>with Vision</td>
<td>Memories</td>
<td>Nervousness</td>
<td></td>
</tr>
<tr>
<td>Tiredness</td>
<td>Trouble Retaining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light &amp; Noise</td>
<td>Fresh Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Puzzled about</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confused</td>
<td>Current events</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shocked</td>
<td>Responds slowly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reiterates questions</td>
<td></td>
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Note: Adapted from Halstead & Walter, 2010, p. 599
With a wide range of symptoms, it is not surprising that so many concussions go unnoticed by the athletes, their teammates, coaches, and guardians. Moreover, the athlete may know s/he is sleeping more than usual and is sensitive to light and noise, but s/he may not attribute these symptoms to being hit in the head a few days earlier during a soccer game. The most commonly reported symptom post-concussion is headache; up to 78% of people who are concussed experience this symptom.

**Academic/cognitive consequences.** After a concussion occurs, the individual’s brain tries to heal itself. A concussion results in a neurochemical imbalance; after a concussion, the brain tries to heal itself by reestablishing the fragile balance between chemicals (McAvoy, 2013). Because of this unstable state, a simple cognitive task like reading or taking a test may cause symptoms to flare. Therefore, when an athlete sustains a concussion, it is important that school personnel realize the consequences this injury has on the individual’s ability to perform in the classroom. As indicated in Table 1, cognitive symptoms of concussion may include responding slowly, not being able to recall new information, trouble focusing, trouble processing information, and difficulty with executive functioning (Halstead & Walter, 2010, p. 599). Also, because concussions are unique to each individual, the academic progress of the student athlete may vary greatly and bounce between improvement and decline (Glang, Tyler, Pearson, Todis, & Morvant, 2004).

**Behavioral and emotional consequences.** Several behavioral and emotional consequences may arise in an athlete after a concussion. These emotional outcomes include, but are not limited to: “mood disturbances including shock, depression, anger, frustration, anxiety, boredom, reduced self-esteem, fear of reinjury, and uncertainty about
the future” (Mainwaring et al., 2012, p.252). With visible injuries, such as a broken leg or laceration, athletes tend to experience positive emotions because of their obvious, visible recovery. However, with an invisible injury like a concussion, the feeling of optimism is less likely to occur (Mainwaring et al., 2012). The discrepancy in emotional experiences post-injury is illustrated by a study that compared concussed athletes to athletes with musculoskeletal injuries. Hutchinson, Mainwaring, Comper, Richards, and Bisschop (2009) found that concussed athletes experienced fatigue and decreased vigor, while those who had musculoskeletal injuries demonstrated an increase in anger. In addition to emotional symptoms, it was also discovered that most of these negative emotional effects lasted about three weeks (Mainwaring et al., 2004). Therefore, coaches, medical professionals, teammates, family members, and all other individuals who interact with a newly concussed athlete should be sensitive to these emotional needs.

**Post-concussion syndrome.** Post-concussion syndrome (PCS) is a state in which a person experiences persistent symptoms (generally defined as longer than three months after their concussion occurred, though there are opinions on specific criteria for PCS diagnosis). According to the World Health Organization, PCS occurs when an individual has sustained a head trauma and subsequently experiences any number of these symptoms: 1) headache, 2) dizziness, 3) fatigue, 4) irritability, 5) difficulty concentrating and performing mental tasks, 6) impairment of memory, 7) insomnia, and 8) reduced tolerance to stress, emotional excitement, or alcohol (Jotwani & Harmon, 2010). Currently, there is not a defined time frame to which these symptoms must persist.

On the other hand, according to the Diagnostic Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), PCS is not specifically
defined but rather the aforementioned symptoms are listed under Major or Mild Neurocognitive Disorder Due (NCD) to a Traumatic Brain Injury. According to the DSM-5, “Traumatic Brain Injury is defined as brain trauma with specific characteristics that include at least one of the following: loss of consciousness, post traumatic amnesia, disorientation and confusion, or, in more severe cases, neurological signs (e.g., positive neuroimaging, a new onset of seizures or a marked worsening or a preexisting seizure disorder, visual field cuts, anosmia, hemiparesis)”. Furthermore, “to be attributable a TBI, the NCD must present either immediately after the brain injury occurs or immediately after the individual recovers consciousness after the injury and persist past the acute post-injury period” (American Psychiatric Association, 2013, p.625).

Regardless of the definition, PCS is a debilitating condition. In a study conducted by Roe, Sveen, Alvsaker, and Bautz-Holter (2009), 30% of participants reported concussion symptoms three months after their head injury occurred. In adolescents, students with PCS may have regular headaches, extreme sensitivity to light, and lightheadedness alongside issues with retaining new and old information and symptoms of anxiety (Lee, 2007). Such issues can be misinterpreted as ADHD, social anxiety or a number of other disorders.

**Chronic traumatic encephalopathy.** Chronic traumatic encephalopathy (CTE) is a “neurodegenerative disease that occurs years or decades following recovery from the acute or post-acute effects of head trauma” (Gavett, Stern, & McKee, 2011, p.2). Because it can only be diagnosed during autopsy, there is no clinical diagnostic tool that can prove an individual has CTE. By creating profiles, symptoms such as increased anger, suicidality, poor episodic memory, and executive functioning were commonly
reported as the first signs of an individual with CTE. As the disease progresses, individuals may have decreased movement and speech difficulties. These symptoms do not occur right after a series of concussions, but appear later in life (mean age of onset is 43; Gavett et al., 2011). During the autopsy, individuals suspected of having CTE exhibited brain abnormalities including reduction in brain volume due to deterioration of frontal, temporal, and parietal lobes; ventriculomegaly of lateral and third ventricles; cavum septum pellucidum; and damaging of cerebellar tonsils (Saffary, Chin, & Cantu, 2012). CTE has been reported in American football, wrestling, boxing, soccer, and hockey (Gavett et al., 2011). Given that these are all high-impact sports, and many athletes sustain multiple concussions, it is widely believed that these individuals are at an elevated risk for developing CTE later in life.

Second impact syndrome. Second impact syndrome (SIS) occurs when a concussed athlete incurs a second concussion before the first one has healed, typically within seven days (McCrory, Davis, & Makdissi, 2012). This results in a swelling of the cerebral cortex of the brain and can cause permanent impairment or even death. This syndrome is extremely rare, with 17 possible cases in the past 35 years reported by the U.S. National Center for Catastrophic Sport Injury Research (2010). SIS is most likely to occur in boxers, as these athletes sustain multiple blows to the head in a short time frame. There is limited research on SIS; however, athletes and coaches who are involved with sports where multiple blows to the head can occur in a short amount of time should be aware of this condition (McCrory et al., 2012).
Issues Affecting Concussion Outcomes

A variety of biological and environmental factors can influence the outcome of a sports-related concussion. Factors such as severity of the impact, previously attained injuries, age, and gender can all affect how an individual responds to a head injury.

Severity of impact. How hard an athlete is hit may affect the degree to which s/he experiences concussion symptoms. For example, one study found that retrograde and anterograde amnesia at 24-48 hours after the concussion has occurred, predicts neurological dysfunction (Williams & Wilkins, 2002). Because amnesia tends to accompany harder blows to the head, this implies a relationship between severity of impact and cognitive dysfunction. On the other hand, in a study in which severity grades of concussions were compared to neuropsychological test performance, no relationship was found between lower test scores and severity of impact (Hinton-Bayre & Geffen, 2002). Of note, all athletes studied who sustained a head injury showed a loss in cognitive ability two days after the injury.

New versus recurring concussions. A new concussion occurs when an athlete has not previously sustained a concussion. A recurring concussion is diagnosed when an individual has previously had a concussion. This is different from Second Impact Syndrome (SIS) because in recurring concussions, the first concussion has properly healed before the next concussion was sustained. It is estimated that 13.2% of high-school athletic concussions are recurring (Castile, Collins, McLlvain, & Comstock, 2012). It was found that this high-school concussed population, “had long symptom resolution times, were kept out of play longer, and reported loss of consciousness more frequently” (Catile et al., 2012, p. 603). Therefore, this group of athletes has a higher risk of long-
term impairment and should be monitored closely.

**Age and gender.** The age and gender of a concussed person may be a significant factor impacting recovery. For example, McLeod, Bay, Lam, and Chhabra (2012) found that in high school athletics, females, upper-classmen, and non-concussed peers performed better academically than their counterparts. The implication is that, in general, athletes with one of the above age and gender qualities are more likely to recover faster. Though this cannot be generalized across all populations, it is important to note that males, younger students, and previously concussed individuals may have more intense symptoms and need more time to recuperate before returning to play.

Research has demonstrated that female athletes report more concussion symptoms than their male counterparts (Covassin, Elbin, Harris, Parker, & Kontos, 2012). This is important because females are more likely to have symptoms resolve faster than males (Covassin et al., 2012). Therefore, because females report more symptoms and their symptoms dissipate quicker, it is possible that they are getting more support and treatment for symptoms, consequently facilitating their faster recovery.

**Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT)**

At the high school and collegiate level, a commonly-used computerized testing system for a concussion is the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT; Covassin et al., 2009). Frequently administered by athletic trainers, this program collects a baseline level of cognitive function from athletes in order to compare the scores to post injury data should they sustain a concussion. After an athlete sustains a concussion, a post-concussion neurocognitive survey is administered to see how the athlete is performing. Generally, the athletes need to have scores within the
baseline range to be cleared to return to play. Over the course of one year, a study showed that the ImPACT consistently produced valid results for high school athletes (Elbin, Schatz, & Covassin, 2011). A survey conducted by Covassin et al (2009) found that the majority of athletic trainers used this software on male football players and male and female soccer players.

Other assessment tools for concussion detection include the Post-Concussion Symptom Scale (PCSS), Standardized Assessment of Concussion (SAC), Neuropsychological testing, Balance Error Scoring System (BESS), and the Sensory Organization Test (SOT). The PCSS is a symptoms checklist for anyone who observes the concussed to fill out. The SAC is an assessment that can be used directly after an athlete has sustained a concussion. The SAC evaluates four cognitive domains (orientation, memory, concentration and recall) in only six minutes. On the other hand, neuropsychological testing entails the use of a computer and interpretation by a neuropsychologist. The BESS is a measure of balance and the SOT uses technology to measure the individual’s ability to sustain equilibrium.

Harmon et al (2013) states, “Preseasons testing requires an honest effort on the part of an athlete” (p.20). It is speculated that some athletes can “beat” the ImPACT system by purposely answering questions wrong so they can receive a lower score. Therefore, when these tests are examined to see if the athlete has the symptoms of a concussion, the injured athlete has a better chance of scoring similarly to their baseline data. In addition, Covassin et al (2009) found that only roughly 50% of athletic trainers checked their ImPACT results for validity. To improve accuracy of data, it is recommended by the American Academy of Neurology to use a combination of
assessments when diagnosing or monitoring an individual with a concussion (American Academy of Neurology, 2013).

**Concussion Management**

Concussion management refers to the way in which one responds to and treats their concussion. It is comprised of several different factors. Rehabilitation, return to academics, and return to play all take a role in how well a student athlete recuperates from a concussion.

**Rehabilitation.** There are several ways in which professionals can help student athletes recover from a concussion. Early education, cognitive behavioral therapy (CBT), and light aerobic exercises (under the guidance of a trained professional) have helped individuals recover from a concussion (Leddy, Sandhu, Sodhi, Baker, & Willer, 2012). Early education involves discussing the symptoms, recovery time, and recovery strategies with the concussed individual (Leddy et al., 2012). CBT is a psychological intervention that involves changing an individual’s maladaptive thought patterns. This therapy may be employed when an individual who has sustained a concussion becomes depressed or anxious due to their injury (Leddy et al., 2012). When an individual who has sustained a concussion reports no symptoms while at rest, s/he can begin light aerobic exercise. Examples of these exercises include walking and light cycling (Leddy et al., 2012). When making a plan for a student’s recovery course back to the game, these approaches should be considered. Depending on the player, intensity and amount of rehabilitation will vary.

**Return to academics.** There is currently no mandated protocol for when students who have sustained concussions should return to the classroom. The National Center for Injury Prevention and Control (NCIPC, 2013) recommends that schools build a
concussion management team to create an intervention plan and monitor students who have sustained a concussion. McGrath (2010) suggests five key people in the school system should be involved in supporting the concussed student’s return to the classroom, including the athletic trainer, school nurse, guidance counselor, social worker, and school psychologist. Any other member of the school system deemed necessary may also be included. Along with the student and their parents/guardians, this team of individuals can make sure that the student is receiving the correct post injury management. Also, the concussion management team should devise a plan that will ensure that the student is receiving the proper assistance during the academic day and confirm that an emergency medical action plan is created (NCIPC, 2013). Other responsibilities of this team include assessing the student’s needs and adjusting academic assistance as necessary (McAvoy, 2013).

The Oregon Center for Applied Science (ORCAS, 2011) developed a six-step progression of how schools should determine if a student is ready to return to the classroom. Because every student is different, s/he may begin at any step (contingent on symptoms) and remain in any step as long as needed. The following is an adapted list of steps from the ORCAS protocol:

1. Home – Complete Relaxation
   a. Remain in the household
   b. No driving
   c. No mental application

2. Home – Simple Mental Exertion
   a. Remain in the household
b. No driving

c. Maximum of 30 minutes of mental application

d. Minimal concentration

*When the student can manage 30 minutes of mental activity without his/her symptoms becoming worse, s/he may progress to step 3

3. School - Part Time (Full Accommodations/Reduced School Day)

a. Planned mental breaks

b. Provide area for lunch in less noisy atmosphere

c. Avoid classroom or standardized examinations

d. Adjust rather than delay academics

e. Allow extra time, support, and adjust assignments

*When the student can manage 30-40 minutes of mental activity without his/her symptoms becoming worse, s/he may progress to step 4.

4. School – Part Time (Reasonable Accommodations/Reduced School Day)

a. Avoid standardized examinations

b. Adapted classroom examinations

c. Modest reduction of extra time, support, and adjustments of assignments

*When the student can manage 60 minutes of mental activity without his/her symptoms becoming worse, s/he may progress to step 5.

5. School – Full Time (Minimum Accommodations)

a. Avoid standardized examinations

b. Maintain reduction of extra time, support, and adjustments of assignments
c. Continue helping student in difficult academic classes

*When the student can manage his/her academic classes in sequence without his/her symptoms worsening AND s/he has complete medical clearance for both return to academics and athletics, s/he may progress to step 6.

6. School – Full Time (No Accommodations)

a. Goes to all academic subjects

b. Normal homework and examinations resume

Along with this protocol, McGrath (2010) suggests specific accommodations that should be considered when a newly concussed athlete returns to the classroom (p.494-496). The following is a list adapted from their suggestions:

1. Permitted absences from courses
2. Time during the school day to take a break
3. Additional time to complete homework
4. Rearrangement or postponement of exams
5. Exemption from particular exams, projects, and homework assignments
6. Prolonged time during exams
7. Modifications and accommodations for sensitivity to light, sound, or both
8. Exemption from physical education and extracurricular sport training
9. Abstaining from physical effort
10. Provide a reader for homework and exams
11. Provide a transcriber during class
12. Provide a smaller, less distracting room for testing
13. Seat the child in the front of the class
14. Provide support from a tutor to help with arranging and rating homework importance

Other accommodations and modifications suggested by the Colorado Department of Education (McAvoy & Werther, 2012) include: sunglasses for students experiencing sensitivity to light, permission to leave school early, establishing a “signal” for the teacher to know when the student needs help, and allowing the concussed student to leave class if s/he is feeling frustrated.

**Return to play.** Day, Hansen, and Reding (2012) conducted a study, which found that 38% of athletes have a neurocognitive deficit after the resolution of concussion symptoms, implying that athletes may not be mentally fit to return to athletics despite being perceived as physically healthy. It is imperative that coaches, athletic trainers, parents, and student athletes are aware of the threats to the health of the athlete if s/he returns to play too early. “When in doubt, sit them out!” (Halstead & Walter, 2010) should be a motto for all sports teams that is never questioned. The damage that can be done to the adolescent brain post-injury is not worth playing in a game.

McCrory et al (2009) summarized a “gradual return to play” protocol which was derived from a consensus statement on concussion in sports developed at the 3rd international conference in Zurich (November, 2008). This group of professionals established the following six steps for proper return to play, which should be separated by 24 hours. The concussed individual should not advance to the next step if any symptoms reappear:
1. **NO ACTIVITY**: Complete physical and cognitive rest

2. **Light aerobic exercise**: Walking, swimming, or stationary cycling; No resistance training

3. **Sport-specific exercise**: No contact; Running or skating drills; No head impact activities

4. **Non-contact training drills**: Complex training drills; Passing/shooting drills; Progressive resistance training

5. **Full-contact practice**: Following medical clearance, resume normal practice activity

6. **Return to play**: Resume full participation in practices and games with no restrictions

This protocol implies that a student athlete’s return to play after a concussion should take at least six days. The student should gradually ease back into physical activity with close monitoring and should wait until s/he feels confident that s/he is ready to return. In addition to these guidelines, neurocognitive testing should be included in the assessment if the individual feels s/he is ready to get back into a sport. Though outward symptoms may resolve, in many cases neurocognitive deficits have been shown to outlast the physical symptoms of a concussion (Day, Hanson, & Reding, 2012). Therefore, a pre- and post-test program, such as ImPACT, should be implemented in all schools, including middle, secondary, and post-secondary schools. By testing all student athletes to establish baseline data before their season starts, athletic trainers can compare the neurocognitive function of an athlete pre- and post-concussion to assist with return-to-play decision making.
The National Center for Injury Prevention (NCIP, 2013) also stresses that it is important to incorporate a broad range of stakeholders’ input when developing return to play guidelines. The NCIP also recommends building in time for developing a plan for return to play implementation, being specific about roles that individuals will play (inside and outside of the school), and providing easy access to educational materials when developing a systematic protocol for return to play.

Return to play guidelines should not be the only intervention in place to protect student athletes from the dangers of concussions. Advocates are now arguing for revisions of the rules in high-contact sports such as football, hockey, and soccer. Changing regulations that allow for high-risk contact may decrease concussion risk. For example, limiting blocking and tackling from childhood football is one way to reduce risk of head injury (Johnson, 2012).

**Concussion Prevention**

Federal and state legislation, the Center for Disease Control and Prevention (CDC), online training, and collaboration are four important sources for concussion prevention initiatives.

**Legislation and policy.** Nationally, all 50 states and Washington D.C. have passed legislation providing guidelines for concussion education and management (Frollo, 2014). In addition, 42 states have passed legislation for return to play policies (National Center for Injury Prevention and Control, 2013). This is a promising step for the United States to protect student athletes from threatening head injuries. With more than 25 concussion assessment tools available, government funding could potentially determine which tools schools can utilize (Halstead & Walter, 2012). Effective April 26,
2013, Ohio passed legislation through the Ohio High School Athletic Association (OHSAA), which provided a protocol for return to play. Return to play requirements were set for coaches, students, parents, and contest officials, online concussions education courses were approved, and the National Federation of State High School Associations (NFHS) suggested requiring medical clearances as a part of high schools’ return to play protocol (2013).

On a smaller scale, in order to effectively aid student athletes who sustain a concussion, Davies, Russon, and Osborne (2011) suggest that school boards take the lead. Tactics such as creating collaborative teams to write and enforce policies and provide professional development for coaches and teachers are all ways in which a school board can promote healthy practices in regard to sports-related concussions. This tactic can also be employed in the collegiate athletic setting. Polices regarding concussion prevention and management should be collaboratively created by collegiate athletic boards in order to protect student athletes from injury (Goldberger, 2014).

Center for Disease Control and Prevention (CDC). The CDC has worked with professionals in the field to create a tool kit for high school coaches in order to educate them about the dangers, signs, and regulations of sport-related concussions. The kit includes a guide for coaches, a video, a clipboard sticker, a wallet card, and fact sheets for parents and athletes (Sarmiento, Mitchiko, Klein, & Wong, 2010). This tool kit has resulted in “favorable changes in knowledge, attitudes, and practices toward the prevention and management of concussions” (Sarmiento et al., 2010, p.11). Though participating coaches did not report using all of the materials provided, at least 50% reported that they planned to use all materials in the future (Sarmiento et al., 2010).
**Online training.** Another effective method for educating coaches about concussions is *ACTive: Athletic Concussion Training using Interacting Video Education* (Glang, Koester, Beaver, Clay, & McLaughlin, 2010). These easy-to-use videos are designed to quickly and concisely educate coaches of athletes aged 10-18 years old about prevention, recognition, and management of athletes who sustain concussions. There are three short modules, which build upon each other to guide the user through the information. Other videos involve short clips from medical professionals, professional athletes, and various coaches. *ACTive* also uses real life situations (termed “application exercises”) to assess how the coach would respond to various situations.

This program has demonstrated effectiveness for improving concussion awareness among coaches. Comparing pre- and post-test results, coaches significantly improved in four content areas: knowledge, self-efficacy, intention to take appropriate actions, and attitudes toward brain injury. The positive results from this study indicate that online training may be an effective way to educate coaches about athletic concussions (Glang et al., 2010).

**Collaboration.** It is vital that coaches, athletic trainers, teachers, and parents all work together to help student athletes recover from a concussion (Faure, 2010). In taking a collaborative approach, this group of individuals can ensure that student athletes are receiving consistent care at school, at home, and on the field. The trainer will most likely be the best person to lead the team due to their education. In addition, Meehan, d’Hemecourt, Collins, and Comstock (2011) revealed that an athletic trainer assessed 94.4% of concussions. Other persons who could be involved in this recovery process include the concussed student’s teachers, the coach, a representative from the disabilities
office, the student himself/herself, and the student’s doctor.

**Motivations for Underreporting Sports-related Suspected Concussions**

Individual case studies have demonstrated that athletes frequently refuse to self-report about sustained concussions (Williams & Wilkins, 2002). An overarching theme that affects the attitudes of athletes is the culture of sports: athletes are expected to be tough and behave in the best interest of their team rather than themselves. To many athletes, this means shrugging off a “ding” to the head and getting back in to finish the game. The attitude of not wanting to seem inferior due to an invisible injury can be detrimental to the health of student athletes. According to the October 2013 Report Brief on Sports-Related Concussions in Youth, many people involved in sports (whether as athletes, coaches, or supporters) do not entirely realize the severity of concussions. Though the research is scarce, a study conducted by McCrea, Hammeke, Olsen, Leo, and Guskiewicz (2004) examined the underreporting of concussions in high school football players in Wisconsin. Only 47.3% of the players who knew they had a concussion reported it to someone they trusted. In addition, the researchers discovered that three areas were reported as the most common purposes for not reporting athletic concussions: 66.4% of athletes did not believe the injury required medical attention; 41.0% did not want to be suspended from the game; and 36.1% were unaware they could have sustained a concussion in sport (McCrea et al., 2004). The players who reported their concussions indicated that 76% confided a certified athletic trainer, 38.8% to a coach, 35.9% to a parent and 27.2% to a teammate.

Another study concerning the reporting of high school athletic concussions found that 48.8% of athletes did not report their concussions. The two main reasons reported
were that they did not think it was serious enough to report, 70.2%, and they did not want to be removed from a game, 36.5% (Register-Mihalik et al., 2013).

In addition to the aforementioned studies, Chrisman, Quitiquit, and Rivara (2013) found that when high school athletes were given scenarios containing symptoms of concussions, all participants chose to continue playing or to take a brief break and return to the game. When asked why, athletes provided the answers of not wanting to be removed from the game, not being in enough pain, and not knowing the specific symptoms of getting a concussion. A study from Canada examined the underreporting of concussions in youth ice hockey. This study found that concussions were only reported to team personnel 50% of the time (Williamson & Goodman, 2006). Finally, Booher, Wisniewski, Smith, and Sigurdsson (2002) conducted a study in which the athletic trainers for 87 NCAA Division I college football programs prepared weekly reports of possible exposures to concussions and athletes’ reports of concussions. For 87 programs, athletic trainers reported 507,277 athletic exposures to head injury and players reported 373 concussions. Therefore the researchers concluded that players were refusing to report concussions.

The Present Research Study

Athletic concussions are a silent epidemic in the United States. Current research emphasizes the assessment, prevention, and management of concussions in adolescent sports. With the advancements in our understanding of sport related head-injuries, it is imperative that professionals such as athletic trainers and student athletes have the proper education about the risks associated with refusing to self-report concussions. It is clear that athletes who do not report concussion symptoms are at risk for impairment. Factors
such as wanting to stay in the game, not knowing the repercussions of concussions, and the symptoms of a concussion have been provided as reasons why players do not report their concussions in one study. More information on motivations for under-reporting suspected concussion symptoms may help us better educate athletes, coaches, parents, and school personnel on how, why, and to whom athletes should report suspected concussions. The purpose of this study was to determine suspected concussion symptom reporting rates amongst athletes at the University and potential factors that may influence those rates.
CHAPTER III
METHOD

Research Questions and Predictions

The following research questions and predictions were developed for the present research study:

(1) *What percent of college student athletes report suspected concussions or the suspected concussions of their teammates?*

It was predicted that approximately 50% of student athletes would report their suspected concussions and symptoms and the suspected concussions of a teammate. This hypothesis was based on the study conducted by McCrea, Hammeke, Olsen, Leo, and Guskiewicz (2004) who found that only 47.3% of high school athletes who knew they had a concussion reported.

(2) *Why do student athletes refrain from reporting their suspected concussions or the suspected concussion of a teammate?*

It was predicted that college student athletes fail to report their suspected concussions or the suspected concussion of a teammate so the individual who possibly sustained the concussion could continue playing their sport, because they did not know the consequences of incurring a concussion, and because they or their teammate did not realize the concussed was experiencing symptoms of a concussion. This prediction was
based on McCrea et al. (2004) who found these three reasons as the main motivations for refraining to report the concussion of a teammate reported by high school athletes.

**Research Design**

The study involved a descriptive research design. The study was conducted using a survey with multiple-choice questions resulting in quantitative data.

**Participants and Setting**

Participants in the study were selected through a criterion sample method. Participants who were invited to complete the survey included (n = 283) college athletes in high-risk sports enrolled at a mid-size, private university located in the Midwestern region of the United States. Participants included both female and male athletes whose academic standing ranged from freshman to fifth year senior.

Two-hundred and eighty-three athletes from the University’s men’s baseball, men’s basketball, women’s basketball, cheerleading, men’s football, women’s softball, men’s soccer, and women’s soccer teams were emailed and invited to participate. Of the students emailed, 193 student athletes replied, yielding a response rate of 68.2%. Table 2 illustrates the response rate per team and Table 3 describes the participants by academic standing.
Table 2

*Response Rate Per Team*

<table>
<thead>
<tr>
<th>Sport</th>
<th>Total Athletes</th>
<th>Participants</th>
<th>Percent Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men’s Baseball</td>
<td>42</td>
<td>36</td>
<td>85.71%</td>
</tr>
<tr>
<td>Men’s Basketball</td>
<td>16</td>
<td>4</td>
<td>25%</td>
</tr>
<tr>
<td>Women’s Basketball</td>
<td>12</td>
<td>10</td>
<td>83.33%</td>
</tr>
<tr>
<td>Cheerleading</td>
<td>23</td>
<td>17</td>
<td>73.92%</td>
</tr>
<tr>
<td>Men’s Football</td>
<td>108</td>
<td>71</td>
<td>65.74%</td>
</tr>
<tr>
<td>Women’s Softball</td>
<td>26</td>
<td>16</td>
<td>61.54%</td>
</tr>
<tr>
<td>Men’s Soccer</td>
<td>33</td>
<td>20</td>
<td>60.61%</td>
</tr>
<tr>
<td>Women’s Soccer</td>
<td>23</td>
<td>19</td>
<td>82.61%</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
<td>193</td>
<td>68.20%</td>
</tr>
</tbody>
</table>

Table 3

*Response Rate Per Academic Standing*

<table>
<thead>
<tr>
<th>Standing</th>
<th>Participants</th>
<th>Percent Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>63</td>
<td>32.64%</td>
</tr>
<tr>
<td>Sophomore</td>
<td>56</td>
<td>29.02%</td>
</tr>
<tr>
<td>Junior</td>
<td>38</td>
<td>19.69%</td>
</tr>
<tr>
<td>Senior</td>
<td>30</td>
<td>15.54%</td>
</tr>
<tr>
<td>5th Year</td>
<td>6</td>
<td>3.11%</td>
</tr>
</tbody>
</table>
A letter granting permission to distribute the survey was obtained from the University’s Assistant Athletic Director. The student athletes from the aforementioned sports were emailed in October of 2013 and asked to take the electronic survey regarding athletic concussions. A follow-up email reminding the athletes about the survey was sent one week later. The email containing the link to the survey described participant confidentiality, anonymity, the option to stop taking the survey at any time, and the chance to win a $50 Visa gift card (see Appendix A). Students were provided with an email address created specifically for the survey, to which they could email their name and number by a specific date to be entered into the drawing for the gift card.

**Measure**

The survey used in this study was adapted from the survey used in McCrea et al (2004) “Unreported Concussion in High School Football Players Implications for Prevention” (see Appendix B). The survey was created and distributed electronically through the Google forms application. The content of the survey yielded suspected concussion symptom reporting rates amongst athletes at the University and identified potential factors that may have influenced those rates. The questions were separated into “before the 2012-2013 athletic seasons” and “during the 2012-2013 athletic season”. This distinction was made in order to collect data about the most recent season as well as data about suspected concussions during the athletes’ entire colligate career. The survey was piloted with school psychology students at the University of Dayton. The pilot results indicated that the survey questions and the timeframe of college athletic seasons needed to be specified. Adjustments to the survey were made based on these results.
Procedures

**Phase I: IRB approval.** The study was submitted for approval to the Institutional Review Board at the University of Dayton. This submission included a letter written by the Assistant Athletic Director at the University, who gave permission to administer an electronic survey regarding athletic concussions to student athletes from the aforementioned sports.

**Phase II: Recruitment.** The researcher attended a coaches meeting at the University, led by the Assistant Athletic Director. During this meeting, the researcher explained the purpose of the survey and asked the coaches to encourage their athletes to participate when they received the email. Consent was obtained from participants, indicated by clicking into the electronic survey.

**Phase III: Data collection.** The researcher collected the data from October 2013 to November 2013. Student athletes from the aforementioned sports were emailed and asked to take the survey. They received a follow-up email one week later to remind them about the survey. Data were collected electronically using a Google online survey. Students who decided to complete the survey were entered into a drawing to win a $50 Visa gift card. After the initial email request was sent, 162 responses were recorded and an additional 31 responses were recorded a week later when the second email was sent.
CHAPTER IV

RESULTS

The results of the study were analyzed by calculating the response percentage for each survey question. The survey results yielded ordinal and interval data. The results of the survey were also analyzed using Statistical Package for the Social Sciences (SPSS) software.

Research Question One

The data were analyzed by calculating the response percentage of each survey question. These analyses indicated if the University student athletes reported their suspected concussions and the suspected concussions of their teammates during their college athletic careers.

Reported suspected concussions before the 2012-2013 athletic seasons. The survey of the University’s athletes revealed that 14% of respondents suspect s/he sustained a concussion in college before the 2012-2013 collegiate athletic season. Twenty-one percent of the athletes identified themselves as freshman and chose the options of “not applicable”. Of the remaining participants, 60% reported that they did not suspect s/he sustained a concussion and 5% of athletes surveyed were unsure. Of the participants who reported that they suspected s/he sustained a concussion or were unsure, 62% reported that they had one known concussion, 28% sustained two concussions, 8%
sustained three concussions, 3% sustained four concussions, and no one reported incurring five or more concussions.

**Reported suspected concussions during the 2012-2013 athletic seasons.**

According to the survey, 8% of respondents suspect s/he sustained a concussion during the 2012-2013 athletic season. Of the remaining participants, 87% reported that they did not have a concussion and 5% of athletes surveyed were unsure. Of the participants who reported that s/he suspects they had a concussion or were unsure, 79% reported that they had one known concussion, 16% sustained two concussions, 5% sustained three concussions, and no one reported incurring four or more concussions.

**Reported teammates’ suspected concussions during the 2012-2013 athletic seasons.** The participants were also asked about reporting the suspected concussions of their teammates. Of the 193 respondents, 60% reported that they had known of a teammate whom they suspect had a sports-related concussion in the 2012-2013 athletic seasons and 40% responded that they had not. The 116 student athletes who suspected a teammate sustained a concussion were then asked whether they reported their teammate’s suspected concussion. Of this group, 50% of the athletes answered “yes” and the remaining 50% responded “no.”

**Research Question Two**

The data were analyzed by calculating the response percentage to each survey question. These analyses yielded information indicating why the University student athletes failed to report their suspected concussions or the suspected concussion of a teammate during their college athletic careers. Participants were able to choose more than
one motivation for refraining to report their suspected concussions or the suspected concussion of a teammate.

Percent of athletes who reported suspected concussions and motivations before the 2012-2013 athletic season. The 37 student athletes who suspect s/he sustained a concussion prior to the 2012-2013 athletic season were asked to answer if they reported their suspected concussion. Sixty-two percent of the concussed athletes answered “yes” and the remaining 38% responded “no”. Of the 23 athletes who reported his/her suspected concussions, 19 reported they confided in an athletic trainer, 13 in their coach, 13 in a parent, and 7 in a teammate. Of the 14 players who failed to report their suspected concussions, 9 stated it was because they “didn’t think it was serious enough,” 7 chose “didn’t know it was a concussion,” 5 indicated they “didn’t want to be pulled out of the game or practice,” 3 responded, “didn’t want to let down teammates,” and 1 chose “other”. Figure 1 breaks down these motivations by percentiles.

Figure 1. Motivations to not report a suspected concussion before the 2012-2013 athletic seasons
Percent of athletes who reported suspected concussions and motivations during the 2012-2013 athletic season. The 22 student athletes who suspect s/he sustained a concussion during the 2012-2013 season were asked if they reported the suspected concussion. Fifty-five percent of the concussed athletes answered “yes” and the remaining 45% responded “no.” According to the athletes who reported their suspected concussions, 9 stated they informed an athletic trainer, 7 to a coach, 5 to a parent, 2 to a teammate, and 1 chose “other”. Of the 10 players who failed to report their suspected concussions, 7 stated it was because they “didn’t think it was serious enough,” 7 indicated they “didn’t want to be pulled out of the game or practice,” 5 chose “didn’t know it was a concussion,” and 1 selected “didn’t want to let down teammates.” Figure 2 breaks down these motivations by percentiles.

![Figure 2. Motivations to not report a suspected concussion during 2012-2013 athletic seasons](image-url)
Percent of athletes who reported suspected concussions and motivations for not reporting teammates’ suspected concussions during the 2012-2013 athletic seasons. According to the athletes who reported their teammates’ suspected concussions, 38 reported they confided in an athletic trainer, 17 in their coach, 3 in another teammate, 1 chose “other,” and no one reported confiding in a parent. Of the 57 players who failed to report the suspected concussions of their teammates, 23 stated it was because the individual reported it themself, 13 indicated that the trainer already knew, 10 chose “didn’t know it was a concussion,” 7 selected “didn’t want him/her to be pulled out of the game or practice”, 7 chose, “didn’t think it was serious enough”, 3 indicated, “Didn’t want to let down teammates,” and 2 reported that a doctor checked on the teammate. Figure 3 breaks down these motivations by percentiles.
Figure 3. Motivations to not report the suspected concussion of a teammate during 2012-2013 athletic seasons

Statistical Analysis

A series of chi-square tests were conducted in order to see if there was a relationship between different sets of variables. For all of the analyses conducted, the majority of the cells had an expected count less than five, indicating that the results are not strong indicators.

Participant sport. The first analysis compared the participant’s sport with suspected concussions sustained before 2012-2013 athletic seasons variable. This analysis yielded a result of $X^2 (24, N=193) = 52.06, p = .001$, indicating the relationship
between these variables was not coincidental. The second analysis compared the participant’s sport with the suspected concussions during 2012-2013 athletic seasons. This analysis yielded a result of $X^2(16, N=193) = 14.01, p = .592$, indicating that there was no relationship between the two variables.

**Academic standing.** A chi-square analysis was used to compare the participant’s academic standing with suspected concussions before 2012-2013 athletic seasons variable. This analysis yielded a result of $X^2(12, N=193) = 128.12, p < .001$, indicating that the relationship between these variables was not coincidental. The second analysis compared the academic standing variable with the suspected concussions during 2012-2013 athletic seasons. This analysis yielded a result of $X^2(8, N=193) = 8.74, p = .365$ suggesting that the relationship between these two variables was not coincidental.
CHAPTER V
DISCUSSION

Review of Purpose and Major Findings

The purpose of this study was to determine the percentage of college athletes at a mid-size private University who report their suspected concussions and the suspected concussions of teammates, as well as the motivations behind refraining to report an incident. The data reported from before the 2012-2013 athletic seasons and during the 2012-2013 athletic seasons indicated that 38 - 45% of student athletes at the University are not reporting their suspected concussions to anyone. The student athletes indicated that the strongest motivations behind refraining to disclose the information include not thinking the concussion was a serious enough injury, not wanting to be pulled out of the game or practice, and not knowing s/he sustained a concussion. For both prior to and during the 2012-2013 seasons, the strongest motivator for not reporting a suspected concussion was believing the concussion was not a severe enough injury.

Interpretation of Findings Relative to Predictions

The data collected from the student athletes supported the predicted hypothesis for research question one.

Research question one. According to the October 2013 Report Brief on Sports-Related Concussions in Youth, many athletes, coaches, and supporters do not completely
understand the consequences of concussions. A study completed by Register-Mihalik et al (2013) concerning the reporting of high school athletic concussions found that 48.8% of athletes did not report their concussions. It was predicted that 50% of the students would indicate that they did not report their suspected concussions and the results of the present study indicated that 38 - 45% of student athletes in the sample failed to report their suspected concussions, slightly lower than previous research findings. These findings are consistent with the previous research but are slightly lower than expected. The hypothesis in the current study was based on a study (McCrea et al., 2004) conducted with high school athletes, while the current study’s participants were college athletes. It is possible that the college-age participants had more exposure to the signs and symptoms of a concussion and therefore were more inclined to report their suspected concussions. Another possible reason for this lower rate could be that college athletes may be more mature and feel more responsible for their well-being and therefore reported their suspected concussions. Finally, it is possible that the University’s student athletes felt more comfortable with the staff members on their teams and therefore chose to report their suspected concussions.

**Research question two.** It was predicted that the students would choose the three reasons indicated by the study completed by McCrea et al (2004) for refraining to report concussions. For both prior to and during the 2012-2013 seasons, the students athletes chose “didn’t think it was serious enough” as the top reason they failed to report their suspected concussions. An inferred cause for this occurrence is that student athletes at the University are not educated about the harmful effects a concussion may have (Leddy et al., 2012). Another possible reason could be due to the fact that a concussion is not a
visible injury; student athletes may have felt “weak” or afraid of being perceived as weak if they reported their concussion (Report Brief on Sports-Related Concussions in Youth, 2013).

In addition, “didn’t know it was a concussion” was the second highest (28%) motivation for the pre 2012-2013 season and the third highest (25%) for the 2012-2013 season. This implies that many student athletes do not know the signs and symptoms of a concussion. Therefore, the University may benefit from a formal education program for their student athletes and athletic staff about concussions – prevention, the signs and symptoms, and proper management on and off the athletic field.

**Statistical analysis.** Though the analysis indicated that the results are not strong statistical indicators, there was a relationship found between the participants’ academic standing and their reporting of suspected concussions both prior to and during the 2012-2013 athletic seasons. This finding implies that the academic standing of a student athlete may influence if s/he will report a suspected concussion. In addition, comparing pre 2012-2013 athletic seasons with both participant sport and academic standing resulted in a not coincidental relationship. This may indicate that the University educated their student athletes differently during the pre 2012-2013 seasons and during the 2012-2013 season.

**Limitations**

A limitation of this study is the restricted sample of student athletes at only one university, therefore creating a sampling bias. To yield more generalizable results, it is recommended that the study be replicated at universities of varying size and demographics around the country. In addition, 36.8% of responses were collected from
the football team due to the size of the football roster. Thus, it is recommended that studies focus on collecting this data across multiple universities focusing on sports other than football. In addition, the study questioned if student athletes sustained a concussion, yet there was no way for the researchers to know if the student accurately knew whether or not they had sustained a concussion. This also applies to reporting teammates' concussions. Adding a question to the survey about how the student knew s/he sustained a concussion would help address this limitation. In addition, question 2c asked student athletes if they sustained a concussion during their collegiate athletic career. Because freshman could not answer this question, there was a “not applicable” option. However, according to the results, some freshman answered this question. Therefore, this may have not accurately represented the numbers of students sustaining a concussion during their collegiate career. Also, depending on the academic standing of the student, athletes may have more knowledge about concussions and have had more opportunities to sustain a concussion. Finally, due to the limited sample size, the statistical analysis of the data was not considered strong. Therefore, a larger sample size would have been optimal.

**Implications for Future Research**

Several participating athletes reported that they did not know they sustained a concussion. It is crucial that universities educate their sports programs about the causes, symptoms, and possible outcomes of sustaining a concussion. The frequency of use and efficacy of informational programs on concussions needs to be examined with the college athlete population.
In addition, results indicate that 60% of the athletes knew of a teammate whom they suspect sustained a concussion. Several of these respondents indicated they did not report a teammate’s suspected concussion because an athletic trainer witnessed the incident and therefore they did not feel the need to report their teammate’s suspected concussion themselves. A study might further investigate this statement. It is possible that the student assumed the trainer witnessed the incident, the trainer did not treat the athlete, or that the student athlete lied to the trainer about his symptoms but confided in a teammate.

**Conclusion**

The present study examined if the University’s student athletes involved in high-risk sports reported their suspected concussions and the suspected concussions of their teammates as well as the motivations behind refraining from reporting suspected concussions. The findings indicated that roughly 38 - 45% of athletes did not report their suspected concussions and 50% of athletes did not report the suspected concussions of a teammate. The participants indicated that the highest ranked motivation behind refraining to report their own suspected concussions was that they did not think their suspected concussion was a serious enough injury. This implies that student athletes may not be aware of the serious repercussions that a concussion can have on their health (Report Brief on Sports-Related Concussions in Youth, 2013).

It is important that college athletic programs educate student athletes and personnel about sports-related concussions. The results of the current study indicated that student athletes may lack knowledge of what a concussion is and of the possible impact it can have on their well-being. Therefore, athletic programs need to focus on educating
students about the signs and symptoms, as well as the seriousness of a concussion.

Programs should also address the importance of athletes’ self-advocacy about injuries as well as the importance of reporting the concussion of a teammate.
REFERENCES


services for students with TBI through statewide consulting teams.

_NeuroRehabilitation 19_, 219-231.

Goldberger, A. (2014). Team effort needed when it comes to managing the risk of concussion on the field and on the court. _Sports Litigation Alert 11_(3), 12


doi:10.1136/bjsports-2012-091941.


American Academy of Neurology, 1-8


The following script is an email that will be sent with the survey link to university’s student athletes who participate in men’s baseball, men’s basketball, women’s basketball, men’s football, women’s softball, men’s soccer, women’s soccer, and cheerleading.

**Subject:** Brief University _________ Athlete Survey

**Content:**

Dear University _________ Student Athlete:

I am a school psychology intern completing my thesis in the school psychology program at The University _________ . I am asking all student athletes at UD to participate in a study designed to investigate reporting athletic concussions. Additionally, the study will examine the motivations behind failing to report a concussion. **It is estimated that this 10-item survey will only take 3 minutes of your time.** This data will help us determine what percentage of University _________ athletes report concussions and possible motivations for not reporting. The results may help improve efforts to help college athletes recognize and respond to concussions.
After you have finished the survey, there will be an option to provide your email for the chance to win a $50 visa card.

Your consent to participate in this study will be indicated by your submission of a completed survey. All information received will be incorporated into group data; you will not be identifiable to me or anyone else. Because you are completing this survey online, absolute confidentiality cannot be guaranteed due to the limited protections of Internet access. There are no anticipated risks involved in participating in this research. Your participation is voluntary and you can stop completing the survey without penalty. If you choose not to participate, your decision will not affect your relationship with the University ________ or affect services to which you are otherwise entitled.

If you have any questions about the study, you can contact me directly at birdb1@udayton.edu. If you choose not to participate, please disregard this e-mail. Thank you in advance for your time and cooperation.

Sincerely,

Brenna Bird

School Psychology Graduate Student at The University of Dayton

Intern School Psychologist

Faculty Sponsor: Susan C. Davies, Ed.D
APPENDIX B
SURVEY

Concussions in Collegiate Athletics

Thank you for viewing this survey. If you have any questions, please contact Brenna Bird (email: birdb1@udayton.edu)

Definition of Concussion: A concussion is a blow to the head followed by a variety of symptoms that may include any of the following: headache, dizziness, loss of balance, blurred vision, “seeing stars,” “feeling in a fog” or slowed down, memory problems, poor concentration, nausea, or throwing up. Getting “knocked out” or being unconscious does NOT always occur with a concussion.

1. Do you give your consent to complete this survey? 
   (This is an anonymous survey and your answers will remain confidential)
   • Yes - links to question 2a
   • No - links to question 14

2a. Which sport(s) do you participate in at the University ________? 
   (Check all that apply)
   • Men's Baseball
   • Men's Basketball
   • Women's Basketball
   • Cheerleading
   • Men's Football
   • Women's Softball
   • Men's Soccer
   • Women's Soccer

2b. In what year of school are you currently enrolled? 
   • Freshman (0-29.9 semester hours completed)
   • Sophomore (30-59.9 semester hours completed)
   • Junior (60-89.9 semester hours completed)
   • Senior (90+ semester hours completed)
   • 5th Year (Red shirted)
2c. During your college athletic career, do you think you have had a sports-related concussion before your 2012-2013 season? (Check “Yes” if you think you might have had a concussion – even if you did not tell anyone)
   • Yes – Links to question 3a
   • No – Links to question 6
   • Not sure - Links to question 3a
   • Not Applicable (e.g. Freshman) – Links to question 6

3a. During your college athletic career, how many sports-related concussions do you think you have you had before this athletic season?
   • 1
   • 2
   • 3
   • 4
   • 5+

3b. Did you report any of your sports-related concussions to anyone?
   • Yes – Links to question 4
   • No – Links to question 5

4. To whom did you report your sports-related concussion? – all answers link to question 6
   (Check all that apply)
   • Athletic trainer
   • Coach
   • Teammate
   • Parent
   • Other ____________

5. If you did not report your sports-related concussion to anyone, why not? – all answers link to question 6
   (Check all that apply)
   • Didn’t think it was serious enough
   • Didn’t want to be pulled out of the game or practice
   • Didn’t know it was a concussion
   • Didn’t want to let down teammates
   • Other ____________

6. Do you think you have had any sports-related concussions as a result of playing your sport in your 2012-2013 season? (Check “Yes” if you think you might have had a concussion – even if you did not tell anyone)
7a. How many concussions do you think you had this athletic season?
   • 1
   • 2
   • 3
   • 4
   • 5+

7b. Did you report your sports-related concussion to anyone?
   • Yes – links to question 8
   • No - links to question 9

8. To whom did you report your sports-related concussion? – all answers link to question 10
   (Check all that apply)
   • Athletic trainer
   • Coach
   • Teammate
   • Parent
   • Other __________

9. If you did not report your sports-related concussion to anyone, why not? – all answers link to question 10
   (Check all that apply)
   • Didn’t think it was serious enough
   • Didn’t want to be pulled out of the game or practice
   • Didn’t know it was a concussion
   • Didn’t want to let down teammates
   • Other _____________

10. In your 2012-2013 season, have you known of any teammates who had a sports-related concussion?
    • Yes – links to question 11
    • No – links to question 14

11. If yes, did you report your teammate's sports-related concussion to anyone?
    • Yes – links to question 12
    • No – links to question 13

12. To whom did you report your teammate's sports-related concussion? – all answers link to question 14
• Athletic Trainer
• Coach
• Other teammate
• Other___________

13. If no, why did you not report your teammates' sports-related concussion? – *all answers link to question 10*
(Check all that apply)
• Didn't think it was serious enough
• Didn’t want him/her to be pulled out of the game or practice
• Didn’t know it was a concussion
• Didn’t want to let down teammates
• Other___________

14. Thank you for completing this survey! Please email the following Google email address with your name if you would like to be entered into a drawing for a $50 visa card! ________________

Link to Google survey:
https://docs.google.com/forms/d/1SOPT5IQjNsG5uMjoWknbXTnHE7q0ydJFX0igrxWZds/viewform