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Perceived Pressure from Coaches, Teammates, and Parents Influences College Athletes'

Intentions to Report Concussion Symptoms

A Thesis

Presented to the Faculty of the

Department of Sports Medicine

West Chester University

West Chester, Pennsylvania

In Partial Fulfillment of the Requirements for the

Degree of

Master of Science

By

Christian J. Klucsarits

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Abstract

Help-seeking behaviors among collegiate athletes are influenced by social norms and by the implicit and explicit expectations of others, including coaches, teammates, and parents. The purpose of this study was to investigate which social group has the greatest influence on collegiate athletes' intentions to report sport-related concussion symptoms. In this cross-sectional study, 2,984 NCAA student-athletes from 22 colleges/universities across Pennsylvania completed anonymous online surveys related to concussion symptom reporting attitudes and behaviors. Of the 51 original items included in the survey, 21 items were included in this study, including demographic information, perceived social pressure, and intention to report concussion symptoms.

Multiple regression analysis revealed that collegiate athletes who perceived greater combined positive pressure from coaches, teammates, and parents demonstrated greater intention to report concussion symptoms. Of these three sources of social pressure, teammates had the greatest influence on intention to report, followed by parents and then coaches. Overall, females were slightly more likely to report concussion symptoms compared to males; however, when controlling for other variables, no statistically significant difference existed, suggesting that the small differences based on sex are more likely related to variables such as sport type and social pressure.

These results suggest that student-athletes who perceive greater positive social pressure will have greater intention to seek medical attention for concussion symptoms. Because teammates have the greatest influence on student-athletes' intention to report concussion symptoms, these individuals may play an important role in creating a positive environment where symptom-reporting is encouraged.

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Chapter 1: Introduction

Sport-related concussion (SRC) constitutes a major public health concern.¹⁻⁴ SRC is an increasingly prevalent injury in the world of athletics, affecting athletes at every level of sport.¹ Following the most recent international conference on concussion in sport, McCrory et al.³ defined concussion as “a traumatic brain injury induced by biomechanical forces,” representing “the immediate and transient symptoms of traumatic brain injury.” Approximately 460,000 individuals participate in collegiate athletics, in the United States each year; given the inherent exposure to injury risk in this population, the sheer volume of individuals participating in collegiate athletics creates a large concern about the dangers of participating and sustaining an SRC.^{1, 4}

In the last two decades, SRC diagnosis has increased in frequency due to improved education and awareness, and improved diagnostic tools. For example, over the course of a 16-year study from 1988-2004, Hootman et al.⁵ found that the rate of SRC diagnosis increased by 7% compared to other common sport-related injuries such as, anterior cruciate ligament sprains and lateral ankle sprains. Another study conducted by Wasserman et al.⁴ found that between 2009 and 2014, SRCs occurred 4.47 times per 10,000 athlete exposures across a sample of collegiate athletics, compared to anterior cruciate ligament sprains, which only occurred 3.3 times per 10,000 athlete exposures⁵. This shows the high rate at which collegiate athletes sustain SRCs compared to another common sport-related injury. SRC can occur in any sport, but most frequently occurs in collision and high contact sports such as football, ice hockey, wrestling, and soccer.^{4, 6} Though these are male-dominated sports, female athletes are at a higher risk for SRC than male athletes⁶, especially in women’s soccer.⁴ Kerr et al.⁶ also reported higher concussion

rates in females in baseball/softball, basketball, and soccer. This evidence demonstrates the variances in concussion rates between sexes.

Due to the complex nature of the injury and the broad range of symptoms that can occur, many clinicians and researchers consider SRCs to be among the most complex injuries in sports medicine to assess, diagnose, and manage.³ Many signs and symptoms of SRC are not directly observable, therefore, medical personnel often rely on the athlete recognizing and reporting their symptoms.⁷ The most common signs and symptoms of SRC include, headache, dizziness, and difficulty concentrating.⁴ When athletes choose to withhold injury symptoms from medical personnel and continue participating in sport, they put themselves at a greater risk for sustaining further brain trauma and neurologic symptoms.⁷ These athletes also put themselves at a heightened risk for more serious effects of a second injury if they continue to participate while experiencing signs and symptoms from the initial SRC.¹

Concussion education is important so that athletes are educated in recognizing signs and symptoms, but research suggests that mandated educational courses have had no effect on athletes' intention to report SRC symptoms.⁸⁻¹⁰ Carroll-Alfano⁸ found that when education resulted in an increase in knowledge of SRC symptoms, that increased knowledge did not lead to increased self-reporting and treatment. An athlete's beliefs and the attitudes of coaches, teammates, and parents may play a much larger role in SRC intention to report than mandated educational courses.^{7, 8} Before 2010, the National Collegiate Athletic Association (NCAA) did not require concussion education for all athletes.¹¹ As new research in the field of concussion education emerged, by 2014, all states in the United States passed legislation requiring student athletes to receive some form of concussion education.^{12, 13} Though these legislative mandates are in place, Kroshus et al.⁷ found that concussion knowledge was not significantly associated

with reporting behaviors. Therefore, increased concussion knowledge does not necessarily correlate with intention to report symptoms.

A wide range of internal and external pressures can cause an athlete to underreport SRC symptoms.⁷ Defining pressure as “an internal experience in response to external demands,” Kroshus et al.¹⁴ found that the most common internal motive for not reporting an SRC was an athlete thinking that the injury was not serious enough to warrant medical attention.¹⁴ Other internal motives include not recognizing that the symptoms they were experiencing were a concussion, and not wanting to be withheld from competition.¹ These internal motives for not reporting SRC symptoms points to a lack of proper and appropriate knowledge related to the risks and potential consequences of SRC.^{1, 7, 8, 12}

External factors associated with underreporting of SRC symptoms also play an important role in the intention to report, in addition to the internal factors discussed above. Social environment can influence reporting behavior by teaching an athlete which reporting outcomes are valued by important people in the athlete’s life.¹⁴ Influential people in an athlete’s social environment who help shape the norms and attitudes that affect intention to report SRC symptoms include coaches, teammates, and parents.¹⁴ Many athletes seek to fit into a specific identity, therefore, causing them to be more likely to engage in what they see as normal, or normative, behavior.¹⁵ An athletic identity takes on a masculine persona, where the athlete feels the need to play through an injury; because SRC symptoms cannot always be physically seen, athletes especially feel the need to play through these injuries in order to stay consistent with their athletic identity.¹⁴⁻¹⁶ In some cases, athletes who rely heavily on this identity for self-validation may play through their symptoms in order to please coaches, teammates, or parents, and to preserve their identity as an athlete.^{14, 17}

Previous research has investigated both internal and external motives for underreporting SRC symptoms in collegiate athletics. Based on a thorough review of the literature, limited research has investigated which external motive plays the largest role in the intention to report SRC symptoms. Coach, teammate, and parental influence are all external motivators for underreporting; this study will investigate which of these motives has the greatest influence on the intention to report SRC symptoms. Based on the results of this investigation, healthcare providers, athletic administrators, and coaches may be able to identify and develop more focused interventions, beyond basic SRC symptom education, to address specific areas that have the most influence on athlete's intentions to report symptoms.

In the next chapter, I will provide a review of existing literature and, summarize current research that underscores the importance of SRC, underreporting of SRCs, complications of unreported SRCs, and perceived social and external pressures relating to underreporting through coach, teammate, and parental pressures on the athlete.

Chapter 2: Review of Literature

Sport-related concussions pose a difficult challenge for health care providers. There are no biological markers or gold standard diagnostic tests that can detect a concussion, making the injury one of the most ambiguous facing sports medicine clinicians.¹ No two SRCs are alike, and often the same athlete may experience different symptoms at different intensity levels from one SRC to the next.³ Therefore, athletic trainers and other sports medicine professionals must rely on their clinical expertise, and on the athlete to honestly report suspected symptoms.^{15, 18} Over 50% of concussions go unreported and therefore undiagnosed each year.^{1, 19, 20} Diagnosis of SRC is very difficult.¹¹ The motives that athletes use for withholding symptoms of a suspected SRC can be categorized into internal and external motives.^{1, 7, 11, 15, 18, 21} In the following pages, this review of literature will explore athlete's internal and external motivations for withholding SRC symptoms.

Underreporting of Concussions

One of the major reasons that athletes withhold SRC symptoms is due to internal motivations experienced by the athlete.^{1, 7, 10} The first major study of intention to report concussion symptoms was published in 2004 by McCrea et al.,¹ who looked at unreported concussions in high school football players. The authors of this study concluded that the majority of high school football players withheld symptoms of SRC for internal motives only.¹ Common reasons given for withholding symptoms of suspected SRC included, "Did not think it was serious enough," or "Did not know it was a concussion."¹ Before this study, based on historical stereotypes of athletes, the original motive for nondisclosure of SRC symptoms was based solely on individual competitive factors.¹ Despite knowing the symptoms of SRC, many athletes purposefully exclude themselves from medical care and continue to play while still experiencing

symptoms of an SRC.²² In a more recent study conducted by Kerr et al.,¹¹ a large portion of athletes identified that they did not want to be taken out of the game/practice as the primary reason why they did not report their SRC symptoms. This study also revealed that a large portion of athletes identified external pressures as a primary reason influencing their nondisclosure.¹¹ External pressures can come from sources such as, coaches, teammates, parents, or even fans, who support an athlete to continue playing while experiencing SRC symptoms.¹⁴ Many athletes feel the need to continue playing, even while injured. These same athletes perceive it to be unacceptable to come out of play due to a headache or dizziness, which creates misconceptions about playing while symptomatic.^{14, 23}

These motives support the theory that athletes do not receive proper concussion education.¹¹ Due to the concussion education athletes receive, they are able to properly identify SRC symptoms, but still choose not to report.^{1, 11} Concussion education has resulted in an increase in knowledge, but has not led to an increase in self-reporting or treatment.⁸ The athlete's personal beliefs and the attitudes of their coaches, teammates, and parents may play a larger role in the intention to report SRC symptoms than formal classroom education.⁸ Although there is a small relationship between an individual's ability to identify SRC symptoms and SRC knowledge, these findings do not lead to an increased rate of SRC reporting.^{7, 15, 22, 23} Current SRC education has not been significantly associated with increases in reporting behavior, showing that the current standard of SRC education and training should not be the only tool when attempting to improve intention to report SRC.⁷ Identifying the additional factors that contribute to low reporting intention may help clinicians develop strategies to improve reporting behavior.

Complications of Concussions and Underreporting

There are many complications and risks associated with concussions and the underreporting of concussions. These risks can have detrimental effects on an athlete's health and well-being. Some of the risks associated with unreported and undiagnosed concussions include, delayed recovery time and prolonged symptomology²⁴, second impact syndrome²⁵, chronic traumatic encephalopathy²⁵, and other mental health consequences, specifically; depression.²⁵⁻²⁷

Many complications can arise from the failure of reporting SRC symptoms. It is imperative that athletes receive immediate cognitive and physical rest after experiencing an SRC.^{24, 28, 29} Immediate cognitive and physical rest has shown to lead to a quicker recovery time and also puts athletes at a decreased risk for a prolonged recovery following an SRC.^{28, 29} In a recent study, even athletes who experienced a delayed onset of symptoms and were removed from participation immediately upon recognition of those symptoms, still experienced shorter symptom duration and quicker recovery time compared to those athletes who delayed their own removal from sport.²⁴

Delayed recovery time and prolonged symptomatology

Asken et al.^{24, 28} found that delayed reporting of SRC symptoms led to a recovery time of an added five days compared to those who reported their symptoms immediately. In addition, those who did not report their symptoms immediately reported an added two days where they experienced symptoms.²⁴ Those who continue to participate after experiencing an SRC may be exposing their injured brains to additional stresses via physical exertion and possible further head trauma.²⁸ The physical exertion that is put on the brain following continued participation after

SRC can lead to detrimental effects in the healing process, lengthening the overall recovery time.²⁸

In addition to lengthier recovery time and further trauma to the brain after nondisclosure of an SRC, evidence suggests that an athlete is 3.39 times more likely to sustain a lower extremity musculoskeletal injury after continued play following an SRC.²² Not only can underreporting lead to longer rehabilitation times and lower extremity musculoskeletal injury, but underreporting can also lead to serious health concerns immediately following trauma and later in the athlete's life as well.

Second impact syndrome

Following an SRC, the brain enters a dysregulated neurometabolic state and is at a heightened risk for a more serious injury.²⁸ After a trauma to the head, the brain is in a susceptible state, known as the "window of vulnerability."²⁸ During this time, a second impact to the head can have detrimental and long lasting effects on the brain. Second impact syndrome occurs when an athlete suffers an SRC and then suffers another trauma before the first injury is fully healed.^{1, 3, 25} After this second impact occurs, swelling of the cerebral cortex takes place causing further neurological impairment and in some serious cases, even death.²⁵ Though it is uncommon for second impact syndrome to occur, athletes, athletic trainers, coaches, teammates, and parents need to keep in mind the possible consequences of playing with an undiagnosed SRC.²⁵ Promptly reporting any SRC symptoms to a healthcare professional can greatly reduce the risk of experiencing second impact syndrome.^{24, 28}

Chronic traumatic encephalopathy

Though not necessarily related to underreporting, another emerging consequence of repeated SRC is chronic traumatic encephalopathy (CTE). CTE is a result of long-term exposure

and exposure to recurrent head trauma.³ CTE can present years or even decades after an athlete sustained an impact to their head.²⁵ Only a small amount of literature has been published on CTE and there are no diagnostic tools to identify an individual who is living with the condition. Only an autopsy of the deceased individual's brain can diagnose CTE.²⁵ A decrease in brain volume due to the deterioration of the frontal, temporal, and parietal lobes of the brain can be seen upon an autopsy of a brain that suffered from CTE.²⁵ Initial signs and symptoms of CTE are not clear, but upon analyzing multiple cases in which individuals were diagnosed with CTE postmortem, initial signs and symptoms include an increase in anger, suicidal tendencies, poor memory, and a decrease in executive functioning.²⁵ As CTE continues to progress, signs and symptoms become more severe and life altering. Later signs and symptoms include a decrease in movement and difficulty with speech.²⁵ Though more research needs to be conducted on the exact causes of CTE, athletes who experience multiple SRCs and continue to play while symptomatic may face an increased risk for potential life altering conditions after their playing careers have come to an end.

Mental health consequences

Second impact syndrome and CTE are detrimental consequences of underreporting SRC symptoms, but it is important to note that other mental health disorders are associated with underreporting. For many, SRC is considered to be an invisible injury.²⁶ The physical and cognitive signs remain unseen to those looking at the athlete.²⁶ Emotional disturbances following an SRC include high fatigue, low energy and elevated depression which cannot be seen from an outside perspective.²⁶

Previous research has linked depression and SRC, demonstrating athletes who experience an SRC are 1.5 times more likely to be diagnosed with depression than those athletes who did

not experience an SRC.^{3,30} Athletes may experience depression or depression symptoms following injury, especially when their absence from sport participation leads to a perceived loss of identity.²⁷ Orthopedic injury can lead to depression in athletes.²⁶ The intensity, duration, and quality of depressed moods can be very different between an athlete experiencing an SRC and one who is experiencing a musculoskeletal injury.²⁶

Attributes of depression differ from musculoskeletal injuries due to the diminished cognitive function associated with SRC.²⁶ SRC can result in lesions in the brain causing biomechanical changes and neuronal loss.²⁷ Guskiewicz et al.²⁷ found that the loss of these neurons from SRC lead to structural changes in the brain which can also be seen in individuals with depression. An individual who experiences an SRC and the effects of the SRC later into life is at a heightened risk for depression because of the disruption of social relationships.²⁷ Although developing depression following injury is not unique to those who have sustained an SRC, it is important to note the long term effects that it can have on the individual both cognitively and physically.

The consequences and risks that can be caused by concussions or underreporting of concussions illustrate the severity of the injury when not properly diagnosed or treated. The risks associated with concussion and underreporting may have short-term or long-term effects on the individual.²⁸ Giving athletes the proper education on the possible consequences and risks may lead to a better understanding of the injury and the effects it may have on the body.

Perceived Social Pressure and Underreporting

During injury, athletes face an immense amount of social pressure to play through injury or to return to participation in sport as quickly as possible. Athletes who experience an SRC frequently feel an added social pressure to continue to play while symptomatic, because their

symptoms are often unobservable.¹⁴ They may feel pressure from their coaches, teammates, parents, and fans to either continue playing while symptomatic, or to return to play as soon as possible.¹⁴ Each of these factors can play a major role in determining whether an athlete will choose to report their SRC symptoms. Many times, the social pressure athletes face to continue playing while symptomatic may be conveyed to them directly or indirectly, and may be explicit or implied.¹⁴ Collegiate athletes face tremendous pressure to compete at the highest level possible, and many go to great lengths to continue playing, even if that means withholding their symptoms of a suspected SRC from sports medicine providers.

Coach Pressures

For many athletes, coaches represent an authoritative figure, and for new college freshmen, a parental figure.¹⁷ A coach plays a key role in an athlete's social environment and possesses the potential to impact the athlete's perceptions about appropriate behavior within the context of the sport.³¹ Consequently, athletes often seek their coach's approval and go to great lengths to avoid their disapproval.¹⁷ It is important to note the substantial impact the coach-athlete relationship can play in the intention to report SRC symptoms.

The coach-athlete relationship is defined as a situation where the coach and the athlete have mutually interconnected emotions, thoughts, and behaviors.^{31, 32} This relationship consists of three separate elements: closeness, commitment, and complementarity.³¹ McGee et al.³¹ described closeness as how emotionally close the coach and athlete feel towards each other in the relationship. Commitment, in this context, refers to the individual's intention to maintain their coach-athlete relationship.³¹ Lastly, complementarity refers to the extent to which the coach and athlete work together.³¹ High levels of each element may result in stronger and more adaptive relationships between coaches and athletes.³¹ When a coach-athlete relationship is healthy and

appropriate, the athlete will see the coach as a source of comfort and safety during difficult and stressful situations.³³ This type of support and dependence is comparable to the parent-child dyad, meaning the coach-athlete relationship is similar to the relationship formed between a parent and their child.³³ When the coach-athlete relationship develops in a positive and healthy manner, the athlete may worry less about possible negative reactions their coach may have to certain actions they perform, which may include reporting symptoms of a suspected SRC.³³

An effective and positive coach can be identified as one who is responsive to their athletes' needs, can provide guidance and advice, and can support their athletes' autonomy.³⁴ Athletes who experience a secure and positive attachment with an effective coach are likely to believe their coach will care more about their health and well-being than the team's overall athletic performance.³³ Davis et al.³⁴ found that athletes who are comfortable and have emotional closeness with their coach, perceive their coaches to be available to provide support. These athletes believe that their coaches value the importance of the coach-athlete relationship. Athletes who perceive their coaches to be available for support and believe their coaches value the coach-athlete relationship are less likely to experience conflict with their coaches. This positive type of relationship is especially important for an athlete to feel safe when they report their SRC symptoms, stemming from the fact that they have the support and responsiveness of their coach.

Conversely, some coaches may fall into an authoritative role regarding their coaching style. Athletes with less secure relationships with their coaches feel as though they could be punished for reporting their SRC symptoms. Punishment for reporting symptoms may come in the form of losing a starting roster position or reducing future playing time.^{15, 23, 33} For many high profile coaches in the NCAA, their salaries and job security are performance-based.¹⁷ Losing a

starting athlete due to an SRC puts them at risk for having an unsuccessful season, therefore, a coach may encourage an athlete to withhold SRC symptoms.¹⁷ Baugh et al.¹⁷ found that perceived coach support was a significant predictor of an athlete's intention to report their SRC symptoms. When an athlete perceives higher levels of support from their coach, they are more likely to report their SRC symptoms compared to those athletes who perceive lesser levels of support from their coach.¹⁷

Healthcare providers play the largest role in educating athletes about the dangers of SRC underreporting, but coaches play the next largest role in providing athletes with SRC education by creating and reinforcing team cultures and norms that support positive SRC reporting behaviors.^{14, 17} The communication between a coach and an athlete can function to normalize the ethos and culture of continuing to play while injured.¹⁶ A coach's support and education about safe SRC reporting behaviors plays a critical role in a team's overall safety behaviors.¹⁷

Teammate Pressures

An athlete's social environment plays a critical role in the athlete's intention to report SRC symptoms, and peers and teammates contribute heavily to that environment.^{15, 35} Teammates play a major role in shaping an athlete's perceived SRC reporting norms.¹⁵ This is done by influencing how an individual would think their teammates would report their symptoms of a suspected SRC.¹⁵ Athletes attach value to specific behaviors, especially those behaviors that they believe to be socially accepted by a specific group.¹⁵ In the context of social norms, valued behaviors are rewarded and deviant behaviors punished. This in turn, creates patterns of behavior which are not functional outside the specific group context.¹⁵ To many outside individuals, continuing to play with SRC symptoms would seem to not have any value or benefit to the athlete, given the potential harm and physical risk. From an outside perspective, one might

expect the overall health and wellbeing of the athlete to be more important than the outcome of a game. However, within the context of sport, an athlete may strongly identify with peers who may perceive value in continuing to play while symptomatic. Thus, the perceived notion that influential individuals would want the athlete to continue participating in sport, even while symptomatic, would cause the athlete to withhold any SRC symptoms that they are experiencing.¹⁵ Athletes who experience this negative social pressure are less likely to report an SRC if they believe their team would not want them to. Conversely, athletes who receive positive social pressure would be more likely to report symptoms if they believed their team would want them to do so.^{15,35}

An intervention in a group occurs when a group finds an issue to be important.³⁵ The majority of that group need to support the intervention in order for it to become a norm.³⁵ In regards to SRC, a team's perceived norm could be nondisclosure of a suspected SRC to a healthcare professional. These actions are not always supported by the entirety of the team. This perceived norm could be changed by multiple team members observing inaction when another member of the team sustains an impact to the head that would warrant concern.³⁵ Observing a teammate suffer from the result of an SRC may warrant change in perceived norms and may influence the team's willingness to comply to the team's perceived normative behavior. Addressing a group's perceptions about reporting behaviors and changing their reporting environment may help a team understand the potential consequences of unreported SRCs.³⁶ To change a perceived norm, athletes must understand and classify that specific behavior as being problematic and having detrimental effects to the overall well-being of the team.³⁵

Delayed recovery, or the risk of secondary injury can have detrimental effects to the overall well-being of a team.^{24,35} Symptoms of an SRC need to be identified by the team as well

as the potential dangers of continuing to participate in sport with a nondisclosed SRC.³⁵ There is a balance in reporting SRC symptoms that athletes need to understand and must note the costs and benefits of reporting symptoms.³⁵ Costs and benefits of a specific action are strong predictors of behavior, and the perceived benefit must be greater than the cost in order for an individual to act on that action.³⁵

Kroshus et al.³⁵ found that perceived norms were not as strongly associated with intentions to alert an athletic trainer about a potential SRC when the athlete believed there were performance consequences of continuing to play with an SRC. For example, if a starting athlete was not able to perform at their full potential due to an SRC, there is a greater chance that their team would want them to report their SRC in order to allow an athlete who could play to their full potential to take their place on the field. This result can reflect that deviating from a team norm is acceptable, but only if it supports another team goal, in this case, winning.³⁵ The most important predictor of a specific behavior is the intention to perform that behavior.³⁶ Athletes who identify more strongly with their team and with their role as an athlete are more likely to engage in what they believe to be normative behaviors.¹⁵ Athletes who believed there were negative health and performance consequences of continued play with a concussion were more likely to intervene as a bystander and break team norms if they suspected another teammate had sustained an SRC.³⁵ This further stresses the importance of creating a team environment that stresses the importance of SRC reporting and puts on emphasis on effective communication skills between teammates.

An individual's sense of self comes from their interactions with others and is a product of social interaction.³⁷ For those who participate in athletics, an athletic team provides members of the team with a sense of self-meaning, which influences their social behaviors.³⁷ The greater

identification an athlete has with athletic identity, the greater the likelihood that they will behave in a manner that is consistent with that role.¹⁵ When an athlete performs or does not perform a given behavior, reinforcement from the team can establish behavioral patterns that are considered desirable.¹⁰ There are some instances where a behavior is considered harmful to the individual, but may be considered desirable if the result of the action benefits the group as a whole.¹⁰ Athletes are encouraged to conceal all fear in the pursuit of glory, and must show no signs of pain or distress during injury.³⁸ In the United States, masculine ethos is instilled in athletes at a very young age and many young athletes are encouraged to adhere to warrior narratives in order to see success in sport.³⁸ Many athletes face the pressure to play through debilitating injury to show their commitment to sport and victory, warranting praise from their teammates.³⁸ The fact that SRC symptoms are often unseen by an observer is the main reason for teammates to encourage one another to play through injury. Athletes who play through injury believe they will receive glory for playing through their injury and putting the team before their own well-being.¹⁵

Parental Pressures

Pressure from parents to play through an SRC can be compared to the same pressures experienced from coaches and teammates.¹⁴ Parents play an important role in encouraging athletes to seek care for suspected SRCs.³⁹ Education about general health and safety starts at home and comes from parents.³⁹ In general, parents who perceive greater consequences from SRC may be more likely to engage their child in SRC related safety practices.³⁹ Parents have the ability to talk with their child about SRC symptoms and care-seeking for their SRC, as well as providing positive reinforcement for care-seeking behaviors.³⁹ Some parents who strongly value their child's sports involvement may view SRC help-seeking as interfering with possible athletic

achievement, causing them to be less likely to encourage their child to seek help after they experience SRC symptoms.³⁹ Kroshus et al.¹⁴ found that athletes who experienced negative pressure from parents had a lower intention to report symptoms of a future SRC, compared with peers who did not experience parental pressure. This study also found that one in 10 collegiate athletes experienced pressure from their parents to continue participation while experiencing SRC symptoms, which was associated with being less likely to seek care for a future suspected SRC.^{14, 39}

Parents' attitudes about their athletes sport achievement may influence their communication about SRC symptom reporting and safety behaviors.³⁹ From the beginning of their child's involvement in athletics, parents play an important role in their child's socialization in sport participation.³⁹ Not every parent's actions during this time are in the best interest of their child's overall health and development.³⁹ Some parents may have their child focus only on one sport and train/compete year round without adequate periods of rest.³⁹ This type of training and competition can have physical, mental, and behavioral consequences on the child.³⁹ It is important to provide parents with information about SRCs and teach the effective methods on how to talk to their children about SRCs.³⁹ This type of communication can decrease their child's potential for harm by increasing early help-seeking behaviors.³⁹

Some parents believe that if their child reports a minor SRC, then that child will be unnecessarily kept out of play, resulting in the loss competitive opportunities with the team.³⁹ These same parents may also believe that communicating the signs and symptoms of an SRC to their child will make them play more tentatively and may result in an oversensitivity to SRC symptoms that are not a result of an actual impact.³⁹ Kroshus et al.³⁹ found that only two thirds of parents engage their child in some form of SRC education. This study also found that parents

who place more pressure on their child will cause them to be less likely to encourage SRC reporting behaviors to their children.³⁹ Not only should concussion education focus on athletes and coaches, but it should also focus on parents who play an important role in shaping their child's attitudes and behaviors toward help seeking following a suspected SRC.³⁹

Chapter Summary

Because healthcare providers rely heavily on patients to report their SRC symptoms in order to make an accurate diagnosis, over 50% of SRCs go undiagnosed each year, often due to underreporting of symptoms.^{1, 19, 20} Motives for underreporting can be categorized into internal and external pressures.^{1, 7, 11, 15, 18, 21} Internal pressures originate from attitudes and beliefs about SRC and come from within the individual, whereas external pressures originate as social pressures stemming from one's environment.^{1, 14} External pressures can come from coaches, teammates, and parents.¹⁴ Continuing to play while experiencing SRC symptoms can lead to serious health problems for the athlete.^{3, 25} The athlete may experience a lengthier recovery time as a result of continuing to play while symptomatic.^{24, 28} Unreported SRCs can also lead to more serious health problems such as second impact syndrome, chronic traumatic encephalopathy, and depression.^{25, 27} These factors can add detrimental consequences to the athlete's life, long after they retire from playing sports.²⁷

External social pressures from coaches, teammates, and parents to continue playing while experiencing SRC symptoms can place a heavy toll on the athlete.¹⁴ A positive and supportive relationship between a coach and an athlete will lead that athlete to be more likely to report symptoms of an SRC.^{17, 31, 33} A healthy coach-athlete relationship will cause an athlete to see their coach as source of safety during difficult situations, which can be during the time of an injury.³³ An athlete will go to great lengths to seek their coach's approval and to avoid their

disapproval.¹⁷ Perceived coach support is a significant predictor of an athlete's reporting intention.¹⁷

Besides coaches, teammates play a large role in an athlete's intention to report SRC symptoms. Athletes attach value to specific behaviors that they believe to be socially accepted by a group.¹⁵ The cost and benefit of a specific action are significant predictors of behavior, where the perceived benefit must be greater than the cost in order for the action to be carried out.³⁵

Education about general health and safety in sports starts at home with an athlete's parents.³⁹ This is an opportunity for parents to provide positive reinforcement for care seeking behaviors.³⁹ Some parents believe if their child reports symptoms of an SRC, they will be unnecessarily kept out of play, in turn, causing them to lose competitive opportunities.³⁹ Athletes who experience pressure from their parents have lower intention to report future SRCs than those who do not.³⁹

In this chapter, I performed an in-depth review of the existing literature on underreporting of SRCs. I outlined why underreporting of SRCs is an area of concern for athletes. I also discussed the complications of concussions and intention to report such injuries. This discussion included delayed recovery time, prolonged symptomatology, second impact syndrome, chronic traumatic encephalopathy, as well as other mental health consequences. Lastly, I outlined the effects that perceived social pressures have on intention to report SRC. I discussed coach, teammate, and parent pressure separately and the role each play on an athlete's intention to report. Based on existing literature, the purpose of this study was to investigate which social referent group, coach, teammate, or parent, had the greatest influence on collegiate athletes' intentions to report concussion symptoms. The research questions I sought to answer through this study included:

1. Do collegiate athletes who perceive greater positive pressure from coaches, teammates, and parents have greater intention to report concussion symptoms than those who do not?
2. Which social referent group (coaches, teammates, or parents) has the greatest influence on intention to report concussion symptoms?
3. Are there differences between males and females in intention to report concussion symptoms?
4. Does perceived social pressure have a greater influence on underclassman or upperclassman?

In the next chapter I will provide an overview of the study methodology. I will explain all variables and hypotheses that will be tested. I will also give details outlining the survey and data analysis.

Chapter 3: Methods

The present research relies on existing survey data from both male and female NCAA student-athletes participating in non-contact, contact, and collision sports from 22 Pennsylvania colleges/universities. Participants were given a questionnaire-based survey that was completed anonymously and voluntarily. Related to the purpose of the current investigation, the survey included demographic information and questions related to concussion reporting intention, concussion history, and perceived social pressures to report concussion symptoms. The questionnaire and research methods were reviewed and approved by the Institutional Review Board at Indiana University of Pennsylvania.

Collegiate athletes face pressures on and off the playing field. Social pressures can stem from coaches, teammates, and parents who want an athlete to perform at a high level and achieve success within their sport.¹⁴ In order to meet the expectation of coaches, teammates, and parents, athletes often feel compelled – whether implicitly or explicitly – to play through injuries, especially concussions, due to the often “unobservable” nature of such injuries.^{14, 26} The physical and cognitive symptoms of a concussion remain unseen to those looking on.²⁶ As previously described in this document, the dangers of playing through concussion symptoms can lead to serious consequences to an athlete’s health.

Legislation in all 50 states, the District of Columbia, and the National Collegiate Athletic Association (NCAA) makes concussion education programs mandatory for all athletes, so they can identify concussion symptoms and the dangers of playing through a brain injury.⁸ Not all concussion education programs take into account the perceived influence that coaches, teammates, and parents have on an athlete. The perceived pressure that athletes feel from these external sources of influence can play a pivotal role in their reporting intentions of a suspected

concussion. Understanding more about the social pressures that athletes receive after they experience a concussion will help determine areas in concussion education programs that need modification to ensure the safety and wellbeing of all athletes. In addition to providing education about recognizing and reporting symptoms, SRC intervention programs should also address the role of coaches, teammates, and parents to promote concussion help seeking behaviors among collegiate athletes. Therefore, the purpose of this study is to investigate which social referent group has the greatest influence on collegiate athletes' intentions to report concussion symptoms. As previously stated in chapter 2, the research questions for this study include:

1. Do collegiate athletes who perceive greater combined positive pressure from coaches, teammates, and parents have greater intention to report concussion symptoms than those who do not?
2. Which social referent group (coaches, teammates, or parents) has the greatest influence on intention to report concussion symptoms?
3. Are there differences between males and females in intention to report concussion symptoms?
4. Does perceived social pressure have a greater influence on underclassman or upperclassman?

Research Design

The present study is a secondary analysis of cross-sectional survey data. I analyzed an existing data set from previous research⁴⁰ to examine the influence of various sources of social pressure on concussion reporting intention in collegiate athletes. The survey primarily focused on athletes' athletic identity and their intention to report concussion symptoms.⁴⁰ This survey utilized intention rather actual symptom reporting.⁴⁰

Variables and Hypotheses

The dependent variable for this study was student-athlete intention to report concussion symptoms. The independent variables were perceived social pressure from coaches, teammates, and parents. Demographic information such as sex, age, minority status, type of sport (non-contact, contact, or collision), years participating in primary sport, and previous history of concussion, were used as control variables.

The present study tested the following hypotheses:

Hypothesis 1: Collegiate athletes who perceive greater combined positive pressure from coaches, teammates, and parents will have greater intention to report concussion symptoms.

Hypothesis 2: All things being equal, coaches will have the greatest influence on intention to report concussion symptoms compared to parents and teammates.

Hypothesis 3: All things being equal, female athletes will have lower intention to report concussion symptoms compared to males.

Hypothesis 4: All things being equal, perceived social pressure will have a greater influence on underclassman student-athletes' intention to report compared to upperclassman athletes.

Participants

The participants of this study were NCAA student-athletes recruited from 22 colleges/universities across the state of Pennsylvania. These athletes participated in 23 different sports falling into categories of limited/non-contact (badminton, baseball, cross country, golf, rowing, softball, swimming, tennis, track & field, and volleyball), contact (acrobatics & tumbling, basketball, cheerleading, diving, field hockey, gymnastics, women's lacrosse, soccer,

and water polo), and collision sports (football, ice hockey, men's lacrosse, rugby, and wrestling).⁴⁰ An electronic survey was sent to approximately 8,769 student-athletes and the survey link was opened by 3,513. After eliminating participants with incomplete responses on the items utilized in this study, 2,984 remaining respondents completed the survey which is equivalent to a 34.02% completion rate.

The participants in this study were all contacted via email. An initial email was sent to the athletic trainers of each of the 22 colleges/universities. Each athletic trainer was asked if they were willing and able to distribute the survey. If the athletic trainer was not willing to distribute the survey, or if they did not have access to all student-athlete email addresses at their institution, they were asked who would be the best person to distribute the survey. Those willing to distribute the survey included, coaches, faculty athletic representatives, NCAA compliance officers, athletic directors, and athletic mentors/advisors.

Instrumentation

The instrumentation used in the present study is a cross-sectional questionnaire-based survey. This study involved a secondary analysis of the survey data, with data from only a few selected items being utilized. Of the original 51 questions used on the survey, 21 questions were utilized in the present study (Appendix A). Intention to report concussion symptoms was assessed through a series of 7 items, each measured on a 7-point scale.⁴⁰ Perceived social pressure was assessed through a series 6 items, also measured on a 7-point scale.^{19, 40} The demographic portion of the survey was answered through a dropdown list and each respondent had multiple options to choose which answer best suited them.⁴⁰ Demographic items included: sex, age, racial/ethnic minority, school, year in school, primary sport, number of previous concussions, and international athlete status.⁴⁰

Data Analysis

To analyze the data for this study, I utilized the Statistical Package for the Social Sciences (SPSS). This computer program allowed me to run the statistical tests needed to analyze the data. The dependent variable for each hypothesis was intention to report concussion symptoms. This variable was created from items 9-15 on the survey (Appendix A). To ensure each item was measuring the same factor, I conducted a factor analysis and Cronbach's alpha analysis on those items. The independent variables for each hypothesis included perceived social pressure from coaches, teammates, and parents. In order to create these variables, I combined items measuring belief strength (items 34-36) with items measuring motivation to comply (items 38-40) for each of the three influential social groups. To create a mean pressure score, I conducted a factor analysis and Cronbach's alpha analysis on the pressure variables.

For hypothesis one, two, and four, I conducted an ordinary least square (OLS) regression. For hypothesis one, I included demographic variables and mean pressure to determine the effect they have on intention. Hypothesis two included demographic variables and three separate sources of perceived social pressure (coach, teammate, and parent) and determine the effect they have on intention. Lastly, hypothesis four included demographic variables, mean pressure and year in school as main effect variables, and one interaction variable (mean pressure and year in school) to determine the effect they have on intention. In accordance with OLS regression guidelines, I analyzed variance of inflation factors (VIF) to test for multicollinearity within the regression.

For hypothesis three, I conducted an independent sample t-test to compare the mean scores of intention between males and females. This test did not control for any possible confounding demographic variables.

Limitations

The survey instrument was a cross-sectional survey design. Cross-sectional survey designs make it difficult to establish causal relationships. The survey was a questionnaire that focused on self-reporting SRC symptoms. The participants were asked to answer questions in regards to future intentions to report SRC symptoms. These intentions could change when it comes time for them to actually report symptoms.

Chapter Summary

In this chapter I discussed the study and provided an overview of the methods used to analyze the data from the study. I described the research design and various components of the survey. I also described the variables and hypotheses that I was going to test in depth. The participants of the study were discussed and the instrumentation to record their results was also discussed. Lastly, I went into detail about the statistical tests I would perform to analyze the data. In the next chapter I will discuss the results from these statistical tests for each hypothesis.

Chapter 4: Data and Analysis

This chapter describes the results of the data analysis which were presented in the previous chapter. I will first discuss the demographic information that was gathered from the survey. I will then describe the independent and dependent variables which were statistically tested. For both the dependent and independent variables, I used a factor analysis and a Cronbach's alpha analysis to create a single variable. After interpreting the factor analysis and Cronbach's alpha analysis, I discuss the univariate statistics for each composite variable. Lastly, I interpret the multiple regression models that were used to test hypothesis one, two, and four. Hypothesis three utilized an independent sample t-test, which I interpret as well.

Participants

Response Rate

The survey was distributed to 22 colleges/universities across the state of Pennsylvania. Approximately 8,769 student-athletes received the survey. Of those 8,769, 3,513 student-athletes opened the survey. 2,984 student-athletes completed all pertinent items on the survey for a completion rate of 34.02%. I was able to utilize those 2,984 respondents for my hypothesis testing.

Demographic Information

Tables 1 and 2 provide an in depth look at the demographic information that was provided by respondents of the survey. Females made up the majority of the respondents to the survey accounting for 63.6% of the sample. Freshman student-athletes had the greatest response rate of 28.4% compared to their older counterparts. Racial minorities only accounted for a small percentage of respondents (14.0%). Respondents who had a history of a concussion (47.5%) were relatively equal to the number of respondents who did not have a history of a concussion

(52.2%). Non-contact student athletes made up the majority of the respondents with a response rate of 44.7%. The mean age of respondents was 20.03 years old and the mean number of years the respondents were playing their respective sport was 7.74 years.

Table 1. Categorical Demographic Variables

Demographic Variable	Frequency (n)	Percentage
Sex		
Male	1,064	35.7%
Female	1,899	63.6%
Missing	21	0.7%
Year in school		
Freshman	847	28.4%
Sophomore	705	23.6%
Junior	726	24.3%
Senior	605	20.3%
5 th year	53	1.8%
Graduate student	31	1.0%
Missing	17	0.6%
Race/Ethnicity		
Minority	418	14.0%
Non-minority	2,538	85.1%
Missing	28	0.9%
History of concussion		
Yes	1,417	47.5%
No	1,557	52.2%
Missing	10	0.3%
Sport type		
Collision	486	16.3%
Contact	1,112	37.3%
Non-contact	1,333	44.7%
Missing	53	1.8%

Table 2. Continuous Demographic Variables

Demographic Variable	Mean	Std. Deviation	Range
Age	20.03	1.38	18-25
Year in sport	7.74	2.03	1-11

Dependent Variable

For each of the four hypotheses tested in this document, intention to report concussion symptoms served as the dependent variable. The intention variable was created from items 9-15 on the survey (Appendix A). To ensure these seven items could be manipulated into one variable, I conducted a factor analysis on those items. The factor analysis revealed an Eigenvalue of 4.973 (Table 3) and a Cronbach's alpha analysis revealed an alpha of 0.931 (Table 4). The one-factor model explained 71.04% of the variance across the seven items from the survey. These analyses revealed high internal consistency indicating that items 9-15 were all measuring the same basic concept. Based on the results of the factor analysis and the Cronbach's alpha analysis, I generated a mean score of the seven items from each respondent to create a scale for the new variable, intention to report concussion symptoms. Upon conducting univariate analysis of the intention to report concussion symptoms mean score, a histogram revealed an approximately normal distribution (Table 5; Figure 1).

Table 3. Factor Analysis of Intention

Factor	Eigenvalue	Percentage of Variance	Cumulative Variance
Factor1	4.973	71.040%	71.040%
Factor2	0.832	11.890%	82.930%
Factor3	0.441	6.296%	89.226%
Factor4	0.324	4.630%	93.856%
Factor5	0.206	2.943%	96.799%
Factor6	0.114	1.630%	98.429%
Factor7	0.110	1.571%	100.000%

Table 4. Cronbach's Alpha for Intention

Item	N	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Practice symptoms	2943	0.856	0.770	0.913
Game symptoms	2943	0.867	0.837	0.912
Playoff symptoms	2943	0.748	0.745	0.924
Symptoms < 24 hours	2943	0.664	0.539	0.931
Symptoms > 1 week	2943	0.817	0.820	0.917
Mild symptoms	2943	0.785	0.628	0.920
Severe symptoms	2943	0.731	0.798	0.926

Table 5. Univariate Analysis of Intention

Mean	Median	Std. Deviation	N
4.1802	4.2857	1.6904	2984

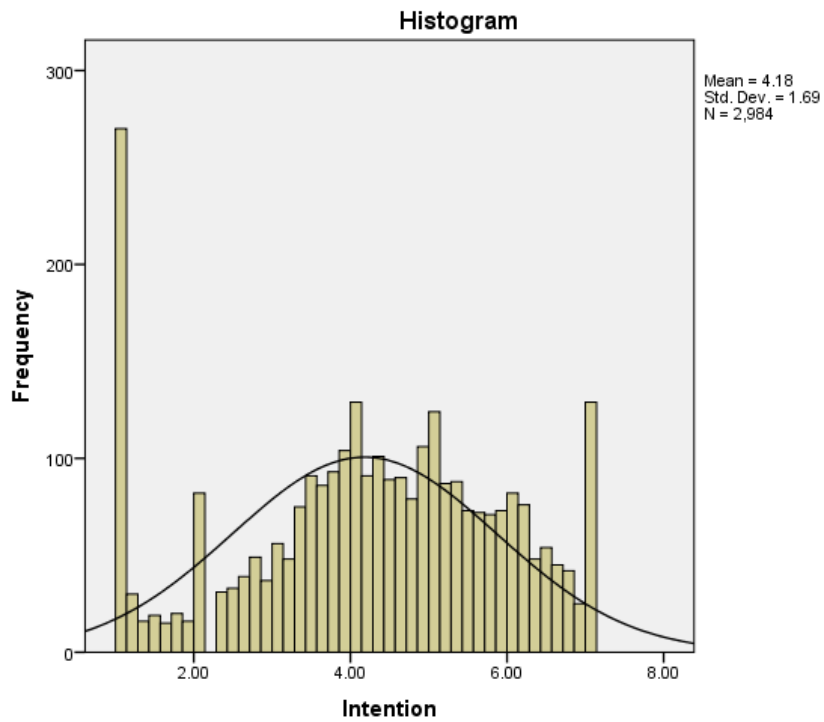


Figure 1. Histogram of mean intention scores

Independent Variables

The independent variables for each of the four hypotheses included pressure from coaches, teammates, and parents. In hypothesis one, the independent variable was a mean pressure score. Hypothesis two utilized coach pressure, teammate pressure, and parent pressure as the independent variables. Hypothesis four utilized mean pressure and year in school as an interaction effect. In order to create these variables, I combined items measuring belief strength (items 34-36) with items measuring motivation to comply (items 38-40) for each of the three influential social groups. Before they were combined, belief strength items were measured on a scale of -3 (“I should not report”) to +3 (“I should report”). Motivation to comply items were measured on a scale of 0 (“I do not want to do what others want me to do”) to 6 (“I do want to do what others want me to do”). I generated a product by taking the belief strength items multiplied by the motivation to comply items for each social group to create three separate coach, teammate, and parent pressure variables. Upon reviewing the new variables, a high positive number means the athlete perceived high positive pressure from that source. A high negative number means the athlete perceived high negative pressure from that source. A univariate analysis of coach pressure revealed a distribution that was skewed left. (Table 6; Figure 2). A univariate analysis of teammate pressure revealed a distribution that was also slightly skewed left (Table 6; Figure 3). Lastly, a univariate analysis of parent pressure revealed a distribution that was also skewed left (Table 6; Figure 4).

Table 6. Univariate Analysis of Coach, Teammate, and Parent Pressure

Variable	Mean	Median	Std. Deviation	N
Coach Pressure	10.8011	12.0000	6.7368	2967
Teammate Pressure	7.1211	6.0000	6.6992	2965
Parent Pressure	12.2855	15.0000	5.9464	2956

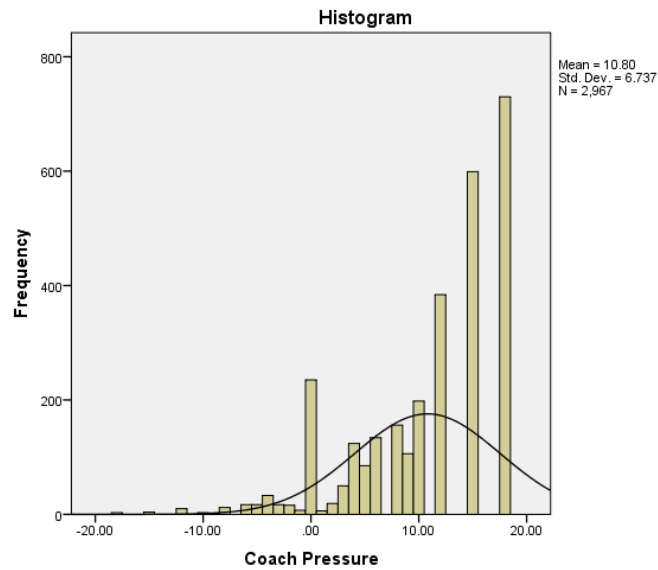


Figure 2. Histogram of coach pressure scores

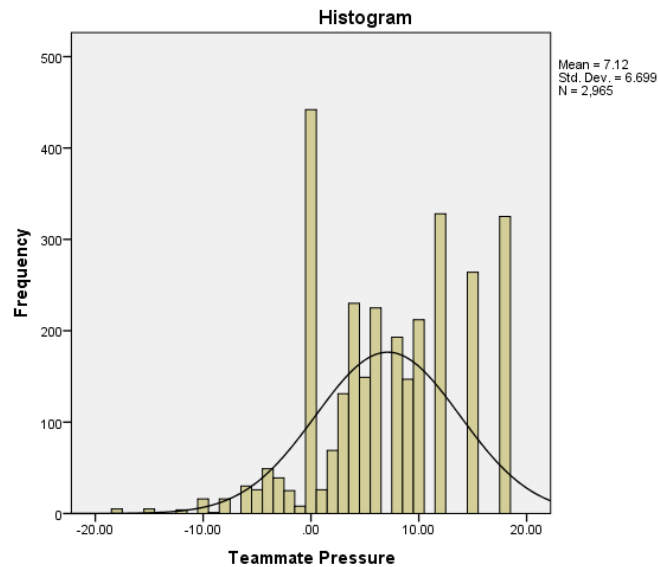


Figure 3. Histogram of teammate pressure scores

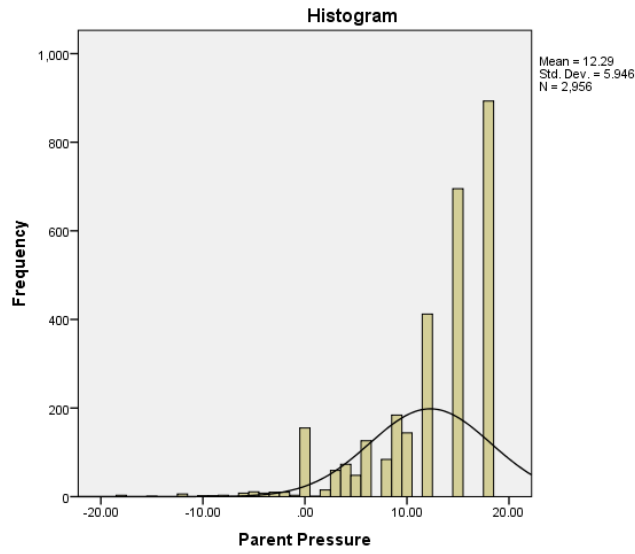


Figure 4. Histogram of parent pressure scores

A mean pressure variable was created by taking a mean score of coach, teammate, and parent pressures. To ensure these three variables could be manipulated into one, I conducted a factor analysis on those variables. The factor analysis revealed an Eigenvalue of 1.978 (Table 7) and a Cronbach's alpha analysis revealed an alpha of 0.740 (Table 8). The one-factor model explained 69.94% of variance across the three pressure variables from the survey. Based on the results from the factor analysis and the Cronbach's alpha analysis, I created a mean pressure score based on the three sources of pressure from the survey. Upon conducting a univariate analysis of the mean pressure scores, a histogram revealed a distribution that was skewed left (Table 9; Figure 5).

Table 7. Factor Analysis of Mean Pressure

Factor	Eigenvalue	Percentage of Variance	Cumulative Variance
Factor1	1.978	65.944%	65.944%
Factor2	0.547	18.224%	84.168%
Factor3	0.475	15.832%	100.000%

Table 8. Cronbach's Alpha of Mean Pressure

Item	N	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Coach Pressure	2934	0.590	0.349	0.625
Teammate Pressure	2934	0.567	0.323	0.654
Parent Pressure	2934	0.544	0.297	0.682

Table 9. Univariate Analysis of Mean Pressure

Mean	Median	Std. Deviation	N
10.0586	10.6667	5.2719	2978

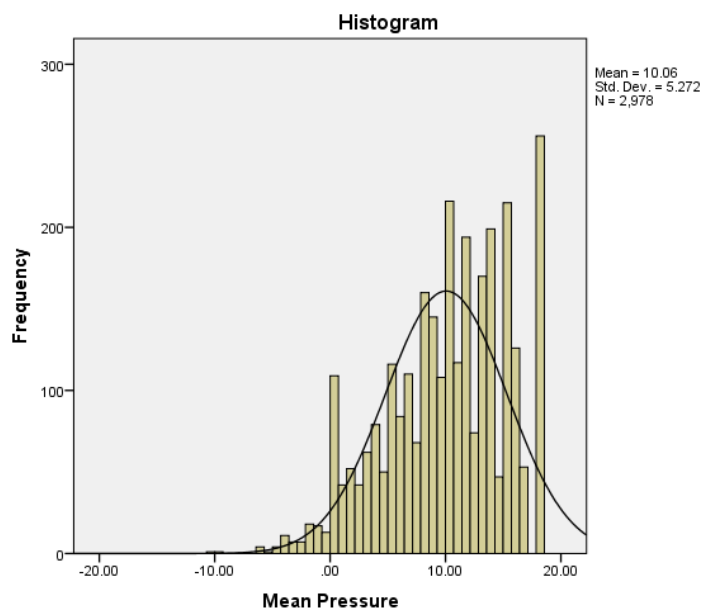


Figure 5. Histogram of mean pressure scores

Hypothesis Testing

Hypothesis 1

To statistically test hypothesis one, I utilized an ordinary least squares (OLS) regression to analyze the statistical relationship between demographic variables, mean pressure, and the effect they had on intention to report concussion symptoms. I used a hierarchical regression which included seven control variables (sex, age, minority status, years in sport, history of concussion, collision sports, and contact sports) and one independent variable (mean pressure) to determine the effect on intention to report concussion symptoms. In accordance with an OLS regression, I looked at variance of inflation factors (VIF) to test for multicollinearity within the regression model (Table 10).

Table 10. Test for Multicollinearity

Variable	VIF	Tolerance
Sex	1.467	0.682
Age	1.395	0.717
Minority status	1.042	0.960
Years in sport	1.381	0.724
History of concussion	1.071	0.933
Collision sports	1.561	0.641
Contact sports	1.214	0.824
Mean pressure	1.067	0.937

The test for multicollinearity revealed slight heteroscedasticity within the model, which suggested that an OLS regression with robust standard errors would be more appropriate to run. I utilized the Huber-White sandwich estimator of variance to correct the robust standard errors in the OLS regression (Table 11). The regression revealed an R squared value of 0.0659. With an a priori alpha level of 0.05, mean pressure demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.2347$), meaning that athletes who perceived greater positive pressure were more likely to intend to report SRC symptoms. Collision sports

demonstrated a significant negative effect ($p = 0.0348$) on intention to report concussion symptoms ($\beta = -0.0482$), meaning athletes who participated in collision sports were less likely to intend to report SRC symptoms. Age demonstrated a significant positive effect ($p = 0.0141$) on intention to report concussion symptoms ($\beta = 0.0531$), meaning older athletes were more likely to intend to report SRC symptoms.

Table 11. Regression of Mean Pressure on Intention

Variable	B	Std. Error	Beta	t	p-value
Sex	0.0213	0.0804	0.0061	0.2655	0.7907
Age	0.0648	0.0264	0.0531	2.4566	*0.0141
Minority status	-0.1462	0.0940	-0.0303	-1.5550	0.1201
Years in sport	-0.0245	0.0181	-0.0294	-1.3524	0.1764
History of concussion	-0.0301	0.0630	-0.0089	-0.4784	0.6324
Collision sports	-0.2178	0.1031	-0.0482	-2.1117	*0.0348
Contact sports	0.0384	0.0688	0.0111	0.5574	0.5773
Mean pressure	0.0750	0.0060	0.2347	12.5393	*0.0000

n = 2,864

R Squared = 0.0659

*p < 0.05

Hypothesis 2

To statistically test hypothesis two, I again utilized an OLS regression to analyze the data. For this regression, I analyzed demographic variables, three separate sources of pressure, and the effect they had on the intention to report concussion symptoms. The model included seven control variables (sex, age, minority status, years in sport, history of concussion, collision sports, and contact sports) and three independent variables (coach pressure, teammate pressure, and parent pressure) to determine the effect they had on the intention to report concussion symptoms. Again, I conducted a VIF test to assess for multicollinearity within the regression model (Table 12).

Table 12. Test for Multicollinearity

Variable	VIF	Tolerance
Sex	1.478	0.676
Age	1.399	0.715
Minority status	1.044	0.956
Years in sport	1.382	0.724
History of concussion	1.075	0.930
Collision sports	1.571	0.636
Contact sports	1.215	0.823
Coach pressure	1.567	0.638
Teammate pressure	1.546	0.647
Parent pressure	1.430	0.700

The test for multicollinearity revealed slight heteroscedasticity within the model, which suggested that an OLS regression with robust standard errors would be more appropriate to run again. I utilized the Huber-White sandwich estimator of variance to correct the robust standard errors in the OLS regression (Table 13). The regression revealed an R squared value of 0.0670. With an a priori alpha level of 0.05, coach pressure demonstrated a significant positive effect ($p = 0.0048$) on intention to report concussion symptoms ($\beta = 0.0594$), meaning that athletes who perceived greater positive pressure from coaches were more likely to intend to report SRC symptoms. Teammate pressure demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.1275$), meaning that athletes who perceived greater positive pressure from teammates were more likely to intend to report SRC symptoms. Parent pressure demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.1038$), meaning that athletes who perceived greater positive pressure from parents were more likely to intend to report SRC symptoms. Collision sports demonstrated a significant negative effect ($p = 0.0500$) on intention to report concussion symptoms ($\beta = -0.0453$), meaning athletes who participated in collision sports were less likely to intend to report SRC symptoms. Age demonstrated a significant positive effect ($p = 0.0215$) on

intention to report concussion symptoms ($\beta = 0.0500$), meaning older athletes were more likely to intend to report SRC symptoms. Looking at the beta value, standardized coefficient, the regression revealed that teammate pressure had a beta at 0.1275, followed by parent pressure at 0.1038 and coach pressure at 0.0594. Though all three sources of pressure were statistically significant, teammate pressure had the greatest influence on intention to report as determined by this variable having the highest beta value.

Table 13. Regression of Coach, Teammate, and Parent Pressure on Intention

Variable	B	Std. Error	Beta	t	p-value
Sex	0.0277	0.0819	0.0079	0.3376	0.7357
Age	0.0611	0.0266	0.0500	2.3008	*0.0215
Minority Status	-0.1437	0.0945	-0.0298	-1.5204	0.1285
Years in sport	-0.0231	0.0182	-0.0278	-1.2701	0.2042
History of concussion	-0.0269	0.0637	-0.0080	-0.4221	0.6730
Collision sports	-0.2054	0.1047	-0.0453	-1.9612	*0.0500
Contact sports	0.0328	0.0694	0.0094	0.4722	0.6368
Coach pressure	0.0150	0.0053	0.0594	2.8208	*0.0048
Teammate pressure	0.0319	0.0056	0.1275	5.7031	*0.0000
Parent pressure	0.0294	0.0059	0.1038	4.9696	*0.0000

n = 2,821

R Squared = 0.0670

*p < 0.05

Hypothesis 3

To statistically test hypothesis three, I utilized an independent sample t-test (Table 14, Figure 6) to analyze the data. In this test, I compared mean intention scores between males and females. Levene's test for equality of variances revealed that equal variances could not be assumed between males and females. Therefore, applying the independent sample t-test indicated a significant difference in intention to report concussions between sexes. Females had a slightly higher intention to report concussions compared to their male counterparts.

I then wanted to examine the differences in mean perceived social pressure between sexes. I again utilized an independent sample t-test (Table 15, Figure 7), but changed the

dependent variable to mean pressure. Levene’s test for equality of variances revealed that equal variances could not be assumed between males and females. Therefore, applying the independent sample t-test indicated a significant difference in mean perceived social pressure between sexes. These independent sample t-tests only looked at sex in isolation and did not take into account any other possible confounding demographic variables, such as age, minority status, years in sport, history of concussion, and sport type.

Table 14. Independent Sample T-Test (Intention)

	t	df	p-value (2-tailed)	Mean Difference	Std. Error Difference
Equal Variances Not Assumed	-4.287	2098.9	*0.000	-0.28101	0.06555

*p < 0.05

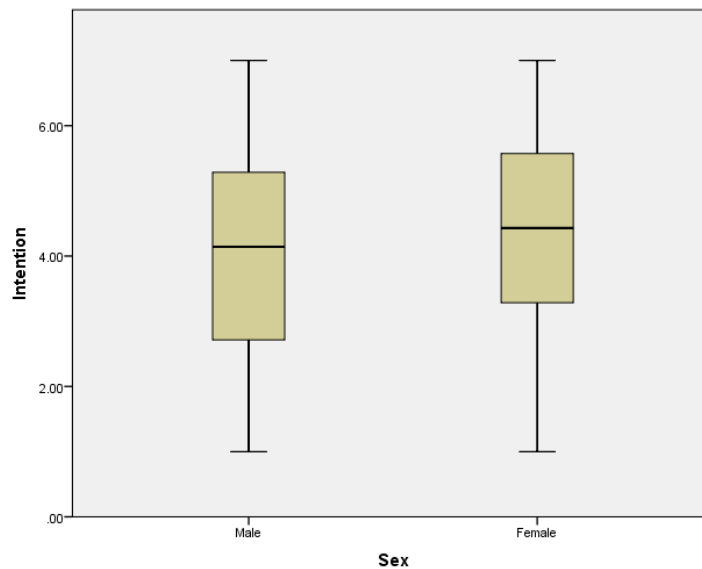


Figure 6. Box and whisker plot of sex differences (Intention)

Table 15. Independent Sample T-Test (Mean Pressure)

	t	df	p-value (2-tailed)	Mean Difference	Std. Error Difference
Equal Variances Not Assumed	-9.205	2046.083	*0.000	-1.87575	0.20378

*p < 0.05

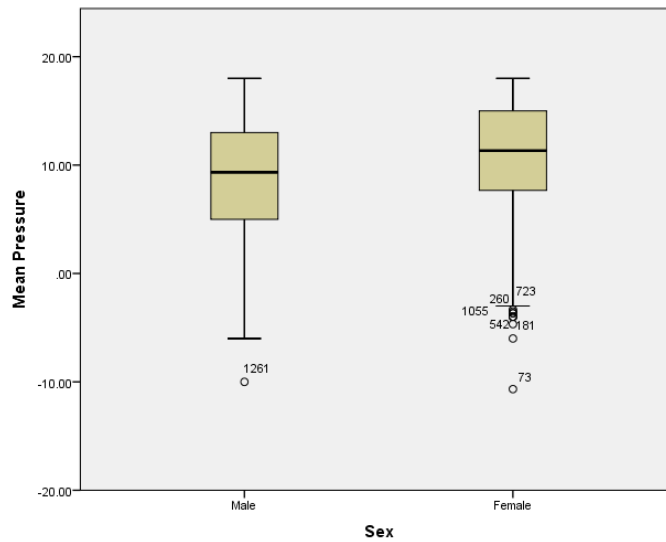


Figure 7. Box and whisker plot of sex differences (Mean pressure)

Hypothesis 4

To statistically test hypothesis four, I utilized an OLS regression to analyze the data. For this regression, I analyzed demographic variables, mean pressure, and an interaction variable between mean pressure and year in school, to test the effect pressure had the intention of different years in school to report concussion symptoms. In this regression I included seven control variables (sex, year in school, minority status, years in sport, history of concussion, collision sports, and contact sports). I then utilized mean pressure as an independent variable and included an interaction term (product of mean pressure and year in school) to determine the

effect each variable had on intention to report concussion symptoms. In accordance with an OLS regression, I conducted a VIF to test for multicollinearity within the regression model (Table 16). The preliminary VIF revealed multicollinearity between the interaction variables and the main effect variables. In order to diminish the multicollinearity between the variables, I subtracted the mean from year in school, mean pressure, and the interaction effect to center them. I then ran a VIF again to test the centered variables (Table 15), which substantially diminished the multicollinearity between variables.

Table 16. Test for Multicollinearity

Variable	VIF	Tolerance
Sex	1.461	0.684
Minority status	1.041	0.960
Years in sport	1.348	0.742
History of concussion	1.072	0.932
Collision sports	1.566	0.639
Contact sports	1.216	0.822
Year in school	1.345	0.744
Mean pressure	1.067	0.937
Interaction effect	1.003	0.997

After I centered the values, I conducted an OLS regression on the variables to analyze the data (Table 17). The regression revealed an R squared value of 0.067. With an a priori alpha level of 0.05, mean pressure demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.237$), meaning that athletes who perceived greater positive were more likely to intend to report SRC symptoms. Year in school demonstrated a significant positive effect ($p = 0.0100$) on intention to report concussion symptoms ($\beta = 0.053$), meaning older athletes were more likely to intend to report SRC symptoms. Collision sports demonstrated a significant negative effect ($p = 0.0400$) on intention to report concussion symptoms ($\beta = -0.046$), meaning athletes who participated in collision sports were less likely to intend to report SRC symptoms. The interaction effect (mean pressure \times year in school) was not a statistically

significant predictor of intention ($p = 0.404$). Figure 8 shows the change in intention between years in school.

Table 17. Regression of Mean Pressure and Year in School on Intention

Variable	B	Std. Error	Beta	t	p-value
Sex	0.036	0.076	0.010	0.470	0.638
Minority status	-0.106	0.089	-0.022	-1.195	0.232
Years in sport	-0.025	0.017	-0.029	-1.416	0.157
History of concussion	-0.004	0.063	-0.001	-0.058	0.953
Collision sports	-0.210	0.102	-0.046	-2.054	*0.040
Contact sports	0.031	0.069	0.009	0.449	0.654
Year in school	0.075	0.029	0.053	2.564	*0.010
Mean pressure	0.076	0.006	0.237	12.799	*0.000
Mean pressure \times Year in school	-0.004	0.005	-0.015	-0.834	0.404

n = 2,825

R Squared = 0.067

*p < 0.05

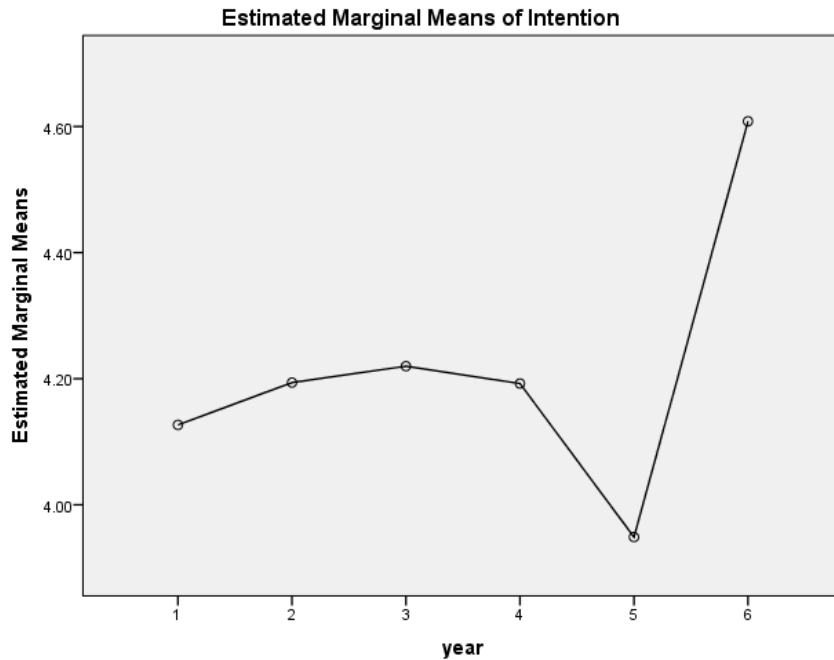


Figure 8. Estimated marginal means of intention

In figure 7, each number on the x-axis represents a year in school. 1 = Freshman, 2 = Sophomore, 3 = Junior, 4 = Senior, 5 = 5th Year Senior, and 6 = Graduate Student.

Summary of Results

To test hypothesis one, I utilized an OLS regression to analyze the data from the survey (Table 11). The results of the regression supported hypothesis one, that collegiate athletes who perceive greater combined positive pressure from coaches, teammates, and parents would have greater intention to report concussion symptoms.

In analyzing hypothesis two, I utilized an OLS regression (Table 13). The results from this regression did not support hypothesis two, that coaches would have the greatest influence on intention to report concussion symptoms compared to parents and teammates. According to the results from this regression, teammates had the greatest influence on intention to report concussion symptoms. Parents had the second greatest influence on intention, followed lastly by coaches. Coaches actually had the least amount of influence compared to teammates and parents.

In order to test hypothesis three, I utilized an independent sample t-test to compare mean intention scores between males and females (Table 14) and I utilized an independent sample t-test to compare mean perceived social pressure between males and females (Table 15). The results from this test did not support hypothesis three, that female athletes would have lower intention to report concussion symptoms compared to males. The results revealed that females had a slightly higher intention to report concussion symptoms than males. This independent sample t-test only compared sex in isolation and did not factor in any other confounding demographic variables. When analyzing sex in the OLS regressions from the previous hypotheses, sex did not have a statistically significant effect on intention, but when analyzed in isolation, it did. Therefore, other confounding demographic variables have a greater effect on intention than sex.

To test hypothesis four, I again utilized an OLS regression. In this regression, I added an interaction effect to measure to the effect that pressure has on year in school (Table 17). The results from this regression did not support hypothesis four, that perceived social pressure would have a greater influence on underclassman student-athletes' intention to report compared to upperclassman athletes. The regression revealed that year in school and mean pressure were statistically significant as main effects. When they were combined into one interaction term, the combined effect was not statistically significant, therefore, no conclusions could be drawn from the results of the regression.

Table 18 represents a summary of the results and conclusions from each hypothesis test from this study.

Table 18. Hypothesis Test Results Summary

Number	Hypothesis	Conclusion
1	Collegiate athletes who perceive greater combined positive pressure from coaches, teammates, and parents will have greater intention to report concussion symptoms.	Supported
2	All things being equal, coaches will have the greatest influence on intention to report concussion symptoms compared to parents and teammates.	Not supported
3	All things being equal, female athletes will have lower intention to report concussion symptoms compared to males.	Not supported
4	All things being equal, perceived social pressure will have a greater influence on younger student-athletes' intention to report compared to older athletes.	Not supported

Chapter Summary

In this chapter, I discussed the data analysis and results for this study. I first discussed the response rate and respondent's demographic information. I provided a summary of the demographic information that was recorded from the survey.

I then discussed the dependent and independent variables used in this study. I provided univariate statistics and a histogram for each variable. I also provided explanation for the use of a factor analysis and Cronbach's alpha analysis to create mean multi-item scales for intention to report concussion symptoms and mean pressure to report symptoms.

Once I developed the dependent and independent variables, I began my hypothesis testing. For hypothesis one, I utilized OLS multiple regression to analyze the data. I included demographic variables and mean pressure to determine the effect they have on intention to report concussion symptoms. I also utilized OLS multiple regression to analyze the data for hypothesis two. I included demographic variables and three sources of social pressure (coach, teammate, and parent) to determine the effect they have on intention to report concussion symptoms. For hypothesis three, I utilized an independent sample t-test to compare the mean intention scores between males and females and an independent sample t-test to compare mean perceived social pressure between males and females. I did not control for any possible confounding demographic variables in this test. Lastly, I utilized OLS multiple regression to analyze the data for hypothesis four. I included demographic variables and mean pressure and year in school to determine the effect on intention to report concussion symptoms. I included an interaction variable to accurately measure the effect on intention. For each regression I ran VIF tests to test for multicollinearity.

In the next chapter, I will discuss the implications from this study and possible recommendations to guide future research on the topic. I will provide further discussion on the results from this study and how they can be applied into clinical practice. I will also discuss limitations I faced throughout this study.

Chapter 5: Discussion and Conclusions

In this chapter, I will discuss and summarize the key findings from my research. Using my results, I will provide an analysis and give recommendations for methods to help create positive environments among teams that foster concussion help-seeking behaviors. I will also discuss the limitations I experienced during this study. Lastly, I will provide recommendations that will be useful for future research on this topic.

Hypothesis Testing Results

Hypothesis 1

For hypothesis 1, I hypothesized that collegiate athletes who perceived greater combined positive pressure from coaches, teammates, and parents would have greater intention to report concussion symptoms. The data from the OLS regression analysis (Table 11) fully supported this hypothesis. In a previous study, Kroshus et al.¹⁴ found that one in four athletes experienced pressure from a teammate, coach, parent, or fan to continue to play, and that perceived social pressures influenced intention to report SRC symptoms. Based on the results of the current investigation, and consistent with previous findings related to negative pressure decreasing intention to report,¹⁴ collegiate athletes who perceived greater combined positive pressure from coaches, teammates, and parents had greater intention to report concussion symptoms.

Previous studies have failed to utilize a mean pressure score and analyze the effects a mean pressure would have on intention.^{14, 17, 35, 39} The regression analysis in this study utilized a mean pressure score which was created from perceived coach, teammate, and parent pressures. Kroshus et al.¹⁴ analyzed each pressure source separately; however, the authors did not combine these variables to generate a mean pressure score. Similar studies focused on one specific source of social pressure, but failed to consider multiple social pressures simultaneously. For example,

Baugh et al.¹⁷ analyzed coach pressure in isolation and Kroshus et al.³⁹ analyzed parent pressure in isolation.

Another methodological difference is that Kroshus et al.¹⁴ controlled for demographic variables, but did not include age and sport type. In this study, age ($p = 0.0141$, $\beta = 0.0531$) and collision sports ($p = 0.0348$, $\beta = -0.0482$) were statistically significant and demonstrated significant effects on intention to report SRC symptoms. Mean pressure in this study demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.2347$), meaning that athletes who perceived greater positive pressure were more likely to intend to report SRC symptoms. Overall, this study supports and is consistent with existing literature that perceived social pressures influence intention to report SRC symptoms when controlling for specific demographic variables.

Hypothesis 2

For hypothesis 2, I hypothesized that coaches would have the greatest influence on intention to report concussion symptoms compared to parents and teammates. Teammates ($p < 0.0001$, $\beta = 0.1275$) demonstrated the greatest influence on intention to report SRC symptoms. Parents ($p < 0.0001$, $\beta = 0.1038$) had the second greatest influence on intention to report SRC symptoms. Coaches ($p = 0.0048$, $\beta = 0.0594$) demonstrated the least amount of influence on intention to report SRC symptoms. The data did not support this hypothesis.

Previous studies produced mixed results on the effects of perceived coach pressure on intention to report SRC symptoms. Based on the findings from Baugh et al.¹⁷, athletes perceived more support from coaches ($p < 0.001$) than they did from their teammates ($p = 0.069$). Baugh et al.¹⁷ concluded that coach support was a significant predictor of SRC reporting outcomes, and perceived coach support for SRC reporting was associated with significantly fewer undiagnosed

concussions. That study controlled for year in school, but only analyzed male, football players.¹⁷ Conversely, Kroshus et al.¹⁴ found that pressure from coaches was not associated with reporting intention. This finding was surprising due to the fact that coaches play a significant central role in controlling the reinforcements for reporting behaviors by controlling playing time and determining starting roster spots.¹⁴ As previously noted, that study did not control for demographic variables such as age and sport type.¹⁴

There is limited research on the effect of teammate pressure on intention to report SRC in isolation. Kroshus et al.¹⁴ analyzed teammate pressure, but also analyzed pressure from coaches, parents, and fans. According to Kroshus et al.¹⁴ teammate pressure had a significant, direct effect on intention to report SRC symptoms ($p = 0.005$). Baugh et al.¹⁷ measured teammate pressure in comparison to coach pressure. In that study, teammate pressure ($p = 0.069$) was less significant than coach pressure ($p < 0.001$). In the present study, teammate pressure demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.1275$), meaning that athletes who perceived greater positive pressure from teammates were more likely to intend to report SRC symptoms.

A large portion of collegiate athletes receive pressure from a parent or guardian to continue play after an impact or trauma to the head.¹⁴ The athletes who experience this pressure are less likely to intend to report SRC symptoms.¹⁴ Similarly, in another study by Kroshus et al.,³⁹ parents who placed more pressure on their child were less likely to encourage their child to report SRC symptoms. Communication about SRC education was less strong among those parents who placed more pressure on their child.³⁹ Some parents may believe that communicating to their child about SRC reporting will make them play more tentatively.³⁹ Consistent with the existing literature, the present study revealed that parent pressure

demonstrated a significant positive effect ($p < 0.0001$) on intention to report concussion symptoms ($\beta = 0.1038$), meaning that athletes who perceived greater positive pressure from parents were more likely to intend to report SRC symptoms.

While controlling for demographic variables, age ($p = 0.0215$, $\beta = 0.0500$) and collision sports ($p = 0.0500$, $\beta = -0.0453$) were statistically significant and demonstrated significant effects on intention to report SRC symptoms. Each source of perceived social pressure demonstrated significant effects on intention to report SRC symptoms. Teammate pressure ($\beta = 0.1275$) had the greatest influence on intention to report SRC symptoms. Overall, the data did not support my hypothesis and revealed that coaches had the least amount of influence on intention. The most influence stemmed from perceived pressure from teammates, followed by pressure from parents.

Hypothesis 3

For hypothesis 3, I hypothesized that females would have lower intention to report concussion symptoms compared to males. The data did not support this hypothesis. This hypothesis was based on a study conducted by Kroshus et al.¹⁶, who found that some female coaches intentionally engage in what they believe to be masculine coaching behaviors, such as negative reinforcement of proper SRC reporting. This type of coach reinforcement would lead female athletes to be less likely to intend to report SRC symptoms. Many female coaches and female athletes subscribe to a traditionally masculine sport ethos of risk taking and playing through debilitating injury for the sake of sport and victory.^{16, 38} However, the results of the test revealed that females had slightly higher intention to report SRC symptoms than males and that females perceived more social pressure than males.

To statistically test this hypothesis, I utilized two independent sample t-tests, rather than an OLS regression. This statistical test compared the means of females and males and tested them in isolation. The independent sample t-tests did not control for other demographic variables. When controlling for demographic variables in the OLS regressions for the other hypotheses, no statistically significant differences existed between females and males. This finding suggests that the differences based on sex were more likely related to other variables such as age, sport type, or social pressure.

Consistent with the current findings, Kroshus et al.¹⁴ also found greater reporting intention behaviors among female compared to males. The differences found in the reporting behaviors of females in this study were attributed to team normative behaviors and perceived social pressure.¹⁴ These findings are consistent with the results of the OLS regressions from hypotheses one, two, and four. In each of these regressions, sex was not statistically significant and did not have a direct effect on intention to report SRC symptoms when controlling for other demographic variables. In the OLS regressions, collision sport participation, which is more common for males than for females, was significantly associated with lower reporting intention. Overall, the independent sample t-test revealed that females had greater intention to report SRC symptoms than males, but those small differences are likely based on other related demographic variables such as sport type, age, and perceived social pressure.

Hypothesis 4

For hypothesis 4, I hypothesized that perceived social pressure would have a greater influence on underclassman student-athletes' intention to report compared to upperclassman athletes. The data did not support this hypothesis. Previous research produced mixed results about the effects perceived pressure has on year in school.^{14, 17} Existing literature conducted by

Baugh et al.¹⁷ found that freshmen were more likely to comply with what their coaches would want them to do compared to their older teammates. When comparing perceived support from teammates, Baugh et al.¹⁷ did not find any significant differences between underclassmen and upperclassmen. This study only measured perceived support from coaches and teammates and did not measure parent support between years in school.¹⁷ Kroshus et al.¹⁴ conducted a similar study where the authors measured perceived pressure from coaches, teammates, parents, and fans. This study controlled for demographic variables and included year in school.¹⁴ The authors conducted a one-way ANOVA to examine mean pressure differences between year in school and no significant differences in pressure were found.¹⁴

To test this hypothesis, I utilized an OLS regression with the addition of an interaction term to compare mean pressure and year in school. Kroshus et al.³⁹ utilized a similar regression to analyze interaction effects among perceived parent pressures. In the present study, the interaction effect (mean pressure \times year in school) was not a statistically significant predictor of intention ($p = 0.404$). The regression revealed that collision sports ($p = 0.040$, $\beta = -0.046$), year in school ($p = 0.010$, $\beta = 0.053$), and mean pressure ($p < 0.001$, $\beta = 0.237$) demonstrated significant effects on intention to report SRC symptoms (Table 17). Overall, the OLS regression revealed that mean pressure \times year in school could not be used to draw significant conclusions about intention to report SRC symptoms. Therefore, the hypothesis could not be supported.

Practical Application of Findings

The findings from this study show that perceived social pressure has a direct effect on a student-athlete's intention to report SRC symptoms. Coaches, teammates, and parents all influenced intention behaviors. The vast majority of respondents wanted to comply with what they thought their coaches, teammates, and parents would want them to do in the event of an

SRC. Educating these social groups and informing them that their actions influence others' behaviors may help foster help-seeking behaviors. Having clear communication about expectations in regards to symptoms reporting in the event of an SRC will help create help-seeking behaviors among student-athletes.

Because teammates have the most influence on intention to report SRC symptoms, it is important to target them with future concussion education programs. Encouraging discussions between teammates about help-seeking behaviors may facilitate positive reporting behaviors and norms among teams. Open communication and discussions about SRC symptom reporting are the most practical way to encourage teammates to promote these positive behaviors. Teammate support is especially important because many times, these are the individuals that student-athletes spend the majority of their time with. Because age and teammate pressure were significant predictors of intention to report SRC symptoms, senior athletes and captains should be involved in leading discussions with younger student-athletes about SRC help-seeking behaviors. These senior student-athletes are seen as role models to the younger student-athletes and can influence their behaviors. Targeting senior captains with SRC education programs may be the most effective means of fostering positive reporting environments among athletic teams. Creating help-seeking behaviors among teams will ultimately increase intention reporting behaviors among student-athletes.

Limitations

One limitation of the study was the recruitment strategy used by each institution. The online survey was sent to a total of 22 universities and colleges across the state of Pennsylvania. At the majority of the institutions included, a school liaison received an email that included the survey link. That liaison then sent the survey directly to the student-athletes. However, there

were some institutions where the liaison forwarded the email to the coaches, rather than the student-athletes. Because the email was forwarded to the coaches, the coaches were the individuals primarily responsible for the email reaching the student-athletes. It was not possible to verify that the coaches followed the necessary steps when forwarding the email to their student-athletes. Some of these coaches may not have forwarded the email to their student-athletes at all. Overall, the schools that relied on their coaches to forward the email to their student-athletes produced lower response rates compared to the schools who forwarded the emails to their student-athletes from a single liaison. This individualized recruitment strategy produced a high survey completion rate (34.02%), however the lack of consistent communication at some institutions is still a limitation.

Another limitation in this study was the time in which the survey was given to the student-athletes to complete. Some student-athletes were in-season and some were out-of-season when the survey was distributed. Depending on if the student-athlete was in-season or not could have affected and influenced the responses that were given. Even though the survey was completely anonymous some participants may have feared that others would find out about their answers, which would ultimately affect their playing time. Due to this fear, these individuals may not have answered the questions truthfully.

Recommendations for Future Research

One of the strengths of this study was the large sample size that was used ($n = 2,984$). The sample mainly consisted of Division II athletes ($n = 2,220$). There were only 36 Division I athletes that participated in the study. Future research could be conducted on a sample that consists mostly of Division I athletes. Division I athletes may perceive social pressure differently than Division II athletes. This could be due to the monetary scholarships associated with

Division I athletics. These student-athletes may take their participation in sports more seriously and may perceive social pressure from the various referent groups differently than Division II athletes. Future research is warranted to investigate the differences in perceived social pressure between Division I and Division II athletes.

The three sources of pressure that were analyzed in this study included, coaches, teammates, and parents. On the survey (Appendix A) there were also questions related to perceived pressure from athletic trainers. This social pressure was not investigated in the current study, but future research to investigate this social referent group may provide additional information about the role of external pressure on reporting intention. Athletic trainers play a predominant role in the student-athlete's life. They have daily interactions with student-athletes and develop professional and personal relationships with each student-athlete. Many student-athletes see their athletic trainers as important figures in their lives and value their opinions. Because their opinions are valued, student-athletes may perceive pressure from their athletic trainers to report SRC symptoms. Future research should be directed at investigating perceived social pressure from athletic trainers. Investigating the perceived social pressure from athletic trainers can lead to improvements in SRC symptom reporting and can foster positive, help-seeking environments for the student-athletes.

Future research should also consider using this survey to conduct a longitudinal research study. A longitudinal research study could follow a sample of incoming freshmen student-athletes to a college or university. The present survey could establish their current levels of perceived social pressure and intention to report SRC symptoms. Each subsequent year following their freshmen year, the survey could be given to these student-athletes again to measure their current perceived social pressure and intention to report SRC symptoms. By

measuring these items each year, it would be possible to examine the changes in pressure and intention that occur over time during a college athletic career.

Conclusion

The purpose of this study was to investigate which social referent group had the greatest influence on collegiate athletes' intentions to report SRC symptoms. Previous studies have measured perceived social pressures and their effect on intention to report, but these studies were limited by small sample sizes and lack of control over certain demographic variables.

This study expands upon previous research on perceived social pressures and intention to report SRC symptoms. I included multiple sources of social pressure and controlled for several influential demographic variables among a substantial sample size. The results of this study suggest that student-athletes who perceive greater positive social pressure will have greater intention to seek medical attention for SRC symptoms. Based on these results, teammates are the most influential social group to student-athletes in regards to intention to report SRC symptoms. Because teammates have the greatest influence, these individuals may play an important role in creating a positive environment where symptom-reporting is encouraged. Future concussion education programs should target these individuals to help create a positive reporting and help-seeking environment.

Teams should address normative behaviors about intention to report SRC symptoms. Addressing these pre-existing behaviors and creating normative behaviors that support medical help-seeking for SRCs should be encouraged among teams. Teams have the ability to promote positive communication about the dangers of playing with a suspected SRC and should explicitly communicate the team's expectations if a student-athlete sustains an SRC. Concussion education

programs in the future should create positive help-seeking environments that encourage student-athletes to report SRC symptoms rather than shame them.

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- | | | | | | | | | |
|-----|--|---|---|---|---|---|---|------------------|
| | Extremely unlikely | — | — | — | — | — | — | Extremely likely |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. | Symptoms that last for 24 hours or less | | | | | | | |
| | Extremely unlikely | — | — | — | — | — | — | Extremely likely |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. | Symptoms that last for more than 1 week | | | | | | | |
| | Extremely unlikely | — | — | — | — | — | — | Extremely likely |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. | Mild concussion symptoms | | | | | | | |
| | Extremely unlikely | — | — | — | — | — | — | Extremely likely |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15. | Severe concussion symptoms | | | | | | | |
| | Extremely unlikely | — | — | — | — | — | — | Extremely likely |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16. | In general, if one of your teammates experiences concussion symptoms following a blow to the head, how likely are you to tell a coach or athletic trainer? | | | | | | | |
| | Extremely unlikely | — | — | — | — | — | — | Extremely likely |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Please indicate how much you agree or disagree with the following statements.

- | | | | | | | | | |
|-----|---|---|---|---|---|---|---|----------------|
| 17. | I consider myself an athlete. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18. | I have many goals related to sport. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19. | Most of my friends are athletes. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20. | Sport is the most important part of my life. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21. | I spend more time thinking about sport than anything else. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. | I feel bad about myself when I do poorly in sport. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. | I would be very depressed if I were injured and could not compete in sport. | | | | | | | |
| | Strongly disagree | — | — | — | — | — | — | Strongly agree |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Please indicate how you feel about the following statement for each word pair listed below.
 For me to report possible concussive symptoms to a coach or medical professional when I experience them is:

- | | | | | | | | | |
|-----------------|---|---|---|---|---|---|---|--------------|
| 24. Cowardly | — | — | — | — | — | — | — | Brave |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 25. Pleasant | — | — | — | — | — | — | — | Embarrassing |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 26. Harmful | — | — | — | — | — | — | — | Beneficial |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 27. Good | — | — | — | — | — | — | — | Bad |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 28. Unimportant | — | — | — | — | — | — | — | Important |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 29. Worthless | — | — | — | — | — | — | — | Valuable |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

Please answer the following questions based on your perceptions of concussion symptom reporting.

30. Most people like me report possible concussion symptoms to a coach or a medical professional, when they experience them.
- | | | | | | | | | |
|-------|---|---|---|---|---|---|---|--------|
| Never | — | — | — | — | — | — | — | Always |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
31. How many people in your sport do you think report possible concussion symptoms to a coach or a medical professional, when they experience them?
- | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|------------|
| Virtually none | — | — | — | — | — | — | — | Almost All |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
32. How many of your teammates report possible concussion symptoms to a coach or a medical professional, when they experience them?
- | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|------------|
| Virtually none | — | — | — | — | — | — | — | Almost All |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
33. How many college athletes report possible concussion symptoms to a coach or a medical professional, when they experience them?
- | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|------------|
| Virtually none | — | — | — | — | — | — | — | Almost All |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
34. When it comes to reporting possible concussion symptoms to a coach or medical professional, my coaches think that:
- | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|----------|
| I should not | — | — | — | — | — | — | — | I should |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
35. When it comes to reporting possible concussion symptoms to a coach or medical professional, my teammates think that:
- | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|----------|
| I should not | — | — | — | — | — | — | — | I should |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

1 2 3 4 5 6 7
48. I have complete control over whether or not I report symptoms of a concussion.
Strongly disagree — — — — — — — Strongly agree

1 2 3 4 5 6 7
49. Have you ever had a concussion or experienced concussion symptoms?
Yes, No

If answered “yes” to number 43, move on to number 44 and 45. If answered “no” to number 43, survey is complete.

50. How many *diagnosed* concussions have you previously had?
1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

51. When you have experienced possible concussion symptoms, how often have you reported them to someone (e.g. coach, athletic trainer, etc.)?
Never — — — — — — — Always
1 2 3 4 5 6 7