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SOURCES OF STRESS AND THE SOCIAL SUPPORT
FROM PRIMARY PROVIDERS FOLLOWING A SPORTS-
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AN EXPLORATORY STUDY

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PROVIDERS FOLLOWING A SPORTS-RELATED CONCUSSION IN HIGH
SCHOOL ATHLETES: AN EXPLORATORY STUDY**

By

Arielle Faith Goldsmith

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ABSTRACT

SOURCES OF STRESS AND THE SOCIAL SUPPORT FROM PRIMARY PROVIDERS FOLLOWING A SPORTS-RELATED CONCUSSION IN HIGH SCHOOL ATHLETES: AN EXPLORATORY STUDY

By

Arielle Faith Goldsmith

A concussion, often known as an “invisible injury”, is a unique type of sports injury where the recovery varies on an individual basis. Many external factors, such as the lack of knowledge regarding diagnosis and a specific treatment, pressures from the external environment (i.e. media, parents, coaches), and the fears associated with the injury (i.e. fear of re-injury, seeking help), can lead to a stressful experience for the injured athlete. The amount, type, and who is providing social support has been found to play a critical role in the athlete’s coping ability of dealing with external stressors post-injury. Therefore, the purpose of the present study was twofold: (a) to gain more information regarding the external sources of stress and the social support experienced by high school athletes who have incurred a sports-related concussion, and, (b) to further understand the relationship between primary providers of social support and the level of stress an athlete experiences from external factors following a sports-related concussion. The survey was administered to 17 high school athletes. Results revealed that high school concussed athletes worried moderately low amounts following their injury. One’s immediate family provided the most social support to concussed athletes, while sports-related individuals and healthcare providers provided the least amount of support. In conclusion, there is a weak relationship between stress experienced by athletes and the amount of social support from primary providers.

DEDICATION

To my family...

“Families are the compass that guide us. They are the inspiration to reach great heights,
and our comfort when we occasionally falter.” Brad Henry

Thank you for all your love and support throughout everything that I do.

Dad- Just as you gave me the motivation to push forward, I hope to be able to give you
that same strength during this difficult time. I love you and I know you will get better.

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Chapter 1

Introduction

Overview of the Problem

A concussion is a unique type of sports injury that often goes undiagnosed due to the difficulty in detecting concussion signs and symptoms. As a result, concussion is often termed the ‘invisible injury’. The recovery process from a concussion should be determined on an individual basis. Sports injuries are often treated through rehabilitation and pharmacological treatment; however, concussed athletes often find themselves with no specific treatment (Bloom, Horton, McCrory, & Johnston, 2004), potentially leading to a stressful experience for the athlete. Research has shown that social support alleviates stress and enhances recovery following a physical injury such as an anterior cruciate ligament (ACL) tear (Brewer et al., 2003; Tracey, 2003; Wiese, Weiss, & Yukelson, 1991), but little to no research addresses the role social support plays with concussion. Furthermore, it has been suggested that there is often a lack of social support because there are no visible signs of a concussion. Therefore, many athletes may feel pressured by family members, teammates, coaches, and the media to return to play prematurely.

Sports are a dominant aspect of many high school athletes’ lives and will often become an important part of how they identify themselves. Subsequently, injuries constantly occur as a result of sports and can result in many psychological problems and emotional responses. Social support is important following a sports-related injury to help the individual cope with the emotional and behavioral responses the athlete may be

experiencing as a result of this injury. To date, very limited research has focused on non-musculoskeletal injuries, such as a sports-related concussion, and the emotional responses that an individual experiences following this injury (Mainwaring et al., 2004).

This study has further contributed to the sports-related concussion literature by providing descriptive information regarding the development of potential stressors. In addition, the relationship between the development of these stressors and the type and amount of social support bestowed from primary providers following a sports-related concussion was examined. This information may potentially provide individuals in the sports medicine profession with the knowledge needed to help concussed athletes in recovering from this injury as well as help guide family, friends, teammates, and coaches in aiding the athlete in full participation and a good quality of life.

Significance of the Problem

Concussions remain a serious public health concern. The most recent estimates from the Center for Disease Control and Prevention (CDC) indicate that sports-related concussions have increased to approximately 1.6 to 3.0 million per year (CDC, 2006). Approximately 62,816 cases of concussions occur annually at the high school level with American football accounting for approximately 63% of all cases (Powell & Barber-Foss, 1999). From 2001 to 2005, estimates of 207,830 athletes were treated in Emergency Departments for nonfatal sports-related traumatic brain injuries (TBIs), with the highest rates occurring among 10-14 year olds followed by those aged 15-19 (CDC, 2007).

During the 1990's, the dangers of a sports-related concussion became a

heightened concern, with several athletes being forced to retire due to multiple concussions (Kaut, DePompei, Kerr, & Congeni, 2003). In 1999, the National Institutes of Health declared that mild traumatic brain injuries (mTBI) was a major health problem and that efforts to manage and prevent post-mTBI disability should be taken as a national priority in research (Bazarian et al., 2005). Furthermore, due to the unique characteristics of a concussion and the difficulties in diagnosing this injury, it is difficult for sports medicine professionals to know exactly when it is appropriate for a concussed athlete to return to play. Prematurely returning an athlete back increases the risk of possible catastrophic consequences, such as second impact syndrome (SIS) (Cantu & Voy, 1995). Second impact syndrome is a rare, but serious condition that occurs when an athlete returns to play too soon and sustains another head injury before the prior concussion has completely resolved (Cantu & Voy, 1995). During SIS, there is interruption of the brain's autoregulatory system which increases intracranial pressure (Cantu & Voy, 1995). This increase of pressure leads to "herniation of the medial surface (uncus) of the temporal lobe or lobes below the tentorium or of the cerebellar tonsils through the foramen magnum" (Cantu & Voy, 1995 p. 3). A second impact prior to a full recovery can potentially lead to deleterious effects and can end with mortality (McClincy, Lovell, Pardini, Collins, & Spore, 2006) due to brain stem failure within 2 to 5 minutes (Cantu & Voy, 1995).

In addition to SIS, athletes may suffer from post-concussion syndrome (PCS). Post-concussion syndrome is a concussion that results in memory or attention deficits and the onset or worsening of any three of the following symptoms: tiring easily,

disordered sleep, headaches, vertigo/ dizziness, irritability, anxiety/depression/affective lability, changes in personality, or apathy [Ryan & Warden, 2003; World Health Organization (WHO), 1992].

Many athletes have responded to a concussion, as well as other injuries, with feelings of the inability to cope with the injury (Bianco, 2001). Furthermore, an extended rehabilitation process and the inhibition of participating in physical activity often leads to a sense of being controlled by the injury (Leddy, Lambert, & Ogles, 1994). These coping difficulties can impact a person cognitively, emotionally, and behaviorally and often result in a stressful experience for the individual (Bianco, 2001). Another factor is the amount of social support given from primary providers. It has been found that without receiving social support following a traumatic brain injury (TBI), the symptoms that the injured person is feeling may intensify (O'Connor, Colantonio, & Polatajko, 2005). In addition, many individuals, such as coaches and parents, may not understand the recovery process and the feelings that a concussed athlete is experiencing (Bianco, 2001). This can decrease the amount of social support, which can be assumed to impact the individual's motivation to return to physical activity. With more accurate methods for detecting and evaluating concussion signs and symptoms (i.e. neuropsychological testing), as well as improved management techniques following diagnosis (i.e. adequate social support from primary providers), it is believed that the risks of cumulative neurocognitive dysfunction and potential impact fatalities associated with SIS will be reduced. In addition, the athlete will be able to safely return back to physical activity in a reasonable amount of time.

Problem Statement

The first purpose of this study was descriptive in nature and sought to gain more information regarding the external sources of stress and the social support experienced by high school athletes who have suffered a sports-related concussion. It was also designed to profile the demographic characteristics of high school athletes who experience concussions. Finally, the level of trait anxiety experienced prior to the injury and the state anxiety by the athlete post concussion was assessed.

Purpose 2 examined the relationship between overall levels of social support (provided that a total social support score can be obtained from the measure) and level of post concussion state anxiety the injured athlete experienced. In addition, the levels of social support provided by different providers and the level of state anxiety an athlete experiences following a sports-related concussion was examined. The primary providers for this study consisted of friends, family, coaches, athletic trainers, teammates, physical/medical staff, and any other individual the concussed athlete believed provided support. Levels of stress experienced were assessed by the amount of state anxiety reported after the concussion was obtained.

Definition of Terms

Traumatic Brain Injury: A traumatic brain injury is an externally caused injury that inhibits the physical, mental, and psychosocial functioning of an individual (Kaut et al., 2003).

Concussion: A concussion is a trauma to the brain caused by a direct blow to the head, face, neck, or body and results in the rapid onset of neurological impairment that

resolves spontaneously (McCrory et al., 2009).

Social Support: Social support is the interaction between two or more individuals with the intent of exchanging resources in an attempt to enhance the well-being of the recipient (Bianco, 2001).

Sources of Stress: Sources of stress include the lack of knowledge of “invisible injuries”, external pressure, fear of re-injury, and the amount of social support from primary providers including friends, family, coaches, athletic trainer, teammate, physician/medical staff, and other individuals who may provide significant support.

Chapter 2

Review of Related Literature

The literature addresses sports-related concussions, sources of external stress, and social support. The sections are divided into (a) defining a concussion; (b) pathophysiology of a concussion; (c) symptoms of a concussion; (d) concussion severity; (e) return to play guidelines and neurological testing; (f) post-concussion syndrome; (g) multiple concussions; (h) sources of external stress following a concussion; (i) coping; and (j) social support

Defining a Concussion

Traumatic Brain Injury (TBI) is defined as an externally caused injury that inhibits the physical, mental, and psychosocial functioning of an individual (Kaut et al., 2003). The Vienna Concussion in Sport group defined a concussion as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces (McCrory et al., 2009). A concussion typically results in the rapid onset of brief neurological impairments and neuropathological changes (McCrory et al., 2009). Within the sporting world, mild TBIs and the term concussion are used interchangeably.

Pathophysiology of a Concussion

A concussion is a major concern for all sports that have the potential for head impact or collisions (Bailes & Hudson, 2001). Head impact usually results from an acceleration-deceleration or rotational mechanisms (Bailes & Hudson, 2001). An acceleration-deceleration head injury, also known as linear (translational) impact typically occurs when the head hits a solid object while traveling at a certain speed or a

stationary head is hit by a moving object and results in shearing of white-matter fiber tracts (Bailes & Hudson, 2001). This is most likely to occur in contact sports, especially football, ice hockey, and boxing through motions including blocking and tackling, checking, and jabbing (Bailes & Hudson, 2001). A rotary component on the head is a major influential factor that potentially causes a loss of consciousness (LOC) and is less effectively prevented by headgear (Bailes & Hudson, 2001). A LOC is a disruption in the feedback-loop between the reticular activating system extending through the brain stem and interacting with the hypothalamus and cerebral hemisphere (Bailes & Hudson, 2001).

In addition to the biomechanical implications of a concussion, physiological responses in the brain occur when a concussion occurs (Bailes & Hudson, 2001). The activation of the glycolytic process in an attempt to maintain ionic gradients occurs during a concussion (Bailes & Hudson, 2001). There are signs of a large increase in extracellular potassium concentrations through the voltage-gated potassium channels (Bailes & Hudson, 2001). Neurotransmitters play a significant role in the opening of ionic channels (Bailes & Hudson, 2001). Newer models indicate an increase in glucose utilization in an attempt to correct the ionic changes in the transmembrane potentials (Bailes & Hudson, 2001). Following a concussive injury, there appears to be a higher demand for glucose to fix the altered ionic movements and the reduction in blood flow in the cerebrum influenced by the calcium movements (Bailes & Hudson, 2001).

Symptoms of a Concussion

General symptoms. In order to manage a concussion appropriately, it is

important to understand the symptoms that can arise following a concussion. Sports-related concussions are associated with cognitive, physical, psychological dysfunction, and emotional distress (Mainwaring et al., 2004). Disorientation to time, place, or situation is often stereotyped with receiving a concussion. Research has shown that more than 90% of athletes do not experience LOC, posttraumatic amnesia, or disorientation (Delaney, Lacroix, Veclerc, & Johnston, 2002; McCrea, 2001b). Instead, the most common symptoms that are exhibited following a concussion include headaches, dizziness, nausea, balance problems, and fluctuation of emotions (Macciocchi, Barth, Alves, Rimel, & Jane, 1996). In addition, neurocognitive deficits including impaired attention, concentration, information-processing speed, and memory may also be present (Delaney et al., 2002; Macciocchi et al., 1996; McCrea, 2001b). For example, concussed soccer players have shown deficits in attention, concentration, memory, and judgment as compared to controls (Delaney et al., 2002).

Iverson and associates (2006) conducted a study to illustrate the use of a computerized neuropsychological test battery to monitor 30 amateur athletes following a concussion. Sixty percent of athletes who experienced symptoms following a concussion exhibits decreased verbal memory at day one compared to pre-season (Iverson, Brooks, Collins, & Lovell, 2006). In addition, 30% experienced visual memory deficits, 67% had issues with processing speed, and 70% had reaction time problems (Iverson et al., 2006).

Guskiewicz and associates (2001) attempted to examine the effects of concussion on neurocognitive function in 36 collegiate athletes who had experienced a

concussion and 36 control subjects with no previous history of concussion. It was found that concussed collegiate athletes demonstrated significantly worse performance when asked to recite the reverse order of the numbers provided on the Wechsler Digit Span Test (WDST), which measures concentration and immediate memory recall (Guskiewicz, Ross, & Marshall, 2001). In addition, the athletes performed significantly worse on the Trail-Making Test B, which measures rapid visual processing and working memory (Guskiewicz et al., 2001).

Immediately following a concussion, athletes could experience mood disruptions where negative moods increased and positive moods diminished (Mainwaring et al., 2004) resulting in increased levels of frustration, depression, anger (Anson & Ponsford, 2006; Leddy et al., 1994), tension, confusion (Mainwaring et al., 2004), and anxiety (Anson & Ponsford, 2006). Other immediate symptoms including LOC, headache, dizziness, nausea or vomiting, slurred, incoherent or slow speech, (Fisher & Vaca, 2004), and imbalance or incoordination (Kushner, 2001). Other later onset symptoms include memory dysfunction (Mainwaring et al., 2004), irritability, intolerance to bright lights or loud noises, or sleep disturbance (Fisher & Vaca, 2004; Mainwaring et al., 2004). Many studies also indicated a decrease in self-esteem and vigor (Leddy et al., 1994).

Many athletes experienced problems with balance (Johnston et al., 2004) as a result of sensory interaction problems that prevent athletes from using and exchanging sensory information from the visual, vestibular, and somatosensory systems (Guskiewicz et al., 2001). The presence of these symptoms was indicative of the

impact which caused the concussion, thus, increasing the risk for future and more serious concussions (Kaut et al., 2003).

Concussed athletes have been found to experience symptoms such as isolation, pain, anxiety, and disruption of daily life which can lead to emotional responses including anger, denial, distress, bargaining, shock, guilt (Bloom et al., 2004), frustration, tension, and confusion (Mainwaring et al., 2004), which can still be seen several weeks later (McClincy et al., 2006). The most significant emotional distress reported in athletes was depression (Mainwaring et al., 2004). McCauley and associates (2001) found that depressive symptoms often remain in mild head injured patients who showed satisfactory cognitive recovery. In addition, persistent emotional sequelae were documented under the same conditions despite improved cognition (McCauley, Boake, Levin, Contant, & Song, 2001). These post-concussive symptoms were found to effect up to 50% of mTBI patients within a month (Bazarian et al., 2005) to three months post-injury (Ferguson et al., 1999).

Factors associated with the symptoms. Other factors associated with the cause of the symptoms following a concussion include type of injury, time of injury during the year, playing season, and other factors, which are of vital importance when considering the psychological recovery of an athlete following a sporting injury, such as a concussion (Mainwaring et al., 2004). More severe injuries have greater mood disturbances (Mainwaring et al., 2004). In addition, greater mood disturbances are likely to occur when an athlete has little knowledge or receives little information about the injury or the recovery period (Mainwaring et al., 2004).

Typical resolution of symptoms. Concussed athletes postural instability typically resolves within three to five days, while self-reported symptoms resolve and cognitive impairments improve by Day 7 (Iverson et al., 2006). Most cognitive impairments returned to baseline by 10 days post-injury (Macciocchi et al., 1996; Macciocchi, Barth, Littlefield, & Cantu, 2001). Mainwaring and associates (2004) found that depression and confusion were still observed into the second and third weeks following a concussion.

Concussion Severity

In the past decade, the use of a grading scale to categorize the severity of a sports-related concussion has shown to be extremely valuable and useful (American Academy of Neurology [AAN], 1997). A *Grade one* concussion is characterized by brief confusion (the hallmark sign), no LOC, and any abnormalities resulting from concussion symptoms or mental status on examination resolving in less than 15 minutes (AAN, 1997). To many athletes, this may be considered a “ding” (AAN, 1997). A *Grade two* concussion has the same characteristics as a *Grade one* concussion with the exception that any abnormalities’ resulting from concussion symptoms or mental status on examination lasts longer than 15 minutes (AAN, 1997). The most severe concussion is a *Grade three* concussion and is defined as having LOC for any period of time, brief or prolonged (AAN, 1997).

In 2001, the 1st International Symposium on Concussion in Sport was held in Vienna. This committee recommended that the concussion grading scales be abolished in exchange of combined measures of recovery to determine the severity of the injury;

thus, determining return to play decisions on an individual basis (McCrory et al., 2005). In addition, the members of this committee agreed that the severity of a concussion could only be determined after all the symptoms disappeared and neurocognitive function returned to baseline (McCrory et al., 2005).

Return-To-Play Guidelines and Neurological Testing

The most crucial aspect of managing an athlete after a sports-related concussion has occurred is determining when it is safe to return to play. Based on animal research, it has been found that metabolic dysfunction is potentially related to symptoms of sports concussions and, until fully recovered, an athlete's neurological vulnerability will be heightened if another trauma occurs (McClincy et al., 2006). Therefore, proper management and care for a concussed athlete is crucial in the recovery process to prevent permanent cognitive impairment or fatality as a result of second impact syndrome (SIS) (McClincy et al., 2006).

One of the most widely used return-to-play guidelines was developed by the AAN. A *Grade one* sports-related concussion allows the players to return back to play the same day of injury as long as symptoms resolve within 15 minutes of the injury at rest and exertion (AAN, 1997). With a *Grade two* concussion, athletes can return to play after being asymptomatic within one week of the injury (AAN, 1997). With a *Grade three* concussion, the athlete can return back to play one to two weeks once asymptomatic.

The Concussion in Sport group did not endorse any return-to-play guidelines; however, they recommended a new stepwise protocol for return-to-play (Aubry et al.,

2001). The Vienna return-to-play guidelines were developed based on the Canadian Academy of Sports Medicine Committee guidelines published in 2000. This protocol begins with no activity or complete rest until the concussed athlete is asymptomatic. Once asymptomatic, the injured athlete would perform light aerobic exercise with no resistance training (Aubry et al., 2001). If the athlete continued to be asymptomatic then he or she could proceed to the next stage. The following stages (e.g., sport specific exercise, non-contact drills, etc.) must be completed without symptoms over a 24- hour period (Aubry et al., 2001). If symptoms returned, the athlete must revert back to the preceding stage until asymptomatic and then begin the stepwise progression from this point forward (Aubry et al., 2001). Once the athlete could complete non-contact drills without experiencing symptoms, he or she could begin full contact drills and return to game play with medical clearance (Aubry et al., 2001).

The NATA position paper (Guskiewicz et al., 2004) recommended a similar protocol for returning a concussed athlete back to participation. If the concussed athlete was asymptomatic after exertion (i.e. biking, push-up, jogging); the athlete could progress to sport specific skills. Upon completion of symptom- free sport-specific skills, a neuropsychological and postural-stability assessment was recommended prior to full contact participation. The NATA position paper (Guskiewicz et al., 2004) does not recommend a time-frame (e.g., 24 hours) between each progressive step, which was a major difference from the Vienna Guidelines.

In the sport of rugby, the International Rugby Board required that any player that was diagnosed or self-reported that a concussion has occurred was automatically

suspended from games and practices for 3-weeks, even if the injury was grade one or milder (Marshall & Spencer, 2001). Since a hearing before the House Judiciary Committee on October 28, 2009, the NFL has enforced that players must be cleared by brain-injury experts that are not affiliated with a team, and cannot return back to play in a game or practice where concussive symptoms are seen, the latter recommended an N.C.A.A panel committee (“N.F.L. Acknowledges Long-Term Concussion Effects”, 2009, p. D1). Individual differences must be taken into consideration for return-to-play guidelines to be effective in preventing an athlete from having concussion symptoms persist or receiving another concussion prematurely (McClincy et al., 2006). Recovery time could vary from athlete to athlete (McClincy et al., 2006) as well as the severity of the symptoms (McCrea, 2001b).

Most clinicians are now aware of the importance of systematic testing versus the use of stereotype questions such as “how many fingers am I holding up?” to determine the mental status of an injured athlete (McCrea, 2001b). Standardized screening instruments reduced the amount of guessing that occurs by medical clinicians, coaches, and athletic trainers with assessing the concussion of an athlete while still on the field (McCrea, 2001b). These tests would be able to help clarify the acute effects of an injury as well as give a broad idea of the severity of the injury (McCrea, 2001b). By accurately determining these factors while still on the sideline, there was potential for “reduced risk of recurrent injury, cumulative neuropsychological impairment, and catastrophic outcome associated with sport-related concussions” (McCrea, 2001b, p.176).

One form of a standardized method that assesses the mental status of an athlete

following a concussion is the Standardized Assessment of Concussion (SAC). The SAC is an assessment that was found to be more objective and immediate in evaluating an athlete while on the sideline within minutes of a concussion occurring (McCrea, 2001b). McCrea (2001b) investigated the validity of the SAC in 63 high school and collegiate football players with concussions and 55 uninjured control subjects and concluded that injured athletes that were categorized by the AAN as having a concussion experienced a decrease of more than 4 points on the SAC immediately following a concussion compared to the control group. These results indicated that the decline in scores were due to injury of cognitive functioning and not external factors, such as fatigue (McCrea, 2001b). Results from a standardized method of mental status conducted on the sideline are helpful in determining how a clinician should track the recovery of an athlete (McCrea, 2001b).

It is important to note that side-line standardized testing should not be used as the sole determinant of when an athlete can return to play because it was not fully effective in diagnosing and managing a concussion on its own (McCrea, 2001b). It is imperative for this form of testing to be combined with other forms of concussion methods such as a neuropsychological evaluation and postural stability testing for it to be most effective in treating an injured athlete (McCrea, 2001b).

Neuropsychological testing has become one of the most effective tools in monitoring neurocognitive deficits and determining when it is safe for an athlete to return to play on an individual level (Fisher & Vaca, 2004; McClincy et al., 2006; McCrea, 2001b). Rather than determining a treatment plan based on a generalized

guideline used for all athletes, the neuropsychological responses provided by the athlete post-injury can be analyzed and compared to baseline responses (McCrea, 2001b). Some researchers suggested that the most important role of neuropsychological testing is to identify undetected conditions once the athlete appears to be asymptomatic or lingering signs and symptoms continued (Guskiewicz et al., 2001). This form of testing also eliminated the problems with a player's self-report of symptoms where a person may be motivated to appear symptom-free in order to return to play more rapidly or when a person was uneducated about the symptoms associated with a head injury (McCrea, 2001a).

Post-Concussion Syndrome (PCS)

Definition, causes, and risk factors. Post-concussion syndrome is a concussion that results in memory or attention deficits and the onset or worsening of any three of the following symptoms: tiring easily, disordered sleep, headaches, vertigo/dizziness, irritability, anxiety/depression/affective lability, changes in personality, or apathy (Ryan & Warden, 2003; WHO, 1992). These symptoms need to persist for a minimum of one month to be diagnosed (WHO, 1992).

Depression. Several studies have found depression to be the most significant emotional distress following the development of PCS as well as being indicated as a strong predictor of PCS (Anson & Ponsford, 2006; Powell, Ekin-Wood, & Collin, 2007). It is important to note that age, gender, specific type of head injury, and time since the injury were not associated with the level of depression a concussed person experienced (Anson & Ponsford, 2006). Mainwaring and associates (2004) conducted a

study interested in further understanding the emotional responses that can occur following a mTBI. A shortened version of the Profile of Mood States was used within 72 hours following a mTBI, which found that the increase in depression may be due to the removal from competition or the inhibition of activity (Mainwaring et al., 2004). Furthermore, Johnston and associates (2004) found that even when some of the symptoms of concussion are decreasing with recovery, other symptoms involving the individual's mood state may increase. Therefore, it is crucial that depression be minimized as much as possible when attempting to treat a person with PCS (Perna, 2005).

Difficulties in diagnosing Post-Concussion Syndrome. As with any symptom following a concussion, the reason PCS is so difficult to treat is because the symptoms are similar to common complaints that a person may have in their daily lives or as a result of other injuries (Ferguson et al., 1999), also known as the “expectation as etiology” theory (Gunstad & Suhr, 2001). Studies have found that approximately 67% shared variance occurred between symptoms that a person may experience daily and symptoms as a result of PCS (Gunstad & Suhr, 2001). In addition, according to Ross and Conway's (1986) constructive model of memory, individuals maintained memories of their present belief, attitude or state of mind, and then assumed information about the past that was consistent with their expectations. As a result, athletes would often report their symptoms as being worse following a head injury than in the past solely based on them believing they were healthier in the past (Gunstad & Suhr, 2001). Another explanation is that athletes may be disregarding that the symptoms present were began

previous to the head injury (Gunstad & Suhr, 2001) causing a feeling of emotional distress about PCS symptoms (Ferguson et al., 1999).

While many still believe that the “expectation as etiology” theory is valid, Gunstad and Suhr (2001) found results differed when they examined the association of malingering, emotional state, expectations, and chronic pain to reporting PCS symptoms. They used 141 subjects broken down into five groups who were asked to complete a 97- item symptom checklist. The first group were healthy controls, the second were individuals who identified high rates of depressive symptoms but were not receiving any treatment or therapy, the third were athletes who reported a history of a head injury or concussion, the fourth were athletes who had not experienced a head injury and the last group were individuals who experience chronic headaches but were not seeking treatment for their headaches (Gunstad & Suhr, 2001). The study found that athletes that had experienced a mild head injury were not more likely to report current PCS symptoms in comparison to the other groups. In fact, these athletes had expectations of recovery and were found to seek treatment following a head injury (Gunstad & Suhr, 2001). These expectations could be a result of experience, such as being present when mild head injuries occur and witnessing a quick recovery, or from general expectations or pressure from teammates, coaches (Gunstad & Suhr, 2001), families, or even the media (Mainwaring et al., 2004).

Because Gunstad and Suhr (2001) found that both the head injured group and the non head injured group both reported more PCS symptoms than prior to the injury, PCS symptoms were found to not be specific to PCS but rather were found to be

consistent with the “good old days” hypothesis. This hypothesis indicated that any negative event that a person may experience becomes an important landmark for comparison of his/her current state as negative compared to the past (Gunstad & Suhr, 2001). Other individuals experienced “expectancy-guided recall” where the recall of past status on a given symptom or feeling is consistent with one’s expectations of the present status of a symptom or feeling (Ferguson et al., 1999).

Ferguson and associates (1999) were interested in how the expectations of symptoms play a role in athletes following a mild head injury. Two hundred and eighty-six males enrolled in collegiate, postgraduate, and high school amateur collision sports programs completed a 30-item symptom checklist (Ferguson et al., 1999). Results indicating post-concussion complaints led to the conclusion that uninjured athletes believed that a concussion would produce persisting symptoms while concussed athletes believed that the head trauma actually did produce those symptoms (Ferguson et al., 1999). More specifically, “the head trauma participants reported a 550% increase in concentration problems, a 100% increase in irritability, a 50% increase in fatigue and anxiety, and a 30% increase in depression” (Ferguson et al., 1999, pg. 586). As a result, there appeared to be a circular effect that symptom-expectation-stress-reactivity reinforcement may result as well as maintain PCS symptoms (Ferguson et al., 1999).

Multiple Concussions

Risk factor. Previous studies with high school and collegiate athletes have indicated that multiple concussions are found to have cumulative effects, an increased risk of future concussions, overall greater severity of concussions (Iverson, Gaetz,

Lovell, & Collins, 2004; Iverson et al., 2006) and symptoms persisting for a longer period of time (Bruce & Eschemendia, 2004). Multiple studies have found that the risk of experiencing a concussion in football has been found to be four-to-six times greater if the player has already experienced a concussion (Gerberich, Priest, Boen, Straub, & Maxwell, 1983; Guskiewicz et al., 2007; Zemper 1994). It is important to note that football is the highest risk sport for experiencing a concussion (Delaney, 2004) and was found to account for nearly 63% of concussions in sports (Kaut et al., 2003). Moreover, 20% of the 62,000 high school football players who incur a concussion each year have been diagnosed with multiple concussions (McClincy et al., 2006). Delaney and associates (2002) found that during the 1998 year, 70.4% of participants who played football experienced a concussion. Approximately 84% of those concussed participants experienced more than one episode and 27.2% experienced more than five concussions (Delaney et al., 2002). One athlete claimed that he had experienced 99 occurrences in one season (Delaney et al., 2002). In regard to soccer, another high-risk sport for concussions (Delaney, 2004), 62.7% of the participants in their study experienced a concussion during the 1998 season (Delaney et al., 2002). Approximately 82% percent of those concussed athletes experienced more than one concussion and 11.9% experienced more than five concussions (Delaney et al., 2002).

Multiple concussed athletes were found to have more severe, immediate symptoms following their next concussion, such as headaches, memory problems, problems with the ability to think (Iverson et al., 2004; Iverson et al., 2006) as well as long-term alterations in neurophysiology, subjective symptoms, and neuropsychological

impairments (Delaney et al., 2002; Iverson et al., 2006; Macciocchi et al., 2001).

Multiple concussed athletes were six times more likely to experience post-traumatic amnesia and approximately eight times more likely to experience five or more minutes of mental disturbances (Iverson et al., 2004). These athletes were found to have greater critical changes in memory performance, and were more likely to require a longer recovery period (Iverson et al., 2004; Iverson et al., 2006). In addition, these symptoms could become permanent (Iverson et al., 2004).

Development of second impact syndrome. As a result of multiple concussions, certain athletes are at risk of developing second impact syndrome. First described in 1973 by Schnieder, second impact syndrome (SIS) is a concussion received while an athlete is still symptomatic from an earlier concussion (Kushner, 2001). Between 1980 and 1993, The National Center for Catastrophic Sports Injury Research recognized 29 cases of SIS (Mueller & Cantu, 2000). Each of these cases was found to have preexisting head injuries, persistent concussive-type symptoms (often disregarded or unacknowledged), and a second impact to the head or torso of the athlete (Mueller & Cantu, 2000).

Results of second impact syndrome. A second impact often results in a loss of the brain's "ability to autoregulate intercranial and cerebral perfusion pressure" (Fisher & Vaca, 2004, p. 264) as well as massive cerebral hyperemia and cerebral edema followed by fatal herniation (Fisher & Vaca, 2004). Death can occur rapidly with significantly little time to save the athlete (Fisher & Vaca, 2004). Second impact syndrome has been found to have a mortality rate of approximately 50% and a

morbidity rate reaching as high as 100% (Mueller, 2001). Iverson and associates (2004) found that, in literature between 1992 and 1997, at least 17 deaths were related to SIS according to literature examined (Cantu & Voy, 1995). Most of these cases were athletes ranging in age from 13 to 18 years old (Iverson et al., 2004). The National Center for Catastrophic Sports Injury Research collected data with the assistance of coaches, athletic trainers, athletic directors, executive officials of state and national athletic organizations, a national newspaper clipping service, and researchers on catastrophic head injury. It was found that from 1945 to 1999, except in 1990, a fatality had occurred every year as a result of a head injury (Mueller, 2001). Of the 712 deaths that occurred in football from 1945 to 1999, 491 (69%) were a result of head injuries (Mueller, 2001). As a result of these deaths, in 1976 a rule, which prohibited initial contact of the head and face, was put into effect as a result of the high fatalities in football due to head injuries (Mueller, 2001). This rule decreased the amount of fatalities but athletes are still at a deadly risk of experiencing a second impact prematurely (Mueller, 2001).

In regard to other sports that are at high-risk of concussions occurring, three deaths occurred in the pole vault and a number of catastrophic head injuries have occurred as a result of being hit by a thrown discus, shot put, or javelin (Mueller, 2001). Cheerleading has accounted for over 50% of catastrophic head injuries in female participants within the last 17 years (Mueller, 2001).

Given the potentially serious consequences of a head injury of any severity or amount, accurately identifying the risk factors and developing methods for managing

and preventing sports-related head injuries are of vital importance (Kaut et al., 2003). The only way to prevent an athlete from the risk of mortality due to multiple concussions is to manage the first one effectively and efficiently. Presently, there still remains a debate on how to manage and prevent future sports-related concussions. The acknowledgement of concussions, the repercussions that may occur post-injury, and the management of these concussed athletes pose to be among the greatest challenges for high school and collegiate athletic trainers, team physicians, and other medical personnel involved with athletics (Kaut et al., 2003) as well as friends and family of the injured individual.

Sources of External Stress Following a Concussion

Lack of knowledge of “invisible injuries”. A concussion is often viewed as an “invisible injury” (Bloom et al., 2004; Mainwaring et al., 2004) in which there are no visible signs of injury. It is very complicated to specify the type of brain injury without standardized, sensitive diagnostic tests (Mainwaring et al., 2004). In addition, recovery time can vary from athlete to athlete (McClincy et al., 2006) as well as the severity of the symptoms (McCrea, 2001b). As previously mentioned, the majority of concussions occurred at the high school and collegiate level, yet many coaches, athletic trainers, and team doctors were unaware of the detrimental consequences that could occur when an athlete returns back to play prematurely (McClincy et al., 2006).

Another issue that complicates sports-related concussions is that coaches, athletic trainers, team doctors, and athletes may be limited in understanding the relationship between a sports-related concussion and the symptoms that occur in the

days and weeks following the injury (Kaut et al., 2003). This may cause stress for some concussed athletes. Kaut and associates (2003) were interested in finding out the amount of head injuries and related symptoms that occurred in 461 college athletes, as well as the knowledge of the consequences of this injury. The athletes completed a concussive head injury survey at the beginning of the season and it was found that less than 20% of athletes who were experiencing a concussion actually realized they had suffered a concussion (Kaut et al., 2003). In addition, more than half of all athletes in the study indicated that they did not understand the results that could occur from an injury, such as a concussion (Kaut et al., 2003). The acknowledgement of concussions, the repercussions that may occur post-injury, and the management of these concussed athletes pose to be among the greatest challenges for high school and collegiate athletic trainers, team physicians, and other medical personnel involved with athletics (Kaut et al., 2003). Furthermore, greater mood disturbances are likely to occur when an athlete has little knowledge or receives little information about the injury or the recovery period (Mainwaring et al., 2004).

Social environment. The biggest problem identified today that a sports-related concussed athlete experiences is the “culture of risk”, a social environment which emphasizes the belief that an athlete should continue playing despite feelings of pain or discomfort that the athlete is experiencing (Mainwaring et al., 2004). This is further supported through the harsh media commentary that applies extreme amounts of pressure on athletes to continue playing despite receiving an injury (Bloom et al., 2004). This will often lead to an increase in anxiety and frustration and the likelihood that an

athlete will return to play well before he is physically and psychologically ready to play. The strategy of pushing through pain as a result of a concussion will often lead to setbacks (Johnston et al., 2004).

Another reason that athletes experience stress following a concussion is that many individuals may feel that they are letting down the team by being injured and fear that they may be ignored by their teammates and coaches now that they are injured (Robbins & Rosenfeld, 2001). In a follow-up study of the injuries on the US ski team, it was found that more than half of the skiers found their coaches became distant, insensitive to their injury, held a lack of belief in the team, and provided inappropriate and insufficient help during the recovery process (Udry, Gould, Bridges, & Beck, 1997).

The amount and type of social support has been found to have an effect on an athlete following a sports-related concussion, although social support is not universally beneficial. It has been found that without receiving social support following a TBI, the symptoms that the injured person is feeling may intensify (O'Connor et al., 2005). Another problem with social support has been the lack of understanding with the restraints of the injury. Many family members may not understand the rehabilitation process and the feelings that an individual is experiencing following an injury (Bianco, 2001), which can affect the amount and type of social support provided.

Too much social support can lead to unwanted pressure and can be just as unhelpful as a lack of social support (Bianco, 2001). Concussions can cause a significant disruption to daily activities, such as academics and sports, which affects the

whole family through parental time off from work and arranging for care of the injured athlete (Abernethy & MacAuley, 2003). This can impact the pressure that a parent places on the athlete to return back to the typical lifestyles they had previous to the injury.

Fears. Athletes have indicated that fear of re-injury and kinesiophobia, the fear of movement, (Tripp, Stanish, Ebel-Lam, Brewer, & Bichard, 2007) are common concerns associated with returning to sports participation (Thomee et al., 2006). This psychological barrier must be overcome before an individual is able to return to full activity level following an injury (Cupal & Brewer, 2001; Tripp et al., 2007). Athletes will often experience feelings of apprehension, anxiety, or even fear as a result of consequences from previous injuries (Chase, Magyar, & Drake, 2005). A major contributing factor is the athlete's lack of confidence in his or her ability to perform successfully without being injured again (Chase et al., 2005). It can be assumed that specifically in the case of sports-related concussions, many athletes may fear that if they return to play prematurely and are re-injured, they may potentially experience second impact syndrome.

Research has shown that other fears also experienced by individuals following an injury were a fear of loss of fitness, fear of loss of independence, fear of asking for assistance, and fear of losing a spot on the team (Chase et al., 2005; Tracey, 2003). Overall, any fear indicated by an athlete following an injury is typically a result of a high level of identity, significant time investment in the sport, and being eliminated from sports participation that has become an important aspect of one's life (Tracey,

2003).

Coping

Coping is defined as the constant changing of a person's cognitive and behavioral ways to deal with specific internal and external demands that are perceived as difficult to the individual (Anson & Ponsford, 2006). A person can deal with this distress by either directly dealing with the situation itself, by becoming educated in managing the situation, or by changing the situation (Anson & Ponsford, 2006). On the other hand, the person can dwell on the emotional responses to the situation at hand by avoiding or denying it (Anson & Ponsford, 2006). The biggest problem a person may experience following a TBI is the cognitive sequelae that follows this injury (Anson & Ponsford, 2006). Head injuries, such as concussions, are not only a threat to life but a threat to the individual's development and a situation where previous coping mechanisms may be unavailable (Anson & Ponsford, 2006). A person may have difficulties recalling adaptive strategies used in the past, flexibly choosing the appropriate strategy to use, and maintaining attentional focus necessary to use the desired mechanism (Anson & Ponsford, 2006).

Time following the injury and age were found to be associated with an individual's style of coping. Younger children who experience an injury were likely to respond with lower levels of adaptive, active, problem-focused coping mechanisms due to the lack of knowledge and experience with effective coping strategies (Anson & Ponsford, 2006). As time progresses following an injury, it was likely for an individual to begin losing hope and rely on avoidant coping mechanisms rather than active,

problem-focused coping (Anson & Ponsford, 2006; Powell et al., 2007).

Providing an athlete with a wide range of coping strategies prior to an injury could enhance the athlete's ability to manage the uncertainty, stress, and adjustments that occur following a TBI (Anson & Ponsford, 2006). Some examples of active coping include working on the problem and using humor and enjoyable activities to handle stress (Anson & Ponsford, 2006). By educating the athlete on the symptoms and proper management techniques, the athlete should feel in control and feel a sense of control over the outcome following a concussion resulting in more active, problem-focused coping and better psychological outcome (Anson & Ponsford, 2006).

Social Support

Social support was found to be a valuable way of helping athletes cope effectively with an injury by influencing a positive management, treatment, and rehabilitation (Bianco, 2001) following a sport injury. This includes listening support, emotional comfort and challenge, shared reality of the issue, challenges and appreciation for techniques, and getting assistance when needed (Bianco, 2001). Individuals in support groups improved their psychological state by decreasing feelings such as anger, confusion, frustration, anxiety, depression, and isolation (Johnston et al., 2004).

Satisfaction with social support. Several authors have found that social support is only effective when the injured person is satisfied with the social support given; therefore, it is important for the support to be positive, confront the issue at hand, and match the expectation of the injured person (Bianco, 2001). By recognizing the

challenges associated with the injury and treatment period, those involved in developing and giving social support interventions would be best in aiding the injured athlete to return efficiently (Bianco, 2001). The athlete's perception of social support, as well as other influencing factors, could mediate the emotional responses and recovery after a concussion (Mainwaring et al., 2004). The nature and degree of the athletic injury would influence the amount and type of support that the athlete needs to manage the injury (Bianco, 2001).

Bianco (2001) conducted a study to examine the importance of coping resources following an athletic injury by conducting open-ended interviews with 10 high-performance skiers who had recovered from serious sporting injuries, including one concussion. It was found that, in skiers, when psychological disruption occurred following an athletic injury, listening emotional support was most needed (Bianco, 2001). In addition, Bianco (2001) concluded that skiers found the effectiveness of social support to be influenced by the level of intimacy between the injured athlete and the supporter and the quality of relationship the athlete has with the supporter. The skiers indicated that family and close friends were constant emotional support throughout the post-injury period (Bianco, 2001). The support was not asked for and would occur spontaneously, indicating that the supporters were aware of the skiers' needs and desires (Bianco, 2001). In addition, the athletes indicated that it was crucial for their families to remain positive, optimistic, and unconditional in their social support.

Individuals providing social support. In addition to the type and amount of support that an injured athlete receives, the people providing the social support are

important as well. Bianco (2001) concluded that skiers found the effectiveness of social support to be influenced by the level of expertise the supporter has, the level of intimacy between the injured athlete and the supporter, and the quality of the relationship the athlete has with the supporter. The most common social support providers for athletes are teammates, coaches, medical staff, and family.

Family. To have a successful recovery following an injury, familial actions and support has been found to be vital (Van Baalen et al., 2007). The type of support that parents provide aids the patient to effectively cope with the stressful reality of the chronic physical, psychological, emotional, and behavior issues that have or potentially may arise (Van Baalen et al., 2007). The biggest issue with family social support is the fact that the injury could impact the family lifestyle significantly as well. This could lead to the social support provider being stressed as well. Some research has shown that families suffer as much, if not more, than the injured individual, especially with severe injuries such as a traumatic brain injury (Benn & McColl, 2004). Table 1 provides information regarding the type of social support from family (and friends) based on the results of Bianco's study on social support in elite skiers.

Following an injury, families often experienced dramatic mood swings, ranging from fear to happiness to discouragement, and could reach the point of depression (Conoley & Sheridan, 1996). This could be highly influenced based on the caregiver's own coping style and perception of social support (Van Baalen et al., 2007) as a result of the stress of the diagnosis and treatment of the injury (Benn & McColl, 2004).

Table 1

Social Support of Family (And Friends) during Each Phase of the Recovery

Phase of Recovery	Emotional Support	Informational Support	Tangible Support
Injury phase	<ul style="list-style-type: none"> - Listen to the athlete - Offered emotional comfort - Offered unconditional support - Expressed empathy 	N/A	N/A
Rehabilitation phase	<ul style="list-style-type: none"> - Listened to the athlete - Offered emotional comfort - Offered unconditional support - Expressed empathy - Helped athlete stay positive - Offered encouragement 	<ul style="list-style-type: none"> - Acknowledged effort - Provided Feedback 	- Helped athlete get around
Return to full activity phase	N/A	N/A	N/A

The day-to-day effects of a traumatic brain injury on a child require parents to be able to alter and reframe their perceptions and interpretations as a result of the present obstacles (Benn & McColl, 2004).

Van Baalen and associates (2007) were interested in investigating how the coping style of a caregiver influences the functional outcome of an individual who has experienced a traumatic brain injury. The first 51 consecutive patients with caregivers

were used from the longitudinal Rotterdam TBI study (Van Baalen et al., 2007). It was found that the way that a caregiver copes with the injury would have a substantial influence on the caregiver themselves in addition to the outcome of the TBI patient (Van Baalen et al., 2007). The better the caregiver dealt with the situation, the better the patient recovered (Van Baalen et al., 2007). When familial functioning was unhealthy, there was a lower improvement rate on the disability rating scale and the TBI patient's overall level of functioning (Van Baalen et al., 2007). It was concluded that having a passive coping style has a negative impact with the functional participation outcome of the patient (Van Baalen et al., 2007).

Research has shown that the satisfaction of caregivers was significantly related to social support with practical support being essential to the functioning of the family (Benn & McColl, 2004). The use of problem-focused coping allowed for families to experience less psychological distress (Benn & McColl, 2004), which would ultimately be beneficial for the support they are then providing to their child. Overall, the positive relationship between perception-focused strategies and family cohesion that has been found in research implies that families who are more successful in adapting to the obstacles that may arise with an injury are those that are found to be more intact and a cohesive family environment as a whole (Benn & McColl, 2004). It could be assumed that this family environment would have a direct impact on the social support parents or legal guardians provide to their injured athletes.

Coach. Head and assistant coaches serve as a valuable form of social support following an athletic injury because they can have a significant effect on the quality and

experience of the recovery process (Podlog & Eklund, 2007; Robbins & Rosenfeld, 2001). One reason for this is they are often the ones to determine who will be playing and who will be sitting on the bench each day. Coaches have the ability to encourage an injured athlete to return to play, potentially enhancing self-esteem and indicating that the team needs the athlete, or ignoring the injured athlete which can contribute to feelings of frustration, anger, and possible discouragement from a positive recovery (Robbins & Rosenfeld, 2001) if perceived as a lack of importance to the team.

From the athlete's perspective, social support from coaches is necessary in various forms at different points post-injury (Podlog & Eklund, 2007). The need for emotional support is important for the athlete at the beginning of the rehabilitation process as he or she is attempting to grasp the reality of the injury; meanwhile, informational support is desired towards the end of the rehabilitation process to ensure that the athlete is not returning back to play prematurely (Podlog & Eklund, 2007). Table 2 further explains this concept based on the results of Bianco's (2001) study.

From the coach's perspective, taking a personal interest in the athlete by listening to concerns was important when providing accurate social support and maintaining a positive coach-athlete relationship despite the injury limitations (Podlog & Eklund, 2007). In addition, it is valuable for the coach to provide the athlete with positive encouragement, feedback, and reassurance if a poor performance or injury-related setback occurs by reminding the athlete what he or she has already accomplished and what he or she is still capable of accomplishing despite the potential injury limitation (Podlog & Eklund, 2007).

Table 2

Social Support of Coaches during Each Phase of the Recovery

Phase of Recovery	Emotional Support	Informational Support	Tangible Support
Injury phase	<ul style="list-style-type: none"> - Console athlete - Offer encouragement - Reassure athlete it's okay 	<ul style="list-style-type: none"> - Shared injury experiences - Offered words of wisdom 	<ul style="list-style-type: none"> - Oversaw arrangements - Organized transport to airport - Accompanied athlete to airport
Rehabilitation Phase	<ul style="list-style-type: none"> - Showed concern - Offered encouragement - Reassured athletes it's okay - Expressed belief in athlete - Offered emotional comfort - Help athlete stay positive 	<ul style="list-style-type: none"> - Shared experiences - Offered advice - Provided feedback - Acknowledged effort - Challenged athlete - Didn't pressure athlete 	<ul style="list-style-type: none"> - Maintained contact with athlete - Followed up on medical care
Return to Full Activity Phase	<ul style="list-style-type: none"> - Reassured athletes - Offered encouragement - Kept athlete positive - Expressed belief in athlete 	<ul style="list-style-type: none"> - Shared injury experiences - Offered words of wisdom - Reassured athlete that there was no pressure to perform 	<ul style="list-style-type: none"> - Worked closely with athlete - Offered individual training - Let athlete work at own pace

By helping the athlete set goals, coaches find the injured athlete to be excited about what direction their sporting ability is heading (Podlog & Eklund, 2007), ultimately motivating the athlete to recovery efficiently.

As expected, this sort of support, despite being desired and positive for the

athletic injury recovery experience, was not offered by all coaches involved in sports. Research has found that coaches believe that they can not be responsible for all aspects of the injury rehabilitation (Podlog & Eklund, 2007). Gould and associates (1997) conducted a study with the U.S. ski team regarding athletic injuries and found that only 19% of the athletes indicated support from their coaches. In a follow-up using the same athletes, two-thirds of the athletes described their coaches as being distant, insensitive to the injury, portraying a lack of hope in the athlete to return to play, and little guidance through the process following the injury (Udry et al., 1997).

Rosenfeld and associates (1989) conducted a study focusing on why coaches would not provide emotional support for their athletes and found that many coaches believed that it would be inappropriate to provide emotional support to the injured athlete. The injury was an opportunity for the athlete to grow and solve problems on one's own and it would be unfair to the rest of the team if attention was given to the injured athlete (Rosenfeld et al., 1989). Overall, the lack of social support from coaches can be extremely detrimental to the athlete returning to play because the sport-specific advice, encouragement, and feedback desired was not received when it was most needed from the coaches (Podlog & Eklund, 2007).

Teammates. Following an injury, such as a concussion, athletes will often feel isolated and estranged from their teammates and sport resulting in increased feelings of depression and anger and a decrease in vigor and motivation to return (Robbins & Rosenfeld, 2001). By having teammates help with the tedious details immediately following an injury, injured athletes were able to feel less stressed and overwhelmed

(Bianco, 2001). In addition, having former teammates offer supporting words of encouragement and advice based on his or her own experience were seen as an honor that these teammates were showing concern for them and encouraging them (Bianco, 2001). In a study conducted by Chase and associates (2005), female gymnasts' fear of injury, their sources of self-efficacy, and the psychological strategies used to overcome their fears was investigated using individual interviews. One gymnast indicated that "I usually talk to a friend [teammate] and she helps me out with that [the fears following an injury]. She tells me the opposite thing, that I can do it, and if I concentrate, I'll be fine" (Chase, 2005, p. 472). With the encouragement and support from teammates, it can be implied that these individuals will feel valuable and an important contributing factor to the team's success. On the other hand, research has shown that some individuals felt uncomfortable receiving attention from teammates and did not want to talk about the injury or the implications (Bianco, 2001). Table 3 provides the teammates results from Bianco's (2001) study on social support for elite skiers.

Medical staff. Athletes reported that the medical staff provided important sources of support because they are a major resource of information regarding the injury and can influence some of the emotional responses experienced (Tracey, 2003). In addition, similar to the coaches, the medical staff works closely with the recovering athlete following an injury (Robbins & Rosenfeld, 2001). An early to midseason moderate injury would more readily be accepted by the participants immediately if the medical staff reported that they would be able to return to competition because they could look forward to participating in the sport in the future (Tracey, 2003).

Table 3

Social Support of Teammates during Each Phase of the Recovery

Phase of Recovery	Emotional Support	Informational Support	Tangible Support
Injury Phase	<ul style="list-style-type: none"> - Offered encouragement 	<ul style="list-style-type: none"> - Shared injury experience 	<ul style="list-style-type: none"> - Collected athlete's gear - Packed athlete's bag - Got food for athlete - Ran errands for athlete - Accompanied athlete to airport
Rehabilitation Phase	<ul style="list-style-type: none"> - Offered encouragement - Offered emotional comfort - Expressed empathy - Expressed concern 	<ul style="list-style-type: none"> - Shared injury experience - Offered advice - Acknowledged effort - Provided feedback 	N/A
Return to Full Activity Phase	<ul style="list-style-type: none"> - Offered encouragement - Showed empathy 	<ul style="list-style-type: none"> - Challenged athlete - Shared injury experiences 	N/A

Being able to look ahead and plan goals to return to sporting competition served as a significant factor in how an athlete deals with the injury (Tracey, 2003). It is important for the medical staff to be attentive to how their verbal assessments and non-verbal expressions can significantly impact the affective responses of the athletes, especially for the rest of that day (Tracey, 2003). The medical staff may potentially be the most important provider of social support for a concussion because they provide the athlete with the knowledge that the individual may not already possess, especially

because there is a lack of agreement on this invisible injury (Robbins & Rosenfeld, 2001). These individuals allowed the concussed athlete to potentially gain control over the situation (Robbins & Rosenfeld, 2001). Table 4 provides the medical staff results from Bianco's (2001) study on social support in elite skiers.

Table 4

Social support of Medical Staff during Each Phase of the Recovery

Phase of Recovery	Emotional Support	Informational Support	Tangible Support
Injury Phase	N/A	N/A	N/A
Rehabilitation Phase	<ul style="list-style-type: none"> - Offer hope - Express concern - Offered listening support - Offered encouragement 	<ul style="list-style-type: none"> - Gave accurate diagnosis - Gave athlete-specific info - Provided feedback - Gave advice to athletes - Acknowledged effort - Pushed athletes harder 	<ul style="list-style-type: none"> - Recommended physiotherapists - Organized physiotherapy - Liaised with administrators - Was flexible with appointments
Return to Full Activity Phase	N/A	<ul style="list-style-type: none"> - Reassured athlete about recovery - Gave specific instructions 	N/A

Summary

Until recently, very little research has been conducted on sports-related concussions. The majority of the research today focuses on the neuropsychological symptoms following a sport-related concussion and ways to test for these symptoms. Research indicates that many external factors including the lack of knowledge regarding "invisible injuries", pressures from the external environment including the media,

parents, and coaches, and the fears associated with an injury, such as the fear of re-injury and fear of asking for assistance, will cause stress for athletes following a sports-related concussion.

As a result, social support has been found to play a major contributing role in the coping ability of the athlete in dealing with external sources of stress following a sports-related concussion. The amount of social support provided by parents, as well as other influential figures, is assumed to play a significant role in the way that the athlete will cope with the sources of stress following a sports-related concussion. Moreover, high school athletes are at the highest risk of incurring a concussion (Field, Collins, Lovell, & Maroon, 2003). Therefore, it is important to understanding how this population specifically will respond to a concussion and what can be done to aid the athlete in coping with the responses following a sports-related concussion.

The first purpose of this study was descriptive in nature and sought to gain more information regarding the external sources of stress and the social support experienced by high school athletes who have suffered a sports-related concussion. It was also designed to profile the demographic characteristics of high school athletes who experience concussions. Finally, the level of trait anxiety experienced prior to the injury and the state anxiety by the athlete post concussion was assessed nally, the level of trait anxiety experienced by the athlete post concussion was assessed.

Purpose 2 examined the relationship between overall levels of social support (provided that a total social support score can be obtained from the measure) and level of post concussion state anxiety the injured athlete experienced. In addition, the levels

of social support provided by different providers and the level of state anxiety an athlete experiences following a sports-related concussion was examined. The primary providers for this study consists of friends, family, coaches, athletic trainers, teammates, physical/medical staff, and any other individual the concussed athlete believed provided support. Levels of stress experienced were assessed by the amount of state anxiety reported after the concussion was obtained.

Chapter 3

Method

Participants

Seventeen participants who sustained a sports-related concussion while participating in a variety of high school sports during the period of November 2008 to December 2009 were asked to volunteer for this study. The average age of the participants was 16.00 (SD= \pm .791). The majority of athletes were playing football (n= 6, 35.29%), followed by basketball (n=3, 17.65%), soccer (n=2, 11.76%), lacrosse (n= 2, 11.76%), wrestling (n=1, 5.88%), hockey (n=1, 5.88%), baseball (n=1, 5.88%), and volleyball (n=1, 5.88%).

Measurements

Demographics Questionnaire. The demographics questionnaire (see Appendix A) served as a way to assess and account for variables that could potentially impact the results found in this study. When researching injuries in athletics, it is important to take into consideration the time of season that the injury occurs (Mainwaring et al., 2004). If it were during the season or will affect play in the season, the individual would likely respond differently than if the injury occurs during the off-season or towards the end of the season. It was also important to know the date that the injury occurred, the date that the sports-concussed athlete was cleared to return-to-play, and the date that the participant completed the surveys. This helped determine the length of time that the participant was unable to participate in sports and how long ago the participant was trying to recall retrospectively.

Other variables that were assessed in the demographics section was the sport that the individual participates in, the age of the participant, if the individual is hoping to receive a scholarship to play the sport in college, and how many concussions the individual had previously. Lastly, this questionnaire gave the athlete an opportunity to indicate with whom the athlete lives with (i.e., mom, dad, aunt, grandfather).

The Sources of Stress Scale (SSS) (Gould, Horn, & Spreemann, 1983) -- modified. This scale was a modified version of the Sources of Stress Scale (Gould, Horn, & Spreemann, 1983), which was originally designed to assess the sources of stress reported by wrestlers (See Appendix B). The questions were adapted to focus on external sources that may produce stress in a high school concussed athlete during the recovery period and once the athlete has been cleared to return to play by the athletic trainer. These included statements like “I worry about what my coach will think or say”, “I worry about letting my team down by being injured”, and “I worry about inconveniencing my family by being injured”. The scale has a total of 26 statements. There are no psychometric properties available with this measure. This information was used to determine how often a potential source of stress makes the athlete nervous or worried using a 7-point Likert Scale.

The State-Trait Anxiety Inventory (STAI) (Form Y) (Spielberger, Gorsuch, & Lushene, 1970) – modified. The STAI (Form Y) is an instrument aimed for measuring anxiety in adults using two separate 20-item self-report scales for measuring state (S-Anxiety) and trait (T-Anxiety) anxiety (see Appendix C). A 4-point Likert response format was used (1= Almost never; 2= Sometimes; 3= Often, 4= Almost

Always). The reliability, validity, and factor structure of the STAI (form Y) have been demonstrated across a variety of different samples (Spielberger & Rickman, 1991; Spielberger & Vagg, 1984) including neuropsychiatric patients and high school students (Spielberger, Ritterband, Sydeman, Reheiser, & Unger, 1995). The directions were slightly changed so that it was explicitly clear to the participant to answer each statement by retrospectively thinking about how they felt during the recovery period and once the individual has been cleared to return back to play. There are no psychometric properties available of this measure with the new directions.

The Norbeck Social Support Questionnaire (NSSQ) (Norbeck, 1995)-modified. The NSSQ measured multiple components of social support including functional properties of social support (e.g., emotional and tangible support) and network properties (e.g. stability of relationships), as well as providing descriptive data about recent losses of supportive relationships (See Appendix D). In addition, the amount of support from specific sources was calculated. The NSSQ took approximately 10 minutes to complete and consisted of nine items. Because the NSSQ is not a summative-type instrument, internal consistency was determined using a Pearson correlation and found that internal consistency for the NSSQ ranges from .88 to .96 for the three network properties (Number in Network, Duration of Relationships, and Frequency of Contact) (Norbeck, Lindsey, & Carrieri, 1981). The test-retest reliability for the three network properties were each .92 (Norbeck et al., 1981). This questionnaire has been used with nursing graduate students as well as employed adults (Norbeck et al., 1981; Norbeck, Lindsey, & Carrieri, 1983). This measure was modified

by providing a list of social support providers rather than having the participants indicate their own social support system. In addition, the directions were altered to ensure that it was clear to the participants how to complete the measurement.

Procedure

Once IRB approval was received, certified athletic trainers at high schools across America were contacted in numerous ways. A list of athletic trainers was obtained for the 2007 school year from the National Athletic Trainer's Association. In addition, high schools that use ImPACT, a computer program that measures numerous aspects of cognitive functioning, were obtained from www.impacttest.com. Since these high schools were active in neuro-cognitive testing for concussions, it was assumed that they would be most persistent in distributing the present study. From these lists, e-mail and phone numbers were obtained from either the school website or by calling up the school and asking for the certified athletic trainer's contact information. The athletic trainers were then contacted by e-mail or telephone and explained the study in hopes of receiving their assistance.

Of the 250 schools contacted, 33 schools initially agreed to participate in the study. Three schools never responded after agreeing to participate so they were dropped from the contact list and one school had to drop out due to the athletic trainer retiring with no replacement; therefore, a total of 29 schools actively participated in the study. It is unknown how many schools actually distributed the survey because it was the athletic trainer's responsibility to make the survey available to the athlete. After corresponding with the schools, it was clear that many athletic trainers had numerous concussions but

were unable to have the athlete complete the study due to numerous issues such as never seeing the athlete once cleared to return back to play. Subsequently, six schools were responsible for the 17 completed surveys.

Athletic trainers who evaluated a concussed athlete asked his or her parent/guardian if their child could participate in a study. All parents who agreed to participate in the study were administered a consent form to sign (see Appendix E). It was ensured that each participant had the option to participate in the study with no form of coercion from the school. The participants completed the survey through SurveyMonkey.com within one month of being cleared to return to play. SurveyMonkey.com is an on-line database that allows professionals to post surveys for studies. The participants accessed this website through the certified athletic trainer. It was preferred for the participant to complete the surveys on a computer in the office of the certified athletic trainer but if no computer was available, the participant was sent the website, through the certified athletic trainer, to be completed at the first available moment within the required one month deadline. Complete confidentiality was maintained because at no point in the testing session was the athlete required to identify him or herself. Informed assent was implied through the completion of the survey with a brief paragraph explaining this prior to beginning the study (see Appendix F).

The study was held throughout each of the sporting seasons from November 2008 to December 2009. A reminder was sent through e-mail to the certified athletic trainers to ensure that the data was collected for each sports-related concussion within the time requirement. Once notification had been received that the participant

completed the surveys, the certified athletic trainers were contacted to obtain more information regarding the severity of the injury.

Through SurveyMonkey, the researcher had complete access to the surveys and the answers provided. The identity and information recorded during the study for each subject remained confidential. All subjects were identified based on the date the injury occurred and the date that the athlete returned back to play, as indicated on the Demographics survey.

Data Analysis

For Purpose 1, descriptive statistics including central tendency and standard deviation were calculated for the Demographics Survey, the Sources of Stress Survey-modified, and the Norbeck Social Support Questionnaire - modified using the Statistical Package for Social Sciences (SPSS). For the State and Trait Anxiety Inventory, a scoring key provided by the author of the inventory, Dr. Charles D. Spielberger, was used to determine a score for state anxiety and trait anxiety. For the Norbeck Social Support Questionnaire- modified, the data was put into a single scoring sheet and SPSS was used to calculate variables, subscales, and source-specific scores. Each social support provider was placed into a category depending on the relationship the social support provider had with the sports-related concussed athlete (i.e., immediate family, extended family, sports-related individuals and healthcare providers, other).

For Purpose 2, a Pearson's Correlation using SPSS was run to determine the relationship between the amount of stress as a result of external sources of stress and the amount of social support from primary providers. Because of the small sample size

achieved, advanced regression techniques could not be used as originally planned. The alpha level used was $P > .05$.

Chapter 4

Results

The first purpose of this study was descriptive in nature and sought to gain more information regarding the external sources of stress and the social support experienced by high school athletes who have incurred a sports-related concussion. It was also designed to profile the demographic characteristics of high school athletes who experience concussions. Finally, the level of trait anxiety experienced by the athlete post concussion was assessed.

Purpose 2 examined the relationship between overall levels of social support (provided that a total social support score could be obtained from the measure) and level of post concussion state anxiety the injured athlete experienced. In addition, the levels of social support provided by different providers and the level of state anxiety an athlete experienced following a sports-related concussion was examined. The primary providers for this study consisted of friends, family, coaches, athletic trainers, teammates, physical/medical staff, and any other individual the concussed athlete believed provided support. Levels of stress experienced were assessed by the amount of state anxiety reported after the concussion was obtained. Because of the small sample size achieved, advanced regression techniques could not be used as originally planned.

Purpose 1: A Profile of the Concussed High School Athlete

Demographics. There were a total of 17 athletes that volunteered to participate in this study. Athletes ranged in age from 15- 18 years, with an average age of 16.00 (SD= \pm .791) years. The majority of the concussed athletes were playing football

(n= 6, 35.29%) when the injury occurred followed by basketball (n= 3, 17.65%). The majority of the injuries (58.82%) occurred during the beginning of or mid-season. Over half the injured high school athletes (52.94%) planned on playing a sport at the collegiate level. When asked about previous concussions (not including their current concussion), 52.90% never incurred a concussion. On average, the recovery period, which included the date of the injury to the date that the athlete was cleared to return back to play, was 15.12 days (SD = ± 13.41).

Sources of Stress Scale – modified. Specific sources of stress or worry that the athletes experienced after receiving their concussions are contained in Appendix G. A 7-point Likert scale was used. The higher the total number, the lower the amount of stress the athlete had. Concussed athletes worried most about getting re-injured (M= 3.94, SD= ± 2.11), about being able to get mentally ready to return to competition (M= 3.94, SD= ± 2.36), and about letting one's team down by being injured (M= 3.65, SD= ± 2.23). The concussed athletes worried least about the spectators getting on him or her (M= 5.76, SD= ± 1.82), that he or she had been misdiagnosed (M= 5.71, SD= ± 1.45), and about asking for assistance (M= 5.63, SD= ± 1.82).

State and trait anxiety levels experienced. The State Anxiety Inventory - modified retrospectively estimated the recovery period had a mean of 45.65 with a standard deviation of ± 11.49 while the Trait Anxiety Inventory- modified retrospectively estimated prior to the concussion had a mean of 38.71 with standard deviation of ± 11.38 . With the total scores for each inventory ranging from 20 to 80, these scores indicated that the athletes had moderately low anxiety as a personality trait

and only experienced moderately low anxiety following the injury. As would be expected from the previous research, there was a significant correlation between the State Anxiety Inventory - modified and the Trait Anxiety Inventory - modified ($r=.48$, $p=.05$).

The Norbeck Social Support Questionnaire – modified. The Norbeck Social Support Questionnaire - modified measures multiple components of social support including functional properties of social support (e.g., emotional and tangible support) and network properties (e.g. stability of relationships), as well as providing descriptive data about recent losses of supportive relationships. The data from this questionnaire were analyzed by putting the data into a single scoring sheet (Appendix I). Descriptive statistics was then be used to identify who provided social support, the level of social support provided, and the type of social support provided.

The Norbeck Social Support Questionnaire - modified focused on four categories of providers: (1) immediate family members; (2) extended family; (3) Sports-related individuals and Healthcare Providers; and (4) Other and measured the degree of social support provided by each provider category. It was important to compare these provider categories to whom the athlete lives with to further understand the relationship the participants had with each of the primary providers of social support (see for Figure 1). Research has shown that sports-related concussions not only impacts the athlete but the lifestyle of one's family can impact the social support provided (Van Baalen et al., 2008). It can be assumed that knowing who the athlete lives with will constitute who the athlete considers to be family. Most of the athletes currently live with a mother, father,

and sister.

Immediate Family. In general, all athletes indicated receiving emotional support from at least one member of the immediate family ($M=41.12$, $SD= \pm 13.13$). However, only 16 individuals indicated receiving tangible support from at least one immediate family member ($M= 21.25$, $SD= \pm 7.40$). The mean for total amount of support was 61.12 with a standard deviation of ± 21.16 . These scores indicated that a moderate amount of emotional, tangible, and total social support was provided from one's immediate family.

Mother. All athletes indicated receiving emotional social support from one's mother ($M= 12.94$, $SD \pm 4.71$, see Table 5). Sixteen athletes indicated receiving tangible social support from one's mother ($M=6.81$, $SD= \pm 2.34$, see Table 5). One athlete indicated that within the last year, one's mother was no longer available to provide social support (see Table 5).

Father. Sixteen athletes indicated receiving emotional social support from one's father ($M=13.44$, $SD= \pm 3.63$, see Table 5). Fifteen athletes indicated receiving tangible social support from one's father ($M=7.40$, $SD= 1.30$, see Table 5). No athletes indicated that within the last year, one's father was no longer available to provide social support (see Table 5).

Sister. Eleven athletes indicated receiving emotional social support from one's sister ($M=13.45$, $SD= \pm 3.48$, see Table 5) while 10 athletes indicated receiving tangible social support from one's sister ($M= 6.20$, $SD= \pm 2.90$, see Table 5). No athletes

indicated that within the last year, one's sister was no longer available to provide social support (see Table 5).

Brother. Nine athletes indicated receiving emotional social support from one's brother ($M= 12.80$, $SD= \pm 3.48$, see Table 5). In addition, nine athletes indicated receiving tangible social support from one's brother ($M=6.44$, $SD= \pm 1.88$, see Table 5). Only one athlete indicated that within the last year, one's brother was no longer available to provide social support (see Table 5).

Table 5

Social Support From Immediate Family

Social Support	Mother	Father	Sister	Brother
Emotional	n= 17	n= 16	n= 11	n= 9
Mean	12.94	13.44	13.45	12.89
SD	4.71	3.63	3.48	3.48
Tangible	n= 16	n= 15	n= 10	n= 9
Mean	6.81	7.40	6.20	6.44
SD	2.34	1.30	2.90	1.88
Overall				
Mean	19.35	20.38	19.09	19.33
SD	7.31	5.66	5.75	4.36
Loss of Social Support	1	0	0	1

Extended Family. A total of 14 athletes indicated receiving some type of support from extended family members (Emotional Support: $M= 49.50$, $SD= \pm 24.74$; Tangible Support: $M=25.29$, $SD= \pm 14.20$; Total Support: $M=74.93$, $SD = \pm 37.31$). This indicated a moderately high amount of emotional, tangible and total support provided to the athletes from individuals who rated extended family members.

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Grandmother. Thirteen athletes indicated receiving emotional social support from one's grandmother ($M=11.23$, $SD= \pm 5.50$, see Table 6) while 12 of these athletes also indicated receiving tangible social support from one's grandmother ($M= 5.92$, $SD= \pm 2.94$, see Table 6). Three athletes indicated that within the last year, one's grandmother was no longer available to provide social support (see Table 6).

Grandfather. Eight athletes indicated receiving emotional social support from one's grandfather (Mean= 12.75, $SD= \pm 4.86$, see Table 6). In addition, seven athletes indicated receiving tangible social support from one's grandfather ($M= 6.85$, $SD= \pm 2.61$, see Table 6). Two athletes indicated that within the last year, one's grandfather was no longer available to provide social support (see Table 6).

Aunt. Thirteen athletes reported receiving emotional social support from one's aunt. ($M=11.55$, $SD= \pm 4.40$, see Table 6). Twelve athletes indicated receiving tangible social support from one's aunt ($M=6.00$, $SD= \pm 2.15$, see Table 6). No athletes indicated that within the last year, one's aunt was no longer available to provide support (see Table 6).

Uncle. Thirteen athletes indicated receiving emotional social support from one's uncle ($M= 11.46$, $SD= \pm 4.54$, see Table 6) as well as receiving tangible social support from one's uncle ($M=6.00$, $SD= \pm 2.42$, see Table 6). No athletes indicated that within the last year, one's uncle was no longer available to provide social support (see Table 6).

Cousin. When cousins were examined, 13 athletes indicated receiving emotional social support from one's cousin ($M= 11.15$, $SD= \pm 4.56$, see Table 6). In

addition, 13 athletes indicated receiving tangible social support from one's cousin (M=5.92, SD= \pm 2.33, see Table 6). No athletes indicated that within the last year, one's cousin was no longer available to provide social support (see Table 6).

Table 6

Social Support from Extended Family

Social Support	Grandmother	Grandfather	Aunt	Uncle	Cousin
Emotional	n= 13	n= 8	n= 13	n= 13	n= 13
Mean	11.23	12.75	11.77	11.46	11.15
SD	5.50	4.86	4.40	4.54	4.56
Tangible	n= 12	n= 7	n= 12	n= 13	n= 13
Mean	5.92	6.86	6.67	6.00	5.92
SD	2.94	2.61	2.15	2.42	2.33
Overall					
Mean	16.69	18.75	17.92	17.46	17.23
SD	7.84	8.16	6.84	6.59	6.09
Loss of Social Support	3	2	0	0	0

Sports-Related Individuals and Healthcare Providers. Seventeen athletes indicated receiving emotional support from sports-related individuals and healthcare providers (M=42.59, SD= \pm 15.17). Fifteen athletes indicated receiving tangible support (M= 15.67, SD= \pm 7.98). The mean total amount of social support from these individuals was 58.26 (SD= \pm 21.49). This information indicated that sports-related individuals and healthcare providers provided the lowest amount of support, both emotionally and tangible.

Athletic Trainer. Sixteen athletes indicated receiving emotional social support from one's athletic trainer (M= 12.38, SD= \pm 3.34, see Table 7). Fifteen of these athletes

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also indicated receiving tangible social support from one's athletic trainer ($M = 4.67$, $SD = \pm 2.09$, see Table 7). No athletes indicated that within the last year, one's athletic trainer was no longer available to provide social support (see Table 7).

Coach. All athletes indicated receiving emotional social support from one's coach ($M = 10.18$, $SD = \pm 5.27$, see Table 7) while 15 of the athletes also indicated receiving tangible social support from one's coach ($M = 3.47$, $SD = \pm 2.48$, see Table 7). One athlete indicated that within the last year, one's coach was no longer available to provide social support (see Table 7).

Teammate. All athletes rated receiving emotional social support from one's teammate ($M = 11.71$, $SD = \pm 4.21$, see Table 7). Fourteen athletes indicated receiving tangible social support from one's teammate ($M = 4.86$, $SD = \pm 2.18$, see Table 7). Two athletes indicated that within the last year, one's teammate was no longer available to provide social support (see Table 7).

Healthcare Providers. Fourteen athletes felt that they received emotional social support from one's healthcare provider ($M = 11.00$, $SD = \pm 3.76$, see Table 7). Thirteen athletes indicated receiving tangible social support from one's healthcare provider ($M = 3.46$, $SD = \pm 3.05$, see Table 7). One athlete indicated that within the last year, one's healthcare provider was no longer available to provide social support (see Table 7).

Other. One athlete participant indicated that her boyfriend also provided emotional social support ($M = 2.00$, no SD). No tangible social support was indicated. One athlete also indicated that within the last year, other social support provider was no longer available to provide support.

Table 7

Social Support from Sports-Related Individuals and Healthcare Provider

Social Support	Athletic Trainer	Coach	Teammates	Healthcare Provider
Emotional Mean SD	n= 16 12.38 3.34	n= 17 10.18 5.27	n= 17 11.71 4.21	n= 14 11.00 3.76
Tangible Mean SD	n= 15 4.67 2.09	n= 15 3.47 2.48	n= 14 4.86 2.18	n= 13 3.46 3.05
Overall Mean SD	15.76 5.71	13.24 6.69	15.71 5.54	14.21 4.73
Loss of Social Support	0	1	2	1

Summary

In summary, the intention of Phase I was to examine what external sources of stress occur, the amount of anxiety, who provides social support, and the level and type of social support concussed athletes experience post-injury. Results revealed that these 17 athletes underwent moderately low anxiety post-injury when considering one's social environment, fears, and the lack of knowledge about concussions. The amount of anxiety experienced was linked to their level of trait anxiety. The primary providers of social support were the athlete's immediate family and the athletes received a moderate level of emotional and tangible support from them. As expected, sports-related individuals and healthcare providers bestowed the least amount of social support (both emotionally and tangible) to the concussed athletes.

Purpose 2: The Relationship between State Anxiety and Social Support

Purpose 2 of the study examined the relationship between anxiety experience post-concussion and the amount of social support provided post-injury. To test this relationship, a Pearson r correlation was performed to determine if a relationship existed between the post-concussion state anxiety score and total amount of support, total tangible social support, and total emotional support. Results indicated a non-significant, positive relationship between stress and the total amount of social support provided to a high school athlete following a sports-related concussion ($r=.114$, $p=.663$). A non-significant, positive relationship was also found between stress and the amount of emotional social support provided to the athlete ($r=.102$, $p=.697$). Unlike total support and emotional social support, tangible social support had a non-significant, negative relationship with external sources of stress following a sports-related concussion ($r=-.233$, $p=.369$).

The original design of the study called for a regression analysis that would examine the relationship between the amount of stress experienced and specific sources of social support. However, as a result of very small sample size achieved, this analysis could not be conducted.

Chapter 5

Discussion

Purpose 1: Stress and Social Support in Concussed Athletes

The first purpose of this study was descriptive in nature and sought to gain more information regarding the external sources of stress and social support experienced by high school athletes who have suffered a sports-related concussion. Specifically, this study examined who is providing social support, how much social support was being provided, the type of social support provided, and if there was a loss of social support due to the injury. It was also designed to profile the demographic characteristics of high school athletes who experience concussions. Finally, the level of trait anxiety experienced by the athlete post-concussion was assessed.

Overall, results of this study indicated that concussed high school athletes worried a moderately low amount following their injury. One explanation for the low level of stress could be the results found by Mainwaring and associates (2004). It was found that athletes with musculoskeletal injuries are typically the individuals with stress and confusion triggered by the uncertainty about the injury diagnosis and rehabilitation period and lack of information provided during rehabilitation. Concussed athletes are more likely to experience confusion and anxiety due to the neurocognitive dysfunctions experienced (Mainwaring et al., 2004). This is further explained by Hovda and colleagues (1992) research that indicates that brain trauma impairs normal neural activity resulting in neurological deficits that lead to a disruption of normal emotional reactions, such as the level of worrying.

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Another reason that the athletes did not worry a significant amount is because developmentally, high school athletes tend to believe that they are invincible. In other words, the athletes may not have worried about the recovery of a concussion since they may not believe that the negative consequences would happen to them.

It is interesting to note that when the athlete did worry, those thoughts were on fear of re-injury, being mentally ready to return, and letting their teammates down following their injury, which are external stressors for any type of injury, not just ‘invisible injuries’. As with any athlete, physical activity is a coping mechanism used to reduce stress, therefore, it would be assumed that athletes would experience high levels of stress when removed from physical activity, not from the type of injury that occurred.

Because the athletes had worried a moderately low amount, it came as no surprise that high school concussed athletes in this study experienced moderately low anxiety levels. These levels of anxiety involved both trait and state anxiety. Results of this study were also similar to Mainwaring and associates (2004), who examined the emotional responses to sports-related concussions. They found the amount of tension experienced by post-concussed athletes did not increase relative to pre-injury levels (Mainwaring et al., 2004). Furthermore, the participants’ moods returned to normal a full 10 days before returning back to play suggests that athletes respond to removal from competition with mood disturbances, but soon learn how to cope with these emotions leading to mood stability. Because the athletes had already been cleared to return back to play, this could be a very good explanation for why the results in this research found athletes to have moderately low levels of anxiety for both trait and state anxiety

(Mainwaring et al., 2004) as well as worried a moderately low amount.

As previous research would predict, state and trait anxiety were significantly correlated (Leddy et al., 1994). This correlation occurred in other previous research, such as an investigation conducted by Leddy and associates (1994) that examined levels of psychological effects before and after a sporting injury occurred. The State and Trait anxiety inventory was used and found to be significantly correlated ($r = .70$) indicating that athletes are at risk of experiencing emotional responses following an injury, such as anxiety (Leddy et al., 1994). It is important to note that Leddy and associates (2004) studied physical injuries, with 57% were to the head/neck/face in collegiate athletes while the present study focused 100% on head injuries in high-school athletes.

An athletic injury, such as a concussion, has been known to leave people feeling vulnerable (Powell et al., 2007), distressed (Leddy et al., 1994), isolated and separated from their team and sport (Mainwaring, 1999). Social support, particularly from individuals the athlete has close contact with, has been found to have a positive impact on the physical and psychosocial responses that results from an injury and the consequential external stressors (Hardy & Crace, 1993). Researchers have found that the primary providers of social support typically consist of family and friends, coaches, teammates, and professional medical providers (Gould et al., 1997; Powell et al., 2007; Rosenfeld et al., 1989). However, the type and amount of social support will vary based on the relationship the athlete has with the primary provider of social support.

Overall in this study, one's immediate family provided the most social support to an athlete following a sports-related concussion while sports-related individuals and

healthcare providers provided the least amount of support. Specifically, one's father ranked the highest in overall support and one's coach provided the least social support to the injured athlete. One reason for this could be that high school athletes still reside with one's family members. On the other hand, athletic trainers might provide a lack of social support due to the nature of the injury. Athletes that have physical injuries are more likely to spend time in the athletic training room than an individual with a sports-related concussion; therefore, a low level of social support might be felt since the concussed athlete is not seeing the athletic trainer on a constant basis.

This study only examined emotional and tangible social support. Emotional support is defined as the perception that the provider is acting in a caring and comforting way (Robbins & Rosenfeld, 2001), while tangible support is in the form of financial assistance, products, or gifts (Robbins & Rosenfeld, 2001). This study found that one's sister provided the most emotional social support and one's father provided the most tangible social support. One's coach provided the lowest amount of emotional support and one's healthcare provider provided the lowest amount of tangible social support. It is important to note that the difference between sister and father with emotional support differed by .1 and the difference between healthcare provider and coach for tangible support differed by .1. When asked about losing social support within the last year, one's teammate support was most typically lost.

These results could be supported and further explained based on previous research which indicated who is necessary in providing support, how much support is needed, and the type of support provided by different individuals following a sport-

related injury. Gould and associates (1997) investigated the value of social support after an athletic injury in the US Ski Team (one athlete had a concussion) and found that only 19% of athletes indicated the need for support from their coaches while 62% found social support from family and friends to be critical while recuperating. The type of support provided by coaches ranged from taking an interest in the athlete's well being and recovery to providing special attention to the athlete (Gould et al., 1997). Several of the injured athletes indicated that family and friends provided tangible assistance such as "taking me swimming at 5:30 a.m. three to four days a week" or "took me to therapy... fixed me dinner.. and took my dog on a walk" as well as emotional support described as "supportive" or "caring" (Gould et al., 1997, p. 391).

Similarly, Rosenfeld and associates (1989) found the primary providers of social support to be parents, friends, teammates, and coaches. However, coaches were perceived as providing support in the form of task challenge, task appreciation and emotional challenge support and did not provide reality confirmation support, listening support, and emotional support (Rosenfeld et al., 1989). It is important to indicate that the only types of social support that this study examined was emotional and tangible support, which could be an explanation for why coaches were perceived as providing the lowest amount of social support.

Robbins and Rosenfeld (2001) were interested in further understanding athletes' perception of social support provided by sports-related individuals and athletic trainers in collegiate athletes. It was found that athletes perceived that athletic trainers provided more satisfactory social support in comparison to head and assistant coaches (Robbins

& Rosenfeld, 2001).

One main variable to take into consideration is the sample used for each study. The present study did not consider the athlete's satisfaction with the social support received so it would be beneficial for future studies to consider this important concept. In addition, this study used high school athletes while Robbins and Rosenfeld used collegiate athletes. Another factor to take into to take into consideration is that the previous studies indicated above looked at athletes and social support considered college and professional athletes (Gould et al., 1997; Robbins & Rosenfeld, 2001; Rosenfeld et al., 1989) while this study looked at high school athletes. After high school, individuals typically do not reside with family members, therefore, the amount and level of satisfaction desired by high school athletes may differ.

Purpose 2: The Relationship between Stress and Social Support

The second purpose of this study was to further understand the relationship between the amount of stress caused by external sources of stress and the amount of social support provided. Results demonstrated that there was a non-significant relationship between the amount of stress and the amount of social support provided. In fact, the relationship is so minimal that there is almost no association between stress and social support.

No research has directly measured the total amount of social support received and the amount of stress experienced by concussed athletes. What is known from previous research is that it is clear that the amount of social support is not the only factor that is required to play a role in the relationship with the amount of stress

experienced. As Robbins and Rosenfeld (2001) found in their study, there must be a match between the athlete's needs and what the primary provider of social support is able to offer. Gould and associates (1997) were interested in identifying coping strategies that were influential in aiding the recovery of elite skiers who suffered season-ending injuries. Results found that athletes coped with the stress by "hanging out with friends" and "staying in touch with the skiing world and friends" (Gould et al., 1997, p. 388). In addition, other injured athletes were seen as role models for instrumental reasons such as increased motivation and effective techniques to recovery from the injury (Gould et al., 1997). More specifically, 71% of the successfully recovered skiers and 86% of the unsuccessfully recovered skiers felt interpersonal skills played a role in the amount of stress the athlete experienced from the injury (Gould et al., 1997). On the other hand, 14.3% of athletes used avoidance and isolation as a form of coping with the stress experienced (Gould et al., 1997). This variation in the desired amount and type of social support could be one explanation for the little relationship between the amount of stress and social support.

Another explanation for the lack of a significant relationship between stress level and amount of social support provided is the low sample size. Furthermore, because the stress experienced by the concussed athletes may have been due to physiological responses, social support may not play a role in relieving the level of stress experienced by the athlete.

Implications, Limitations, and Future Directions

The findings of this study are important because very little research has been

conducted on external sources of stress and social support for sports-related concussed high school athletes. One way to assist those who experience concussions is to better understand stress sources that accompany concussed athletes and ways to provide social support to concussed athletes. Unfortunately, no significant stress sources and social support relationships were found in this study which may be due to the low sample size. In addition, a moderately low level of worrying as a result of the external sources of stress (i.e. lack of knowledge, fears, and social environment) contradicted previous research that would have suggested that high stress levels following a sports-related concussion would increase an athletes' worrying.

This study has several limitations. First, this study had a very low sample size. This likely resulted from many factors including athletes who feel pressured to play and hide their symptoms may have been unwilling to complete the survey in fear of the repercussions or one's parents not wanting one's children to participate. In addition, was the necessity of having the athletic trainers be responsible for participant selection. Despite continuous efforts to be in contact with the athletic trainers to remind them of the study or to address any issues regarding the limitation of surveys, only six of the 33 participating schools were responsible for the 17 completed surveys. Most athletic trainers are extremely busy individuals and although they agreed to help select athletes, their busy schedules may have caused them to not be vigilant in providing the assistance needed to secure participation. The limited sample certainly limits the studies generalizability.

A second limitation of this study was that the participants had to retrospectively

consider their stress and social support during the recovery period rather than complete the survey during the recovery period itself. Following a concussion, there are many neurocognitive dysfunctions that can occur including memory loss, disorientation, and inability to focus on an assignment. By having the athletes complete the survey while recovering might have risked prolonging the recovery period since the brain needs to rest until the injury has healed and should be strained as little as possible. In addition, due to neuropsychological problems, the answers provided might not be accurate. On the other hand, having participants recall the recovery period runs the chance of relying on one's memory, which is not always precise.

A third limitation is the lack of psychometric properties for the measurement instruments used. The Sources of Stress Survey, the State- Trait Anxiety Inventory, and The Norbeck Social Support Questionnaire were all modified and therefore, the psychometric properties initially determined for the original forms may not accurately pertain to the altered forms. It is important to know the reliability and validity of measurements prior to using them, however, future psychometric research on these measurements will strengthen the present study.

Finally, the questionnaires were answered anonymously. While completing the measurement anonymously increased the likelihood of truthful answers being provided with little to no fear of consequences, it inhibited the ability to confirm any questionable data from the player. For this research, the ability to contact the athletes would clarify any miscommunication that may have occurred while the athletes were completing the survey. One example is that it appeared that the athletes were confused on one section

of the Norbeck Social Support Questionnaire. When asked “During the past year, have you lost any important relationships due to moving, a job change, divorce or separation, death, or some other reason?”, numerous athletes indicated no yet provided answers when asked to “Please indicate the number of persons from each category who are no longer available to you” and “Overall, how much of your support was provided by these people who are no longer available to you”.

The questions raised in this study are important ones and should be pursued in future research. Future research should include a larger sample size. The best approach to accomplish this would be to recruit more high schools to participate in the study and to prolong the data collection period until a significant amount of concussed athletes from across the United States has completed the survey. Moreover, an incentive system should be employed where athletic trainers are tangibly rewarded for their participation. Having a personal relationship with the athletic trainers at a minimum of 15 high schools might increase the likelihood of a more reliable study since knowing the trainer might increase the motivation of the athletic trainers to ensure that the athletes complete the study.

In terms of the rehabilitation period, future research should examine various points throughout the rehabilitation process. In the present study, the athletes were asked to base their answers on the period from when the injury occurred to when cleared to return back to play. Research has shown that it is important to evaluate athletes post-concussion at various points during the recovery process (Iverson et al., 2006). By looking at this, individuals such as the athletes, parents, coaches, and

healthcare providers would be more informed of specifics regarding the recovery following a sports-related concussion and may decrease the amount of stress that these individuals are experiencing during the recovery period. This could be accomplished by having the athlete complete the survey at the beginning of the season and then post-concussion, complete various forms of the survey at certain points throughout the recovery period, including after the athlete has been cleared to return back to play. In addition, more information regarding the limitations from the injury and the rehabilitation process would be beneficial to know. For example, some athletes are unable to attend school while others can return immediately.

It may be valuable for research to focus on the amount of previous concussions that occurred and the responses provided by the athletes. Research has found that athletes that have not had a previous concussion may be unaccustomed to the concussion symptoms and the recovery process, therefore becoming more stressed (Bruce & Echemedia, 2004) and potentially requiring more social support.

Finding out more information regarding the relationship with the primary providers of social support measured previous to the injury would allow researchers to further understand the type of relationship that the athlete had with each individual prior to the injury. In addition, more information could be obtained regarding the interaction the athlete had with each provider of social support. Research has shown that having coaches stay in contact with the athlete, being involved in the rehabilitation process and keeping the athlete involved with the team impacts the amount of social support felt by the athlete (Gould et al., 1997). The amount of social support received previous to the

injury might influence the amount of support expected to be received post-injury and should be further examined.

Finally, further research should be performed on the loss of relationships post-injury. This was briefly examined in this study but results were not significant due to the limited amount of information obtained from the athletes. Rather than knowing the general amount of social support lost by primary providers, it would be beneficial to learn how much support was lost per person and how much influence this had over the amount of stress that the athlete was experiencing. This ambiguous loss and boundary ambiguity can be associated with considerable stress and may correlate with the negative impact on parental and family relationships (Landau & Hisset, 2008).

Conclusion

In conclusion, athletes experienced moderately low stress from external sources. When stress did occur, it was caused by the fear of being re-injured, being mentally ready to return to play, and letting one's teammates down by being injured. The amount of state anxiety experienced by the athlete post-injury was significantly related to having the personality characteristic of being nervous. In other words, the athletes of this study had low levels of anxiety as indicated on both the Sources of Stress Survey-modified and the State Anxiety Inventory. The athlete also had low levels of anxiety previous to the injury as identified by the Trait Anxiety Inventory.

One's immediate family provided the most social support, both emotionally and tangible, with one's father providing the most overall support. When broken down by emotional support and tangible support, one's sister provided the most emotional

support followed by one's father. The father of high school concussed athletes' also provided the most tangible support. Sports-related individuals and healthcare providers provided the least social support, both emotionally and tangible, with one's coach providing the least overall support.

There is almost no association between the amount of stress from external sources and the amount of social support from primary providers. It is fair to assume that a stronger relationship would have been seen if a comparison was made based on the different types of social support provided (i.e., Emotional support, tangible support, informational support) and the expectation the athlete had regarding the social support being provided.

APPENDICES

APPENDIX A

Demographics Questionnaire

Date of Injury: _____ Date Cleared to Return Back to Play: _____
Today's Date: _____ Age: _____
High School: _____

1. What sport were you playing when the sports-related concussion occurred?

2. When did the injury occur?
 - a. Pre-Season
 - b. Beginning of season
 - c. Mid-season
 - d. End of season
3. Are you hoping to receive a scholarship for playing the sport that you received a sports-related concussion?
 - a. Yes
 - b. No
 - c. Unknown
4. Including this concussion, what is the total number of concussions you have been diagnosed with by either a certified athletic trainer or doctor?
 - a. 0
 - b. 1
 - c. 2
 - d. 3
 - e. 4 or more
5. Who do you live with? *(please check all that apply)*
 - a. Mother
 - b. Father
 - c. Sister
 - d. Brother
 - e. Grandmother
 - f. Grandfather
 - g. Cousin
 - h. Aunt
 - i. Uncle
 - j. Other: _____

APPENDIX B

Sources of Stress Survey (Gould, Horn, & Spreemann, 1983)—Modified

Please think back on the recovery period from your concussion. This includes the day that your concussion occurred to the day you were cleared to return back to play. We would like to know which of the following things caused you to worry and made you nervous during this time. Please indicate how often you experienced each of the items below.

1= Always 2= Almost Always 3= A lot 4= Sometimes 5= Hardly Ever

6= Hardly Ever

7= Never

1. I worried about what my coach thought or said

1 2 3 4 5 6 7

2. I worried about what my teammates thought or said

1 2 3 4 5 6 7

3. I worried about what my parents thought or said

1 2 3 4 5 6 7

4. I worried about getting re-injured

1 2 3 4 5 6 7

5. I worried about making mistakes

1 2 3 4 5 6 7

6. I worried about my physical condition since the injury occurred

1 2 3 4 5 6 7

7. I worried about performing up to my level of ability prior to the injury

1 2 3 4 5 6 7

8. I worried about being able to get mentally ready to return to competition

1 2 3 4 5 6 7

9. I worried about returning back to play prematurely

1 2 3 4 5 6 7

10. I worried about running out of gas- my physical condition

1 2 3 4 5 6 7

11. I worried about going stale

1 2 3 4 5 6 7

12. I worried about feeling weak

1 2 3 4 5 6 7

13. I worried about the spectators getting on me

1 2 3 4 5 6 7

14. I worried that I would lose my position on the team if I took too long to recovery

1 2 3 4 5 6 7

15. I worried about the lack of information that is known concussion

1 2 3 4 5 6 7

16. I worried that my coach was not educated on concussions

1 2 3 4 5 6 7

17. I worried that I had been misdiagnosed

1 2 3 4 5 6 7

18. I worried because I did not know what would occur during my recovery

1 2 3 4 5 6 7

19. I worried that my coach would think I was lying about my symptoms

1 2 3 4 5 6 7

20. I worried that my teammates would think I was lying about my symptoms

1 2 3 4 5 6 7

21. I worried that my parents would think I was lying about my symptoms

1 2 3 4 5 6 7

22. I worried that I was letting my team down by being injured

1 2 3 4 5 6 7

23. I worried about distinguish the symptoms associated with concussions from symptoms of daily life or a previous injury

1 2 3 4 5 6 7

24. I worried about asking for assistance

1 2 3 4 5 6 7

25. I worried about needing to rely on other people during my recovery period

1 2 3 4 5 6 7

26. I worried about inconveniencing my family by being injured

1 2 3 4 5 6 7

APPENDIX C

State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1970)- Modified

Retrospective State Anxiety Inventory

Read each statement below and indicate how you felt from the time you got your concussion to the time that you were cleared to return to play. Do not spend too much time on any statement, but give the answer which seems to describe how you felt. There are no right or wrong answers.

1= Not At All

2= Somewhat

3= Moderately So

4= Very Much So

Overall, while recovering my concussion...

1. I felt calm

1 2 3 4

2. I felt secure

1 2 3 4

3. I felt tense

1 2 3 4

4. I felt strained

1 2 3 4

5. I felt at ease

1 2 3 4

6. I felt upset

1 2 3 4

7. I worried over possible misfortunes

1 2 3 4

8. I felt satisfied

1 2 3 4

9. I felt frightened

1 2 3 4

10. I felt comfortable

1 2 3 4

11. I felt self-confident

1 2 3 4

12. I felt nervous

1 2 3 4

13. I was jittery

1 2 3 4

14. I felt indecision

1 2 3 4

15. I was relaxed

1 2 3 4

16. I felt content

1 2 3 4

17. I was worried

1 2 3 4

18. I felt confused

1 2 3 4

19. I felt steady

1 2 3 4

20. I felt pleasant

1 2 3 4

Trait Anxiety Inventory

Listed below are a number of statements which people have used to describe themselves. Reach each statement and indicate how you generally felt PREVIOUS TO YOUR SPORTS-RELATED CONCUSSION. Do not spend too much time on any one statement but give the answer which seems to describe how you generally felt. There are no right or wrong answers.

1= Almost Never

2= Sometimes

3= Often

4= Almost always

21. I felt pleasant

1 2 3 4

22. I felt nervous and restless

1 2 3 4

23. I felt satisfied with myself

1 2 3 4

24. I wished I could be as happy as others seem to be

1 2 3 4

25. I felt like a failure

1 2 3 4

26. I felt rested

1 2 3 4

27. I was "calm, cool, and collected"

1 2 3 4

28. I felt that difficulties are piling up so that I cannot overcome them

1 2 3 4

29. I worried too much over something that really doesn't matter

1 2 3 4

30. I was happy

1 2 3 4

31. I had disturbing thoughts

1 2 3 4

32. I lacked self confidence

1 2 3 4

33. I felt secure

1 2 3 4

34. I made decision easily

1 2 3 4

35. I felt inadequate

1 2 3 4

36. I was content

1 2 3 4

37. Some unimportant thoughts ran through my mind and bothered me

1 2 3 4

38. I took disappointments so keenly that I can't put them out of my mind

1 2 3 4

39. I was steady person

1 2 3 4

40. I got in a state of tension or turmoil as I thought over my recent concerns and interests

1 2 3 4

APPENDIX D

Norbeck Social Support Questionnaire (Norbeck, 1995)- modified

Please think about your recovery time from your concussion. Answer the following questions based on the amount of social support you have received during your recovery from each individual listed below. PLEASE ANSWER FOR ALL 14 INDIVIDUALS LISTED! If individuals do not apply, please choose Not Applicable.

NOTE: If you have more than one person in each category, such as three sisters, please chose the person that has the most impact on your recovery period

Example:

0 = not at all 1= a little 2= moderately 3= quite a bit 4= a great deal NA= Not applicable

Question 1:

How much does this person make you feel liked or loved?

1. Mother- A great deal
2. Father- Moderately
3. Sister- Not applicable
4. Brother- Not at all
5. Grandmother- Not applicable
6. Grandfather- Not applicable
7. Aunt- A great deal
8. Uncle- A great deal
9. Cousin- Moderately
10. Athletic Trainer- Moderately
11. Coach- Not at all
12. Teammate- Moderately
13. Healthcare Provider- Moderately
14. Other: Teacher- A great deal

0 = not at all 1= a little 2= moderately 3= quite a bit 4= a great deal NA= Not applicable

1. How much does this person make you feel liked or loved?

Mother	0	1	2	3	4	NA
Father	0	1	2	3	4	NA
Sister	0	1	2	3	4	NA

Brother	0	1	2	3	4	NA
Grandmother	0	1	2	3	4	NA
Grandfather	0	1	2	3	4	NA
Aunt	0	1	2	3	4	NA
Uncle	0	1	2	3	4	NA
Cousin	0	1	2	3	4	NA
Athletic Trainer	0	1	2	3	4	NA
Coach	0	1	2	3	4	NA
Healthcare Provider	0	1	2	3	4	NA
Other (Please Specify)_____	0	1	2	3	4	NA

2. How much does this person make you feel respected or admired?

Mother	0	1	2	3	4	NA
Father	0	1	2	3	4	NA
Sister	0	1	2	3	4	NA
Brother	0	1	2	3	4	NA
Grandmother	0	1	2	3	4	NA
Grandfather	0	1	2	3	4	NA
Aunt	0	1	2	3	4	NA
Uncle	0	1	2	3	4	NA
Cousin	0	1	2	3	4	NA
Athletic Trainer	0	1	2	3	4	NA
Coach	0	1	2	3	4	NA
Healthcare Provider	0	1	2	3	4	NA

Other (Please Specify)_____	0	1	2	3	4	NA
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3. How much can you confide in this person?

Mother	0	1	2	3	4	NA
Father	0	1	2	3	4	NA
Sister	0	1	2	3	4	NA
Brother	0	1	2	3	4	NA
Grandmother	0	1	2	3	4	NA
Grandfather	0	1	2	3	4	NA
Aunt	0	1	2	3	4	NA
Uncle	0	1	2	3	4	NA
Cousin	0	1	2	3	4	NA
Athletic Trainer	0	1	2	3	4	NA
Coach	0	1	2	3	4	NA
Healthcare Provider	0	1	2	3	4	NA
Other (Please Specify)_____	0	1	2	3	4	NA

4. How much does this person agree with or support your actions or thoughts?

Mother	0	1	2	3	4	NA
Father	0	1	2	3	4	NA
Sister	0	1	2	3	4	NA
Brother	0	1	2	3	4	NA
Grandmother	0	1	2	3	4	NA

Grandfather	0	1	2	3	4	NA
Aunt	0	1	2	3	4	NA
Uncle	0	1	2	3	4	NA
Cousin	0	1	2	3	4	NA
Athletic Trainer	0	1	2	3	4	NA
Coach	0	1	2	3	4	NA
Healthcare Provider	0	1	2	3	4	NA
Other (Please Specify)_____	0	1	2	3	4	NA

5. If you need to borrow \$10, a ride to the doctor, or some other immediate help, how much could this person usually help?

Mother	0	1	2	3	4	NA
Father	0	1	2	3	4	NA
Sister	0	1	2	3	4	NA
Brother	0	1	2	3	4	NA
Grandmother	0	1	2	3	4	NA
Grandfather	0	1	2	3	4	NA
Aunt	0	1	2	3	4	NA
Uncle	0	1	2	3	4	NA
Cousin	0	1	2	3	4	NA
Athletic Trainer	0	1	2	3	4	NA
Coach	0	1	2	3	4	NA
Healthcare Provider	0	1	2	3	4	NA
Other (Please Specify)_____	0	1	2	3	4	NA

6.If you were confined to bed for several weeks, how much could this person help you?

Mother	0	1	2	3	4	NA
Father	0	1	2	3	4	NA
Sister	0	1	2	3	4	NA
Brother	0	1	2	3	4	NA
Grandmother	0	1	2	3	4	NA
Grandfather	0	1	2	3	4	NA
Aunt	0	1	2	3	4	NA
Uncle	0	1	2	3	4	NA
Cousin	0	1	2	3	4	NA
Athletic Trainer	0	1	2	3	4	NA
Coach	0	1	2	3	4	NA
Healthcare Provider	0	1	2	3	4	NA
Other (Please Specify)_____	0	1	2	3	4	NA

1= Less than 6 months 2= 6 to 12 months 3= 1 to 2 years 4= 2 to 5 years

5= More than 5 years

7.How long have you known this person?

Mother	1	2	3	4	5
Father	1	2	3	4	5
Sister	1	2	3	4	5
Brother	1	2	3	4	5

Grandmother	1	2	3	4	5
Grandfather	1	2	3	4	5
Aunt	1	2	3	4	5
Uncle	1	2	3	4	5
Cousin	1	2	3	4	5
Athletic Trainer	1	2	3	4	5
Coach	1	2	3	4	5
Healthcare Provider	1	2	3	4	5
Other (Please Specify)_____	1	2	3	4	5

5= Daily 4= Weekly 3= Monthly 2= a few times a year 1=once a year or less

8. How frequently do you usually have contact with this person? (Phone calls, visits, or letters)

Mother	5	4	3	2	1
Father	5	4	3	2	1
Sister	5	4	3	2	1
Brother	5	4	3	2	1
Grandmother	5	4	3	2	1
Grandfather	5	4	3	2	1
Aunt	5	4	3	2	1
Uncle	5	4	3	2	1
Cousin	5	4	3	2	1
Athletic Trainer	5	4	3	2	1
Coach	5	4	3	2	1
Healthcare Provider	5	4	3	2	1

Other 5 4 3 2 1
(Please Specify) _____

9. During the past year, have you lost any important relationships due to moving, a job change, divorce or separation, death, or some other reason?

0= No

1= Yes

10. Please indicate the number of persons from each category who are no longer available to you.

_____ Mother

_____ Father

_____ Sister

_____ Brother

_____ Grandmother

_____ Grandfather

_____ Aunt

_____ Uncle

_____ Cousin

_____ Athletic Trainer

_____ Coach

_____ Teammate

_____ Healthcare Provider

_____ Other

0 = None at all 1= A little 2= A moderate amount 3= Quite a bit 4= A great deal

11. Overall, how much of your support was provided by these people who are no longer available to you?

Mother	0	1	2	3	4
Father	0	1	2	3	4
Sister	0	1	2	3	4
Brother	0	1	2	3	4
Grandmother	0	1	2	3	4
Grandfather	0	1	2	3	4
Aunt	0	1	2	3	4
Uncle	0	1	2	3	4
Cousin	0	1	2	3	4
Athletic Trainer	0	1	2	3	4
Coach	0	1	2	3	4
Healthcare Provider	0	1	2	3	4
Other (Please Specify)_____	0	1	2	3	4

APPENDIX E

Sources of Stress and the Social Support from Primary Providers Following a Sports-Related Concussion in High School Athletes: An Exploratory Study Informed Consent for High School Athletes

*For questions regarding this study,
Please contact:*

Tracey Covassin Ph.D, ATC
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Michigan State University
Phone: (517) 353-2010
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or

Arielle Goldsmith, B.S., B.A
Department of Kinesiology
Michigan State University
Phone: (516)815-6031
E-mail: goldsm43@msu.com

*For questions regarding your rights
as a research participant, please contact:*

Michigan State University's
Human Research Protection Program
202 Olds Hall
East Lansing, MI 48824
irb@msu.edu
Phone: (517)-432-4502
Fax: (517) 432-4503

Purpose:

The first purpose is to gain more information regarding the external sources of stress and the social support experienced by high school athletes who have suffered a sports-related concussion. The second purpose is to further understand the relationship between primary providers of support and the level of stress an athlete experiences from external factors following a sports-related concussion.

Consent:

Your child's participation in the research study is voluntary, as you may choose not to have your child participate at all. Your child has the right to refuse to answer certain questions, or discontinue participation at any time without penalty or loss of benefits. Circumstances may arise which might cause the certified athletic trainer to terminate your child's participation in the study before its completion.

General Experimental Procedures:

This study will require your child to complete four short surveys which will be distributed by the certified athletic trainer at your child's high school. All surveys will be completed on a computer through surveymonkey.com. The surveys must be completed within one month of your child being cleared to return to play. The four surveys include Demographics, the Sources of Stress Survey- Modified, the Norbeck Social Support Questionnaire, and the State-Trait Anxiety Inventory- Modified. Combined, they should take approximately 15 minutes to complete. A Demographics questionnaire will be distributed as a

way to assess and account for additional information that may be valuable for this study. This includes questions such as the date of the injury, the date the participant was cleared to return to play, and the date the survey was completed.

The Sources of Stress (SSS)- Modified will be used to assess the external sources of stress of a sports-related concussed athlete. The scale has a total of 26 statements. This information will be used to determine how often a potential source of stress makes athletes nervous or worried using a 7-point Likert Scale. The Norbeck Social Support Questionnaire (NSSQ) will assess the social support experienced by your child after he/she incurs a concussion. This item consists of nine items.

To measure the level of stress, the State-Trait Anxiety Inventory (STAI) will be distributed. The STAI (Form Y) is an instrument aimed for measuring anxiety in adults using two separate 20-item self-report scales for measuring states (S-Anxiety) and trait (T-Anxiety). A 4- point Likert response format is used.

Possible Risks:

You will not directly benefit from your child's participation in this study. However, you will receive exploratory information regarding how you can aid you child in recovering in a healthy way following a sports-related concussion. Sports-related concussions can not only affect the athlete but the individual's family as well. This information will be valuable in helping your child return to competition as soon as possible.

Confidentiality/Anonymity:

Participation in this study is completely voluntary. This only people who have access to your child's answers are the certified athletic trainer and the researcher. Your child's identity and information recorded during the study will remain confidential. Confidentiality will be protected by; (a) results will be presented in aggregate form in any presentations and publications; and (b) all data will be stored in a computer that has a password necessary to see confidential data. Your child's privacy will be protected to the maximum extend allowable by law. Your child may also discontinue participation at any time without penalty. Your child's participation in this research will not involve any additional costs to you or your health care insurer.

Disclaimer/Withdrawal:

If your child is injured as a result of participation in this research project, Michigan State University will assist you in obtaining emergency care, if necessary, for your child's research related injuries. If you have insurance for medical care, your insurance carrier will be billed in the ordinary manner. As with any medical insurance, any costs that are not covered or in excess of what are paid by your insurance, including deductibles, will be your responsibility. Financial compensation for lost wages, disability, pain or discomfort is not available. This does not mean that you are giving up legal rights you may have. You may contact Dr. Tracey Covassin at 517-353-2010 with any questions.

Institutional Contacts:

If you have any questions or concerns about your role and rights as a legal guardian to the research participant, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State Human Research Protection Program, at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 202 Olds Hall, MSU, East Lansing, MI 48824. Your signature below indicates your voluntary agreement for your child to participate in this study.

I, _____ have read and agree to allow _____ to
participate in this study as described above. *(Please Print Child's Name)*
(Please Print Your Name)

_____/_____/_____
(Please Sign Your Name) (Date)

This consent form was approved by the Biomedical and Health Institutional Review Board (BIRB) at Michigan State University. Approved 11/04/08 – valid through 11/03/09. This version supersedes all previous versions. IRB # 08-902.

Appendix F

Letter of Assent

Michigan State University Master's student, Arielle Goldsmith, is requesting your assistance with a research project investigating the external sources of stress and social support from primary providers for high school athletes who have experienced a sports-related concussion.

Purpose: The first purpose is to gain more information regarding the external sources of stress and the social support experienced by high school athletes who have suffered a sports-related concussion. To assess the external sources of stress of a sports-related concussed athlete, the Sources of Stress Survey (SSS)- Modified will be used. The scale has a total of 26 statements. This information will be used to determine how often a potential source of stress makes the athletes nervous or worried using a 7-point Likert Scale. To assess the social support experienced by high school sports-related concussed athletes, the Norbeck Social Support Questionnaire (NSSQ) will be distributed. The NSSQ measures multiple components of social support including type of social support (e.g., emotional and tangible support) and network properties (e.g. stability of relationships), as well as providing information about recent losses of supportive relationships. In addition, the amount of support from specific sources can be calculated. This item consists of nine items.

The second purpose is to further understand the relationship between primary providers of support and the level of stress an athlete experiences from external factors following a sports-related concussion. The NSSQ, which has been described above, will be used to determine who is or is not providing social support and how much social support is being by each of these individuals. To measure the level of stress, the State-Trait Anxiety Inventory (STAI) will be distributed. The STAI (Form Y) is an instrument aimed for measuring anxiety in adults using two separate 20-item self-report scales for measuring state (S-Anxiety) and trait (T-Anxiety). A 4-point Likert response format is used.

A demographic questionnaire will be distributed as a way to assess and account for additional information that may be valuable for this study. This includes questions such as the date of the injury, the date the participant was cleared to return to play, the dates the survey was completed.

Informed Assent: There are no identifying questions on any of the four surveys. Your responses will be returned to the survey website as anonymous data. You will indicate your voluntary agreement to participate in this research by completing and submitting the survey.

Possible Risks: There will be little to no discomfort to you. If you choose to participate you may chose to not answer certain questions or withdraw at any time without consequence. **All answers are strictly confidential.** Data may be released to IRB's and other funding agencies as required by law.

Benefits: You will directly benefit from participation in this study. This information will provide the sports medicine profession with the knowledge needed to help you, a concussed

athlete, recover from injury, as well as help guide family, friends, teammates, and coaches in aiding you in a healthy recovery.

General Experimental Procedures: Please click on the link below to begin the survey. The survey will take you approximately 10 minutes to complete. Your participation in this study is confidential. The results of this study may be published in a peer-reviewed journal; however any information that could identify you will not be included.

Institutional Contacts: This study has been approved by the human subjects committee at Michigan State University. Any questions about this study may be addressed to either myself or to the undergraduate Athletic Training Program Director, Dr. Tracey Covassin, Ph.D., ATC at 517-353-2010. Thank you for your participation and support.

http://www.surveymonkey.com/s.aspx?sm=jIIhufLnPRIHps8L7qwZkw_3d_3d

Sincerely,
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APPENDIX G

Table G.1

Mean and Standard Deviation of Sources of Stress Survey-Modified

	Mean	SD
<i>S1: I worried about what my coach thought or said</i>	4.47	2.13
<i>S2: I worried about what my teammates thought or said</i>	4.53	1.84
<i>S3: I worried about what my parents thought or said</i>	4.41	2.06
<i>S4: I worried about getting re-injury</i>	3.94	2.11
<i>S5: I worried about making mistakes</i>	4.35	1.66
<i>S6: I worried about my physical condition since the injury occurred</i>	4.41	2.09
<i>S7: I worried about performing up to my level of ability prior to the injury</i>	4.06	2.16
<i>S8: I worried about being able to get mentally ready to return to competition</i>	3.94	2.36
<i>S9: I worried about returning back to play prematurely</i>	4.06	2.14
<i>S10: I worried about running out of gas- my physical condition</i>	4.47	1.94
<i>S11: I worried about going stale</i>	5.29	1.53
<i>S12: I worried about feeling weak</i>	4.82	2.07
<i>S13: I worried about the spectators getting on me</i>	5.76	1.82
<i>S14: I worried that I would lose my position on the team if I took too long to recover</i>	4.50	2.37
<i>S15: I worried about the lack of information that is known about a concussion</i>	5.18	1.67
<i>S16: I worried that my coach was not education on concussions</i>	5.35	1.94

<i>S17: I worried that I had been misdiagnosed</i>	5.71	1.45
<i>S18: I worried because I did not know what would occur during my recovery</i>	5.00	1.66
<i>S19: I worried that my coach would think I was lying about my symptoms</i>	4.82	2.27
<i>S20: I worried that my teammates would think I was lying about my symptoms</i>	4.24	2.49
<i>S21: I worried that my parents would think I was lying about my symptoms</i>	5.00	2.26
<i>S22: I worried that I was letting my team down by being injured</i>	3.65	2.23
<i>S23: I worried about distinguishing the symptoms associated with concussions from symptoms of daily life or a previous injury</i>	4.53	1.84
<i>S24: I worried about asking for assistance</i>	5.63	1.82
<i>S25: I worried about needing to rely on other people during my recovery period</i>	5.24	2.14
<i>S26: I worried about inconveniencing my family by being injured</i>	5.47	1.91
<i>Total</i>	122.24	36.35

REFERENCES

References

- Abernethy, L. & MacAuley, D. (2003). Impact of school sports injury. *British Journal of Sports Medicine*, 37(4), 354-355.
- American Academy of Neurology. (1997). Practice Parameter: the management of concussion in sports (summary statement) report of the quality standards subcommittee. *Neurology*, 48, 581-585.
- Anson, K., & Ponsford, J. (2006). Coping and emotional adjustment following traumatic brain injury. *Journal of Human Trauma Rehabilitation*, 21(3), 248- 259.
- Aubry, M., Cantu, R., Dvorak, J., Graf-Baumann, T., Johnston, K.M., Kelly, J., et al. (2002). Summary and agreement statement of the 1st International Symposium on Concussion in Sport, Vienna 2001. *Clinical Journal of Sports Medicine*, 12(1), 6-11.
- Bailes, J.E. & Hudson, V. (2001). Classification of sports-related head trauma: A spectrum of mild to severe injury. *Journal of Athletic Training*, 36(3), 236-243.
- Bazarian, J. J., McClung, J., Shah, M.N, Cheng, Y.T., Flesher, W., & Kraus, J. (2005). Mild traumatic brain injury in the United States, 1998-2000. *Brain Injury*, 19(2), 85-91.
- Benn, K.M. & McColl, M.A. (2004). Parental coping following childhood acquired brain injury. *Brain Injury*, 18(3), 239-255.
- Bianco, T. (2001). Social support and recovery from sport injury: Elite skiers share their experiences. *Research Quarterly for Exercise and Sport*, 72(4), 376-388.
- Bloom, G.A., Horton, A.S., McCrory, P., & Johnston, K.M. (2004). Sport psychology and concussion: new impacts to explore. *British Journal of Sports Medicine*, 38, 519-521.
- Brewer, B.W. Cornelius, A.E., Van Raalte, J.R., Petitpas, A.J., Sklart, J.H., Pohlman, M.H, et al. (2003). Age-related difference in predictors of adherence to rehabilitation after anterior cruciate ligament reconstruction. *Journal of Athletic Training*, 38(2), 158-162.

- Bruce, J.M. & Echemendia, R.J. (2004). Concussion history predicts self-reported symptoms before and following a concussive event. *Official Journal of the American Academy of Neurology*, 63, 1516-1518.
- Cantu, R.C. & Voy, R. (1995). Second impact syndrome, *Physician and Sportsmedicine*, 23(6), 27-35.
- Center for Disease Control and Prevention (CDC). (2006). Sports-related injuries among high school athletes in the United States. *Morbidity and Mortality Weekly Report*, 55.
- Center for Disease Control and Prevention (CDC). (2007). Nonfatal traumatic brain injuries from sports and recreation activities- United States, 2001-2005. *Morbidity and Mortality Weekly Report*, 56.
- Chase, M.A., Magyar, M., & Drake, B.M. (2005). Fear of injury in gymnastics: Self- efficacy and psychological strategies to keep on tumbling. *Journal of Sports Sciences*, 23(5), 465-475.
- Conoley, J.C. & Sheridan, S.M. (1996). Pediatric traumatic brain injury: Challenges and interventions for families. *Journal of Learning Disabilities*, 29, 662-669.
- Cupal, D.D. & Brewer, B.W. (2001). Effects of relaxation and guided imagery on knee strength, reinjury anxiety, and pain following anterior cruciate ligament reconstruction. *Rehabilitation Psychology*, 46(1), 28-43.
- Delaney, J.S. (2004). Head injuries presenting to emergency departments in the United States from 1990 to 1999 for ice hockey, soccer, and football. *Clinical Journal of Sport Medicine*, 14(2), 80-87.
- Delaney, J.S., Lacroix, V.J., Leclerc, S., & Johnston, K.M. (2002). Concussions among university football and soccer players. *Clinical Journal of Sport Medicine*, 12, 331-338.
- Ferguson, R.J., Mittenberg, W., Barone, D.F., & Schneider, B. (1999). Post-concussion syndrome following sports-related head injury: Expectation as etiology. *Neuropsychology*, 13(4), 582-589.
- Fisher, J.M., & Vaca, F.E. (2004). Sport-related concussions in the emergency department. *Topics in Emergency Medicine*, 26(3), 260-266.

- Field, M., Collins, M.W., Lovell, M.R. & Maroon, J. (2003). Does age play a role in recovery from sports-related concussion? A comparison of high school and collegiate athletes. *The Journal of Pediatrics*, 142(5), 546-553.
- Gerberich, S.G., Priest, J.D., Boen, J.R., Straub, C.P., & Maxwell, R.E. (1983). Concussion incidences and severity in secondary school varsity football players. *American Journal of Public Health*, 73(12), 1370-1375.
- Gould, D., Horn, T., & Spreemann, J. (1983). Sources of stress in junior elite wrestlers. *Journal of Sport Psychology*, 5, 159-171.
- Gould, D., Udry, E., Bridges, D., & Beck, L. (1997). Coping with season-ending injuries. *The Sport Psychologist*, 11, 379-399.
- Gunstad, J., & Suhr, J. (2001). "Expectation as etiology" versus "the good old days": Postconcussion syndrome symptom reporting in athletes, headache sufferers, and depressed individuals. *Journal of the International Neuropsychological Society*, 7, 323-333.
- Guskiewicz, K.M., Bruce, S.L., Cantu, R.C., Ferrara, M.S., Kelly, J.P., McCrea, M., et al. (2004). National Athletic Trainers' Association position statement: Management of sports-related concussion. *Journal of Athletic Training*, 39(3), 280-297.
- Guskiewicz, K.M., Marshall, S.W., Bailes, J., McCrea, M., Harding Jr., H.P., Matthews, A., et al. (2007). Recurrent concussion and risk of depression in retired professional football players. *Medicine and science in Sports and Exercise*, 39, 903-909.
- Guskiewicz, K.M., Ross, S.E., & Marshall, S.W. (2001). Postural stability and neuropsychological deficits after concussion in collegiate athletes. *Journal of Athletic Training*, 36(3), 263-273.
- Hardy, C.J. & Crece R.K. (1993). The dimensions of social support when dealing with sports injuries. In D. Pargman (ed.), *Psychological bases of sports injuries* (pp.121-144). Morgantown, WV: Fitness Information Technology.
- Hovda, D.A., Becker, D.P., & Katayama, Y. (1992). Secondary injury and acidosis. *Journal of Neurotrauma*, 9 (S1), S47-S60.

- Iverson, G.L., Gaetz, M., Lovell, M.R., & Collins, M.W. (2004). Cumulative effects of concussion in amateur athletes. *Brain Injury*, 18(5), 433-443.
- Iverson, G.L., Brooks, B.L., Collins, M.W., & Lovell, M.R. (2006). Tracking neuropsychological recovery following concussion in sport. *Brain Injury*, 20(3), 245- 252.
- Johnston, K.M., Bloom, G.A., Ramsay J., Kissick, J., Montgomery, D., Foley, D., et al. (2004). Current concepts in concussion rehabilitation. *Current Sports Medicine Reports*, 3, 316-323.
- Kaut, K.P., DePompei, R., Kerr, J., Congeni, J. (2003). Reports of head injury and symptom knowledge among college athletes: Implications for assessment and educational intervention. *Clinical Journal of Sport Medicine*, 13, 213-221.
- Kushner, D.S. (2001). Concussion in sports: Minimizing the risk for complications. *American Family Physician*, 64(6), 1007-1012.
- Landau, J. & Hissett, J. (2008). Mild traumatic brain injury: Impact on identity and ambiguous loss in the family. *Families, Systems & Health*, 26(1), 69- 85.
- Leddy, M.H, Lambert, M.J., & Ogles, B.M. (1994). Psychological consequences of athletic injury among high-level competitors. *Research Quarterly for Exercise and Sport*, 65(4), 347-354.
- Macciocchi, S.N., Barth, J.T., Alves, W. Rimel, R.W., & Jane, J. A. (1996). Neuropsychological functioning and recovery after mild head injury in collegiate athletes. *Neurosurgery*. 39(3), 510-514.
- Macciochi, S.N., Barth, J.T., Littlefield, L., & Cantu, R.C. (2001). Multiple concussions and neuropsychological functioning in collegiate football players. *Journal of Athletic Training*, 36 (3), 303-306.
- Mainwaring, L.M., Bisschop, S.M., Green, R.E.A, Antoniazzi, M., Comper, P., & Kristman, V. et al. (2004). Emotional reaction to varsity athletes to sport- related concussion. *Journal of Sport and Exercise Psychology*, 26, 119- 135.
- Marshall, S.W. & Spencer, R.J. (2001). Concussion in rugby: The hidden epidemic. *Journal of Athletic Training*, 36(3), 334-338.

- McCauley, S.R., Boake, C., Levin, H.S., Contant, C.F., & Song, J.X. (2001). Postconcussional disorder following mild to moderate traumatic brain injury: Anxiety, depression and social support as risk factors and comorbidities. *Journal of Clinical and Experimental Neuropsychology*, 23(6), 792-808.
- McClincy, M.P., Lovell, M.R., Perdini, J., Collins, M., & Spore, M.K. (2006). Recovery from sports concussions in high school and collegiate athletes. *Brain Injury*, 20(1), 33-39.
- McCrea, M. (2001a). Standardized mental status assessment of sports concussion. *Clinical Journal of Sport Medicine*, 11, 176-181.
- McCrea, M. (2001b). Standardized mental status testing on the sideline after sport- related concussion. *Journal of Athletic Training*, 36(3), 274-279.
- McCrory, P., Johnston, K., Meeuwisse W., Aubry, M., Cantu, R., Dvorak, J., et al. (2005). Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004. *British Journal of Sports Medicine*, 39(4), 196-204.
- McCrory, P., Meeuwisse, W., Johnson, K. Dvorak, J., Aubry, M., Molloy, M., et al. (2009) Consensus statement of concussion in sport: The 3rd International Conference on Concussion in Sport held in Zurich, November, 2008. *British Journal of Sports Medicine*, 43, i76-i84.
- Mueller, F.O. & Cantu, R.C. (2000). *Annual survey of catastrophic football injuries, 1977-1999*. Overland Park, KS: National Collegiate Athletic Association, 1-21.
- National Collegiate Athletic Association (NCAA). (2004). Concussion or mild traumatic brain injury (mTBI) in the athlete. In *2009-10 NCAA Sports Medicine Handbook*. Retrieved November 20, 2009, from http://www.ncaapublications.com/Uploads/PDF/Sports_Medicine_Handbookc8cd2dbe-6aa9-4d9a-bbee-2e426d0759a2.pdf
- N.F.L. Acknowledges Long-Term Concussion Effects. (2009, December 21). *New York Times*, pg D1.
- Norbeck, J.S., Lindsey, A.M., & Carrieri, V.L. (1981). The development of an instrument to measure social support. *Nursing Research*, 30, 264-269.

- Norbeck, J.S., Lindsey, A.M., & Carrieri, V.L. (1983). Further development of the Norbeck social support questionnaire: Normative data and validity testing. *Nursing Research*, 32, 4-9.
- Norbeck, J.S. (1995). *Norbeck social support questionnaire*. Retrieved on August 15, 2008, from the University of California, San Francisco, School of Nursing website: <http://nurseweb.ucsf.edu/www/ffnorb.htm>
- O'Conner, C., Colantonio, A., & Polatajko, H. (2005). Long term symptoms and limitations of activity of people with traumatic brain injury: A ten-year follow-up. *Psychological Reports*, 97, 169-179.
- Perna, R. (2005). Major depression and suicidality following brain injury. *The Journal of Cognitive Rehabilitation*, 23, 5-7.
- Podlog, L. & Eklund, R.C. (2007). Professional coaches' perspective on the return to sport following serious injury. *Journal of Applied Sport Psychology*, 19, 207-225.
- Powell, J.W. & Barber-Foss, K.D. (1999). Traumatic brain injury in high school athletes. *Journal of American Medical Association*, 282(10), 958-963.
- Powell, T., Ekin-Wood, A., & Collin, C. (2007). Post-traumatic growth after head injury: A long-term follow-up, 21, 31-38.
- Robbins, J.E. & Rosenfeld, L.B. (2001). Athletes' perceptions of social support provided by their head coach, assistant coach, and athletic trainer, pre-injury and during rehabilitation. *Journal of Sport Behavior*, 24(3), 277-297.
- Rosenfeld, L.B., Richman, J.M., & Hardy, C.H. (1989). Examining social support networks among athletes: description and relationship to stress. *Sport Psychologist*, 3, 23-33.
- Ross, M. & Conway, M. (1986). Remembering one's own past: The construction of personal histories. In R.M. Sorrentino & E.T. Higgins (Eds.), *Handbook of motivation and cognition* (Vol. 1, pp. 122-144). New York: Guilford Press.
- Ryan, L.M. & Warden, D.K. (2003). Post concussion syndrome. *International Review of Psychiatry*, 15(4), 310.

- Schneider, R.C. (1973). *Head and neck injuries in football: Mechanisms, treatment and prevention*. Baltimore, MD: Williams & Wilkins.
- Spielberger, C.D., Gorsuch, R.L., & Lushene, R.D. (1970). *STAI: Manual for the State-Trait Anxiety Inventory*. Palo Alto: Consulting Psychologists Press.
- Spielberger, C.D., & Rickman, R.L. (1991). Assessment of state and trait anxiety. In N. Sartorius, V. Andreoli, G. Cassaro, L. Eisenberg, P., Kielholz, P. Pancheri, & G. Racagni (Eds.), *Anxiety: Psychobiological and clinical perspectives* (pp. 69-83). Washington, DC: Hemisphere/Taylor & Francis.
- Spielberger, C.D., Ritterband, L.M., Sydeman, S.J., Reheiser, E.R., & Unger, K.K. (1995). Assessment of emotional states and personality traits: Measuring psychological vital signs. In J.N. Butcher (Ed.), *Clinical personality assessment: Practical approaches*. New York: Oxford University Press.
- Spielberger, C.D. & Vagg, P.R. (1984). Psychometric properties of the STAI: A reply to Ramanaiah, Franzen, and Schill. *Journal of Personality Assessment*, 48(1), 95-97.
- Thomee, P., Wahrborg, P., Borjesson, M., Thomee, R., Eriksson, B.I., & Karlsson, J. (2006). A new instrument for measuring self-efficacy in patients with an anterior cruciate ligament injury. *Scandinavian Journal Of Medicine and Science in Sports*, 16, 181-187.
- Tracey, J. (2003). The emotional response to the injury and rehabilitation process. *Journal of Applied Sport Psychology*, 15(4), 279-293.
- Tripp, D.A., Stanish, W., Ebel-Lam, A., Brewer, B.W., & Bichard, J. (2007). Fear of reinjury, negative affect, and catastrophizing predicting return to sport in recreational athletes with anterior cruciate ligament injuries at one year postsurgery. *Rehabilitation Psychology*, 52(1), 74-81.
- Udry, E., Gould, D., Bridges, D., & Beck, L. (1997). Down but now out: Athletic responses to season-ending injuries. *Journal of Sport and Exercise Psychology*, 19, 229-248.

- Van Baalen, B., Ribbers, G.M., Medema-Meulepas, D., Pas, M.S., Odding, E., & Stam, H.J. (2007). Being restricted in participation after a traumatic brain injury is negatively associated by passive coping style of the caregiver. *Brain Injury*, 21(9), 925-931.
- Wiese, D.M., Weiss, M.R., & Yukelson, D.P. (1991). Sport psychology in the training room: A survey of athletic trainers. *The Sport Psychologist*, 5, 15-24.
- World Health Organization (WHO). (1992). *The ICD-10 Classification of Mental and Behavioral Disorders*. Geneva, Switzerland: WHO.
- Zemper, E.D. (1994). Analysis of cerebral concussion frequency with the most commonly used models of football helmets. *Journal of Athletic Training*, 29(1), 44-50.

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