DISSERTATION

FACTORS RELATED TO SUSCEPTIBILITY TO SPORT-RELATED INJURY

Submitted by

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ABSTRACT

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The study examined the role various factors play in an athlete's susceptibility to injury in sport. The study involved 244 participants from various sports and included athletes who participated at the high school level, the collegiate level, and the professional level. Participants completed questionnaires measuring number and severity of injuries, resiliency, competition anxiety, trait anger, social support, coping skills, and overtraining. Results showed that an athlete's history of injury (i.e. number of injuries) is significantly correlated with an athlete's severity of injuries. Additionally, various significant correlations were found between the factors examined and one's number of injuries and/or severity of injuries. The correlations found were between resiliency and number of injuries, anger and severity of injuries, coping skills and severity of injury, number of hours practiced and number of injuries, and rigorousness of practices and number of injuries. Additionally, the study examined possible interactions among the variables studied and found that social support serves as a moderator when looking at the relationship between total hours practiced and number of injuries. Results were also examined for males and females, contact and non-contact sports, and high school, collegiate, and profession athletes separately. While some differences emerged, overall there was not much variation between the various groups. Overall, the current study revealed that there are a number of physical, environmental, and psychological factors that impact an athlete's susceptibility to injury.

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CHAPTER ONE: INTRODUCTION

Sports-related injuries are highly pervasive, especially for competitive level high-school and collegiate athletes. It is estimated that over 23 million sport-related injuries occur each year, and that that number is climbing (American Sports Data, 2002). Furthermore, sport-related injuries rate second highest, after home and leisure accidents, as sources of injuries (Dekker et. al., 2000). Experiencing an injury in one's sport can have devastating consequences, both physically and psychologically, and can lead to both short-term and long-term difficulties for the athlete. Due to the impact injury can have on athletes, it is important that we understand various factors that can contribute to one's susceptibility, in an effort to protect against injury as much as possible.

Previous research has attempted to identify a number of factors that are related to injury rates, including physical, environmental, and psychological factors. This study aims to expand on prior research by examining a number of psychological factors related to injury for male and female athletes across a number of sports. Specifically, this research will look at one's previous history of injuries, as well as one's resilience, competition anxiety, anger, coping skills and resources, and overtraining in order to examine the relationship between these various personality factors, coping, and susceptibility to injury.

Previous History of Injuries as a Factor

One factor that researchers have examined when looking at an athlete's history of injury is the athlete's history of prior injuries. Andersen & Williams (1988) proposed that one's prevalence

of previous injury, as well as severity of those injuries, is predictive of the probability of future injuries. Previous injury might be an important factor increasing one's susceptibility to injury; for example, the athlete may return to sport before fully recovering from a previous injury, and/or the athlete may not be psychologically ready to return to sport after their injury, leading to further anxiety (Williams, 2001). William, Hogan, & Andersen (1993) found a positive correlation between prior injury and later injury. Lysens et al. (1984) examined students with a history of injury and found that they were at a greater risk for future injury than students who were not previously injured. Using both men and women from the Amsterdam Growth and Health Study (AGHS) data set, Van Mechelen et al. (1996) found that the existence of a previous injury was a more accurate predictor of injury than any other psychological, social, or physiological factors.

Yet despite this report, the impact previous injury can have on one's susceptibility to injury has received little research attention (Maddison & Prapavessis, 2005). Maddison and Prapavessis, in discussing the literature, state that "the relationship between previous injury and vulnerability to subsequent injury has received little empirical investigation and remains to be clarified" (p.291). In their study, Maddison and Prapavessis used previous injury as a dependent variable assessing for time lost due to injury, and examined number of days missed from practice or competition, as well as total number of injuries. They examined 600 male rugby players, ages 16-34, who all played at a competitive level. Their findings revealed that history of previous injury showed a mild correlation with both time lost due to injury and number of injuries. Furthermore, history of injury was shown to have a greater effect when combined with social

support and coping. Specifically, individuals who were low in social support and coping skills were found to sustain more injuries and miss more time due to injury than individuals with high social support and coping skills. The current study will utilize previous injury as one factor when examining the relationship between prior injuries/severity of injuries and total number of injuries an athlete endures during their time in organized sport.

Resiliency as a Factor

Another factor that researchers hope to better understand with regard to its relationship with injury is the trait of resiliency. The concept of resiliency refers to constructive reactions to stress or disadvantage (Maddi, 1997). Despite variations in how researchers define resiliency, a common viewpoint is that resiliency refers to one's ability to positively adapt to adversity (Luthar & Cicchetti, 2000; Luthar, Cicchetti, & Becker, 2000; Masten, 1994). Studies on resiliency have often examined this personality factor in youths and children, revealing positive outcomes for individuals who are seen to be resilient (Jackson, Whitehead, & Wigford, 2010; Tiet & Huizinga, 2002). Tiet & Huizinga (2002) showed an association between resiliency and higher levels of adjustment among inner city youths. Additionally, Jackson, Whitehead, & Wigford (2010) showed resiliency in children to be related to more positive relationships and higher levels of attainment.

Studies have failed to directly examine resiliency in relation to athletes, especially with regard to its relationship with prevalence of injury. Research that has been conducted on resiliency in athletes often falls under the umbrella of "mental toughness." Previous research has utilized

the concept of resiliency as a defining factor of mental toughness (Alderman, 1974, Bull et. al., 2005, Goldberg, 1998, Jones, Hanton, & Connaughton, 2002, and Tutko & Richards, 1976). One study looking at resiliency as it relates to adversities athletes have faced used 10 current and/or former collegiate and professional athletes from a variety of sports. Findings revealed five general dimensions to be part of the resiliency experience of athletes, including breadth and duration, agitation, sociocultural influences, personal resources, and positive outcomes (Galli & Vealey, 2008). The current study aims to explore what, if any, relationship exists between resiliency and injury in athletes.

Competition Anxiety as a Factor

Trait anxiety is one of a number of personality factors that have been examined with regard to its association with injury. Individuals who have high trait anxiety are predisposed to injury (Maddison & Prapavessis, 2005). Some research has found no relationship between trait anxiety and injury (Kerr & Minden, 1988, Lysens et al., 1986). For example, in a study by Kerr & Minden (1988), researchers examined 41 elite female gymnasts from the top two skill levels in Canada. They ranged in age from 11 to 19 years and consisted of contenders for Olympic and World Championship teams, as well as individuals who were members of the junior team. Levels of trait anxiety were examined, using the Spielberger Trait Anxiety Inventory; researchers found no significant relationship between trait anxiety and injury.

However, when using measures specific to sport, other researchers found those with high levels of competition anxiety had more injuries (Dalhauser & Thomas, 1979, Blackwell & McCullagh,

1990, Passer & Seese, 1983). While trait anxiety is defined as a general disposition to view situations as threatening and react with an anxious response, competition anxiety is anxiety that is specific to competing in a sport (Williams & Andersen, 2007). Hanson, McCullagh, & Tonymon (1992) used the Sport Competition Anxiety Test (SCAT) to measures NCAA Division I and II runners' levels of competition anxiety. Their findings revealed that a relationship does exist between competition anxiety and severity of injury. A study by Lavelle and Flint (1996) also used the Sport Competition Anxiety Test (SCAT) to examine level of competition anxiety. Fifty-five male varsity athletes, including football players and rugby players who ranged in age from 19-28, were examined with regard to their level of competition anxiety and rate/severity of injury. Lavelle and Flint reported that competition anxiety was associated with higher frequency and severity of injury. Using 158 male football players from two NCAA Division I-A teams, Petrie (1993) examined the relationship between competition anxiety, also using the SCAT, and frequency and severity of injury. Findings from Petrie's study revealed that college football players with higher levels of trait anxiety also had higher levels of injury among the starters, but not among non-starters. Based on such findings, the current study proposes to specifically examine the relationship between competition anxiety and sport injury.

Anger as a Factor

Anger is a personality factor that has received little attention with regard to sport-related injury. Trait anger refers to a relatively stable construct of proneness to anger. Individuals with high levels of trait anger are likely to experience longer periods of anger states, as well as increased frequency and intensity of anger (Deffenbacher, 1992, Spielberger, 1999). Anger is

also associated with more physical antagonism and less adaptive behavior (Deffenbacher, Oetting, Thwaites, et al., 1996; Deffenbacher, Oetting, Lynch, & Morris, 1996; Spielberger, 1999; Tafrate, Kassinove, & Dundin, 2002).

While research has not examined the direct relationship between trait anger and sport-related injury, studies have demonstrated that anger is associated with other forms of injurious behavior, such as self-injury and suicide (Geigling et al., 2009; Painuly, Sharan, & Mattoo, 2007; Trew & Alden, 2009). A study by Deffenbacher & Kellaway (2010) using 803 students in an introduction to psychology course, found that women were more likely to direct their anger to self-injurious behavior, while men had the tendency to direct their anger towards injury to others. Hazaleus & Deffenbacher (1986) also suggest that a number of negative consequences stem from trait anger, including physical damage to oneself. A study by Lavalle and Flint (1996) measured anger/hostility using the Profile of Mood States (POMS) inventory to examine whether a relationship existed between an angry/hostile mood and injury in an athletic population. Findings revealed that individuals who scored high on the mood state of anger/hostility also reported greater severity of injuries. Given the relationship anger appears to have to behaviors which can lead to injury, the current study hopes to further explore the implications this may have with regard to sport-related injury.

Coping Resources as a Factor

Coping resources have received relatively little attention in the sport injury literature (Williams, 1996). Coping resources and coping skills can lead to lower levels of anxiety for individuals, or

they can allow the individual to better cope with the stressors in their life. Since competition anxiety is associated with injury, then successful coping might reduce injuries. Results have been relatively consistent when examining the relationship between coping resources and injury. One study found that the only predictor of injury in volleyball players was a low level of coping resources (Williams, Tonymon, & Wadsworth, 1986). No relationship was found between life stress and injury. The study by Williams, Tonymon, & Wadsworth included 179 Division I volleyball players (111 females, 68 males). They were recruited from 15 universities, and the Coping Resources section of the Stress Audit Questionnaire was used to assess their use of coping resources. This study included social support and other general coping resources such as eating and sleeping behaviors as measures of overall coping resources. Other studies have supported these findings while also expanding on them to conclude that coping resources, including social support, have moderated the impact of stress on physical outcomes, such as injury (Hanson, McCullagh, & Tonymon, 1992, Hardy, O'Connor, & Geisler, 1990, Hardy, Richman, & Rosenfeld, 1991, Petrie, 1992, and Smith, Smoll, & Ptacek, 1990).

Hanson, McCullagh, & Tonymon's study (1992) using Division I & II track and field athletes found that social support, measured using the "People in My Life" Inventory, was significantly related to the severity of, but not frequency of, athletic injuries. They suggest that a high number of coping resources may serve as a protective factor. Using 250 male and 201 female high school athletes at the varsity level, (ages 14 to 19), Smith, Smoll, & Ptacek (1990) revealed that athletes who were measured to be low in social support and coping skills showed the largest relationship between negative life events and injury. In this study, social support was

measured based on a scale derived from one previously used by Cauce, Felner, and Primavera (1982). Smith et al. further suggest that one's susceptibility to injury may decrease with interventions aimed at increasing an athlete's level of social support. Other researchers obtained similar findings, showing that athletes with low social support were more likely to become injured than those with high levels of social support (Hardy, Prentice, Kirsanoff, Richman, & Rosenfeld, 1987).

Andersen & Williams (1988) suggest that social support is a moderator variable that is directly linked to likelihood of injury. The current study aims to examine the relationship social support has to frequency and severity of injury alone, as well as how it interacts with other variables to serve as a potential protective factor with regard to injury susceptibility.

Coping Skills as a Factor

Coping skills is another component of coping that has been examined in relationship to athletic injury. Petrie (1993) examined the relationship between coping skills and injury using the Athletic Coping Skills Inventory. For collegiate football players who were actively playing as starters, a direct relationship with injury was not found for coping skills alone, nor was it found to serve as a moderator between the stress-injury relationship. While most of the studies done have not found a direct relationship between coping skills and injury prevalence (Lavelle & Flint, 1996; Petrie, 1993; Van Mechelen et al., 1996), the study by Smith, Smoll, & Ptacek (1990) using male and female high school varsity athletes examined coping skills in conjunction with social support. Coping skills was measured using the Athletic Coping Skills Inventory. Their findings

revealed that when combined with social support, high levels of coping skills could decrease the susceptibility to injury. Furthermore, a study done looking at Korean ballet dancers revealed that coping skills, as measured by the Athletic Coping Skills Inventory-28, was related to injury outcome (Noh et al., 2005). Due to the limited amount of research focusing on coping skills and injury, as well as the mixed findings on the relationship between these two factors, the current study aims to further examine this relationship to see what, if any, impact an athletes' coping skills can have on their susceptibility to injury.

Overtraining as a Factor

There are a number of physical factors that also contribute to the prevalence of injury, including overtraining (Andersen & Williams, 1988). Overtraining refers to an "imbalance between training and recovery" and can lead to a myriad of negative consequences (Goss, 1994, p.136; Kuipers & Keizer, 1988, p.79). The level of training that athletes endure has greatly increased in recent decades, and it is often wondered whether or not the level of training athletes engage in is too great (Bompa, 1985, Chambliss, 1989, Goss, 1994, Levin, 1991, & Parker, 1989). Hoffman observed that modern "athletic competition necessitates an extreme amount of grueling hours of practice, dedication, and firm commitment to flawless performance" (Hoffman, 1986, p.391). Hoffman further suggests that this level of overtraining can lead to negative outcomes such as "overtraining to the point of exhaustion and self-injury" (p.390). Excessive amounts of training can be stressful on the body, and often times the results can be harmful (Costill et al., 1988; Goss, 1994). Costill et al. (1988) examined 12 swimmers who participated in an increased training regimen over ten days, and found that overtraining

led to lowered levels of glycogen in one's muscles and less efficiency of motor skills, contributing to susceptibility to injury. Goss (1994) examined the effects of overtraining on 253 male and female swimmers and found various physiological and psychological reactions, including a decrease in vigor and an increase in fatigue. Thus there has been consistent data that overtraining can be associated with a myriad of negative consequences, including increased physical symptoms such as injury (Peterson, 2009). For the current study data will be collected with regard to frequency and intensity of an athlete's training during their time in sport, in order to assess the physical aspects related to injury.

Interactive Relationships

Much of the research appears to support the idea that an interactive relationship exists between various personality factors, coping resources, and injury (Andersen & Williams, 1988, Hanson, McCullagh, & Tonymon, 1992, Smith et al., 1990, and Williams, 1996). For instance, Andersen & Williams (1988) proposed that the reason that most psychological variables have an impact on injury is through their relationship with ones' history of injury and ones' ability to cope. Therefore, according to Williams, various factors, such as history of injury, coping resources, and coping skills interact with one's personality characteristics to contribute to one's susceptibility to injury (1996).

Maddison & Prapavessis (2005) expanded on previous findings using 600 male rugby players. Findings revealed that occurrence of injury that is accounted for by stress varies based on levels of social support and coping. Therefore coping resources appear to moderate the relationship

between stress and injury. One study by Smith et al. (1990) found a similar moderating effect with personality variables and injury, using 250 male and 201 female high school athletes. More specifically, they found that social support and coping skills moderated the effect between stress and injury. Other studies have only found moderate support for these relationships. While Petrie (1993) did find there to be a stress-injury relationship, findings did not support coping resources as playing a moderating role in this stress-injury relationship. However, with regard to personality factors, Petrie did find that competition anxiety moderated the relationship between stress and injury, for football starters. Williams, Tonymon, & Wadsworth (1986) failed to even find a relationship between stress and occurrence of injury, and results did not support previous research showing coping resources to moderate the relationship between stress and injury. Findings appear to be mixed, with the majority of studies finding relationships that exist, but the interactions between a number of factors varying from study to study. The current study aims at taking another look first at factors which might directly affect injury and then exploring if there are moderating or interacting effects.

Summary

While much research has been done on various factors associated with sport-related injury, the overall picture continues to remain unclear, as findings are mixed and various combinations of factors have yet to be examined. By examining the specific psychological, social, and physical variables that are related to an athlete's susceptibility to injury, this study aims to better understand their possible individual influence as well the possible complex interactions. Such

results can contribute to suggesting ways in which athletes could better protect themselves from likelihood of injury.

An initial purpose of the study is to determine whether there are different rates of injury among male and female athletes. Furthermore, this study hopes to identify potential variables and personality factors that affect vulnerability to injury for athletes. Specifically, this study plans to examine the possible relationship between history of injury, personality factors, coping resources, and overtraining with regard to their relative contributions to injury. Secondarily, this study will also explore whether or not differences exist across sports with regard to frequency or severity of injury.

CHAPTER TWO: METHOD

Participants

The sample was recruited from the Colorado State University undergraduate PSY 100 participant pool, as well as from various collegiate teams. The sample consists of male and female athletes who have participated on the Junior Varsity/Varsity level, or at the high school level of organized sport. Participants came from two sources: 1) volunteers as part of the participant pool at CSU and 2) volunteers from current varsity athletes at various Universities with whom I have contact. Coaches from the men's and/or women's gymnastics teams were contacted from Iowa State University and the University of Oklahoma. Furthermore, athletic trainers from Colorado State University were contacted in an effort to utilize athletes from various collegiate sports. Individuals had the choice about whether or not to participate, and could withdraw from the study at any time.

A total of 244 participants completed the study, 103 males and 141 females. Participants ranged in age from 18-33 years old. Nine participants self-identified as African American, nine as Asian American, 210 as Caucasian, 16 as Latino/a, four as Native American, and nine as other. Of the participants who completed the study, 163 have competed at the high school level, 75 at the collegiate level, and 6 at the professional level. 138 indicated participation in multiple sports, while 106 indicated that they have only participated in one sport. 204 participants are from Colorado State University, 17 are from Drury University, 7 from Iowa State University, 5 from Westminster College, 4 from the University of Oklahoma, 2 from the University of Missouri, 1 from Texas State University, 1 from Pittsburg State University, and 3

did not list their University. Of the participants, 138 identified as freshmen in school, 61 as sophomores, 17 as juniors, 15 as seniors, and 14 as graduate students.

Procedure

Participants were asked to complete the following instruments; Basic Questionnaire (BQ), Connor-Davidson Resilience Scale (CD-RISC) (Connor and Davidson, 2003), Sport Competition Anxiety Test (SCAT) (Martens, Vealey, & Burton, 1990), Spielberger Trait Anger Scale (TAS) (Spielberger's original State Anger Scale, 1988), Social Support Questionnaire (SSQ6) (Sarason et al., 1983), and the Athletic Coping Skills Inventory-28 (ACSI-28) (Smith et al., 1995). Participants received a link to the online surveys, and began by consenting to participate. Anonymity was maintained through having participants complete the surveys online, through Qualtrics, with no identifying information being requested from participants.

Measures: Several measures were used as follows:

Basic Questionnaire (BQ). This survey questionnaire obtained basic demographic data, such as age, gender, year in school, sport, etc. Previous injury was assessed by asking individuals the number of injuries they have had in the past, and to rate the severity of injury using a rating based on the Colorado Injury Reporting System (Hanson, McCullagh, & Tonymon, 1992). The Colorado Injury Reporting System utilized certified athletic trainers who documented injuries and illness. All illnesses and injuries that required being looked at by an athletic trainer or team

physician were included. Over-training was assessed by asking individuals to rate the amount of their practices and rigor of such practices (See Appendix 1).

Connor-Davidson Resilience Scale (CD-RISC). The Connor-Davidson Resilience Scale is a 25-item scale that asks participants to rate these items on a 5-point scale (0 to 4). The higher an individual's score, the greater the level of resiliency. Using a repeated measures ANOVA, Connor and Davidson (2003) found that an increase in one's resiliency score on the CD-RISC was associated with greater improvement during treatment with a number of populations including both males and females from a community sample, primary care outpatients, general psychiatric outpatients, clinical trial of generalized anxiety disorder, and two clinical trials of PTSD (Connor & Davidson, 2003). These results showed that the "scale exhibits validity" and "reflects different levels of resilience in populations that are thought to be differentiated" with regard to their degree of resilience (p.81). With regard to internal consistency of the scale, Chronbach's alpha was found to be .89 (See Appendix 2).

Sport Competition Anxiety Test (SCAT). The Sport Competition Anxiety Test (SCAT) is a measure of competitive trait anxiety consisting of 15 items with scores ranging from 10 (low) to 30 (high); the higher one's score, the higher the level of competitive trait anxiety. Participants are asked to answer on a 3-point scale (rarely; sometimes; often); the higher the score, the greater the competition anxiety. The scale was developed by Martens, Vealey, & Burton (1990) and has an internal consistency of.95. Concurrent validity, however, is hard to measure "due to the

inability to relate to other sport anxiety measures versus general anxiety (Lavelle & Flint, 1996, p.297) (See Appendix 3).

*Spielberger Trait Anger Scale (1988, 1999).*This scale is a 10-item Likert-type scale (1= *almost never* to 4= *almost always*) measuring how angry an individual generally feels. Participants are asked to respond according to how they generally feel or react to measure Trait anger. High scores are indicative of high levels of general anger. This scale has internal consistency reliabilities ranging from .81 to .91 with the higher reliability score for college students. The Trait Anger Scale also correlates positively with a number of anger and hostility measures and has high discriminability between high and low anger groups. This measure was developed from Spielberger's original State Anger Scale (1988) (See Appendix 4).

*Social Support Questionnaire-6 (SSQ6).*The Social Support Questionnaire (SSQ6) is a 6-item scale. This is a short form of the original SSQ, which consists of 27 items. Each item consists of two parts with, the first part assessing the number of available others the individual feels as though they can turn to in times of need across a variety of situations. The second part assesses how satisfied the individual is with the perceived support offered in that particular situation (Sarason et al., 1983). Participants are asked to identify how satisfied they are on a 6-point Likert scale ranging from "very dissatisfied" to "very satisfied." Two scores are obtained, one for number of supporters and one for satisfaction with support; high scores are indicative of perceived social support from a high number of people, and high levels of satisfaction with support received. The SSQ6 has been proven to be a good substitute for the SSQ, and has

internal reliability ranging from .90 to .93 for both number of people providing social support and for satisfaction of social support. Additionally, “scores of the SSQ6 are comparable to scores of the SSQ and in its relationship to a variety of personality and social competence variable” (p.11). Furthermore, test-retest reliability has been proven to be satisfactory (See Appendix 5).

Athletic Coping Skills Inventory-28 (ACSI-28). This scale is a 28-item, 7-factor specific sport subscale which measures individual differences in psychological coping skills within a sport context. The seven sport-specific subscales include coping with adversity, peaking under pressure, goal setting/mental preparation, concentration, freedom from worry, confidence and achievement motivation, and coachability. High scores are indicative of good coping skills. These subscales all yield to create a Personal Coping score. (Smith et al., 1995). The original ACSI scale was developed in the mid-1980’s and was adapted to form the new ACSI-28 scale in 1995 by Smith et al. Internal consistency for the scale is .84 for males and .88 for females. The ACSI-28 has been proven to have the strongest dimensional structure and all factors were found to be significant. The ACSI-28 correlated to other coping measures which measure cognitive-behavioral coping skills (See Appendix 6).

CHAPTER THREE: HYPOTHESES

Hypothesis 1: Frequency (number) and severity of injuries between males and females will be compared to determine if differences might be found. To test this hypothesis, the Basic Questionnaire (BQ) regarding number and intensity of injuries will be examined (See Appendix 1).

Hypothesis 2: Determining whether an athlete's history of injury will have an impact on their susceptibility to injury-specifically that athletes with a higher number of injuries will also have injuries rated as more serious than athletes with a lower number of injuries.
To test this hypothesis, the Basic Questionnaire (BQ) regarding number and intensity of injuries will be examined (See Appendix 1).

Hypothesis 3: Various personality factors are associated with number of injuries and severity of injury in individuals currently or previously involved in organized sport.

a) Athletes who are higher in resiliency will have lower number of, and severity of, injuries.

b) Athletes who are higher in competition anxiety will show higher number of injuries, and higher levels of severity of injury.

c) Athletes who are higher in trait anger will show higher number of injuries, and higher levels of severity of injury.

To test these hypotheses, the Connor-Davidson Resilience Scale (CD-RISC), the Sport Competition Anxiety Test (SCAT), and the Spielberger Trait Anger Scale (TAS) will be examined (See Appendices 2, 3, & 4).

Hypothesis 4: Athletes who have better coping resources and coping skills will show lower levels of injuries and lower severity of injury.

To test this hypothesis the Social Support Questionnaire-6 (SSQ6) and the Athletic Coping Skills Inventory-28 (ACSI-28) will be examined (See Appendices 5 & 6).

Hypothesis 5: Athletes who have greater intensity of workouts and training will show higher number of, and severity of, injury.

To test this hypothesis, the Basic Questionnaire (BQ) will be examined (See Appendix 1).

Hypothesis 6: Possible moderating effects of each of the above variables on influencing number and severity of injuries will be examined. It is anticipated that while history of injury, competition anxiety, anger, and overtraining will be associated with higher injuries, these results will be lower in presence of resiliency , coping resources, and coping skills.

To test this hypothesis, the Basic Questionnaire (BQ), the Connor-Davidson Resilience Scale (CD-RISC), the Sport Competition Anxiety Test (SCAT), the Spielberger Trait Anger Scale (TAS), the Social Support Questionnaire-6 (SSQ6), and the Athletic Coping Skills Inventory-28 (ACSI-28) will be examined (See Appendices 1-6).

Hypothesis 7: As an exploratory hypothesis, frequency and severity of injury among individuals who are involved in one sport versus multiple sports, as well as contact sports versus non-contact sports, will be compared to determine if differences might be found across the total sample.

To test this hypothesis, the Basic Questionnaire (BQ) will be examined (See Appendix 1).

Hypothesis 8: As an exploratory hypothesis, the above hypotheses (1-6) will be examined comparing the high school level participants versus the collegiate level participants versus the professional level participants.

To test this hypothesis, the Basic Questionnaire (BQ), the Connor-Davidson Resilience Scale (CD-RISC), the Sport Competition Anxiety Test (SCAT), the Spielberger Trait Anger Scale (TAS), the Social Support Questionnaire-6 (SSQ6), and the Athletic Coping Skills Inventory-28 (ACSI-28) will be examined (See Appendices 1-6).

CHAPTER FOUR: RESULTS

The total sample (N=244) consisted of male (N=103) and female (N=141) athletes who have participated at the high school level (N=163), collegiate level (N=75), and professional level (N=6) of sport. Of the total participants, 138 indicated involvement in multiple sports, while 106 indicated involvement in only one sport. Participants ranged with regard to specific sport, with 51 being involved in contact sports and 55 being involved in non-contact sports. Participants came from a variety of Universities including Colorado State University (N=204), Drury University (N=17), Iowa State University (N=7), Westminster College (N=5), the University of Oklahoma (N=4), the University of Missouri (N=2), Texas State University (N=1), Pittsburg State University (N=1), and 3 did not list their University. Participants ranged in age from 18-33 years old included athletes in different years of school including freshmen (N=138), sophomores (N=61), juniors (N=17), seniors (N=15), and graduate students (N=14).

Hypothesis 1

To test the hypothesis that differences might be found in number and severity of injuries between males (N=103) and females (N=141), an independent samples t-test was run to compare the frequency scores of men versus women, as well as to compare the severity scores of men versus women. This analysis was conducted by utilizing participants' responses on the Basic Questionnaire (BQ) to the number of injuries and the intensity of injuries they have obtained. Results of the analysis did not show a significant difference numbers of injuries between males (M=2.17, SD=1.33) and females (M=2.39, SD=1.70); $t(24)=-1.12, p=.27$, nor did it show a significant difference in severity of injury between males (M=3.72, SD=1.16) and

females (M=3.78, SD=1.36); *t(24)=-.37, p=.71*. These results do not support the hypothesis that differences might exist between males and females with regard to frequency and severity of injury.

Hypothesis 2

The hypothesis that an athlete's history of numbers of injuries will have an impact on their susceptibility to more severe injuries was tested using a correlation analysis. This analysis was conducted using athletes self-report of numbers of injuries and severity of injury on the Basic Questionnaire (BQ). Results of the following analyses can be seen displayed in Table 1. Results of the analysis found a significant correlation between numbers of injuries and severity of injury for the total population (N=244); *r=.44, p<.01*. These results support the hypothesis that there is a positive correlation between frequency of injuries and severity of injuries.

This hypothesis was also examined for males (N=103) and females (N=141) separately. When looking at males only, a significant positive correlation was once again found for number of injuries and severity of injury; *r=.43, p<.01*. For females only, a significant positive correlation was also found when looking at number of injuries and severity of injuries; *r=.45, p<.01*. These results again support the hypothesis that there is a positive correlation for frequency of and severity of injury, specifically for males and for females.

This hypothesis was also examined for contact sports (N=51) versus non-contact sports (N=55) separately. For contact sports, a significant positive correlation was found for number of injuries and severity of injuries; *r=.44, p<.01*; for non-contact sports, a significant positive

correlation was also found for number of injuries and severity of injuries; *r=.54, p<.01*. These results support the hypothesis that there is a significant positive correlation between frequency of and severity of injury, for both contact sports and non-contact sports.

Of interest are the means for frequency and for severity of the contact versus the non-contact sport groups. When compared the means for frequency of injuries for the two groups did not reach statistical significance (M=2.47, SD=1.63 for contact; M=2.35, SD=1.99 for non-contact). Similarly there were no significant differences between the means on severity between the two groups (M=3.90, SD=1.35 for contact; M=3.52, SD=1.41 for non-contact).

Hypothesis 3

a) To examine the hypothesis that athletes' resiliency levels will be associated with number and severity of injuries a correlational analysis was performed. Participants' self-report of both number and severity of injuries on the Basic Questionnaire (BQ) were used, as well as their resiliency score derived from the Connor-Davidson Resiliency Scale (CD-RISC). Results of the following analyses can be seen displayed in Table 2. The correlation between numbers of injuries and resiliency was not statistically significant; *r=.05, p=.24*. Additionally the correlation between severity of injuries and resiliency failed to reach statistical significance; *r=.10, p=.07*. These results did not support the hypothesis that athletes with higher levels of resiliency would have lower number and severity of injuries.

This hypothesis was also examined for males and females separately. For males only, the correlation between number of injuries and resiliency failed to reach statistical significance; *r=.12, p=.12*. The correlation between severity of injuries and resiliency also did not reach statistical significance; *r=.10, p=.16*. For females only, the correlations between number of injuries and resiliency (*r=.01, p=.44*) and between severity of injuries and resiliency (*r=.10, p=.12)* were not statistically significant. These results did not support the hypothesis that athletes with higher levels of resiliency would have lower number and severity of injuries, for males and females specifically.

Finally, this hypothesis was examined for contact and non-contact sports separately. For individuals in contact sports, the correlation between number of injuries and resiliency was statistically significant; *r=.23, p=.05*. For individuals in non-contact sports, results also found no significant correlation for severity of injuries and resiliency; *r=.14, p=.16*. Additionally, for individuals in non-contact sports, the correlation between number of injuries and resiliency was not statistically significant; *r=.20, p=.07.* For individuals in non-contact sports, results also found no significant correlation for severity of injuries and resiliency; *r=.03, p=.41.* These results did not support the hypothesis that athletes with higher levels of resiliency would have lower number and severity of injuries, including for contact sports and non-contact sports.

b) To examine the hypothesis that athletes' competition anxiety will be associated with their number of injuries and severity of injuries a correlational analysis was performed. Participants' self-report of both number and severity of injuries on the Basic Questionnaire (BQ) were used, as well as their competition anxiety score derived from the Sport Competition Anxiety Test (SCAT). Results of the following analyses can be seen displayed in Table 2. The correlation between number of injuries and anxiety was not statistically significant; *r=.05, p=.24*. Additionally, the correlation between severity of injuries and anxiety was not statistically significant; *r=.04, p=.28*. These results did not support the hypothesis that athletes with higher levels of trait anxiety would have higher number and severity of injuries.

This hypothesis was also examined for males and females separately. For males, the correlation between number of injuries and anxiety was not statistically significant (*r=.04, p=.34)* and the correlation between severity of injuries and anxiety was not statistically significant (*r=.07, p=.26)*. For females only, the correlation between number of injuries and anxiety was not statistically significant (*r=.02, p=.40)* and the correlation between severity of injuries and anxiety was not statistically significant (*r=.01, p=.44)*. These results did not support the hypothesis that athletes with higher levels of anxiety would have higher number and severity of injuries, for males and females specifically.

Finally, this hypothesis was examined for contact and non-contact sports separately. For contact sports, the correlation between number of injuries and anxiety was not statistically significant; *r=-.16, p=.14*. For contact sports, the correlation between severity of injuries and anxiety was also not statistically significant; *r=.11, p=.22*. For non-contact sports, the correlation between number of injuries and anxiety was not statistically significant; *r=.20, p=.07.* Also for non-contact sports, the correlation between severity of injuries and anxiety was not statistically significant; *r=.03, p=.41.* These results did not support the hypothesis that athletes with higher levels of anxiety would have higher number and severity of injuries, for contact sports and non-contact sports specifically.

c) To examine the hypothesis that athletes' trait anger will be associated with their number and severity of injuries a correlational analysis was performed. Participants' self-report of both number and severity of injuries on the Basic Questionnaire (BQ) were used, as well as their trait anger score derived from the Spielberger Trait Anger Scale (TAS). Results of the following analyses can be seen displayed in Table 2. The correlation between number of injuries and anger was not statistically significant; *r=-.00, p=.48*. However, the correlation between severity of injuries and anger was statistically significant; *r=.11, p=.05*. These results partially support the hypothesis; while athletes with higher levels of trait anger did not have higher number of injuries, they did show greater severity of injuries. However, it should be noted that the actual size of the one correlation was quite low despite reaching statistical significance.

This hypothesis was also examined for males and females separately. For males, the correlation between number of injuries and anger was not statistically significant; *r=-.05, p=.32.* Additionally for males, the correlation between severity of injuries and anger was not statistically significant; *r=.07, p=.25.* For females, the correlation between number of injuries and anger was not statistically significant; *r=.04, p=.34.* For females, the correlation between severity of injuries and anger was statistically significant, however the actual size of the correlation was low *r=.14, p=.05*. These results partially supported the hypothesis that athletes with higher levels of anger would have higher number and severity of injuries. While for males, no correlations were found to be significant, for females, a significant correlation was found between severity of injuries and anger. However, the actual size of this correlation was low.

Finally, this hypothesis was examined for contact and non-contact sports separately. For contact sports, the correlation between number of injuries and anger was not statistically significant; *r=-.16, p=.14*. For contact sports, the correlation between severity of injuries and anger was not statistically significant; *r=.17, p=.12*. For non-contact sports, the correlation between number of injuries and anger was not statistically significant; *r=.20, p=.07.* For non-contact sports, the correlation between severity of injuries and anger approached statistical significance; *r=.22, p=.06*. These results did not support the hypothesis that athletes with

higher levels of anger would have higher number and severity of injuries, for contact sports and non-contact sports.

Hypothesis 4

a) To examine the hypothesis that athletes who have higher levels of coping resources will have lower number and severity of injuries, a correlational analysis was performed. Participants' self-report of both number and severity of injuries on the Basic Questionnaire (BQ) were used, as well as their total social support score and satisfaction with social support score derived from the Social Support Questionnaire (SSQ6). Results of the following analyses can be seen displayed in Table 3. The correlation between number of injuries and total social support was not statistically significant; *r=-.03, p=.31*. The correlation between severity of injuries and total social support was not statistically significant; *r=-.03, p=.32*. The correlation between number of injuries and satisfaction with social support was not statistically significant; *r=-.03, p=.32*. The correlation between severity of injuries and satisfaction with social support was not statistically significant; *r=-.03, p=.33*. These results do not support the hypothesis that athletes with higher levels of social support and greater satisfaction with social support will have lower number and severity of injuries.

This hypothesis was also examined for males and females separately. For males, the correlation between number of injuries and total social support was not statistically significant; *r=.02, p=.40*. For males, the correlation between severity of injuries and total

social support was not statistically significant; *r=.04, p=.36*. Additionally for males, the correlation between number of injuries and satisfaction with social support was not statistically significant; *r=-.05, p=.30*. For males, the correlation between severity of injuries and satisfaction with social support was not statistically significant; *r=-.02, p=.44*. For females, the correlation between number of injuries and total social support was not statistically significant; *r=-.09, p=.16*. For females, the correlation between severity of injuries and total social support was not statistically significant; *r=-.08, p=.19*. Additionally for females, the correlation between number of injuries and satisfaction with social support was not statistically significant; *r=-.02, p=.43*. For females, the correlation between severity of injuries and satisfaction with social support was not statistically significant; *r=-.04, p=.33*. These results do not support the hypothesis that athletes with higher levels of social support and greater satisfaction with social support will have lower number and severity of injuries, for males and females.

Finally, this hypothesis was examined for contact and non-contact sports separately. For contact sports, the correlation between number of injuries and total social support was not statistically significant; *r=-.20, p=.08*. For contact sports, the correlation between severity of injuries and total social support was not statistically significant; *r=.09, p=.27*. Additionally for contact sports, the correlation between number of injuries and satisfaction with social support was not statistically significant; *r=.06, p=.34*. For contact sports, the correlation between severity of injuries and satisfaction with social support was not statistically significant; *r=-.05, p=.36*. For non-contact sports, the correlation

between number of injuries and total social support was not statistically significant; *r=.07, p=.31*. For non-contact sports, the correlation between severity of injuries and total social support was not statistically significant; *r=-.02, p=.45*. Additionally for non-contact sports, the correlation between number of injuries and satisfaction with social support was not statistically significant; *r=.02, p=.45*. For non-contact sports, the correlation between severity of injuries and satisfaction with social support was not statistically significant; *r=.02, p=.44*. These results do not support the hypothesis that athletes with higher levels of social support and greater satisfaction with social support will have lower number and severity of injuries, for contact sports and non-contact sports.

b) To examine the hypothesis that athletes who have higher levels of coping skills will have lower number and severity of injuries, a correlational analysis was performed. Participants' self-report of both number and severity of injuries on the Basic Questionnaire (BQ) were used, as well as their total coping skills score derived from the Athletic Coping Skills Inventory-28 (ACSI-28). Results of the following analyses can be seen displayed in Table 3. The correlation between number of injuries and coping skills was not statistically significant; *r=.02, p=.39*. However, the correlation between severity of injuries and coping skills was statistically significant; *r=.14, p=.02*. These results do not support the hypothesis that athletes with lower number of injuries would show significantly higher levels of coping skills. Although a significant correlation was found between severity of injuries and coping skills, it was not in the predicted direction. More

specifically, there was a positive correlation between coping skills and severity of injuries; this implies that athletes with higher levels of coping skills also exhibited greater severity of injuries.

This hypothesis was also examined for males and females separately. For males, the correlation between number of injuries and coping skills was not statistically significant; *r=.12, p=.12*. Additionally for males, the correlation between severity of injuries and coping skills was not statistically significant; *r=.09, p=.19*. For females, the correlation between number of injuries and coping skills was not statistically significant; *r=-.02, p=.39*. However, for females, the correlation between severity of injuries and coping skills was statistically significant; *r=.18, p=.02*. These results do not support the hypothesis that athletes with higher levels of coping skills have lower number and severity of injuries, for males and females specifically. However, a significant positive correlation was found for females with regard to severity of injuries and coping skills. Therefore, for females, those who rated injuries as more severe, also had higher levels of coping skills, a finding contrary to the prediction.

Finally, this hypothesis was examined for contact and non-contact sports separately. For contact sports, the correlation between number of injuries and coping skills was positive and statistically significant; *r=.32, p=.01*. In other words, higher numbers of injuries was significantly associated with higher coping skills, an association contrary to the prediction. However, for contact sports, the correlation between severity of injuries and

coping skills was not statistically significant; *r=.11, p=.22*. For non-contact sports, the correlation between number of injuries and coping skills approached statistical significance; *r=-.21, p=.06.* For non-contact sports, the correlation between severity of injuries and coping skills was not statistically significant; *r=.15, p=.14*. These results do not support the hypothesis that athletes with higher levels of social support and greater satisfaction with social support will have lower number and severity of injuries, for contact sports and non-contact sports specifically. Instead a significant positive correlation was found between number of injuries and coping skills for those involved in contact sports, indicating that those who report greater numbers of injuries have significantly higher levels of coping skills.

Hypothesis 5

To test the hypothesis that athletes who report having more rigorous practices and practicing longer hours will have greater prevalence of and severity of injuries, a correlational analysis was performed. This analysis was conducted by utilizing participants' responses on the Basic Questionnaire (BQ) to the level of intensity (rigorousness) of their practices, the number of hours practiced in a week, the number of injuries acquired, and the intensity of injuries they have obtained. Results of the following analyses can be seen displayed in Table 4. The correlation between the number of hours practiced and severity of injuries was not statistically significant; *r=.07, p=.15.* The correlation between rigorousness of practices and severity of injuries was not statistically significant; *r=.08; p=.11.* However, the correlation between rigorousness of practices and number of injuries was statistically significant; *r=.15, p<.01.*

Additionally, the correlation between number of hours practiced and the number of injuries was statistically significant; *r=.18, p<.01.* While these results do not fully support the hypothesis, as hours practice and rigorousness of practices do not show a significant correlation to severity of injuries, results did find partial support for the hypothesis, given that number of hours practiced and rigorousness of practices did have a significant relationship to number of injuries experienced by an athlete. On the other hand, despite reaching significance, both correlations were in actuality low (.15 and .18).

These analyses were also performed for males and females separately. For males, the correlation between rigorousness of practices and number of injuries was statistically significant; *r=.23, p=.01.* For males, the correlation between rigorousness of practices and severity of injuries was not statistically significant; *r=.10, p=.16*. For males, the correlation between number of hours practiced and severity of injuries was not statistically significant; *r=.07, p=.23.* Lastly, for males, the correlation between number of hours practiced and number of injuries was not statistically significant; *r=.04, p=.33.* For females, the correlation between number of hours practiced and number of injuries was statistically significant; *r=.29, p<.01.* For females, the correlation between rigorousness of practices and number of injuries was not statistically significant; *r=.10, p=.12.* For females, the correlation between rigorousness of practices and severity of injuries was not statistically significant; *r=.06, p=.24.* Lastly, for females, the correlation between number of hours practiced and severity of injuries was not statistically significant; *r=.07, p=.20.* These results partially support the hypothesis that number of hours practiced and intensity of practices can be associated with number and severity of

injuries. For males, rigorousness of practices was significantly associated with number of injuries, while for females, number of hours practiced was significantly associated with number of injuries.

Finally, this hypothesis was examined by running correlational analyses for contact versus non-contact sport participants. For contact sport participants, the correlation between number of hours practiced and severity of injuries was not statistically significant; *r=.02, p=.45.* For contact sports, the correlation between number of hours practiced and number of injuries was not statistically significant; *r=.07, p=.32.* For contact sports, the correlation between rigorousness of practices and severity of injuries was not statistically significant; *r=.07, p=.31.* Finally, for contact sports, the correlation between rigorousness of practices and number of injuries was not statistically significant; *r=.19, p=.10.* For non-contact sport participants, the correlation between number of hours practiced and severity of injuries was not statistically significant; *r=.18, p=.10.* For non-contact sports, the correlation between number of hours practiced and number of injuries was statistically significant; *r=.44, p<.01.* For non-contact sports, the correlation between rigorousness of practices and number of injuries was statistically significant; *r=.24, p=.04.* Finally, for non-contact sports, the correlation between rigorousness of practices and severity of injuries was statistically significant; *r=.26, p=.03.* The results show that for contact sport participants, the hypothesis that number and intensity of practices is associated with number and severity of injuries was not supported. However, for non-contact sport participants, this hypothesis was partially supported; rigorousness of practices was

significantly correlated with both number of and severity of injuries, as well as number of hours practiced being significantly correlated with number of injuries, but not severity of injuries.

Hypothesis 6

To test the hypothesis that interactions will exist between various variables and number and severity of injuries, multiple linear regression was used to examine potential moderating effects. Responses on the Basic Questionnaire (BQ) regarding number and severity of injuries, and number of hours of practice and rigorousness of practices were utilized. Additionally, responses from the Connor-Davidson Resilience Scale (CD-RISC) regarding resiliency levels, the Competition Anxiety Test (SCAT) regarding competition anxiety, and the Spielberger Trait Anger Scale (TAS) regarding trait anger were also utilized. Results of the following multiple linear regression analyses can be seen displayed in Table 5.

The first hypothesis, that the relationship between competition anxiety and number and severity of injuries will be moderated by the presence of social support, coping skills, and resiliency, was tested using multiple linear regression. A significant interaction was not found between competition anxiety and social support with regard to number of injuries; $R^2 = .01$, $t = .80$, $p = .43$. The model only predicted 0.6 percent of the variance in number of injuries. It was also found that no significant interaction exists between competition anxiety and social support with regard to severity of injuries; $R^2 = .01$, $t = -.72$, $p = .47$. The model only predicted 0.5 percent of the variance in severity of injuries. Additionally, no significant interaction was found between

competition anxiety and coping skills with regard to number of injuries; $R^2 = .02, t=-1.79, p=.08$. The model predicted 1.7 percent of the variance in number of injuries. Nor was a significant interaction found between competition anxiety and coping skills with regard to severity of injuries; $R^2 = .03, t=-.69, p=.49$. Overall, the model predicted 2.8 percent of the variance in severity of injuries, with coping skills alone significantly contributing to severity of injuries; $t=2.46, p=.02$. Finally, no significant interaction was found between competition anxiety and resiliency with regard to number of injuries; $R^2 = .01, t=-1.1, p=.27$, or with regard to severity of injuries; $R^2 = .01, t=-.42, p=.68$. The model accounted for 1.0 percent of the variance with regard to number of injuries and 1.3 percent of the variance with regard to severity of injuries. Overall, these results did not support the hypothesis that coping resources, coping skills, and resiliency will moderate the relationship between competition anxiety and number and severity of injuries.

The second hypothesis, that the relationship between trait anger and number and severity of injuries will be moderated by the presence of social support, coping skills, and resiliency, was tested using multiple linear regression. A significant interaction was not found between trait anger and social support with regard to number of injuries; $R^2 = .01, t=1.36, p=.18$. The model only predicted 0.9 percent of the variance in number of injuries. It was also found that no significant interaction exists between trait anger and social support with regard to severity of injuries; $R^2 = .02, t=1.76, p=.08$. The model predicted 2.4 percent of the variance in severity of injuries, with trait anger alone having a significant relationship with severity of injuries; $t=2.04,$

p=.04. Additionally, no significant interaction was found between trait anger and coping skills with regard to number of injuries; R^2*= .00, t=-.51, p=.61*. The model only predicted 0.1 percent of the variance in number of injuries. While no significant interaction was found between trait anger and coping skills with regard to severity of injuries; R^2*= .05, t=-1.84, p=.07,* the overall model was significant, *p=.01*, and accounted for 4.6 percent of the variance in severity of injuries. Both anger alone, *t=2.18, p=.03,* and coping skills alone, *t=2.49, p=.01*, are significantly associated with severity of injuries. Finally, no significant interaction was found between trait anger and resiliency with regard to number of injuries; R^2*= .00, t=-.53, p=.60,* or with regard to severity of injuries; R^2*= .03, t=-1.16, p=.25.* The model accounted for 0.3 percent of the variance with regard to number of injuries and 2.9 percent of the variance with regard to severity of injuries. Overall, these results did not support the hypothesis that coping resources, coping skills, and resiliency will moderate the relationship between trait anger and number and severity of injuries.

The third hypothesis, that the relationship between overtraining and number and severity of injuries will be moderated by the presence of social support, coping skills, and resiliency, was tested using multiple linear regression. A significant interaction was found between number of hours practiced and social support with regard to number of injuries; R^2*= .05, t=2.15, p=.03.* The model was significant, *p=.01,* and predicted 4.9 percent of the variance in number of injuries. It was found, however, that no significant interaction exists between hours practiced and social support, with regard to severity of injuries; R^2*= .01, t=-.30, p=.77.* The model predicted 0.6

percent of the variance in severity of injuries. Additionally, no significant interaction was found between number of hours practiced and coping skills with regard to number of injuries; R^2*= .04, t=-1.61, p=.11;* however, the overall model was significant; *p=.02*. Total hours practiced alone was significantly associated with number of injuries; *t=2.86, p=.01.* The model predicted 4.1 percent of the variance in number of injuries. Additionally, no significant interaction was found between number of hours practiced and coping skills with regard to severity of injuries; R^2*= .02, t=-.16, p=.88.* The model predicted 2.0 percent of the variance in severity of injuries. Finally, no significant interaction was found between total hours practiced and resiliency with regard to number of injuries; R^2*= .03, t=-.85, p=.40.* However, the model was significant, *p=.04* and accounted for 3.4 percent of the variance in number of injuries. Also, no significant interaction was found between number of hours practiced and resiliency with regard to severity of injuries; R^2*= .01, t=-.42, p=.68.* The model accounted for 1.4 percent of the variance with regard to severity of injuries. Overall, these results partially supported the hypothesis that coping resources, coping skills, and resiliency will moderate the relationship between overtraining (number of hours practiced) and number and severity of injuries. It was shown that social support appears to moderate the relationship between number of hours practiced and number of injuries. However, the results did not support that social support moderated the relationship between number of hours practiced and severity of injuries. Additionally, the hypothesis that coping skills and resiliency would moderate the relationship between overtraining and number and severity of injuries was not supported.

To further test the hypothesis that the relationship between overtraining and number and severity of injuries will be moderated by coping resources, coping skills, and resiliency, this relationship was also looked at with regard to rigorousness of practices using multiple linear regression. A significant interaction was not found between rigorousness of practices and social support with regard to number of injuries; $R^2 = .03, t=.56, p=.58.$ The model predicted 2.6 percent of the variance in number of injuries, with rigorousness alone having a significant relationship to number of injuries; $t=2.49, p=.01.$ It was found that no significant interaction exists between rigorousness of practices and social support, with regard to severity of injuries; $R^2 = .01, t=.34, p=.73.$ The model predicted 0.8 percent of the variance in severity of injuries. Additionally, no significant interaction was found between rigorousness of practice and coping skills with regard to number of injuries; $R^2 = .02, t=.04, p=.97.$ The model accounted for 2.3 percent of the variance in number of injuries and rigorousness alone was significantly associated with number of injuries; $t=2.44, p=.02$. Additionally, no significant interaction was found between rigorousness of practices and coping skills with regard to severity of injuries; $R^2 = .02, t=.37, p=.71.$ The model predicted 2.2 percent of the variance in severity of injuries. Finally, no significant interaction was found between rigorousness of practices and resiliency with regard to number of injuries; $R^2 = .02, t=.29, p=.77.$ The model accounted for 2.4 percent of the variance in number of injuries, with rigorousness alone having a significant relationship to number of injuries; $t=2.30, p=.02$. Also, no significant interaction was found between rigorousness of practices and resiliency with regard to severity of injuries; $R^2 = .01, t=-.27, p=.78.$ The model accounted for 1.4 percent of the variance with regard to severity of injuries. Overall, these results did not support the hypothesis that coping resources, coping skills, and resiliency

will moderate the relationship between overtraining (rigorousness of practices) and number and severity of injuries. It was shown that there was not a significant interaction indicating that social support, coping skills, and resiliency moderate the relationship between overtraining, specifically rigorousness of practices, and number and severity of injuries.

Hypothesis 7

To explore the hypothesis that number and severity of injuries will differ across sports, participants' answers on the Basic Questionnaire (BQ) to number and severity of injuries, as well as labeling of number and type of sports participated in, were utilized. A one-way ANOVA was run to see if there was a difference in number and severity of injuries between individuals who participated in one sport (N=106) versus individuals who participated in multiple sports (N=138). Results did not find a significant difference in number of injuries for participants involved in one sport versus multiple sports; $F(1, 243)=.95, p=.33$, nor was a significant difference found in severity of injuries for participants involved in one sport versus multiple sports; $F(1, 243)=.24, p=.62.$ These results suggest that differences in number and severity of injuries do not exist between one-sport and multiple-sport participants in the current sample. Additionally, a one-way ANOVA was run to see if there was a possible difference in number and severity of injuries between one-sport participants who were involved in a contact sport versus those who were involved in a non-contact sport. One-sport participants were utilized as the individuals involved in multiple-sports were often involved in both contact and non-contact sports, and therefore could not be placed in either category. Results did not find a significant difference in number of injuries for participants involved in contact sports versus participants

involved in non-contact sports; *F(1, 104)=.12, p=.73,* nor was a significant difference found in severity of injuries for participants involved in contact sports versus participants involved in non-contact sports; *F(1, 104)=2.03, p=.16.* These results suggest that there are no differences in number and severity of injuries between contact and non-contact sport participants in the current sample.

Hypothesis 8

To explore the hypothesis that differences might be found between high school level and collegiate level athletes, an independent samples t-test was run to compare the number and severity scores of high school athletes versus collegiate athletes. Additionally, correlational analyses that were performed for the above hypotheses were performed using high school athletes, collegiate athletes, and professional athletes separately (high school, N=163; collegiate, N=75; professional, N=6).

a) The independent samples t-test analysis was conducted by utilizing participants' responses on the Basic Questionnaire (BQ) to the number of injuries and the intensity of injuries they have obtained. Results of the analysis showed a significant difference in mean number of injuries between high school level participants (M=1.99, SD=1.18) and collegiate level participants (M=2.88, SD=1.87); *t(23)=-4.47, p<.01*. A significant difference was also found in mean severity of injuries between high school level participants (M=3.64, SD=1.26) and collegiate level participants (M=4.00, SD=1.31); *t(23)=-1.20, p=.05*. These results support the hypothesis that differences exist between

high school level athletes and collegiate level athletes with regard to number and severity of injuries.

b) Various correlational analyses were performed to examine the relationships between number of injuries, severity of injuries, competition anxiety, resiliency, trait anger, coping resources, coping skills, number of hours practiced, and rigorousness of practices for high school athletes only. Results of the following analyses can be seen displayed in Tables 7 and 8. For high school athletes, the correlation between number of injuries and severity of injuries was statistically significant; *r=.41, p<.01.* Therefore, as number of injuries increases so does the severity rating of the injuries. For high school athletes, the correlation between trait anger and severity of injuries was also found to be statistically significant (*r=.16, p=.02),* as was the correlation between coping skills and severity of injuries; *r=.19, p=.01.* For high school athletes, the correlation between number of hours practiced and severity of injuries was statistically significant (*r=.17, p=.02),* as was the correlation between rigorousness of practices and number of injuries; *r=.17, p=.02.* For high school athletes, the correlation between resiliency and number of injuries was not statistically significant; *r=.01, p=.44.* The correlation between resiliency and severity of injuries was not statistically significant; *r=.09, p=.13.* Additionally, the correlations between competition anxiety and number of injuries (*r=.05, p=.28),* and competition anxiety and severity of injuries (*r=.07, p=.20)* were not statistically significant. For high school athletes, the correlation between trait anger and number of injuries was not statistically significant; *r=.03, p=.36.* The correlations between number

of injuries and social support (*r=-.01, p=.45),* severity of injuries and social support (*r=-.01, p=.44),* number of injuries and satisfaction with social support (*r=-.09, p=.14),* or severity of injuries and satisfaction with social support (*r=.00, p=.50)* were not statistically significant. Additionally, despite there being a significant relationship between severity of injuries and coping skills, the correlation between number of injuries and coping skills was not statistically significant; *r=.09, p=.12.* Finally, the correlations between number of hours practiced and number of injuries (*r=.11, p=.08)* and between rigorousness of practices and severity of injuries (*r=.04, p=.31)* were not statistically significant.

c) Various correlational analyses were also performed to examine the relationships between number of injuries, severity of injuries, competition anxiety, resiliency, trait anger, coping resources, coping skills, number of hours practiced, and rigorousness of practices for collegiate athletes only. Results of the following analyses can be seen displayed in Tables 7 and 8. For collegiate athletes, the correlation between number of injuries and severity of injuries was statistically significant; *r=.47; p<.01.* No other significant correlations were found for collegiate athletes and the various factors examined. For collegiate athletes, the correlations between resiliency and number of injuries *(r=.12, p=.15)* and resiliency and severity of injuries (*r=.11, p=.19)* were not statistically significant. Similarly, the correlations between competition anxiety and number of injuries (*r=-.01, p=.50)* and competition anxiety and severity of injuries (*r=-.01, p=.45)* were not statistically significant. Additionally for collegiate athletes, the

correlations between trait anger and number of injuries (*r=-.06, p=.30)* and trait anger and severity of injuries (*r=.04, p=.36)* were not statistically significant. The correlations between number of injuries and social support (*r=-.17, p=.08)* and between severity of injuries and social support (*r=-.11, p=.17)* were not statistically significant. For collegiate athletes, the correlations between satisfaction with social support and number of injuries (*r=.05, p=.34)* and satisfaction with social support and severity of injuries (*r=-.12, p=.16)* were not statistically significant. For collegiate athletes, the correlations between coping skills and number of injuries (*r=.02, p=.44)* and coping skills and severity of injuries (*r=.05, p=.32)* were not statistically significant. Finally, for collegiate athletes, overtraining was not shown to be significantly correlated with number and severity of injuries. The correlations between number of hours practiced and number of injuries (*r=.08, p=.25)* and number of hours practiced and severity of injuries (*r=-.10, p=.20)* were not statistically significant. The correlations between rigorousness of practices and number of injuries (*r=.09, p=.22)* and rigorousness of practices and severity of injuries (*r=.12, p=.14)* were not statistically significant.

d) Finally, various correlational analyses were also performed to examine the relationships between number of injuries, severity of injuries, competition anxiety, resiliency, trait anger, coping resources, coping skills, number of hours practiced, and rigorousness of practices for professional athletes only. Results of the following analyses can be seen displayed in Tables 7 and 8. For professional athletes, the correlation between coping skills and number of injuries was statistically significant; *r=-.82; p=.02.* That is, the higher

the individual scored with regard to coping skills, the lower number of injuries they reported. No other significant correlations were found for professional athletes and the various factors examined. For professional athletes, the correlation between number of injuries and severity of injuries was approaching significance; *r=.69, p=.07.* The correlations between resiliency and number of injuries *(r=-.64, p=.09)* and resiliency and severity of injuries (*r=-.22, p=.34)* were not statistically significant. Similarly, for professional athletes, the correlations between competition anxiety and number of injuries (*r=.45, p=.19)* and competition anxiety and severity of injuries (*r=.12, p=.41)* were not statistically significant. Again, the correlations between trait anger and number of injuries (*r=-.08, p=.44)* and trait anger and severity of injuries (*r=-.44, p=.19)* were not statistically significant. For professional athletes, the correlations between number of injuries and social support (*r=.58, p=.11)* and severity of injuries and social support (*r=.44, p=.19)* were not statistically significant. Additionally, the correlations between satisfaction with social support and number of injuries (*r=-.49, p=.16)* and satisfaction with social support and severity of injuries (*r=-.10, p=.43)* were not statistically significant. For professional athletes, the correlation between coping skills and severity of injuries was not statistically significant; *r=-.42, p=.21.* Finally, for professional athletes, overtraining was not shown to be significantly correlated with number and severity of injuries. The correlations between number of hours practiced and number of injuries (*r=.57, p=.12)* and number of hours practiced and severity of injuries (*r=.31, p=.27)* were not statistically significant. The correlations between

rigorousness of practices and number of injuries (*r=-.04, p=.47)* and rigorousness of practices and severity of injuries (*r=-.16, p=.38)* were not statistically significant.

Overall, these findings provide a few indications of differences that exist between high school level, collegiate level, and professional level athletes in the current sample. For the high school level participants, a number of significant correlations were found; for the collegiate level and professional level participants, a few significant correlations were discovered. The significant findings for the high school participants involved the correlations between number of injuries and severity of injuries, trait anger and severity of injuries, coping skills and severity of injuries, number of hours practiced and severity of injuries, and rigorousness of practices and number of injuries. For the college participants, the significant finding involved the correlation between number of injuries and severity of injuries. While there were some high correlations for the professional sample, most did not reach statistical significance due to the very small sample size. For this sample, the significant correlation involved coping skills and number of injuries. The only similarity found between high school level and collegiate level participants was that number of injuries and severity of injuries were significantly correlated. No other similarities were found between the groups.

CHAPTER FIVE: DISCUSSION

The aim of the present study was to examine various factors in an effort to better understand their relationship to frequency and severity of injury in an athletic population. As the literature suggested, identifying factors associated with injuries might prove valuable, especially for those who work with athletes. Based on previous findings indicating that physical, environmental, and psychological factors all contribute to injury rates, the current study chose to look at the personality factors of competition anxiety, trait anger, and resiliency with regard to their relationship with injury. The current study also examined athletes' coping skills and coping resources and the impact these factors had with regard to an athlete's susceptibility to injury. Finally, overtraining, including hours trained and rigorousness of practices, was studied with regard to its relationship to injury. Additionally, not only were findings examined with regard to the overall participants, but they were also looked at broken down between males versus females, contact sports versus non-contact sports, and high school versus college versus professional participants. It is important to understand the relationships that exist between these factors in order to work towards better prevention and treatment of injuries when working with athletes.

One area examined in the current study aimed to determine whether an athlete's history of injury has an impact on their susceptibility to injury. The current study's findings provide valuable information in two ways: first, in adding support for other findings reported in the literature, and next, for adding a new perspective. Regarding the first, a limited amount of

previous research has shown that prevalence of previous injury is predictive of future injuries (Andersen & Williams, 1988). Our results supported this hypothesis, as athletes who reported greater number of injuries also reported higher vulnerability to later injuries in terms of severity of injuries. These results were confirmed for both males and females, as well as athletes involved in both contact sports and non-contact sports. Hence the current data adds to previous research findings that a positive correlation does exist between prior injury and later injury (Lysens et al., 1993; William, Hogan, & Andersen, 1993). These findings were also consistent with previous findings that this is true for both males and females (Van Mechelen et al., 1996). Although the few cited studies do exist, the overall amount of research on the topic remains sparse, thus adding to the significance of the current confirmatory findings. Maddison and Prapavessis (2005) concluded that "the relationship between previous injury and vulnerability to subsequent injury has received little empirical investigation" (Maddison & Prapavessis, 2005, p.291). Perhaps the more important contribution of the current study is in the focus on severity. While prior research has linked the presence of injury with future injury, the current study uniquely contributes to the research by linking the presence of injury with increased severity of injuries. So these findings suggest that not only is an athlete with high number of injuries at risk for more injury, but the risk is for more serious injury.

There are a variety of potential explanations for this relationship between high number of prior injuries and greater severity of later injuries. This relationship could be due to the fact that when injury occurs and an athlete returns to sport too quickly, incomplete healing has

occurred. Therefore an athlete's body may be more vulnerable to more severe injuries in the future. Additionally, the athlete may attempt to compensate for the injury and develop bad habits, thus leading to greater vulnerability to a more severe injury. Knowing this relationship can have practical implications especially for coaches, trainers and athletes themselves. Given the decisions made by coaches and trainers regarding when an athlete should return to sport following an injury, it is important that they recognize the consequences of returning an athlete to sport too soon, especially one with a history of injuries. Additionally for athletes, many are eager to return to practice and competition following an injury, given their dedication to their sport and their team. Athletes may be tempted to return, even when injured, due to a variety of factors including their innate competitiveness, desire to help their team, fear of losing a scholarship, frustration with being injured, and impatience with the healing process. Coaches may also be willing to accept the word of the athlete when they say they are recovered, therefore rushing the return to sport. Therefore, education about the relationships between frequency and severity of injury that exist can provide them a valuable understanding of why they need to allow substantial recovery time before returning to sport. Not only is the possibility of future injury present if an athlete returns too quickly, but the possibility of more severe injuries is also present; this may ultimately keep the athlete from practice and competition even longer, if not permanently. Given the pressures and high demands placed on athletes, it is essential that we understand the factors associated with injury and return to sport, so that we can provide coaches, athletes, and trainers with the information they need to make informed decisions.

Another valuable finding that emerged in the current study was the relationship that was found between anger and severity of injuries. Previous research has been limited with regard to examining the impact of anger in an athletic population. Additionally, no report in the literature is available on anger and its role in sport injury. However, more general research has found that anger is typically associated with physical antagonism and less adaptive behavior (Deffenbacher, Oetting, Thwaites, et al., 1996; Deffenbacher, Oetting, Lynch, & Morris, 1996; Spielberger, 1999; Tafrate, Kassinove, & Dundin, 2002). Therefore, when translated to a sport environment, the physical antagonism may become engaging in rough contact, while the low adaptive behavior may produce inability to cope effectively with adversity. Additionally, anger has been found to be associated with other forms of injurious behavior (Geigling et al., 2009; Hazaleus & Deffenbacher, 1986; Painuly, Sharan, & Mattoo, 2007; Trew & Alden, 2009). Based on previous research on the impact of anger and other injurious behavior, the current study aimed to expand on these findings and examine this relationship in an athletic population. The current study predicted that individuals possessing high levels of trait anger would also be more susceptible to injury. The significant correlations which were discovered suggest a trend for high anger among athletes to be associated with greater severity of injuries. This is consistent with past research on anger but now opens up new avenues when applied to sport behavior. The current results point to the possibility that athletes with higher trait anger might be especially vulnerable when injured to experiencing more serious injury. Interesting is the lack of relationship in the current study between anger and frequency; specifically higher anger is not associated with higher numbers of injuries. Several speculations might be offered to explain this

discrepancy regarding the relation of anger to severity of injury but not frequency. One possibility is that angry athletes are also more aggressive and expose themselves to higher risks. Hence, although they do not experience more frequent injuries, when they are injured, the injury is more severe. When the results are separately analyzed for males versus females another interesting distinction appears: results were not significant for males alone, but were significant for females with regard to trait anger and severity of injury. One possible explanation derives from previous findings that men and women tend to direct their anger differently, thus leading to different consequences. Deffenbacher & Kellaway (2010) found that women tend to direct their anger inwardly, while men tend to direct their anger at others. Perhaps females are more likely to push their bodies to an extreme in an effort to punish themselves, while males may direct anger toward a teammate or coach. Females also may be less likely to acknowledge or vocalize their anger, thus allowing it to build up and lead to less adaptive behavior, and therefore increased negative consequences.

The prior interpretations assume that anger leads to increased injury severity; however, the analyses conducted were correlations. Thus, it is still unknown whether anger leads to more severe injuries or whether individuals who experience more severe injuries become angry, it is only known that a relationship exists. Hence, regarding this correlational finding, there are two possible interpretations: one interpretation would be that somehow angrier athletes get themselves in situations such that when injured, their injuries are more severe. The other interpretation would be that athletes with severe injuries experience greater levels of anger as

an emotional reaction to the implications of the severe damage. Regardless, it seems reasonable to call coaches' attention to these findings regarding anger and their athletes. Without control over anger reactions, an athlete's performance can be affected as the emotions disrupt controlled motor performance, and interfere with cognitive controls. However, once researchers can better understand the relationship that exists, practitioners can assist individuals working with athletes, as well as the athletes themselves, in reducing anger before and after an injury occurs. Often times among athletes, anger is accepted as normal response to stressors or frustrations; however, if coaches are more informed as to the potential negative associations anger can have with injury, they may be more likely to implement/teach more positive coping strategies to their athletes.

Another useful finding of the current study is with regard to the relationship between overtraining and susceptibility to injury. Once again, results are valuable in two ways: first through adding confirmation of findings by others, but more importantly, by adding some new information. Previous research showed that overtraining can lead to negative consequences such as a decrease in vigor, increased fatigue, and greater susceptibility to injury (Costill et al., 1988; Goss, 1994; Peterson, 2009). The current study first found that athletes who engaged in either greater number of practice hours or more rigorous practices, were more likely to experience greater frequency or severity of injury. This is consistent with previous research which demonstrated negative consequences associated with overtraining, whether overtraining is defined in terms of total number hours or intensity of workouts. Although this may seem like

an intuitive finding, these results can be relevant information for injury prevention. Athletes are often tempted to believe that the harder they work and the more practice time they put in, the better they will be. However, the current data would suggest that this could also be associated with increased risk for injury.

The second interesting data that emerged when examining overtraining was the information that the relationship between frequency and intensity of practices and number and severity of injuries existed for those involved in non-contact sports, but not for those involved in contact sports. One possible explanation for this finding maybe be the repetitive beating on the body from overtraining that occurs in non-contact sports. For contact sports, the very actions involved are high risk actions such that the very sport itself provides the primary risk that overrides any risk from overtraining. For a non-contact sport, injury risk might derive less from the sport itself, but other factors such as the off-field/off-court training activities. Therefore, if an athlete is participating in overtraining due to additional off-field/off-court training, they may be adding more repetition, and therefore more potential for injury.

Finally, attention should be called to the fact that the current study found that both overtraining from amount of time practicing, or overtraining deriving from intensity of practices, are related to increased frequency and severity of injury. Therefore, it is not only dangerous for an athlete to work out more hours or engage in more repetitions, but it is also dangerous for an athlete to engage in greater intensity of training in a short amount of time

(such as lifting higher amounts of weight than they should). Many coaches and athletes are tempted to believe that speeding up training by doing more in a limited amount of time (i.e. the idea that "more is better) will lead to greater performance; however, it is more likely that speeding up training could lead to greater number or severity of injuries.

Limitations

There are several limitations of the current study, which could explain some of the failure to support the findings of previous researchers. All of the information in the study, regarding frequency and severity of injuries, was based on self-report from the athletes themselves. Therefore, there may have been inconsistencies in how each individual chose to report their injury. It would be beneficial to expand on the current study by looking at athletic trainers' or doctors' ratings of the athletes' injuries, in an effort to improve consistency among ratings. Additionally, many of the athletes were reporting on previous injury, and were no longer even involved in sport. Therefore, results could have been impacted by their memory of the injuries, thus making their recall less accurate. Also, for athletes no longer involved in sport, their self-report of various personality factors could differ from the levels of anxiety or anger that they may have been experiencing when they were involved in their sport. Another limitation of the study would be the lack of equal representation of participants across all groups, including level of participation and type of sport. Furthermore, other limitations include the limiting of recruitment to participants from collegiate settings.

Future Directions

In closing, while overall findings were mixed regarding the various factors studied, useful insights have emerged from the current study. The discussion section highlighted some of the important results from this study, though there are also several directions which future research might take based on the various findings. First are the possible interaction effects (i.e. interaction effects among themselves, interaction effects when including levels of participants (high school/collegiate/professional), interaction effects when including types of sport (contact/noncontact), interaction effects when including gender, etc.). For instance, the current study found that for high school participants, there was a trend for anger and coping skills to be correlated with severity of injuries. However, for collegiate athletes these factors did not reach significance. On the other hand, for professional athletes, there was a significant relationship between coping skills and frequency of injuries. Next, future research might design studies using different measurements. For instance, for males, when using rigorousness of practice to assess overtraining, there was a significant correlation with number of injuries. However, when using number of hours practicing the measure failed to reach significance. For females, the results were reversed: number of hours significantly correlated with number of injuries, but rigorousness did not. Finally, it may be beneficial for researchers to examine athletes who are currently injured, as opposed to having to recall their injuries, as well as to obtain ratings of frequency and severity of injuries from athletic trainers. This would help maintain consistency in reporting, and minimize some of the limitations of the athlete having to report from memory.

Overall, the findings of this study reveal that there are a number of physical, environmental, and psychological factors that make an athlete more susceptible to injury. A number of unique and significant relationships were found, specifically the relationships between frequency and severity of injuries, trait anger and severity of injury, and overtraining and frequency and severity of injuries. It is important that these valuable results be utilized by practitioners to educate and inform coaches, trainers, and athletes. It cannot be overemphasized how important it is for all individuals involved in the decision-making process to be fully informed as to what factors may impact an athlete's injury process.

TABLES

Table 1
Correlations between Number of Injuries and Severity of Injuries

	r	p	N
Total Sample	.44	<.01	244
Males	.43	<.01	103
Females	.45	<.01	141
Contact	.44	<.01	51
Non-Contact	.54	<.01	55
High School	.41	<.01	163
Collegiate	.47	<.01	75
Profession	.69	.07	6

TABLE 2
Correlations between Psychological Variables and Number of Injuries and Severity of Injuries

		Resiliency with				Anxiety with				Anger with			
		Number		Severity		Number		Severity		Number		Severity	
	N	r	p	r	p	r	p	r	p	r	p	r	p
Total Sample	244	.05	.24	.10	.07	.05	.24	.04	.28	-.00	.48	.11	.05
Males	103	.12	.12	.10	.16	.04	.34	.07	.26	-.05	.32	.07	.25
Females	141	.01	.44	.10	.12	.02	.40	.01	.44	.04	.34	.14	.05
Contact	51	.23	.05	.14	.16	-.16	.14	.11	.22	-.16	.14	.17	.12
Non-contact	55	.14	.16	.20	.07	.20	.07	.03	.41	.20	.07	.22	.06

TABLE 3
Correlations between Support/Coping and Number of Injuries and Severity of Injuries

		Social Support with				Satisfaction w/ SS with				Coping Skills with			
		Number		Severity		Number		Severity		Number		Severity	
	N	r	p	r	p	r	p	r	p	r	p	r	p
Total Sample	244	-.03	.31	- .03	.32	-.03	.32	-.03	.33	.02	.39	.14	.02
Males	103	.02	.40	.04	.36	-.05	.30	-.02	.44	.12	.12	.09	.19
Females	141	-.09	.16	-.08	.19	-.02	.43	-.04	.33	-.02	.39	.18	.02
Contact	51	-.20	.08	.09	.27	.06	.34	-.05	.36	.32	.01	.11	.22
Non-contact	55	.07	.31	-.02	.45	.02	.45	.02	.44	-.21	.06	.15	.14

TABLE 4
Correlations between Overtraining and Number of Injuries and Severity of Injuries

		#Hours Training with				Intensity with			
		Number		Severity		Number		Severity	
	N	r	p	r	p	r	p	r	p
Total Sample	244	.18	<.01	.07	.15	.15	<. 01	.08	.11
Males	103	.04	.33	.07	.23	.23	.01	.10	.16
Females	141	.29	<.01	.07	.20	.10	.12	.06	.24
Contact	51	.07	.32	.02	.45	.19	.10	.07	.31
Non-contact	55	.44	<.01	.18	.10	.24	.04	.26	.03

TABLE 5
Multiple Linear Regression of Social Support, Coping Skills, Resiliency Interaction Effects on Anxiety-Number of Injuries, Anxiety-Severity of Injuries, Anger-Number of Injuries, Anger-Severity of Injuries, Hours Practiced-Number of Injuries, Hours Practiced-Severity of Injuries, Rigor-Number of Injuries, Rigor-Severity of Injuries

	Social Support		Coping Skills		Resiliency	
	R^2	p	R^2	p	R^2	p
Anxiety x # Injuries	.01	.80	.02	.08	.01	.27
Anxiety x Severity	.01	.47	.03	.49	.01	.68
Anger x # Injuries	.01	.18	.00	.61	.00	.60
Anger x Severity	.02	.08	.05	.07	.03	.25
# Hours x # Injuries	.05	.03	.04	.11	.03	.40
# Hours x Severity	.01	.77	.02	.88	.01	.68
Rigor x # Injuries	.03	.58	.02	.97	.02	.77
Rigor x Severity	.01	.73	.02	.71	.01	.78

TABLE 6
Correlations between Psychological Variables and Number of Injuries and Severity of Injuries

		Resiliency with				Anxiety with				Anger with			
		Number		Severity		Number		Severity		Number		Severity	
	N	r	p	r	p	r	p	r	p	r	p	r	p
High-School	163	.01	.44	.09	.13	.05	.28	.07	.20	.03	.36	.16	.02
Collegiate	75	.12	.15	.11	.19	-.01	.50	- .01	.45	-.06	.30	.04	.36
Pro	6	-.64	.09	-.22	.34	.45	.19	.12	.41	-.08	.44	-.44	.19

TABLE 7
Correlations between Support/Coping and Number of Injuries and Severity of Injuries

		Social Support with				Satisfaction w/ SS with				Coping Skills with			
		Number		Severity		Number		Severity		Number		Severity	
	N	r	p	r	p	r	p	r	p	r	p	r	p
High School	163	-.01	.45	- .01	.44	-.09	.32	.00	.50	.09	.12	.19	.01
Collegiate	75	-.17	.08	-.11	.17	.05	.34	-.12	.16	.02	.44	.05	.32
Pro	6	.58	.11	.44	.19	-.49	.16	-.10	.43	-.82	.02	-.42	.21

TABLE 8
Correlations between Overtraining and Number of Injuries and Severity of Injuries

		#Hours Training with				Intensity with			
		Number		Severity		Number		Severity	
	N	r	p	r	p	r	p	r	p
High School	163	.11	.08	.17	.02	.17	.02	.04	.31
Collegiate	75	.08	.25	-.10	.20	.09	.22	.12	.14
Pro	6	.57	.12	.31	.27	-.04	.47	-.16	.38

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APPENDICES

APPENDIX I

Basic Questionnaire

Please indicate the following about yourself:

"ID code"_____

__ Female ___Male

Age___

Year in School: ___ Frosh ___Soph ___ Junior ___ Senior ___Graduate student

University you currently attend: _____

Ethnicity: ___African American ___Asian American ___Caucasian ___

Latino/a ___ Native American ___Other ____

****

NOTE: Reply to the following items relating to when you were actively involved in an organized sport on the junior/senior varsity or pro level

1) What sport are (were) you involved in? _____

2) Check the highest level of sport involvement you have participated in?

__ High School __ College __ Pro

3 How many hours (team plus on your own) you practice(d) per week ___ (# hrs)

4) On a scale of 1 to 7, please rate how physically rigorous you feel your practices typically are/were each week (1 being least rigorous, 7 being most rigorous)(Circle your answer)

1 2 3 4 5 6 7

5) How many years have you been in this sport at this level? ___ (# yrs)

6) How many sport injuries have you had while in this sport? ___ (# injuries)

7) For each injury, please rate how severe that injury was based on the following scale:

(1): No treatment was required, no modification of activity was required

(2): Treatment was required and activity was modified but permitted

(3): Non-participation occurred for 1-6 days

(4): Non-participation occurred for 1-4 weeks

(5): Non-participation occurred for more than 4 weeks

Injury 1: _____ (severity rating)

Injury 2: _____ (rating)

Injury 3:_____ (rating)

Injury_: _____ (rating)

Injury _: _____ (rating)

Injury _: _____ (rating)

Injury _: _____ (rating)

Injury _: _____ (rating)

Injury _: _____ (rating)

Injury _: _____ (rating)

APPENDIX II

Connor-Davidson Resilience Scale

Rate how true each of the following statements is for you on a scale of 0 to 4 (0= Not true at all, 1= rarely true, 2= sometimes true, 3= often true, 4= true nearly all of the time)

1. Able to adapt to change
2. Close and secure relationships
3. Sometimes fate or God can help
4. Can deal with whatever comes
5. Past success gives confidence for new challenge
6. See the humorous side of things
7. Coping with stress strengthens
8. Tend to bounce back after illness or hardship
9. Things happen for a reason
10. Best effort no matter what
11. You can achieve your goals
12. When things look hopeless, I don't give up
13. Know where to turn for help
14. Under pressure, focus and think clearly
15. Prefer to take the lead in problem solving
16. Not easily discouraged by failure
17. Think of self as strong person
18. Make unpopular or difficult decisions

19. Can handle unpleasant feelings
20. Have to act on a hunch
21. Strong sense of purpose
22. In control of your life
23. I like challenges
24. You work to attain your goals
25. Pride in your achievements

APPENDIX III

Sport Competition Anxiety Test

Read each statement below, decide if you "Rarely", "Sometimes" or "Often" feel this way when competing in your sport, circle the appropriate answer to indicate your response.

1. Competing against others is socially enjoyable
Rarely Sometimes Often

2. Before I compete I feel uneasy
Rarely Sometimes Often

3. Before I compete I worry about not performing well
Rarely Sometimes Often

4. I am a good sportsman when I compete
Rarely Sometimes Often

5. When I compete, I worry about making mistakes
Rarely Sometimes Often

6. Before I compete I am calm
Rarely Sometimes Often

7. Setting a goal is important when competing
Rarely Sometimes Often

8. Before I compete I get a queasy feeling in my stomach
Rarely Sometimes Often

9. Just before competing, I notice my heart beats faster than usual
Rarely Sometimes Often

10. I like to compete in games that demands a lot of physical energy
Rarely Sometimes Often

11. Before I compete I feel relaxed
Rarely Sometimes Often

12. Before I compete I am nervous
Rarely Sometimes Often

13. Team sports are more exciting than individual sports
Rarely Sometimes Often

14. I get nervous wanting to start the game
Rarely Sometimes Often

15. Before I compete I usually get uptight
Rarely Sometimes Often

APPENDIX IV

Trait Anger Scale

Directions: A NUMBER OF STATEMENTS WHICH PEOPLE HAVE USED TO DESCRIBE THEMSELVES ARE GIVEN BELOW. READ EACH STATEMENT AND THEN FILL IN THE CIRCLE INDICATING HOW YOU **GENERALLY FEEL**. THERE ARE NO RIGHT OR WRONG ANSWERS. DO NOT SPEND TOO MUCH TIME ON ANY ONE STATEMENT BUT GIVE THE ANSWER WHICH SEEMS TO DESCRIBE HOW YOU **GENERALLY** FEEL.

		ALMOST NEVER	SOME-TIMES	ALMOST OFTEN ALWAYS
1. I am quick tempered	O	O	O	O
2. I am a hotheaded person	O	O	O	O
3. I have a fiery temper	O	O	O	O
4. I get angry when I am slowed down by others' mistakes	O	O	O	O
5. I feel annoyed when I am not given recognition for doing good work	O	O	O	O
6. I fly off the handle	O	O	O	O
7. When I get mad, I say nasty things	O	O	O	O
8. When I get frustrated, I feel like hitting someone	O	O	O	O
9. I feel infuriated when I do a good job and get a poor evaluation	O	O	O	O
10. It makes me furious when I am criticized in front of others	O	O	O	O

APPENDIX V

Social Support Questionnaire 6

1. Whom can you really count on to distract you from your worries when you feel under stress?

No one

1)	4)	7)
2)	5)	8)
3)	6)	9)

How satisfied?

6-Very Satisfied	5-Fairly Satisfied	4-A little Satisfied	3-A little Dissatisfied	2-Fairly Dissatisfied	1-Very Dissatisfied

2. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

No one

1)	4)	7)
2)	5)	8)
3)	6)	9)

How satisfied?

6-Very Satisfied	5-Fairly Satisfied	4-A little Satisfied	3-A little Dissatisfied	2-Fairly Dissatisfied	1-Very Dissatisfied

3. Who accepts you totally, including both your worst and your best points?

No one

1)	4)	7)
2)	5)	8)
3)	6)	9)

How satisfied?

6-Very Satisfied	5-Fairly Satisfied	4-A little Satisfied	3-A little Dissatisfied	2-Fairly Dissatisfied	1-Very Dissatisfied

4. Whom can you really count on to care abou you, regardless of what is happening to you?

No one

1)	4)	7)
2)	5)	8)
3)	6)	9)

How satisfied?

6-Very Satisfied	5-Fairly Satisfied	4-A little Satisfied	3-A little Dissatisfied	2-Fairly Dissatisfied	1-Very Dissatisfied

5. Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?

No one

1)	4)	7)
2)	5)	8)
3)	6)	9)

How satisfied?

6-Very Satisfied	5-Fairly Satisfied	4-A little Satisfied	3-A little Dissatisfied	2-Fairly Dissatisfied	1-Very Dissatisfied

6. Whom can you count on to console you when you are very upset?

No one

1)	4)	7)
2)	5)	8)
3)	6)	9)

How satisfied?

6-Very Satisfied	5-Fairly Satisfied	4-A little Satisfied	3-A little Dissatisfied	2-Fairly Dissatisfied	1-Very Dissatisfied

APENDIX VI

Athletic Coping Skills Inventory-28

Rate yourself on items 1-28 based on the following:
0 = ALMOST NEVER, 1 = SOMETIMES, 2 = OFTEN, 3 = ALMOST ALWAYS

1. On a daily or weekly basis, I set very specific goals for myself that guide what I do. 0 1 2 3
2. I get the most out of my talent and skills. 0 1 2 3
3. When a coach or manager tells me how to correct a mistake I've made, I tend to take it personally and feel upset. 0 1 2 3
4. When I am playing sports, I can focus my attention and block out distractions. 0 1 2 3
5. I remain positive and enthusiastic during competition, no matter how badly things are going. 0 1 2 3
6. I tend to play better under pressure because I think more clearly. 0 1 2 3
7. I worry quite a bit about what others think about my performance. 0 1 2 3
8. I tend to do lots of planning about how to reach my goals. 0 1 2 3
9. I feel confident that I will play well. 0 1 2 3
10. When a coach or manager criticizes me, I become upset rather than helped. 0 1 2 3
11. It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to. 0 1 2 3
12. I put a lot of pressure on myself by worrying how I will perform. 0 1 2 3
13. I set my own performance goals for each practice. 0 1 2 3
14. I don't have to be pushed to practice or play hard; I give 100%. 0 1 2 3
15. If a coach criticizes or yells at me, I correct the mistake without getting upset about it. 0 1 2 3
16. I handle unexpected situations in my sport very well. 0 1 2 3
17. When things are going badly, I tell myself to keep calm, and this works for me. 0 1 2 3
18. The more pressure there is during a game, the more I enjoy it. 0 1 2 3
19. While competing, I worry about making mistakes or failing to come through. 0 1 2 3
20. I have my own game plan worked out in my head long before the game begins. 0 1 2 3

21. When I feel myself getting too tense, I can quickly relax my body and calm myself. 0 1 2 3
22. To me, pressure situations are challenges that I welcome. 0 1 2 3
23. I think about and imagine what will happen if I fail or screw up. 0 1 2 3
24. I maintain emotional control no matter how things are going for me. 0 1 2 3
25. It is easy for me to direct my attention and focus on a single object or person. 0 1 2 3
26. When I fail to reach my goals, it makes me try even harder. 0 1 2 3
27. I improve my skills by listening carefully to advice and instruction from coaches and managers. 0 1 2 3
28. I make fewer mistakes when the pressure's on because I concentrate better. 0 1 2 3