

# PSYCHOLOGICAL CHANGES IN ATHLETES FOLLOWING INJURY

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A thesis submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Masters of Athletic Training in the Exercise and Sports Science department in the University of North Carolina at Chapel Hill.

Chapel Hill  
2017

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## ABSTRACT

Ruth Duvall Fuqua: Psychological Changes in Athletes Following Injury  
(Under the direction of William E. Prentice)

The purpose of this study was to examine psychological changes in Division I varsity and club sport athletes following an acute, traumatic, time-loss injury. Participants completed Internet-based surveys that assessed athlete demographics; psychological health variables including perceived stress, positive and negative affect, depression, anxiety, and athlete burnout; and dispositional characteristics including athletic identity and trait optimism. Surveys were completed at initial injury and return to play. Weekly follow-up surveys were completed if the athlete was injured and restricted from practice for more than seven days. Statistical analysis revealed some factors of psychological health significantly change from initial injury until return to play. These results add to the growing body of knowledge that suggests mental health is a key portion of an athlete's overall health, and should be treated as such.

## ACKNOWLEDGEMENTS

I would like to thank my committee members, especially J.D., for helping me through this process. Without your guidance and support, I would not have been able to accomplish all that I have. I would also like to thank my family and friends for keeping me motivated.

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## LIST OF ABBREVIATIONS

A-ABQ	Accomplishment dimension of the Athlete Burnout Questionnaire
ABQ	Athlete Burnout Questionnaire
AIMS	Athletic Identity Measurement Scale
ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
D-ABQ	Depersonalization dimension of the Athlete Burnout Questionnaire
E-ABQ	Emotional and Physical Exhaustion dimension of the Athlete Burnout Questionnaire
GAD-7	General Anxiety Disorder 7-item Measure
I-PANAS-SF	International Positive and Negative Affect Scale Short Form
LOT	Life Orientation Test
N-PANAS	Negative portion of the International Positive and Negative Affect Scale
NATA	National Athletic Trainers' Association
NCAA	National Collegiate Athletics Association
P-PANAS	Positive portion of the International Positive and Negative Affect Scale
PHQ-9	Patient Health Questionnaire 9-item Measure
PSS-4	Perceived Stress Scale 4-item Measure

## CHAPTER 1: INTRODUCTION

The potential for injury is an inherent risk of sport participation including intercollegiate athletics. Since 1988, the National Collegiate Athletics Association (NCAA) Injury Surveillance System (ISS) has been collecting injury data from various sports. Over a 16-year span, the NCAA ISS collected data from 15 different men's and women's collegiate teams. The NCAA found injuries increased amounts of psychological stress leading to increased emotional and psychological disturbance (B. Hainline, E. Kroshus, & C. Wilfert, 2014; Hootman, Dick, & Agel, 2007).

The relationship between stress and injury has been well documented over the years theoretically and empirically. In 1988, Andersen and Williams developed a psychological model that depicted the relationship between psychological factors and the potential for athletic injury (Williams & Andersen, 1998). This psychological model, known as the stress-injury model, depicts how sport-related stressful events can potentially lead to injury. The injurious event is mediated by psychological factors such as the individual athlete's personality, history of stressors, and coping resources. While the stress-injury model is used primarily to explain how increased stress can possibly lead to injury, it has also been used to depict the relationship between an injury and the stress following the injurious event (Weinberg & Gould, 2011). Once an injury occurs, an individual's stress increases. Restriction from practice and/or physical activity, distance from the team, and healing time of the injury are just a few examples of how injuries have potential to increase the stress levels of an athlete. How one manages or copes with stress is influenced by the factors previously mentioned: personality, history of stressors, and

copied resources. If an athlete possesses maladaptive or negative psychological health factors, he or she can experience increased amounts of stress (Weinberg & Gould, 2011). History of stress (e.g. previous injury), coping resources (e.g. athlete burnout), and personality (e.g. athletic identity and optimism), therefore, all play a large role in the amount of stress an injury can create for an athlete and the way in which he or she will respond to that injury psychologically (Brewer, Linder, & Petitpas, 1999; Brewer & Tasiemski, 2011; Sparkes, 1998; Weinberg & Gould, 2011). Accordingly, the association of these factors with sport stress merits further consideration. The relationship between stress, dispositional factors, and other psychological health factors have rarely been examined as a whole following sport-related injury.

Personality is one of the key psychological factors in the stress-injury model. Many studies have been conducted on the relationship between personality and the response to stressful events (Aitken Harris & Lucia, 2003; Andersen, 1999; Brewer & Cornelius, 2010). Specific personality traits, such as extroversion, neuroticism, and optimism have been linked to predicting positive or negative affective states in individuals (Aitken Harris & Lucia, 2003). Individuals with high self-reported levels of neuroticism tend to be more depressed and anxious, whereas individuals with higher self-reported levels of agreeableness were shown to be less likely to experience depression or anger (Aitken Harris & Lucia, 2003). Identity, or the way an individual defines him or herself, is an important aspect of personality. Athletic identity is just one example of an individual's chosen identity. Athletic identity is the degree in which an individual identifies with the athlete role (Brewer, Van Raalte, & Linder, 1993). It is viewed as a multidimensional construct that encompasses social, cognitive, and affective components. Peers, family, coaches, teams, organization, and the media influence the social aspect of athletic identity (Brewer et al., 1993). The cognitive and affective components are influenced by an athlete's perception and

interpretation of his or her roles as an athlete, and the ways in which the athlete responds to and acts on these interpretations (Lamont-Mills & Christensen, 2006). For example, if an athlete is strongly rooted in his role as a soccer player, he will believe that his social identity is based primarily on the fact that he is a soccer player, his goals and aspiration in life will be geared to advancing in his sport, and he will feel worse if he underperforms in his sport as opposed to other areas of his life. Athletic identity shapes the broader social identity of an athlete and alters the balance between exclusivity and negative affect between sport and other areas of life (Brewer et al., 1993; Lamont-Mills & Christensen, 2006). The stronger an athlete's athletic identity, the more he or she will prioritize sport over other aspects of life like academics or friendships.

Affective responses have also been shown to be associated with sport injuries. Sports injuries are largely considered negative life events (Green & Weinberg, 2001). Negative life events can increase an individual's stress level, thus causing a negative change in mood and/or affect. Therefore, affect is one aspect of psychological health that can be influenced following injury. Affect has been classified as either positive or negative (Crawford & Henry, 2004). Positive affect has been related to positive emotions like enthusiasm, excitement, proudness, and hope. Negative affect, on the other hand, has been linked to negative emotions like fear, anxiousness, self-consciousness, and jitteriness (Crawford & Henry, 2004; Gustafsson, Skoog, Podlog, Lundqvist, & Wagnsson, 2013). Studies have also shown that negative affect has been linked to maladaptive psychological responses such as anxiety and depression (Crawford & Henry, 2004). Moreover, negative affect has been associated with increased psychological stress (Gustafsson et al., 2013; A. R. Nicholls, Backhouse, Polman, & McKenna, 2009). An athlete who suffers a time-loss injury and is unable to participate would likely experience increased negativity and psychological stress (Leddy, Lambert, & Ogles, 1994).

Therefore, he or she would, in turn, experience increase negative affective along with decreased psychological health.

Anxiety and depression are two other aspects of psychological health that can be impacted following injury. Anxiety is described as emotional reactions to events or situations that consist of a combination of three key things: feelings of apprehension, tension, and nervousness; worries or unpleasant thoughts; and physiological changes (Spielberger, 1988). Anxiety has been categorized as either state or trait anxiety (Raglin, 1992). Trait anxiety is relatively stable and unchanging, while state anxiety is more dynamic and changes based on factors in the environment and within the individual (Spielberger, 1988). Studies have shown that regular aerobic exercise can decrease state anxiety in individuals; conversely, if regular exercise is restricted due to injury or other circumstances, anxiety levels can rise (Byrne & Byrne, 1993; Fox, 1999). Increased anxiety has also been linked to increased injury risk and stress in athletes (Kolt & Kirby, 1994). In sum, state anxiety can be increased due to time loss from sport and has also been shown to increase risk of injury in athletes.

Depression is another key psychological health factor that has been found to increased following injury (Brewer, 1993; Brewer, Linder, & Phelps, 1995; A. M. Smith, Scott, O'Fallon, & Young, 1990). It is one of the most common mental disorders in the general population, and it interferes with an individual's ability to eat, work, study, sleep, and generally enjoy life (Kroenke & Spitzer, 2007; Kroenke, Spitzer, & Williams, 2001b). While the exact cause of depression is unknown, it is thought to arise due to a combination of genetic, biological, and environmental factors. Depression can be treated with medication and therapy, but it may also be treated with exercise. Many studies have been conducted on the relationship between physical activity and depression, suggesting that increased physical activity is inversely related to

depression (Byrne & Byrne, 1993; Fox, 1999; McKercher et al., 2009; Strohle, 2009; Teychenne, Ball, & Salmon, 2008). Moreover, athletes who become injured and are no longer able to participate in sport have been shown to display increased signs and symptoms of depression (Brewer, 1993; A. M. Smith et al., 1990; Teychenne et al., 2008).

Psychological health is altered following athletic injury, but optimism is a dispositional trait that may moderate how much of a change occurs (Brewer, 1994; Leddy et al., 1994; Scheier & Carver, 1985; A. M. Smith et al., 1990; Wagman & Khelifa, 1996; Williams & Andersen, 1998). Carver et al. defined optimism as a personality trait that reflects the extent an individual has favorable expectancies of their future (Carver, Scheier, & Segerstrom, 2010). Optimism has been classified as either a trait or state attitude. State optimism changes in relation to current situations or circumstances, while trait optimism refers to changes within one's generally stable optimism (Kluemper, Little, & DeGroot, 2009). An athlete who expresses high levels of state optimism believes that he or she will have a good practice, participate well, and/or have a successful season. An athlete who expresses high levels of trait optimism, as Carver et al. suggests, is only subject to change within his or her optimism during times of life transition, breaks from prior experiences, and when the outcome is uncertain (i.e. a possible career-ending injury) (Carver et al., 2010). State optimism is influenced by in-the-moment circumstances, while trait optimism is a stable trait that is rarely altered.

Building on these conceptualizations, trait optimism may be challenged when an athlete sustains an injury. Burnout can be one repercussion of a decrease in optimism when paired with factors such as increased stress and negative affect (Wadey, Evans, Hanton, & Neil, 2013). Burnout is an aspect of psychological health that is defined as a cognitive affective syndrome encompassing several symptoms such as a reduced sense of accomplishment, emotional and

physical exhaustion, and sport devaluation (Raedeke, 1997). If an athlete gets injured and is unable to participate in his or her sport, negative affect, anxiety, depression, and stress increase along with decreases in optimism and positive affect. All of the above factors place varying situational and physiological demands on the athlete, which could potentially alter his or her cognitive appraisal and coping behavior (Gould, Udry, Tuffey, & Loehr, 1996). If an athlete's cognitive appraisal and coping behavior is negatively distorted, he or she will most likely experience negative thoughts and emotions.

The purpose of the current study is to examine the relationship between factors of psychological health (i.e. optimism, depression, anxiety, burnout, and affect), athletic identity, and perceived stress in collegiate athletes following athletic injury until return to play. The level of athlete identity displayed by an individual has been shown to affect the psychological response to injury (Brewer, 1993; Brewer et al., 1995; Podlog & Eklund, 2009; A. M. Smith et al., 1990). A role-disrupting event to an athlete with a high level of athletic identity, such as an injury, will cause an increase in the negative factors of psychological health. Athletes who display higher levels of athletic identity tend to react more negatively to injury initially and the negative makers of psychological health decrease more slowly over the return to play window than those with low levels of athletic identity. The negative factors of psychological health (i.e. negative affect, depression, anxiety, burnout) tend to stay negative longer and decrease more slowly over the rehabilitation process in athletes who possess high athletic identity (Brewer et al., 1993). Research has been conducted on immediate alterations in psychological health following injury and the changes that occur at the point in which an athlete is able to fully participate again, but little research has focused on the changes in factors of psychological health (i.e. stress, affect, anxiety, depression) from initial injury to return to play.



## Research Questions

Research question 1: How do markers of psychological health (positive and negative affect, depression, anxiety, optimism, athlete burnout) compare immediately following a time-loss injury to when full return to play is achieved in collegiate athletes?

Hypothesis 1: Markers of positive psychological health (i.e. positive affect, optimism) will increase until return to play is achieved as opposed to markers of negative psychological health (negative affect, depression, anxiety, athlete burnout) will decrease until return to play in collegiate athletes.

Research question 2: After controlling for perceived stress, what is the change in psychological health factors in collegiate athletes immediately following a time loss injury until full return to play is achieved?

Hypothesis 2: After controlling for perceived stress, markers of positive psychological health will increase and maladaptive factors will decrease from initial injury until return to play.

Research question 3: After controlling for optimism and perceived stress, does athletic identity moderate the relationships among positive and negative affect and factors of psychological health in collegiate athletes immediately following a time loss injury until full return-to-play status is achieved?

Hypothesis 3: After controlling for optimism and perceived stress, athletes with higher levels of athletic identity will express more negative psychological health variables at the point of injury and the negative variables will decrease more slowly over the return to play window as opposed to athletes with lower levels of athletic identity.

#### Operational Definitions

- *Athletic identity*: the degree to which an individual identifies with the athlete role as measured by the Athletic Identity Measurement Scale (Brewer et al., 1993)
- *Psychological health*: the current psychological state of an individual as measure by his or her responses to the General Anxiety Disorder Questionnaire (Spitzer, Kroenke, Williams, & Lowe, 2006), Patient Health Questionnaire (Kroenke & Spitzer, 2007), Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988), Life Orientation Test (Scheier & Carver, 1985), and Athlete Burnout Questionnaire (Raedeke & Smith, 2001).
- *Athletic Injury*: acute injuries including, but not limited to fractures, sprains, strains, dislocations, and subluxations that 1) require medical attention from a certified athletic trainer and/or sports physician and 2) require the athlete to miss at least 5 days of organized team activities.
- *Negative life event*: an event that occurs in an athlete's life that negatively affect his or her psychological health
- *Return to play*: the point at which an athlete is able to participate fully in organized team activities without restrictions once cleared medically by the team's certified athletic trainer or team physician.

- *Stress*: any life event that causes mental or emotion tension as measured by the Perceived Stress Scale-4 (Cohen et al., 1983).

## CHAPTER 2: LITERATURE REVIEW

### Injury in Sport

Injuries are a common and understood consequence of participating in physical activity. Sports, in particular, hold a high risk of injury. The National Collegiate Athletics Association (NCAA) recognizes these risks as participation in sport is on the rise (Tolbert, McIlvain, Giangarra, & Binkley, 2011). Since 1988, the NCAA Injury Surveillance System (ISS) has been collecting data from various collegiate teams (Hootman et al., 2007). From 1988-1989 through 2003-2004, data from 15 collegiate sports was analyzed for injury occurrence. Injuries were only recorded if they required attention from the team certified athletic trainer or physician and required the athlete to miss one or more days of practice beyond the day of injury. The ISS found that nearly 14 injuries occurred in collegiate sport per 1000 athlete exposures (A-Es) during competition. An A-E is defined as one athlete practicing in one coach-run practice or competition (Dick, Agel, & Marshall, 2007). While the A-Es may seem small, these numbers equate to one injury for every two games or every five practices for a team consisting of 50 players.

Other studies have been conducted using other injury surveillance systems in order to track injury in collegiate sport. Yang et al. conducted a longitudinal study that followed 16 male and female Division I teams from a Big Ten conference college over a three-year period (August 1, 2005 – July 31, 2007). Over this time period, the study tracked acute and chronic injuries that occurred during coach-organized practices or games. Yang's study revealed that 286 overuse

injuries and 931 acute injuries were sustained by 573 athletes, leading the injury rate to be roughly 63 injuries per 1000 A-Es (Yang et al., 2012).

Present data support the position that injuries in athletics are on the rise, and, consequently, advancements in sports medicine have increased to meet demands. Advancements in sports medicine and certified athletic training requirements have begun to make participation in sports safer. In 2000, the National Athletic Trainers' Association (NATA) published a consensus entitled *Recommendations and Guidelines for Appropriate Medical Coverage of Intercollegiate Athletics*, which has since been revised multiple times to account for the growing knowledge of injuries in sport. This statement recommends the number of medical professionals needed for a team based on inherent risk, time required, and other factors pertaining to specific sports (2010). The NATA noted that, depending on the catastrophic index (CI) and injury rate (IR) for each sport, the necessary medical coverage should change. The CI pertains to the risk associated with life threatening injuries such as spinal cord injuries while the IR is related to the overall risk of injury. Lower risk sports, such as golf and tennis, require less medical coverage than higher risk sports like football and lacrosse (2010).

Sports medicine is continuing to grow with it. Great strides have been made over the years in order to protect athletes from physical injury. Yet, there is an aspect of sport injury that has only relatively recently been taken into account (B Hainline et al., 2014; Neal et al., 2013). Not only do injuries cause physical damage, they also have been shown to be associated with athlete psychological responses as well. Athletic injuries are associated with increased amounts of stress leading to increase emotional and psychological disturbance (Andersen, 1999; Bauman, 2005; Clement, Arvinen-Barrow, & Fetty, 2015; Day, Bond, & Smith, 2013; De Heredia, Munoz, & Artaza, 2004; Galambos, Terry, Moyle, Locke, & Lane, 2005; Leddy et al., 1994; A.

M. Smith et al., 1990; Weinberg & Gould, 2011). Consequently, while the focus for decades has been on healing the physical trauma of injury, contemporary exercise and sport science efforts have begun to better understand and treat the psychological response to athletic injury as well.

### A Psychological Model of Injury

Research has shown that athletic injury is associated with increased amounts psychological stress and suffering (Andersen, 1999; Leddy et al., 1994; Quinn & Fallon, 1999; Wagman & Khelifa, 1996; Wiese-Bjornstal, 2010). In 1988, Andersen and Williams created a psychological model to show how psychological factors contribute to injury (Williams & Andersen, 1998). This model, known as the stress-injury model, explains how dispositional and environmental factors, along with individual responses to sport stress, can lead to injury. When faced with a challenging practice, demanding game, or other stressful event, an athlete's history of stressors, personality or dispositional characteristics, and coping resources contribute together or in isolation to the athlete's stress response (Williams & Andersen, 1998). History of stressors includes school stress and previous injury, personality characteristics include athletic identity and optimism, and coping resources include social support/social resources and time management skills. The main hypothesis of the stress-injury model proposed by Andersen and Williams states that individuals with a history of many stressors, personality characteristics that are maladaptive to the stress response, and minimal coping resources will appraise situations as more stressful than those who do not possess the same factors. By appraising a situation as more stressful, these individuals will exhibit increased psychological activation and cognitive-affective reactivity, which leads to increase injury risk (Williams & Andersen, 1998). In other words, if an athlete is placed in a stressful situation and does not have adaptive psychological means of processing and/or coping with the situational demands, injury may be more likely to occur.

Not only does the stress-injury model explain how psychological factors can increase an individual's chances for injury during stressful situations, it also describes how, following an injurious event, psychological factors inherent to the model contribute to athlete psychological stress following injury (Weinberg & Gould, 2011; Williams & Andersen, 1998). For example, if an athlete is injured and has poor coping resources (e.g. poor time management, low social support), a history of many stressors (previous injury, poor interpersonal relations), and maladaptive personality characteristics for managing stress (i.e. low optimism), he or she is likely to experience more stress following injury and throughout the rehabilitation process than an individual who does not possess the same qualities. All of the psychological health factors in the stress-injury model can work together or separately to influence the response to a stressful situation or the response to injury (Williams & Andersen, 1998). Consequently, this model has informed a large amount of research on the psychological antecedents of and psychological responses to athletic injury (Andersen, 1999; Brewer, 1993, 1994; Crossman, 1997).

### Perceived Stress

Stress-based models are often used to explore and understand the psychological ramifications of injury (Williams & Andersen, 1998). Not only has psychological stress been linked to potential injury, it has also been shown to increase following an injurious event (Brewer, 1994; Nippert & Smith, 2008; Williams & Andersen, 1998). Furthermore, the relationship between injury; psychological health factors including affect, depression, anxiety, and burnout; dispositional traits including optimism, and perceived stress have been thoroughly examined over the years in individual studies (Andersen, 1999; Brewer et al., 1995; DeFreese & Smith, 2014; Gustafsson & Skoog, 2012; Leddy et al., 1994; Loudon, 2013a; Raedeke, 1997),

but very few have looked at all of the above factors at one time. Stress is an integral part of sport participation that can be linked, positively or negatively, not only to an athlete's performance, but also his or her response to injury both immediately following the injurious event as well as throughout the rehabilitation process.

Stress has been defined as any demanding event that taxes an individual's resources (Lazarus, 1966). A stress response can be triggered if an athlete perceives that his or her coping skills and resources are not adequate to meet the demands of the current situation (Ford & Gordon, 1999). The physiological and psychological changes that result from the stress response can either increase or decrease an athlete's risk for injury. Psychological distress is the most detrimental stress an athlete can experience while participating in sport (Loudon, 2013a). Physiologically, muscle tension and hormonal secretion can increase; psychologically, an athlete's field of vision may narrow. For example, if a soccer player experiences psychological distress during a game, the athlete can miss a key pass due to narrowed vision or strain a muscle due to increase muscle tension. These adaptations to the stressful events can increase the potential for injury because the cognitive appraisal aspect of the stress response can affect the physiological and attentional arousal of the athlete and vice versa (Ford & Gordon, 1999).

Ford et al. conducted a study that investigated how psychological health and dispositional variables moderate the relationship between life stress and injury time-loss in elite athletes (Ford, Eklund, & Gordon, 2000). The variables they examined were competitive trait anxiety, dispositional optimism, self-esteem, hardiness, and social support. These researchers found that some variables including optimism significantly moderated the relationship between injury and stress. Accordingly, athletes low in dispositional optimism were more likely to suffer greater injury time-loss as opposed to those with greater optimism (Ford et al., 2000). Individuals with



low levels of optimism and high levels of life stress have the potential to react less adaptively to injury, thus increasing stress. This study supported the notion that not only does higher life stress lead to injury and to maladaptive responses to injury, but it also provides evidence to support the idea that other factors, such as trait optimism can affect the relationship between stress and injury. Based on Ford's work, as well as that of other sport scientists (DeFreese & Smith, 2014; L. Smith, 2015), in the current study, trait optimism was examined as a possible moderator in the fluctuation of psychological health factors following injury and throughout the rehabilitation process. Ford et al. provide evidence to support further research into this relationship.

A review of the current literature completed by Nippert and Smith examined psychological stress related to injury and its impact on sports performance (Nippert & Smith, 2008). Nippert and Smith noted that psychological stressors might increase the risk of injury and negatively impact rehabilitation. Their review focused on how psychological and dispositional factors (i.e. athletic identity, life stress) can impact athletes before and after injury. Specifically, Nippert and Smith discovered that both personal factors (i.e. athletic identity, affect, previous injury) and situational factors (i.e. season of competition, level of competition, playing status) affect injury recovery and sport performance. Personal and situational factors influence cognitive, emotional, and behavioral responses (Nippert & Smith, 2008). The stress-injury model proposed by Andersen and Williams explains how stress not only contributes to injury, but it can also increase time-loss and negative psychological health variables following injury (Williams & Andersen, 1998). Studies have shown that negative life stress is positively and strongly correlated with injury and injury risk (Andersen, 1999; Lavallée & Flint, 1996). Thus, increased life stress is an important aspect of injury and injury rehabilitation. The current study examined

psychological stress perceptions in order to identify its relationship with other dispositional and psychological health outcomes following injury until return to play is achieved.

### Athletic Identity

Another key aspect of the stress-injury model proposed by Andersen and Williams is personality factors and their influence on the stress-injury response (Williams & Andersen, 1998). Many studies have been conducted on the relationship between personality and the response to stressful events such as injury (Aitken Harris & Lucia, 2003; Andersen, 1999; Brewer & Cornelius, 2010). Personality factors have been shown to contribute directly to injury risk as well as moderate the influence of stress on injury (Andersen, 1999). Moreover, it is one of the key components to the stress-injury model (Williams & Andersen, 1998). One facet of personality that athletes possess is known as athletic identity. Athletic identity is defined as the degree to which an individual identifies with the athlete role (Brewer et al., 1993). It is viewed as a multidimensional construct that encompasses social, cognitive, and affective components. The cognitive and affective components are influenced by an athlete's perception and interpretation of his or her role as an athlete, and the ways in which he or she responds to and acts on these interpretations (Lamont-Mills & Christensen, 2006).

In 1993, Brewer conducted four studies on the relationship between athletic identity, injury, and negative affect. Brewer chose to examine athletic identity because it is considered a social role with which individuals can strongly and exclusively identify (Brewer, 1993). Time-loss injury was chosen as the role-disrupting event for these studies because, when a time-loss injury occurs, athletes are no longer able to participate in his or her sport and the role that defines them as an athlete is threatened (Brewer, 1993). The four studies Brewer conducted examined the relationship between athletic identity measurements and affective response.

Two of Brewer's studies were conducted on collegiate non-athlete psychology students, while the other two were conducted specifically on injured college student-athletes. In the first two studies completed with collegiate non-athletes, students in different psychology classes (i.e. sports, abnormal, and social psychology) were utilized. The sports psychology class had previously received imagery training as part of the course, and, in the first study, the students were asked to employ those techniques to imagine what it would be like to suffer a career-ending injury. In the second study, students from abnormal and social psychology classes who did not receive imagery training as part of the curriculum were asked merely to respond to how they would feel if they suffered a career-ending sports injury (Brewer, 1993). The first two studies yielded interesting results. Brewer concluded that, while the relationship was weak ( $r = 0.49$  for Study 1 and  $r = 0.12$  for Study 2), depression following injury was positively related to athletic identity (Brewer, 1993).

The second pair of studies Brewer completed after noting the slight positive relationship between depression and athletic identity following an imaginary injury were conducted on an injured athletic population. The first of these two follow-up studies utilized an injured population in a sports medicine clinic. Consistent with the first two studies, Brewer was able to find that depression was positively correlated with athletic identity. Moreover, in this specific study, the relationship between athletic identity and depression were still significant after controlling for stressful life events and physical self-efficacy (Brewer, 1993).

The fourth and final of the studies conducted by Brewer at this time utilized a collegiate varsity football team. The study was completed weeks before the regular season began. 15 of the 75 players who completed the study were identified as injured. Results from this study showed that athletic identity was positively related to depression for the injured subjects ( $r = 0.35$ ) and

negatively related to depression for uninjured subjects ( $r = -0.19$ ) (Brewer, 1993). In conclusion, following all four studies, Brewer stated that a strong, exclusive identification with the athlete role (i.e. social role) was positively linked to a depressive reaction following a role-disrupting event (i.e. athletic injury) (Brewer, 1993). All four studies supported this claim. This set of research is important to the current research study because it conveys that there is a link between athletic identity and depression with regards to injury status.

Other studies have been conducted to examine the relationship between athletic identity, injury, and negative psychological health (Brewer & Cornelius, 2010; Brewer & Tasiemski, 2011; Ford & Gordon, 1999; Stephan & Brewer, 2007; Wiechman & Williams, 1997). Many of these studies have supported the claim that athletic identity moderated changes in affect immediately following injury (Andersen, 1999; Ford & Gordon, 1999). In other words, differing levels of athletic identity have been shown to change the degree to which affective states increase or decrease following injury. Higher levels of athletic identity have been link with more negative affective states immediately following injury while those with lower athletic identity tend to have a slightly less change in affectivity (Brewer, 1993). Because athletes who express high levels of athletic identity invest a greater amount of their self into the athlete role, when the role is disrupted by an event such as injury, the response can be maladaptive. Accordingly, increased depression, anxiety, and athlete burnout symptoms have been shown to be associated with injury and, in particular, to those who identify highly with the athlete role (Albinson & Petrie, 2003; Gustafsson & Skoog, 2012). Thus, athletic identity is a potentially important dispositional characteristic to consider relative to injury and the associated recovery process as it may represent a potential contributor to markers of psychological health linked to an athlete's response to injury and recovery.

## Optimism

Optimism is another aspect of an individual's personality that is key to an athlete's response to injury. It has been defined as a trait that reflects the extent to which an individual has favorable expectancies of the future (Carver et al., 2010). Some have suggested that optimism can be classified as either trait or state depending on the circumstance (Kluemper et al., 2009). Trait optimism is related to more general outcomes like long-term physical and psychological health. State optimism is subject to change due to contextual or situational factors (Kluemper et al., 2009). In 2010, Carver et al. completed a literature review on optimism and suggested it was a relatively stable personality trait and dispositional factor; however, optimism may be subject to change during stressful life events such as large life transitions, breaks from consistently occurring prior experiences, and when outcomes are uncertain. Carver et al. implied that optimism, when combined with other personal and situational factors, could have a protective effect for both an individual's mental and physical health. Moreover, it was stated that those with higher dispositional optimism may be less reactive to life stressors, which could, in turn, lower the physiological stress response (Carver et al., 2010).

Carver et al. discussed many key points relating to dispositional optimism in their literature review that relate directly to how optimism can affect an individual's psychological response to injury. Injuries are more likely to occur when an individual perceives an event as stressful (Williams & Andersen, 1998). Moreover, once injury has occurred, the way in which the individual appraises the situation and reacts to the injury can create more stress (Williams & Andersen, 1998). Accordingly, optimism has been proposed to protect a person from increased psychological stress following injury. If an individual sustains an injury, and he or she has high levels of optimism, it is likely that he or she will experience less negative emotions than those

with low levels of optimism (Carver et al., 2010). In the literature review, Carver et al. cited many studies (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000; Giltay, Zitman, & Kromhout, 2006; Scheier & Carver, 1985) conducted on the relationship between optimism and physical health; most noted that high levels of optimism are related to greater physical health. Moreover, a study conducted by Hanssen et al. investigated the relationship between optimism and pain sensitivity. They concluded that higher levels of optimism reduced pain intensity ratings following a painful event like a time loss injury (Hanssen, Peters, Vlaeyen, Meevissen, & Vancleef, 2013). These studies support the notion that optimism can not only reduce psychological stress following a traumatic event such as injury, but it can also reduce the physical pain experienced as a result.

Ultimately, optimism can be an important dispositional characteristic for an individual to possess when faced with a negative, stressful event such as athletic injury. Wadey et al. conducted a prospective, longitudinal study that examined the direct and moderating effects of optimism on the prediction of injury and the effects of optimism on athletes' responses to injury (Wadey et al., 2013). This study followed 694 collegiate men and women athletes over a two-year period. Of the original sample, 104 sustained time loss injuries during this study. Wadey et al. found that dispositional optimism was significantly related to the prediction of injury: higher levels of optimism were inversely related to injury occurrence (Wadey et al., 2013). This study suggested that one explanation for the relationship between optimism and injury occurrence could be that those with higher levels of dispositional optimism have been shown to take more active steps towards personal health promotion including strategies associated with injury prevention (i.e. proper nutrition, hydration, and adequate rest) (Wadey et al., 2013). The notion that individuals with higher levels of optimism are more likely to take steps towards health

promotion has also been supported by the literature review conducted by Carver et al. (Carver et al., 2010). Moreover, Wadey et al. suggested that athletes with greater levels of dispositional optimism also have the appropriate resources and coping skills to appraise demanding situations as less stressful. Athletes with high dispositional optimism may appraise situation such as injury as a stressful situation, but further perceive the situation as one he or she will be able to respond to with more adaptive coping strategies and psychological responses (Wadey et al., 2013).

Optimism is an aspect of an individual's personality that has been shown to lessen the likelihood of experiencing an athletic injury. High levels of dispositional or trait optimism has been linked to increased psychological health, adaptive appraisal of potentially stressful events, and decreased risk for injury. Conversely, low levels of optimism have been related to maladaptive responses to injury and other negative life events (Carver et al., 2010; Lemyre, Treasure, & Roberts, 2006; Raedeke & Smith, 2004; Scheier & Carver, 1985; Wadey et al., 2013). Optimism has also been linked to high levels of mental toughness and affective coping strategies (Adam R. Nicholls, Polman, Levy, & Backhouse, 2008). Athletes with higher levels of optimism have been shown to react to injury in a more positive manner, and tend to have a positive rehabilitation period and return-to-play (Gustafsson & Skoog, 2012; Adam R. Nicholls et al., 2008; L. Smith, 2015). In the current study, levels of optimism were assessed in order to examine the mediating role it could have as a dispositional factor on an athlete's response to injury.

#### Emotional Consequences of Psychological Harm Following Injury

The stress-injury model put forth by Andersen and Williams examined the role psychological and dispositional factors like personality and history of stressors have in the cognitive appraisal of stressful events such as injury (Williams & Andersen, 1998). As the stress-

injury model explains, injury can cause increased stress and psychological harm (Brewer, 1994; Williams & Andersen, 1998). Four of the markers of psychological health that can be altered following injury that were examined in the current study were: affect, depression, anxiety, and athlete burnout; however these are not the only aspects of psychological health that can be affected by injury (Brewer, 1993; Byrne & Byrne, 1993; Fox, 1999; Lavallée & Flint, 1996).

### Affect

One marker of psychological health that can be greatly altered following injury is affect (Bauman, 2005; Brewer, 1993; A. M. Smith et al., 1990). Affect has been categorized as either positive or negative (Crawford & Henry, 2004). Positive affect relates to positive feelings like determination, alertness, hope, and activeness; whereas negative affect relates to negative emotions like distress, guilt, and fearfulness (Crawford & Henry, 2004; Gustafsson et al., 2013). It is advantageous for an athlete to possess positive affect because this allows the athlete to feel alert, strong, and attentive during practice and competition. Conversely, negative affectivity would lead the athlete to feel distressed, jittery, and fearful. On the one hand, the increased stress associated with negative affectivity could lead to increased injury risk (Gustafsson et al., 2013; A. R. Nicholls et al., 2009). Alternatively, an experience of a sport-related injury can be associated with maladaptive affective responses for athletes.

Many studies have examined the change in affect immediately following athletic injury (Bauman, 2005; Brewer, 1994; Dawes & Roach, 1997; Quinn & Fallon, 1999; A. M. Smith et al., 1990). In 1990, Smith et al. conducted a study to determine an athlete's emotional response to injury. In this study, the researchers followed 72 athletes for four months or until the end of his or her injury. At two-week intervals, the athletes' emotional responses to the injury and his or her current mood states were evaluated using the Emotional Response to Injury Questionnaire



and the Profile of Mood States scale. At the conclusion of the study, Smith et al. found that over the course of an athlete's injury, negative affectivity (i.e. anger, depression, tension), which was initially higher than normative values, decreased. Positivity affectivity (i.e. vigor) increased as the athlete was able to return to play. Smith et al. also noted that the athlete's perception of the severity of his or her injury, and the perceived rate of recovery, seemed to influence affective responses as well (A. M. Smith et al., 1990). If an athlete views the sustained injury as minor, then recovery was likely to be quicker regardless of the medial diagnosis of severity. Smith et al.'s findings support the notion that cognitive appraisal and affectivity are related to an athlete's emotional response to injury and recovery (Brewer, 1994; De Heredia et al., 2004; Nippert & Smith, 2008).

Another important study conducted by Quinn and Fallon in 1999 examined the changes in the psychological health of elite athletes (i.e. Olympic competitors and individuals at the highest level internationally, nationally and state wide) from injury onset until full return to play (Quinn & Fallon, 1999). 136 athletes were surveyed throughout the rehabilitation process in order to note potential changes in psychological health. The athletes who participated in the study were similar to the athletes used in the current study: they consisted of athletes competing at elite levels. The participants represented 25 different sports with the majority being involved in a team sport, and most were training between 10 to 25 hours a week. The length of injury in the study conducted by Quinn and Fallon ranged from 4 to 99 weeks. The mean for recovery from onset of injury to full return-to-play was around 19 weeks. This long recovery period strengthened the power of the study due to the relatively average amount of data that was collected from the participants. Each participant's recovery process was broken into four phases that varied depending on the length of recovery. All phases were created by dividing the

estimated time to full recovery by three, thus keeping the phase lengths constant through a range of recovery times (Quinn & Fallon, 1999).

The questionnaires used by Quinn and Fallon in their study were given to the participants at the beginning of each phase. This ensured four time points of data for each subject in the study. To examine the emotion response to injury, Quinn and Fallon utilized the Profile of Mood States scale. This scale is used to measure six different mood states or emotions: tension, depression, anger, fatigue, confusion, and vigor (Shacham, 1983). Quinn and Fallon found that the negative emotions (i.e. tension, depression, anger, fatigue, and confusion) decreased over the rehabilitation window, while vigor, the positive emotion, increased (Quinn & Fallon, 1999). Quinn and Fallon also found that for tension, depression, anger, confusion, and vigor, the greatest amount of change occurred between Phase 1 and 2 (i.e. onset of injury to beginning of rehabilitation). This provided evidence that participants experienced the greatest amount of negative emotion during Phase 1 (onset of injury), but the negative emotion significantly decreased as they began to progress through rehabilitation (Quinn & Fallon, 1999).

Furthermore, Dawes and Roach conducted another study that followed the emotional responses of athletes receiving rehabilitation following a sport- or exercise-related injury (Dawes & Roach, 1997). 52 subjects with an athletic injury that limited sport participation for at least one day were utilized in this study. The measures used to observe emotional changes were the Psychological Factors Affecting Sporting Injury (PFAI) scale and the Psychological Factors Affecting Sporting Injury-II (PFAI-II). The PFAI was only used during the first testing session immediately following injury, while the PFAI-II was used for the other four testing sessions before full recovery (Dawes & Roach, 1997). These instruments are self-report inventories that include both positive and negative emotions. Participants were asked to score the

level of each emotion that they were *currently* feeling on a 10-point Likert scale. Examples of positive emotions used in the PFASI and PFASI-II include: encouraged, optimistic, excited, and eager. Examples of negative emotions include: helpless, irritable, depressed, and frightened (Dawes & Roach, 1997).

In the analysis of the data collected over five time points, Dawes and Roach found that, in general, negative emotions decreased over the rehabilitation period. Differences in the negative emotions frightened, anger, pain, frustration, inconvenienced, depression, and discouraged were noted to be significant (Dawes & Roach, 1997). Conversely, positive emotions tended to increase; however, only a difference in the positive emotions encouraged, excited, and relieved were found to be significant (Dawes & Roach, 1997). Additionally, Dawes and Roach noted that both positive and negative emotion reversed trends between testing sessions two and three. In other words, between those two testing sessions, positive emotions decreased while negative emotions increased (Dawes & Roach, 1997).

As a result of these findings, Dawes and Roach concluded that positive and negative emotions trend in opposite directions during the injury recovery process in an athletic population. Negative emotions, which are generally high during the initial injury phases, tend to decrease over time. Positive emotions, on the other hand, are relatively low at initial injury, but increase over the rehabilitation process (Dawes & Roach, 1997). Despite its importance to the knowledge base, there are a few limitations to this study. First, there is no indication of the timeframe during which the questionnaire were distributed to the participants. Five data points were used in this study, but the time during the recovery process in which the participants completed the questionnaire is unclear. The time gap created by this could explain some of the variation in the emotional response of the athletes. Moreover, the researchers were unable to provide validity or

reliability data on the questionnaires used. Despite its findings, utilizing validated measures of psychological responses within a clearly delineated post-injury timeframe could have strengthened this study.

There have been many studies that have examined the relationship between injury and emotional response (Clement et al., 2015; Dawes & Roach, 1997; De Heredia et al., 2004; Leddy et al., 1994; Quinn & Fallon, 1999; A. M. Smith et al., 1990). Broadly, studies have shown that mood states and general emotions displayed by athletes following injury tend to be negative at onset, but slowly become more positive as the athlete reaches full recovery (Brewer, 2007; Brewer et al., 1995; Dawes & Roach, 1997; Quinn & Fallon, 1999; A. M. Smith et al., 1990). Nevertheless, the emotional responses to injury can be affected by many other factors. At the same time, few studies have explored the link between injury, affective response, and other variables including athletic identity, trait optimism, and perceived stress simultaneously. In the current study, we hope to add examine these link in order to add to the existing knowledge base.

### Anxiety

Anxiety is a common mental health disorder that affects nearly 6.8 million Americans each year (America, 2015). A commonly accepted model of anxiety proposed by Spielberger describes anxiety states as emotional reactions that consist of a combination of three key things: feelings of apprehension, tension, and nervousness; worries or unpleasant thoughts; and physiological changes (Spielberger, 1988). Spielberger also notes that anxiety can be explained as biopsychosocial model that involves stressors, perceptions and appraisals of the stressors, and emotional reactions to the stressor. A stressor, in this case, is a situation or event that involves some perceived physical or psychological danger (Raglin, 1992; Spielberger, 1988). It is important to note the subjectivity of the triggering stressor. If an individual perceives the

situation he or she is in as threatening, even if no objective danger is present, anxiety will tend to increase (Raglin, 1992). For example, athletes perceive situations in sport differently, and therefore have varying levels of anxiety. A soccer goalie might have increased anxiety during a penalty kick, while another player on the field might not be experiencing anxiety in that moment due to lack of perceived threat.

Anxiety has been categorized as being a state-related or trait-related emotional response (Raglin, 1992). Trait anxiety is a relatively stable and unchanging form of anxiety that is related to an individual's predisposition to perceiving situations as threatening (Spielberger, 1988). State anxiety is a more dynamic construct of anxiety that is variable and changes over time. It is related to changes in the environment (i.e. stressors) and/or factors within the individual (Spielberger, 1988). Because trait anxiety is stable, those with a higher level of trait anxiety generally exhibit higher levels of state anxiety due to the probability of perceiving more situations as dangerous. Conversely, those with lower trait anxiety generally experience less state anxiety as a result of environmental stressors (Raglin, 1992; Spielberger, 1988).

Because anxiety arises from a situation that is perceived by the individual as threatening or dangerous, an injury can either be caused by or be a consequence of increased anxiety (Kolt & Kirby, 1994). An athlete with increased anxiety during a practice or competition can potentially sustain an injury, or, following an injury, can perceive the injury as a reason to potentially lose his or her starting spot on the team. Both of these situations increase stress and therefore increase the state anxiety of the player. Kolt and Kirkby conducted a study in 1994 that focused on injury and anxiety in gymnasts (Kolt & Kirby, 1994). 115 male and female competitive gymnasts ages 13 to 20 years old participated in the study. Kolt and Kirkby surveyed the gymnasts using the Competitive State Anxiety Inventory-2 (CSAI-2) and the Profile of Mood States-Bipolar

(POMS-BS) form to assess the participants' anxiety and mood. The study found that gymnasts who had sustained more injuries reported higher scores on the POMS-BS and the CSAI-2 meaning those with more injuries tended to be more anxious and generally had more a negative mood (Kolt & Kirby, 1994). While the evidence gathered by Kolt and Kirkby supports the link between anxiety and injury, their findings do not indicate whether higher anxiety lead to injury, whether injury lead to increased anxiety, or whether both of these relationships are present. Furthermore, the study they conducted was retrospective such that participants were told to recall how they felt following injury reduces the validity of the self-reported inventories (Kolt & Kirby, 1994).

Another study conducted by Lavallée and Flint in 1996 examined the relationship between stress, anxiety, mood states, social support, and injury. They hypothesized that high levels of stress and competitive anxiety would contribute to greater injury incidence and greater injury severity. Moreover, high stress levels along with negative mood states would contribute to an increase in injury rate and/or severity (Lavallée & Flint, 1996). 57 male football and rugby players participated in the study. The Sport Competition Anxiety Test (SCAT), the Profile of Mood States (POMS), and other measures focusing on stress and social support were administered to each participant at the beginning of the sport's season, at time of injury (if injury occurred), and at the end of the season. Throughout the course of the study, 67 injuries were recorded. Lavallée and Flint found that, in those injured, the injury rate was significantly but weakly correlated to the SCAT ( $r = 0.29$ ,  $p = 0.03$ ). As the scores on the SCAT increased, so did the chance of injury occurrence (Lavallée & Flint, 1996). Moreover, injury rate was significantly and moderately correlated to tension/anxiety scores on the POMS SCAT ( $r = 0.43$ ,  $p = 0.001$ ). Higher levels of tension/anxiety are correlated to higher incidence of injury (Lavallée

& Flint, 1996). In conclusion, this study supported the notion that anxiety is correlated to injury incidence and injury severity.

Few other studies have examined the relationship between anxiety following injury; however, a literature review conducted by Byrne and Byrne examined the relationship between aerobic exercise and anxiety (Byrne & Byrne, 1993). The literature they studied noted that levels of anxiety decreased in individuals who completed regular aerobic activity (Byrne & Byrne, 1993). This suggests a potential for athletes, due to the amount of activity they complete, could experience lower levels of anxiety. When an injury occurs and the athlete is no longer able to participate, anxiety levels could rise. The current study aims to further examine the link between anxiety and injury. Anxiety increases when individuals perceived situations as threatening. If an athlete perceives an injury as threatening, he or she could experience increased anxiety, which could, in turn, prolong rehabilitation or cause the athlete to return before full recovery.

### Depression

Disturbances in mood have been well documented following a sports injury (Brewer, 1993; Brewer et al., 1995; Galambos et al., 2005; Kolt & Kirby, 1994; Leddy et al., 1994; A. M. Smith et al., 1993; Williams & Andersen, 1998). One of the greatest mood disturbances an athlete undergoes once an injury is sustained is a rise in depression (Brewer, 1993). Depression is one of the most prevalent mental health disorders in the world (Health, 2015). It is a disorder that interferes with an individual's ability to work, sleep, eat, study, and generally enjoy life.

When an athlete sustains a moderate to severe injury, sport participation is generally restricted in order to allow time for proper injury healing. Brewer conducted four studies that assessed depression following injury (Brewer, 1993). Two of the four studies utilized non-athlete college students enrolled in psychology classes. The participants in both studies were asked to

imagine sustaining a career-ending injury that would never allow sport participation again. Once the image was set, the subjects completed a few surveys including the Profile of Mood States-Depression scale to assess depression. Both studies revealed depression increased following the imaginary injury (Brewer, 1993).

The second two studies completed by Brewer utilized athlete who had sustained mild to severe injuries (Brewer, 1993). These studies not only utilized the POMS-D, but also employed the Beck Depression Inventory (BDI). Study 3 further supported the notion that sport-related injury causes an increase in depressed mood. Study 4 provided the same evidence (Brewer, 1993). Study 3 and 4 suggested more strongly that athletic injury could lead to depression because injured athletes were utilized in these studies as opposed to psychology students in Studies 1 and 2.

Another study conducted by Galambos et al. utilized health screening questionnaires from 845 elite athletes at the Queensland Academy of Sports collected between 2002 and 2004 (Galambos et al., 2005). The health screening questionnaires were recorded annually and included a full medical history, incidents during the preceding 12 months, training characteristics, and psychological status, among other things. 233 of the athletes' data used in the study represented an uninjured population. Galambos et al. used the psychological data to explore the relationship between sport-related injury, time loss, and psychological variables (i.e. life stress and mood). This study found that mood scores from the Brunel Mood Scale accounted for 50% of the variance in life stress as measured by the Perceived Stress Scale-10 (Galambos et al., 2005). Therefore, high life stress was predicted by high levels of anger, confusion, depression, fatigue, tension, and low levels of vigor. The study conducted by Galambos et al.



supported the notion that mood, specifically depression, can predict injury and injury related variables (Galambos et al., 2005).

In the current study, depression was observed as a marker of psychological health. Studies have shown that exercise and physical activity decrease depressed mood, while restriction of physical activity can enhance it (Brewer, 1993; Brewer et al., 1993; Byrne & Byrne, 1993; Rethorst, Wipfli, & Landers, 2009). Few studies, aside from the current study, have look singularly at depression following injury and how depressed mood can be moderated by other dispositional characteristics like athletic identity and optimism. The current study aimed to shed light on the relationship between depression, injury, and dispositional characteristic of athletes, specifically optimism.

#### Athlete Burnout

Athlete burnout is another example of maladaptive psychological health that can arise from personal and situational factors following injury. Not only can burnout affect an athlete's psychological health, it can also detrimentally affect his or her sport performance (Raedeke & Smith, 2004). Burnout is a psychological variable that consists of three main components: physical and emotional exhaustion stemming from the psychological and physiological demands of competition, reduced sense of accomplishment in regards to sport related abilities and achievements, and negative attitudes towards sport and sport involvement (Raedeke, 1997). Athletes who do not experience improvement, success, or talent in his or her sport have an increased risk for developing symptoms of burnout (Lemyre, Hall, & Roberts, 2008; Raedeke & Smith, 2001). Therefore, if an athlete sustains a time-loss injury and is unable to participate, he or she may experience symptoms of burnout due decreased participation and time improving skills, lack of social support from teammates and coaches, and increased stress.

A study conducted by Grylls and Spittle examined the relationship between burnout and sport injury in athletes (Grylls & Spittle, 2008). Participants in the study were 264 Australian competitive athletes. The competition level ranged from local, state, national, to international organization (Grylls & Spittle, 2008). Of the 264 athletes, 150 were classified as injured. All participants in the study completed a set of psychological questionnaires on one occasion. Grylls and Spittle found that injured athletes had significantly lower scores on three burnout subscales (i.e. physical and emotional exhaustion, depersonalization, and sport accomplishment) than the uninjured athletes (Grylls & Spittle, 2008). Moreover, there was a significant difference for physical and emotional exhaustion in those with higher competition levels: participants at the national and international reported higher scores than those at the local and state level (Grylls & Spittle, 2008). Therefore, this study supported the notion that injury can lead to increased levels of burnout symptoms in athletes of varying competition levels. As the level of competition increases, so does the likelihood that injury can lead to burnout (Grylls & Spittle, 2008).

Another study completed by Lonsdale et al. examined the relationship between burnout and basic psychological needs satisfaction and whether this relationship was mediated by self-determined motivation (Lonsdale, Hodge, & Rose, 2009). They hypothesized that the relationship between burnout and behavioral regulations would vary. Specifically, external and introjected behavioral regulations would be positively associated with athlete burnout. 201 athletes affiliated with the PacificSport Canadian Sport Center participated in this study, with 23% of the athletes being classified as elite. Psychological questionnaires were sent to all participants to examine each athlete's level of athlete burnout, basic needs satisfaction, and motivation (Lonsdale et al., 2009). Lonsdale et al. concluded that basic needs satisfaction scores were negatively correlated with athlete burnout. Moreover, amotivation and controlled forms of

motivation were positively correlated with all burnout subscales (Lonsdale et al., 2009). If an athlete experiences a time loss injury and is unable to compete or practice, they may feel guilt or shame. Lonsdale et al. suggest that if an athlete begins to experience these external demands or controlled extrinsic motivation, burnout symptoms are likely to increase.

In the current study, athlete burnout is examined in order to add to the growing body of knowledge that suggests burnout is positively related to stress and injury. Furthermore, studies have also shown that burnout symptoms can be mediate by levels of dispositional optimism (Chen, Kee, & Tsai, 2008; Gustafsson & Skoog, 2012; Gustafsson et al., 2013). By examining burnout along with other psychological and dispositional factors, we can see if a relationship exists when other important psychosocial variables are accounted for.

#### Rationale for Current Study

The examinations of the psychological outcomes associated with injury and recovery is an important growing line of research in the sports medicine world. Current research supports the notion that stress increases the likelihood of injury and perpetuates the injury once it has occurred (Brewer, 1994; Williams & Andersen, 1998). Moreover, there are many psychological and dispositional factors that have potential to affect and/or moderate an individual's response to injury. Evidence has been found to support the idea that athletic identity is a psychological moderator in the relationship between injury and psychological health (Brewer, 1993; Brewer et al., 1993). Changes in affect, anxiety, and depression have also been noted following injury (Brewer et al., 1995; Kolt & Kirby, 1994; A. R. Nicholls et al., 2009; Raglin, 1992; A. M. Smith et al., 1990). Furthermore, optimism has been identified as characteristic that can decrease an athlete's maladaptive response to injury and, therefore, decrease the likelihood of developing

burnout symptoms as well as other maladaptive psychological health reactions (Chen et al., 2008; Gustafsson & Skoog, 2012).

While studies have been conducted on the relationship between psychological health, athletic identity, optimism, perceived stress, and injury, few studies have examined these relationships concomitantly and within a well-delineated multi-time point framework. These represent two important research gaps, which the current study aims to address. Accordingly, the current study compared athletes' markers of psychological health (i.e. stress, affect, anxiety, depression) immediately following a time-loss injury with the same athletes' responses at full return-to-play. Furthermore, this study investigated, after controlling for perceived stress, what the pattern of variations in psychological health factors in collegiate athletes immediately following a time loss injury until full return-to-play. Optimism and days missed due to injury were also examined as covariates to identify changes in positive and negative affect and factors of psychological health from injury until return-to-play.

The responses athletes have to injury are both physical and psychological. The variables examined in the current study are linked to the psychological changes that can occur. There are gaps in the current body of research in regards to how psychological factors including stress, affect, anxiety, depression, and burnout change following a time loss injury until the athlete is able to fully participate in sport again. There is a need for a study that clearly delineates and assesses these factors immediately post-injury, at specific time points throughout injury process (an exploratory variable in the current study), and when return-to-play is achieved. This study also examines how changes in psychological health differ when controlling for stress, optimism, and days missed due to injury.

## CHAPTER 3: METHODOLOGY

A multi-time point design was utilized to complete this study. The use of this design allows the researcher to follow participants throughout their post-injury experience and collect data at selected time points. Participants had to meet specific criteria to be admitted into the study. The seven questionnaires used to measure psychological health in this study were the Perceived Stress Scale – 4 (PSS-4), Athletic Identity Measurement Scale (AIM), the International Positive Affect and Negative Affect Schedule Short Form (I-PANAS-SF), General Anxiety Disorder – 7 (GAD-7), Patient Health Questionnaire – 9 (PHQ-9), the Life Orientation Test (LOT), and the Athlete Burnout Questionnaire (ABQ). Participants were informed that they were completing a study on psychological health following injury and given a brief description of the study before participating.

### Participants

The researcher hopes to recruit 50 Division-I varsity and club sport athletes between the ages of 18 and 26 years old to participate in this study. With a longitudinal study, there is the chance for attrition. With this in mind, the researcher hopes that at least 30 participants will have complete data for at least three time points throughout the study in order to obtain a 30% attrition rate or less.

Participants were included in the study if they were full-time students at UNC Chapel Hill, were proficient in English, and were Division-I varsity, junior varsity, or club sport athletes. The study was open to all male and female sports to broaden the generalizability. All participants must have sustained an acute injury within the last 72 hours in order to be included. An acute

injury, in this study, was defined as an injury that resulted from one specific mechanism with no prior pain or dysfunction at that body part and required at least four days of restricted activity. Participants were excluded from the study if they were being currently evaluated for a chronic injury with or without time loss, were previously being rehabilitated for a chronic or acute time loss injury at the onset of the study, or did not meet the other inclusion criteria.

## Instrumentation

### Demographics

Demographic information was gathered on each athlete at the beginning of the study. General information included age, sex, race, class, and whether current sport participation was with a UNC varsity, junior varsity, or club sport team. Based on the participant's choice of varsity, junior varsity, or club sport participation, the specific sport, season, years of experience in current sport, and years of experience in all sports were asked. Moreover, there were specific questions about the current injury. Athletes were asked to identify if they were being treated for more than one injury, and specify the body part and type of injury sustained. Head trauma including concussion was included. Finally, the athlete was asked to note if the injury caused immediate removal for practice, competition, or other team activities. Following the demographic information, athletes completed psychological health questionnaires to determine his or her current psychological health state. These questionnaires included the Perceived Stress Scale-4, Athletic Identity Measurement Scale, Positive and Negative Affect Schedule-Short Form, General Anxiety Disorder scale, Patient Health Questionnaire, Life Orientation Test, and the Athlete Burnout Questionnaire.

### Perceived Stress Scale (PSS-4)

The Perceived Stress Scale 4-item measure (PSS-4) is used to assess the degree to which situations in an individual's life are appraised as stressful events (Cohen et al., 1983). The original 14-item Perceived Stress Scale was created by Cohen in 1983. The measurement was designed to indicate the extent to which an individual perceives events in his or her life as stressful (Cohen & Williamson, 1988). The 14-item measure has been reduced to a 10-item and 4-item measure for convenience, limitation of participant response burden, and clinical applicability. All Perceived Stress Scale versions have been shown to be reliable and valid across the general population (Cohen et al., 1983; Cohen & Williamson, 1988; Warttig, Forshaw, South, & White, 2013).

The PSS-4 is a 4-item measurement of perceived stress. The participants are instructed to answer the questions based on how he or she has generally felt over a period of time. For example, "Over the last week, how often have you felt that you were unable to control the important things in your life?" (Cohen et al., 1983) The responses are measured on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). The scoring of the PSS-4 is obtained by adding the responses together. Items 2 and 3 are positively stated; therefore, they are reverse coded (i.e. 0=4, 1=3, etc.). The higher the score obtained from the PSS-4, the more that participant is appraising situations in life as stressful. A measurement for internal consistency reliability was utilized to assess the reliability of the PSS-4 within the current study. Cronbach's Alpha was 0.623, making the internal consistency reliability for the PSS-4 scores only marginally reliable due to the fact that the Cronbach's Alpha is below 0.700.

For the current study, the PSS-4 was selected due to its brevity and tested reliability and validity with an athletic sample (Gustafsson & Skoog, 2012). Many studies have shown the PSS-

4 to be a good indicator of current life stress (Cohen et al., 1983; Cohen & Williamson, 1988; Warttig et al., 2013). Warttig found that items selected for the PSS-4 correlated well with each other ( $r > 0.73$ ), and the measure revealed good internal consistency reliability with a Cronbach Alpha = 0.77 (Warttig et al., 2013). Warttig's study was also conducted across a large participant pool with a variety in age, sex, and ethnicity, which further supports the standardization and generalization of the PSS-4.

#### Athletic Identity Measurement Scale (AIMS)

In 1993 by Brewer, Van Raalte, and Linder developed the Athletic Identity Measurement Scale (AIMS) to assess the level of an individual's identity that was related to sport. This measurement focuses on three main components of athletic identity: social identity, exclusivity, and negative affect. This item has ten questions: four pertaining to social identity, three relating to exclusivity, and three addressing negative affectivity. The participants are instructed to respond to phrases like, "People see me mainly as an athlete" and "Sport is the only important thing in my life" (Brewer et al., 1993) based on how they generally feel. Scoring for the AIMS corresponds to the degree to which the participant associates with the respective aspect of athletic identity. Each question is answered based on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The higher the score, the more an individual identifies with the athlete role. For example, the more a participant selects *agree* or *strongly agree*, the more his or her identity is embedded the sport he or she is currently participating in.

The AIMS (Brewer et al., 1993) is a 10-item questionnaire used to measure the strength and exclusivity of an individual's athletic identity. Specifically, the AIMS focuses on the respondent's social identity (i.e. "I am an athlete"), exclusivity (i.e. "All my friends are



athletes”), and negative affectivity (i.e. “I feel bad about myself when I do poorly in sport) relative to identifying with the athlete role (Brewer, 1993; Lamont-Mills & Christensen, 2006).

In this study, the AIMS was used to assess a participant’s level of athletic identity at the onset of injury. The AIMS has high exhibited test-retest reliability ( $r = 0.89$  over a 2-week time period) and high internal consistency reliability (coefficient alpha = 0.81 to 0.93) in previous administrative efforts, supporting its appropriateness for use within the current study population (Brewer et al., 1993). The AIMS yielded a Cronbach’s Alpha of 0.750, making the internal consistency reliability for the AIMS scores acceptable for the current study.

#### International Positive and Negative Affect Schedule- Short Form (I-PANAS-SF)

The Positive and Negative Affect Schedule (PANAS) was originally created by Watson in 1988 (Watson et al., 1988). The original measurement consisted of two 10-item mood scales pertaining to positive and negative affect. The PANAS asked participants to quantify their responses using a five-point Likert scale. More specifically, the PANAS focused on how the participant felt over the past week. The International PANAS-Short Form was later created by Kercher (Kercher, 1992). This shorter version of the original PANAS consists of two 5-item scales relating to positive and negative affect.

Kercher’s development of the PANAS-Short Form in 1992 was originally utilized for an elderly population (Kercher, 1992). Kercher used 5-items related to positive affect (excited, enthusiastic, alert, inspired, determined) and 5 items related to negative affect (distressed, upset, scared, nervous, afraid) in his version of the PANAS short form. Years later, Mackinnon et al. examined Kercher’s PANAS Short Form and found it reliable across several age groups (Mackinnon et al., 1999). Furthermore, in 2007, Thompson adapted the PANAS-SF and replaced the items used in the original PANAS-SF with new items that included: upset, hostile, alert,

ashamed, inspired, nervous, determined, attentive, afraid, and active. These new items were chosen due to the cross-cultural validity, convergent validity, and test-retest reliability expressed in Thompson's study (Thompson, 2007). Moreover, the new items in the PANAS-SF were identified by their general understanding across and international population.

The I-PANAS SF will be used in the current study to identify positive and negative affect in the participants. If an individual expresses higher levels of negative affect and lower levels of positive affect, he or she is also more likely to experience more negative emotions (Crawford & Henry, 2004). Similarly, if an individual possesses higher levels of positive affect and lower levels of negative affect, he or his is more likely experience more positive emotions (Kercher, 1992; Thompson, 2007; Watson et al., 1988). While positive and negative affect can lead to corresponding emotions, high levels of negative or positive affect do not correlate with low levels of the opposite affect. In other words, there is no inverse relationship between positive and negative affect. Positive and negative affect have been shown to be independent of each other (Crawford & Henry, 2004). For example, if an individual is depressed, he or she may exhibit high negative affect, but might also exhibit high positive affect. For this reason, positive and negative affect examined in this study will be treated as two independent psychological constructs and measured accordingly.

In this research study, we chose to utilize the I-PANAS-SF due to its high validity and reliability within an athletic population (Gustafsson et al., 2013). The I-PANAS-SF consists of 10 items: five relating to positive affect and five relating to negative affect. These positive (inspired, alert, attentive, active, determine) and negative (afraid, upset, nervous, ashamed, hostile) affective items are rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). The questionnaire asks participants to answer each question based on how he or she generally feels

(Thompson, 2007). The internal consistency reliable for the I-PANAS-SF was measured for this study. Cronbach's Alpha was equal to 0.809 for positive affect and 0.647 for negative affect. A Cronbach's Alpha below 0.700 is considered only marginally reliable, making it necessary to interpret the negative affect scores measured by the I-PANAS-SF cautiously.

#### General Anxiety Disorder Scale (GAD-7)

Anxiety is one of the most common mental disorders in the general population (America, 2015). In 2006, Spitzer et al. created a short measurement to assess possible cases of general anxiety disorder (GAD) and the severity of the current symptoms (Spitzer et al., 2006). The measurement originally consisted of nine items that reflect the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria for GAD along with four other items based on existing anxiety scales. This 13-item measurement was used in Spitzer et al.'s research to determine the number of necessary items to achieve good reliability and validity in a patient population (Spitzer et al., 2006).

The GAD-7 is a 7-item measurement that asks participants how often they were bothered by each potentially anxiety related scenario (i.e. "trouble relaxing," "becoming easily annoyed or irritable"). Options for each response ranged from 0 (*not at all*) to 3 (*nearly every day*) on a 4-point Likert scale (Spitzer et al., 2006). This measurement was used in the current study due to its high reliability and validity for identifying probably cases of anxiety disorders.

The research study conducted by Spitzer et al. analyzed the correlation of each item within the 13-item measurement between subsets of the participants in the study. They identified 7 items with the highest correlations ( $r= 0.75-0.85$ ) and used those to create a shorter, 7-item version (GAD-7) (Spitzer et al., 2006). Moreover, Spitzer et al. found the internal consistency for

the GAD-7 was excellent (Cronbach Alpha = 0.92) and the test-retest reliability was also good (intraclass correlation = 0.83).

Other studies have been conducted to assess the validity and reliability of the GAD-7 in the general population (Löwe et al., 2008). The study conducted by Löwe et al. used a much larger subject pool (approx. 5000 subjects) than the previous study by Spitzer et al. This study analyzed more factors than earlier studies and found that the GAD-7 was reliable across age groups. Therefore, it further supported that the GAD-7 shows exceptional validity and reliability, and that this measurement for general anxiety can be standardized to the general population. The Cronbach's Alpha for the GAD-7 in the current study was 0.798, making the internal consistency reliability for this measure acceptable.

#### Patient Health Questionnaire Depression Scale (PHQ-9)

The Patient Health Questionnaire Depression Scale is a 9-item measurement used to assess the probability of major depression (Kroenke et al., 2001b). This questionnaire is based on the Primary Care Evaluation of Mental Disorders (PRIME-MD) measure created by Spitzer et al. (Spitzer, Kroenke, & Williams, 1999). The PRIME-MD is a two-part instrument that involves both a self-reported aspect and a clinical evaluation. For these reasons, the PRIME-MD does not have great clinical application (Kroenke et al., 2001b). In order to have a more clinically applicable measurement, Spitzer et al. created the Patient Health Questionnaire Depression Scale (PHQ-9). This 9-item measurement uses the nine criteria found in the *DSM-IV* on which the diagnosis of depressive disorders is based (Kroenke & Spitzer, 2007). The correlation between the PHQ-9 and the diagnostic criteria for depressive disorders found in the *DSM-IV* are support this measure's validity and reliability across the general adult population.

The PHQ-9 is a 9-item measure that asks participants to rate how often he or she has been bothered by the statements in the measure. All statements are related to the nine criteria for evaluating depressive disorders: depressed mood or irritability, decreased interest; significant weight change or change in appetite; change in sleep patterns; change in activity; fatigue, guilt or worthlessness; decreased concentration; and suicidal tendencies (Kroenke & Spitzer, 2007). All statements in the PHQ-9 are based on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). To score the PHQ-9, all responses are summed together. The greater the total score, the more likely an individual is suffering from a depressive disorder (Spitzer et al., 1999).

Many studies have been conducted to test the validity and reliability of the PHQ-9 in a patient and general populations (Kroenke & Spitzer, 2007; Kroenke et al., 2001b; Spitzer et al., 1999). These studies have shown that sensitivity and specificity of the PHQ-9 for identifying major depression are both 88%, while the likelihood ratio is a positive 7.1 suggesting that scores obtained from the PHQ-9 and the likelihood of depressive disorders are positively correlated (Kroenke & Spitzer, 2007). The internal consistency reliability of this measurement was also found to be excellent with a Cronbach's Alpha ranging from 0.86-0.89 (Kroenke et al., 2001b). The test-retest reliability has also been found to be high.

In the current study, the PHQ-9 was chosen to examine depression due to its high reliability and validity for identifying depressive disorders and associated symptoms. Cronbach's Alpha was assessed for the current study and was equal to 0.89 making the internal consistency reliability acceptable.

#### Life Orientation Test (LOT)

Optimism is a key aspect of positive psychological health. The Life Orientation Test (LOT) is a measurement that assesses how much an individual expects favorable outcomes in the

future (Scheier & Carver, 1985). The LOT has been used in many studies to measure individual optimism in general adult populations (Albinson & Petrie, 2003; Carver et al., 2010; Ford et al., 2000). The LOT consists of four positive items, four negative items, and four filler items. All items are rated on a 5-point Likert scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*) (Scheier & Carver, 1985).

The total score for the LOT is calculated by summing the four positive items (items 1, 4, 5, and 11) and the reverse score of the negative items (items 3, 8, 9, and 12) (Scheier & Carver, 1985). The remaining questions on the LOT are filler questions (2, 6, 7, 10) and are not to be summed with the other eight items. The total score found indicates an individual's level of dispositional optimism (Scheier & Carver, 1985). Higher scores on the LOT correspond with higher levels of optimism, whereas lower scores indicated lower levels of optimism.

The LOT has been shown to have a high test-retest reliability (correlation = 0.79) with undergraduate college students (Scheier & Carver, 1985). Another study found this measurement to have an statistically significant internal consistency in a college student population (Scheier & Carver, 1985). Moreover, the LOT has been shown to be an effective tool for measuring optimism in collegiate athletes (Albinson & Petrie, 2003; Ford et al., 2000; Gustafsson & Skoog, 2012). For this reason, the LOT was chosen for the current study as the measurement for athlete optimism. The internal consistency reliability for the LOT was assessed for the current study and yielded a Cronbach's Alpha of 0.745.

#### Athlete Burnout Questionnaire (ABQ)

The Athlete Burnout Questionnaire (ABQ) is a 15-item self-report inventory that assesses three subscales of athlete burnout: an athlete's emotion and physical exhaustion, sense of sport accomplishment, and sport devaluation (Raedeke & Smith, 2001). The 15 items are scored on a

5-point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). By rating the frequency of symptoms, the burnout subscale (i.e. emotional and physical exhaustion, reduced sense of sport accomplishment, and sport devaluation) that most often affects the athlete can be identified. An overall burnout score can be calculated by averaging all the item responses across the three subscales (Li, Wang, Pyun, & Kee, 2013; Raedeke & Smith, 2001).

In addition to finding the total athlete burnout score, scores for each subscale in the ABQ can be calculated individually. In order to calculate the emotional and physical exhaustion score, items 2, 4, 8, 10, and 12 are averaged together. Finding the total score for the reduced sense of accomplishment is found in a similar way: average the scores of items 1, 5, 7, 13, and 14 together; however, items 1 and 14 of the reduced sense of accomplishment scale must be reverse scored (i.e. 5= 1, 4=2, 3=3, 2=4, 1=5) prior to finding the total subscale score. Sport devaluation is also calculated by averaging the scores of items 3, 6, 9, 11, and 15 (Raedeke & Smith, 2009).

In 2001, Raedeke and Smith completed a study to develop the ABQ and ensure reliability within an athletic population (Raedeke & Smith, 2001). In this study, the ABQ exhibited reliability and construct validity within an adolescent athletic and collegiate athletic population. The test-retest reliability found by Raedeke and Smith for each subscale over a period of seven to nine days was as follows: emotional/physical exhaustion ( $R = 0.92$ ), reduced sense of accomplishment ( $R = 0.86$ ), and sport devaluation ( $R = 0.92$ ) (Raedeke & Smith, 2001). Furthermore, the ABQ has been found to exhibit strong internal consistency reliability for each subscale (emotional/physical exhaustion, reduced sense of accomplishment, and sport devaluation) with alpha coefficients ranging from 0.84 to 0.91 (Raedeke & Smith, 2001). Because of its high internal consistency reliability, this measure was chosen to assess burnout in the current study. The specific Cronbach's Alpha for this study was 0.871 for total athlete

burnout, 0.772 for the sport accomplishment dimension, 0.901 for the mental and physical exhaustion dimension, and 0.797 for the sport devaluation dimension.

## Procedures

### Pilot Testing

Prior to introducing the psychological health questionnaire to the participants of the study, the surveys were pilot tested within a general student ( $n = 13$ ) and athletic ( $n = 15$ ) population over a two-week period in order to identify any problems with the readability and logistics associated with computer-based questionnaires on Qualtrics.com, as well as to measure internal consistency reliability. During the first pilot testing session, the subjects were asked to complete the initial survey. The first survey asked demographic questions and questions pertaining to perceived stress, athletic identity, positive and negative affect, general anxiety, depression, optimism, and athlete burnout. The measurements of perceived stress, athletic identity, positive affect, general anxiety, and depression were all identified as reliable measurements with a Cronbach's Alpha greater than 0.70. The pilot testing of the negative I-PANAS-SF exhibited sub-par reliability (0.66); however, this may be due to the low number of participants.

In the following testing session, the participants were given the second survey that consisted only of the questionnaires that related to perceived stress, positive and negative affect, general anxiety, depression, optimism, and burnout, along with a question to insure sports involvement had not changed since the last testing session. In the second testing session, perceived stress, positive affect, general anxiety, depression were all identified as reliable measurements with a Cronbach's Alpha of greater than 0.70, except for negative affect which was below 0.70. Again, the marginal reliability of the negative affect measure could be due to



the low number of participants. The surveys for optimism and athlete burnout were also pilot tested, but there were too few participants to calculate a reliable Cronbach's Alpha. In addition to examining the internal consistency reliability of the measures in the survey, the researcher also asked for feedback from the participants of the pilot study. This was to ensure the survey was clear, concise, and easily completed. Based on the comments from the participants, the clarity and conciseness of the questions were altered to ensure full comprehension.

#### Initial Participant Assessment

Inclusion and exclusion criteria were set a priori to the completion of the study. If an athlete was under 18 or suffering from a chronic injury, he or she was excluded from the study. In order to participate, athletes must have suffered an acute, time-loss injury in the last three days that required at least three days of restricted participation; be a full-time student at the University of North Carolina at Chapel Hill; and must be a current member of a varsity, junior varsity, or club sport team.

To recruit subjects for this study, the researcher or trained research assistant presented the opportunity to participate to any varsity, junior varsity, or sport club athlete seeking healthcare from a certified athletic trainer in the Stallings-Evans Sports Medicine Building or other sports medicine facility beginning in the Fall of 2015. The researcher or trained research assistants in the Stallings-Evans Sports Medicine Building or other sports medicine building approached athletes if they were being evaluated for an acute injury. Athletes were only approached once the certified athletic trainer responsible for the team gave permission to contact the athlete. Other staff members in Stallings-Evans and other sports medicine faculties were briefed on the study and the inclusion/exclusion criteria. If an athlete presented with an acute injury and met the

inclusion criteria, the presiding staff member could suggest participation in the study and contact the researcher or trained research assistants.

Once potential participants were identified, they were informed of the purpose of the present study, and it was explained that participation is completely voluntary. Moreover, any participant could discontinue the study at any point in time if he or she no longer felt comfortable completing it. Participants were given unique, coded IDs before completing the survey. Surveys were anonymous and no identifying information was requested. Only the researcher and trained research assistants knew each participant's individual ID. Interested participants were asked to sign a written consent form before beginning the first 8- to 10- minute survey following his or her initial injury evaluation. The athletes were told that the study would be focusing on factors of psychological health following injury until return to play. The initial survey and all subsequent surveys were accessed on a tablet provided by the researcher or trained research assistant using wireless Internet or through the participant's personal mobile device. Every survey was computer-based and completed on Qualtrics.com. Additionally, participants were informed that participation would involve taking other shorter surveys once a week during his or her rehabilitation sessions until he or she was cleared to fully participate by the team's certified athletic trainer or corresponding physician. The follow-up survey could either be completed during the athlete's scheduled team treatment times, or on his or her own time through an emailed link sent by the researcher. If the athlete chose to complete the survey outside of treatment times, it must have been completed within 72 hours of receiving the link in order for the data to be utilized. Moreover, once the athlete returned to play, he or she would be asked to complete one final post return to play survey of study variables. An email would be sent to the athlete requesting the final survey be performed within 72 hours of receiving the email. A

follow-up email would be sent to remind the participant after 24 hours had passed since the survey was released and again once 48 hours had passed.

The initial survey was distributed to participants through Qualtrics.com and was completed during the athlete's initial injury evaluation on a wireless tablet provided by the researcher or trained research assistant or on the participant's personal mobile device. The survey consisted of a patient history questionnaire and the specific measures this study used to determine the participant's current psychological health. Demographic information was gathered using the patient history questionnaire and included: age, sex, race, academic status, sport at UNC-CH, total years of experience in current sport, total years of experience in all sports, and currently injury body part. Participants were selected based on inclusion criteria gathered from their patient history questionnaire. If the athlete indicated he or she was under 18 or suffering from a chronic injury, he or she was excluded from the study. Demographic information was gathered in order to group participants into different categories based on age, sport, injury, and years of experience.

Following the demographic patient health questionnaire, the survey continued to measurements used for this study to test current psychological health and athletic identity (PSS-4, AIMS, I-PANAS-SF, GAD-7, PHQ-9, LOT, ABQ).

#### Subsequent Participant Assessments

Once the first survey was completed, participants were asked on what days and at what times they planned to continue their rehabilitation. Based on the given information, subsequent testing sessions were set up with the researcher or trained research assistant. Participants were asked to remember their participant ID; however, the researcher and trained research assistant also had a record of the IDs. If the athlete missed an appointment or was unable to complete the

survey on the chosen day, he or she was contacted through email and asked to complete the survey online within the next 72 hours. The link to the survey was sent out to the participant along with his or her unique ID in order to ensure proper entry of the ID code. A second email would be sent if the survey had still not been completed 24 hours after it was sent, and a subsequent email would be sent if the survey was still not completed after 48 hours. If the participant was still unable to complete the survey in 72 hours, the data for that week were no longer valid and were not used in the study. During the subsequent testing sessions, participants only completed the psychological health measurements (PSS-4, I-PANAS-SF, GAD-7, PHQ-9, ABQ) and a brief question asking if the sport in which the athlete was initially participating in had changed. During each session, participants were reminded that they could choose to discontinue participation in the study without consequences. Moreover, they were reassured that all information is private and no identifying aspects will be used. Testing sessions continued regularly once a week or until the athlete was cleared to fully participate in his or her current sport by the team's certified athletic trainer or team physician.

After the participant was cleared to fully participate in sport by the team's certified athletic trainer or team physician, they completed one more survey. The participants were asked to come to their team's designated treatment times to fill out the quick survey. If the participant was unable to make treatment times due to other obligations, the link for the final survey was sent to him or her via email through Qualtrics.com along with his or her participant ID. It was requested that the survey be completed in 48 hours in order to be valid for this study. A second email and phone call to the number provided would be sent if the survey had still not been completed 24 hours after it was sent. A comment box was added to the end of the final survey to give the participants a chance to comment qualitatively on their experience during study. The

contact information of the researcher was also provided for participants to allow for discussion of results or to discuss any further questions.

INITIAL	FOLLOW-UP (1x/wk)	FINAL (RTP)
<ul style="list-style-type: none"> <li>• Demographics</li> <li>• AIMS (10)</li> <li>• PSS-4 (4)</li> <li>• I-PANAS-SF (10)</li> <li>• PHQ-9 (9)</li> <li>• GAD-7 (7)</li> <li>• LOT-SF (12)</li> <li>• ABQ (15)</li> </ul>	<ul style="list-style-type: none"> <li>• PSS-4 (4)</li> <li>• I-PANAS-SF (10)</li> <li>• PHQ-9 (9)</li> <li>• GAD-7 (7)</li> <li>• ABQ (15)</li> </ul>	<ul style="list-style-type: none"> <li>• PSS-4 (4)</li> <li>• I-PANAS-SF (10)</li> <li>• PHQ-9 (9)</li> <li>• GAD-7 (7)</li> <li>• ABQ (15)</li> </ul>
67 total questions	45 total question	45 total questions

Table 1: Study Timeline

### Statistical Analysis

In this study, the dependent variables included the results from I-PANAS-SF (positive and negative affect), GAD-7 (America), PHQ-9 (America), LOT (optimism), and ABQ (athlete burnout). Perceived stress as measured by the PSS-4 was considered a time-varying covariate in this study along with days missed due to injury and trait optimism.

Three time points were observed in this study: initial injury, rehabilitation, and return to play. The rehabilitation variable consists of the data from the follow-up surveys and was calculated by averaging together the score from all the follow-up surveys completed by each participant individually. This averaging was completed due to the variance in the number of follow-up surveys completed; while some participants only completed one, others completed up to seven different follow-up surveys.

Descriptive analyses were utilized first to assess the distribution of all the variables in the study sample at all time points. Correlation analyses were performed to identify any relationships

between the dispositional variables (athletic identity and trait optimism), markers of psychological health (affect, anxiety, depression, burnout), and perceived stress over time.

Moreover, t-tests were utilized to determine if there was a difference between the markers of psychological health (i.e. positive and negative affect, anxiety, depression, burnout) and perceived stress from across the three assessment time points.

Additionally, the data collected from the participants that completed the initial, follow-up, and return to play questionnaires were analyzed using repeated analysis of variance (ANOVA) measures. The number of follow-up surveys completed by the subjects differed in number. In order to account for this difference, we averaged the data from each participant's questionnaires to create one follow-up data time point for each measure (i.e. PSS-4, I-PANAS-SF, GAD-7, PHQ-9 and ABQ) to displayed how the athlete generally felt during the rehabilitation period.

Six separate ANOVAs were used to identify changes in stress, positive affect, negative affect, anxiety, depression, and athlete burnout at all three time points (i.e. initial, rehabilitation, and return to play). An alpha level of 0.05 was set a priori for the study. In addition, Bonferroni post-hoc tests were used on all six ANOVAs to identify statistical significance between the time points.

Moreover, repeated measure analysis of covariance (ANCOVA) were completed to examine if perceived stress, days missed due to injury, and trait optimism affected the changes between positive and negative psychological health factors at injury, follow-up, and return to play at all three time points as well. A priori, and alpha level of 0.05 was selected and Bonferroni post hoc testing was performed to identity statistical significance at the different time points.

Finally, multilevel linear modeling was conducted to examine the relationship among the dispositional factors (i.e. athletic identity and trait optimism), markers of psychological health (i.e. positive and negative affect, anxiety, depression, burnout), and perceived stress over time. Multilevel linear modeling (MLM) is appropriate to use in the current study because it allows the researcher to examine the change within-person and between-person simultaneously (Singer & Willet, 2003). MLM addresses a two-level research question: 1) what is the within-person change over time and 2) what is the between-person difference in change over time. The three research questions in this study benefited from using MLM because it allowed simultaneous comparison of both levels. MLM was to address how markers of psychological health change from initial injury to when full return-to-play is achieved in within a single athlete and between all athletes that participated in the study. Moreover, MLM was additionally used to see if there was a relationship between changes in markers of psychological health with respect to perceived levels of stress, athletic identity, and trait optimism within- and between-persons (see table 3).

	Instrument	Value
Independent Variables		
<i>Athletic Identity</i>	Athletic Identity Measurement Scale (AIMS)	7—49
<i>Trait Optimism</i>	Life Orientation Test (LOT)	0—48
Dependent Variables		
<i>State Anxiety</i>	General Anxiety Disorder (GAD-7)	0—21
<i>Depression</i>	Patient Health Questionnaire (PHQ-9)	0—27
<i>Negative Affect</i>	Positive and Negative Affect Schedule (PANAS) short form	0—30
<i>Positive Affect</i>	PANAS short form	0—30
<i>Athlete Burnout</i>	Athlete Burnout Questionnaire (ABQ)	15—75
	Dimension of ABQ	
	Sport Accomplishment (A-ABQ)	5—25
	Mental and Physical Exhaustion (E-ABQ)	5—25
	Sport Devaluation (D-ABQ)	5—25
Covariates		
<i>Perceived Stress</i>	Perceived Stress Scale (PSS-4)	0—16

Table 2: Table of Variables



Research Question 1	Hypothesis 1	Analytic Approach
How do markers of psychological health (positive and negative affect, depression, anxiety, optimism, athlete burnout) compare immediately following a time-loss injury until full return-to-play is achieved in collegiate athletes?	Markers of positive psychological health (i.e. positive affect, optimism) will be lowest at time of injury and increase until return to play is achieved as opposed to markers of negative psychological health (negative affect, depression, anxiety, athlete burnout) which will be highest at injury and decrease until return to play in collegiate athletes.	T-Test ANOVA
Research Question 2	Hypothesis 2	Analytical Approach
After controlling for perceived stress, what is the change in psychological health factors in collegiate athletes immediately following a time loss injury until full return to play is achieved?	After controlling for perceived stress, markers of positive psychological health will increase and maladaptive factors will decrease from initial injury until return to play.	ANCOVA
Research Question 3	Hypothesis 3	Analytical Approach
After controlling for optimism and perceived stress, does athletic identity moderate the relationships among positive and negative affect and factors of psychological health in collegiate athletes immediately following a time loss injury until full return-to-play status is achieved?	After controlling for optimism and perceived stress, athletes with higher levels of athletic identity will express more negative psychological health variables at the point of injury and the negative variables will decrease more slowly over the return to play window as opposed to athletes with lower levels of athletic identity..	MLM

Table 3: Variable Analysis

## CHAPTER 4: MANUSCRIPT

### Introduction

The potential for injury is an everyday consequence of participation in physical activity, especially intercollegiate sport. Since 1988, the NCAA has been collecting injury data from various men's and women's collegiate sports teams. They found, over a 16-year period, that not only do injuries cause physical harm, they also increase psychological stress leading to increased emotional and psychological disturbance (B Hainline et al., 2014; Hootman et al., 2007).

The relationship between athlete stress and athletic injury has been extensively researched over the years. In 1988, Andersen and Williams developed a psychological model that depicted the relationship between the potential for athletic injury and psychological factors such as personality, history of stressors, and coping resources (Williams & Andersen, 1998). This psychological model, known as the stress-injury model, depicts how sport-related stress can potentially lead to injury. The injurious event is mediated by psychological factors such as the individual athlete's personality, history of stressors, and coping resources. While the stress-injury model is used primarily to explain how increased stress can potentially lead to injury, it has also been used to depict the relationship between an athletic injury and stress following the injurious event (Weinberg & Gould, 2011). Once injury occurs, an individual's stress levels increase. Restriction from practice and/or all physical activity, distance from the team, and healing time of the injury are just a few examples of how injuries can potentially increase the psychological stress of an athlete. How an athlete manages and copes with this stress is influenced by the factors previously mentioned in the stress-injury model: personality, history of stressors, and

coping resources. If an athlete possesses negative or maladaptive psychological health factors, he or she can experience increased amounts of stress following an injurious event (Weinberg & Gould, 2011). History of stressors (e.g. previous injuries), personality (e.g. athletic identity and trait optimism), and coping resources (e.g. athlete burnout) all play a large role in how stress can increase following an injury and the way in which the athlete will psychologically respond to that injury (Brewer et al., 1999; Brewer & Tasiemski, 2011; Green & Weinberg, 2001; Sparkes, 1998; Weinberg & Gould, 2011). Therefore, the associations among these factors and sports stress merits further consideration.

Multiple studies have been conducted on the relationship between personality and an individual's response to stressful events such as sports injury (Aitken Harris & Lucia, 2003; Andersen, 1999; Brewer, 1993; Brewer & Cornelius, 2010). One's personality has many dimensions and one important aspect of personality is identity. Identity is the way a person defines him or herself. For those participating in sport, athletic identity is just one of many examples of an individual's chosen identity. Athletic identity has been defined as the degree to which an individual identifies with the athlete role (Brewer et al., 1993). It is a multidimensional construct that encompasses cognitive, affective, and social components. Athletic identity shapes the broader social identity of an athlete and alters the balance between sport and other areas of life (Brewer et al., 1993; Lamont-Mills & Christensen, 2006). Thus, athletic identity is an important aspect of personality to consider and it may represent a potential covariate when examining markers of psychological health linked to an athlete's response to injury and recovery.

Optimism is another dispositional characteristic relating to personality that can affect how an athlete responds to injury (Brewer, 1994; Leddy et al., 1994; Scheier & Carver, 1985; A. M. Smith et al., 1990; Wagman & Khelifa, 1996; Williams & Andersen, 1998). Carver et. al

defined optimism as a personality trait that reflects the extent to which an individual has favorable expectancies of the future (Carver et al., 2010). Trait optimism, which we focused on in the current study, is stable and rarely significantly altered. It is believed to only be subject to change during times of great life transition, breaks from prior experiences, and when the outcome of an event is uncertain (i.e. a possibly season- or career-ending injury)(Carver et al., 2010). Trait optimism can potentially be challenged when an athlete sustains an injury; however, athletes with higher levels of optimism have been shown to react to injury in a more positive manner and tend to have a positive rehabilitation and successful return to play (Gustafsson & Skoog, 2012; Adam R. Nicholls et al., 2008; L. Smith, 2015). Studies have shown that an individual's level of optimism, on its own, can affect his or her response to injury, but few studies have examined how optimism, along with other dispositional factors, can affect the psychological response to injury collectively based on their relationships to each other. Based on this idea, levels of optimism were assessed in the current study in order to examine the role optimism could have as a dispositional factor on an athlete's response to injury.

Guided by the Anderson and Williams stress-injury model, changes in psychological factors are another important component to injury and can be influenced by an individual's dispositional characteristics. Specifically, maladaptive changes in athlete affectivity have been shown to be a negative outcome of injury. Affect can be classified as either negative or positive (Crawford & Henry, 2004). Negative affect has been linked to negative emotions while positive affect has been related to positive emotions (Crawford & Henry, 2004; Gustafsson et al., 2013). Moreover, research has shown that negative affect has been linked to maladaptive psychological responses such as depression and anxiety (Crawford & Henry, 2004). Finally, negative affect has been associated with an increase in psychological stress (Gustafsson et al., 2013; A. R. Nicholls

et al., 2009). An athlete who suffers an injury requiring restriction from participation would likely experience increased psychological stress and negative affective responses (i.e., high negative affect, low positive affect) along with decreased positive psychological health factors (Leddy et al., 1994; Loudon, 2013b). Changes in affectivity are just one consequence of injury, and few studies have explored the link between injury, affective response, and other variables including athletic identity, trait optimism, and perceived stress simultaneously. In the current study, we hope to examine these links in order to add to the existing knowledge base.

Anxiety and depression are two other aspects of psychological health that can be impacted by changes in affect and increased stress following injury. Anxiety is an emotional reaction to situations or events that consist of a combination of three key factors: feelings of apprehension, tension, and nervousness; worries or unpleasant thoughts; and physiological changes (Spielberger, 1988). Anxiety is a biopsychosocial process in which stressors; perception and appraisals of stressors; and emotional responses interact in a dynamic way. Furthermore, anxiety can be categorized as either state or trait (Raglin, 1992). Trait anxiety is relatively stable and unchanging, while state anxiety is more dynamic and changes based on factors in the environment and within the individual. In the current study, state anxiety was examined because every individual reacts to situations in a different way due to how he or she perceives and appraises the stimuli present. (Raglin, 1992; Spielberger, 1988). Increased state anxiety has been linked to increased psychological stress and injury risk in athletes. Anxiety is increased when an individual perceives a situation as threatening. The current study aims to further examine the link between anxiety and injury by exploring how state anxiety changes from initial injury until return to play.

Depression is another key psychological health factor that has been found to increase following sports injury (Brewer, 1993; Brewer et al., 1995; A. M. Smith et al., 1990). Many studies have been conducted on the relationship between physical activity and depression. These studies suggest that increased physical activity is inversely related to depression (Byrne & Byrne, 1993; Fox, 1999; McKercher et al., 2009; Strohle, 2009; Teychenne et al., 2008). Depression, along with anxiety and changes in affective states, is just a portion of an athlete's psychological makeup that can be altered following injury. Few studies, aside from the current study, have look singularly at depression following injury and how a depressed mood can be altered by other dispositional characteristics like athletic identity and optimism. The current study aimed to shed light on the relationship between depression, injury, and dispositional characteristic of athletes.

One final outcome of increased stress and negative psychological health is athlete burnout (Wadey et al., 2013). Athlete burnout is an aspect of psychological health that is defined as a cognitive affect syndrome that encompasses several symptoms such as reduced sense of accomplishment in sport, emotion and physical exhaustion, and sport devaluation (Raedeke, 1997). If an athlete gets injured and is no longer able to participate in his or her sport, an increase in negative psychological health factors and stress, along with a decrease in positive psychological health and optimism, may occur. All of the above factors—both positive and negative—place varying situational and psychological demands on the athlete, which could potentially alter his or her coping behavior and cognitive appraisal of the situation (Gould et al., 1996). If an athlete suffers a time loss injury and is restricted from practice and competition, external demands and controlled extrinsic motivation from coaches, teammates, etc., are also likely to increase, thus burnout symptoms are likely to increase as well (Lonsdale et al., 2009). Conversely, injury can be perceived by some athletes as a training break and therefore symptoms

of burnout can decrease. In the current study, athlete burnout is examined in order to add to the growing body of knowledge that suggests burnout is positively related to stress and injury (Gould et al., 1996; Gustafsson & Skoog, 2012; Gustafsson et al., 2013). By examining burnout along with other psychological and dispositional factors, we can see if a relationship is present.

The purpose of the current study was to examine the relationship between psychological health factors (i.e. affect, depression, anxiety, and burnout), dispositional characteristics (i.e. athletic identity and trait optimism), and perceived stress in collegiate athletes following injury through rehabilitation until the athlete is returned to full participation. Negative psychological health factors are known to increase immediately following injury and decrease throughout the rehabilitation process; conversely, positive psychological health factors tend to decrease at initial injury and increase once the athlete has returned to play (Brewer et al., 1995). A multitude of research has been conducted on the immediate alteration in psychological health following injury and the changes that occur at return-to-play, but little research has focused on the changes in psychological health factors (i.e. stress, affect, depression, anxiety, burnout) from initial injury to return to play as a whole. There is a need for more research that looks at the changes and patterns of change for psychological health factors from injury through return to play. Identifying relationships between certain psychological health factors and dispositional characteristics at different time points throughout recovery could help shed light on the athlete's psychological recovery as well as physical recovery from injury. This study attempts to fill this important knowledge gap.

The current study examined psychological stress perceptions in order to identify its relationship with other dispositional and psychological health outcomes following injury until the athlete was able to return to play. The relationship between stress, dispositional factors, and

other psychological health factors have rarely been examined collectively from the time of injury continually until return to play. Thus, the current study aimed to add to the current body of knowledge and support these relationships. The purpose of the study was to identify changes in psychological health variables in athlete from initial injury through rehabilitation until return to play was achieved. We hypothesized that markers of positive psychological health (i.e. positive affect, optimism) would be lowest at time of injury and increase until return to play is achieved as opposed to markers of negative psychological health (negative affect, depression, anxiety, athlete burnout) which would be highest at injury and decrease until return to play in collegiate athletes. Moreover, after controlling for perceived stress, markers of positive psychological health would increase and maladaptive factors will decrease from initial injury until return to play. Finally we examined the trends of positive and negative psychological health variables throughout the recovery process. We believed that positive psychological health factors would initially start low and increase across the three time points, while negative psychological health factors will start high and decrease.

### Research Design

A longitudinal design was utilized to complete this study. The use of this design allowed the researcher to follow participants throughout their post-injury experience and collect data at selected time points. Participants had to meet specific criteria to be admitted into the study. The seven questionnaires used to measure psychological health in this study were the Perceived Stress Scale – 4 (PSS-4), Athletic Identity Measurement Scale (AIMS), the International Positive Affect and Negative Affect Schedule Short Form (I-PANAS-SF), General Anxiety Disorder – 7 (GAD-7), Patient Health Questionnaire – 9 (PHQ-9), the Life Orientation Test (LOT), and the Athlete Burnout Questionnaire (ABQ). Participants were informed that they were completing a study on



psychological health following injury and given a brief description of the study before participating.

## Participants

Participants were included in the study if they were full-time students at UNC Chapel Hill, were proficient in English, and were Division-I varsity, junior varsity, or club sport athletes. The study was open to all male and female sports to broaden the generalizability. All participants must have sustained an acute injury within the last 72 hours in order to be included. An acute injury, in this study, was defined as an injury that resulted from one specific mechanism with no prior pain or dysfunction at that body part and required at least four days of restricted activity. Participants were excluded from the study if they were being currently evaluated for a chronic injury with or without time loss, were previously being rehabilitated for a chronic or acute time loss injury at the onset of the study, or did not meet the other inclusion criteria.

We initially aimed to have 50 participants, but were only able to recruit twenty-eight. The twenty-eight (15 male, 13 female) subjects were UNC Division-I athletes (24) and club sport athletes (4) between the ages of 18-24 years old. All twenty-eight signed the consent form and completed the initial survey, twelve of the twenty-eight completed one or more follow-up surveys, and only seventeen of the original twenty-eight completed the return-to-play survey. Therefore, seventeen participants completed all the surveys required to examine our first and second research questions, while only twelve completed all surveys required to examine the exploratory research question. However, one male participant completed the study twice for two different injuries sustained at different points during the training season. Only the data from his first injury was used. This resulted in requisite changes to the third research question and the associated analysis plan for this research question.

The demographics of all participants were examined to determine trends and frequencies. 15 males and 13 females completed the initial post injury psychological health survey totaling 28 participants. The majority of the participants were white (82%) and played a varsity sport (85%). Most injuries were sustained during the regular season. Subjects who participated in lower extremity dominate sports, such as lacrosse, soccer, and field hockey, sustained the majority of the injuries. Subsequently, the most commonly sustained injuries were that to the lower extremity including knee, foot, ankle, hamstring, and quadriceps.

While 28 athletes were able to complete the initial survey, only 17 of those completed the final return-to-play psychological health questionnaire. Moreover, of the initial participant pool of 28, 12 completed one or more of the follow-up psychological health surveys, but not all were able to complete the return-to-play survey.

Participant ID	Number of follow-up surveys completed
300	2
204	7
210	3
214	4
201	5
216	1
207	1
206	1
202	2
3	3
2	2
4	1

Table 4: Number of Follow-Up Surveys Completed by Participants (N=12)

Sport	Frequency	Percent
Varsity Field Hockey	1	4.17
Varsity Lacrosse	6	25.00
Varsity Rowing	3	12.50
Varsity Soccer	8	33.33
Varsity Tennis	2	8.33
Varsity Volleyball	2	8.33
Varsity Total	24	100
Club Wrestling	1	25
Club Ultimate Frisbee	1	25
Club Soccer	1	25
Club Lacrosse	1	25
Club Total	4	100

Table 5: Participant's sports demographics following first testing session

Gender	Frequency	Percent
Male	15	53.57
Female	13	46.43

Table 6: Gender of participants following first testing session.

Age	Frequency	Percent
18	5	17.86
19	10	35.71
20	5	17.86
21	5	17.86
22	2	7.14
23	0	0
24	1	3.57

Table 7: Age of participants following first testing session

Race	Frequency	Percent
White	23	82.14
Hispanic/Latino	4	14.29
Black or African American	1	3.57

Table 8: Race of participants following first testing session

Season	Frequency	Percent
Pre-season	2	7.14
Regular season	16	57.14
Post season	5	17.86
Off season	5	17.86

Table 9: Season of participant's sport following first testing session

Body Part Injured	Frequency	Percent
Foot/toes	2	7.14
Ankle	6	21.43
Knee	5	17.86
Shoulder	2	7.14
Upper back	1	3.57
Lower back	2	7.14
Lower leg	1	3.57
Thigh (quad/hamstring)	4	14.29
Elbow	2	7.17
Head (other)	3	10.71

Table 10: Body part injured following first testing session

Type of Injury	Frequency	Percent
Ligament sprain	10	35.71
Muscle/tendon strain	7	25.00
Fracture	2	7.14
Ligament/tendon rupture	2	7.14
Muscle spasm	1	3.57
Meniscal tear	1	3.57
Labrum tear	1	3.57
Concussion	3	10.71
Unknown	1	3.57

Table 11: Type of injury sustained following first testing session

## Instrumentation

### Athletic Identity Measurement Scale (AIMS)

The Athletic Identity Measurement Scale (AIMS) is a 10-item questionnaire used to measure the strength and exclusivity of an individual's athletic identity (Brewer et al., 1993). This item has ten questions and the participants are instructed to respond to phrases based on how they generally feel (Brewer et al., 1993; Lamont-Mills & Christensen, 2006). Scoring for the AIMS corresponds to the degree to which the participant associates with the respective aspect of athletic identity. Each question is answered based on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). In this study, the AIMS was used to assess a participant's level of athletic identity at the onset of injury. The AIMS has high exhibited test-retest reliability ( $r = 0.89$  over a 2-week time period) and high internal consistency reliability

(coefficient alpha = 0.81 to 0.93) in previous administrative efforts, supporting its appropriateness for use within the current study population (Brewer et al., 1993). In the current study, the Cronbach's alpha for the AIMS was 0.75.

#### Life Orientation Test (LOT)

Optimism is a key aspect of positive psychological health. The Life Orientation Test (LOT) is a measurement that assesses how much an individual expects favorable outcomes in the future (Scheier & Carver, 1985). The LOT has been used in many studies to measure individual optimism levels in the general adult population (Albinson & Petrie, 2003; Carver et al., 2010; Ford et al., 2000). The LOT consists of four positive items, four negative items, and four filler items. All items are rated on a 5-point Likert scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*) (Scheier & Carver, 1985). The LOT has been shown to have a high test-retest reliability (correlation = 0.79) with undergraduate college students and was found to have a statistically significant internal consistency in the college student population (Scheier & Carver, 1985). Moreover, the LOT has been shown to be an effective tool for measuring optimism in collegiate athletes (Albinson & Petrie, 2003; Ford et al., 2000; Gustafsson et al., 2013). The internal consistency reliability for the LOT was 0.75 in the current study. For this reason, the LOT was chosen for the current study as the measurement for athlete optimism.

#### Perceived Stress Scale (PSS-4)

The Perceived Stress Scale 4-item measure (PSS-4) is a measurement of perceived stress. It is used to assess the degree to which situations in an individual's life are appraised as stressful events (Cohen et al., 1983). Participants are instructed to answer the questions provided based on how he or she has generally felt over a period of time. The responses are measured on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). The PSS-4 was selected for the

current study due to its brevity and tested reliability and validity with an athletic sample (Gustafsson & Skoog, 2012). In the current study, the internal consistency reliability for the PSS4 at the initial, follow-up, and return to play assessments was 0.62, 0.70, and 0.22 respectively. A Cronbach's alpha of less than 0.70 is considered only mildly reliable. Therefore, we must take caution when examining the results from the initial and final assessments.

#### International Positive and Negative Affect Schedule- Short Form (I-PANAS-SF)

The International Positive and Negative Affect Schedule- Short Form (I-PANAS-SF) consists of 10 items: five relating to positive affect and five relating to negative affect. These positive (inspired, alert, attentive, active, determine) and negative (afraid, upset, nervous, ashamed, hostile) affective items are rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). The questionnaire asks participants to answer each question based on how he or she generally feels (Thompson, 2007). In this research study, we chose to utilize the I-PANAS-SF due to its high validity and reliability within in athletic population (Gustafsson et al., 2013). The internal consistency reliability for this study at the initial, follow-up, and return to play assessments were 0.65, 0.79, and 0.86 for the negative affective items of the I-PANAS-SF (N-PANAS) and 0.81, 0.45, and 0.80 for the positive affective items (P-PANAS). The data from the initial N-PANAS and follow-up P-PANAS should be interpreted cautiously due to low internal consistency reliability.

#### Patient Health Questionnaire Depression Scale (PHQ-9)

The Patient Health Questionnaire Depression Scale is a 9-item measurement used to assess the probability of major depression (Kroenke, Spitzer, & Williams, 2001a). The PHQ-9 is a 9-item measure that asks participants to rate how often he or she has been bothered by the statements in the measure. All statements in this measure are based on a 4-point Likert scale

ranging from 0 (*not at all*) to 3 (*nearly every day*). Many studies have been conducted to test the validity and reliability of the PHQ-9 in a patient and general populations (Kroenke & Spitzer, 2007; Kroenke et al., 2001a; Spitzer et al., 1999). The internal consistency reliability of this measurement was also found to be excellent, when used in previous studies, with a Cronbach's Alpha ranging from 0.86-0.89 (Kroenke et al., 2001a). The test-retest reliability has also been found to be high. For these reasons, the PHQ-9 was selected for the current study to examine depression. In the current study, the internal consistency reliability for the PHQ-9 was 0.80, 0.84, 0.65 at the initial, follow-up, and final assessments.

#### General Anxiety Disorder Scale (GAD-7)

Anxiety is one of the most common mental disorders in the general population (America, 2015). The GAD-7 is a 7-item measurement that asks participants how often they were bothered by each potentially anxiety related scenario (i.e. "trouble relaxing," "becoming easily annoyed or irritable"). Options for each response ranged from 0 (*not at all*) to 3 (*nearly every day*) on a 4-point Likert scale. Studies have found the internal consistency for the GAD-7 was excellent (Cronbach Alpha = 0.92) and the test-retest reliability was also good (intraclass correlation = 0.83) (Spitzer et al., 2006). The internal consistency reliability for the current study at initial, follow-up, and return to play was 0.88, 0.92, and 0.94. Therefore, this measurement was used in the current study due to its high reliability and validity for identifying probable cases of anxiety disorders.

#### Athlete Burnout Questionnaire

The Athlete Burnout Questionnaire (ABQ) is a 15-item self-report inventory that assesses three subscales of athlete burnout: an athlete's emotion and physical exhaustion, sense of sport accomplishment, and sport devaluation (Raedeke & Smith, 2001). The 15 items are scored on a

5-point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). By rating the frequency of symptoms, the burnout subscale (i.e. emotional and physical exhaustion, reduced sense of sport accomplishment, and sport devaluation) that most often affects the athlete can be identified. An overall burnout score can be calculated by averaging all the item responses across the three subscales (Li et al., 2013; Raedeke & Smith, 2001). Research has shown that the ABQ has exhibited reliability and construct validity within an adolescent athletic and collegiate athletic population (Raedeke & Smith, 2009). Furthermore, the ABQ has been found to exhibit strong internal consistency reliability for each subscale (emotional/physical exhaustion [E-ABQ], reduced sense of accomplishment [A-ABQ], and sport devaluation[D-ABQ]) with alpha coefficients ranging from 0.84 to 0.91(Raedeke & Smith, 2001). The internal consistency reliability for the ABQ was computed for the current study. Along with a global ABQ Cronbach's alpha, all three subscales were also completed separately. The internal consistency reliability for global ABQ was 0.87, 0.96, and 0.80. The E-ABQ had a Cronbach's alpha of 0.90, 0.97, and 0.88. The internal consistency reliability for the A-ABQ was 0.77, 0.87, and 0.40. Finally, the D-ABQ had an internal consistency reliability of 0.80, 0.93, and 0.79 at all three assesment sessions. Because of its high internal consistency reliability, this measure was chosen to assess burnout in the current study.

## Procedures

### Initial Assessment Session

Inclusion and exclusion criteria were set a priori to the completion of the study. In order to participate, athletes must have suffered an acute, time-loss injury in the last three days that required at least three days of restricted participation; be a full-time student at the University of North Carolina at Chapel Hill; and must be a current member of a varsity, junior varsity, or club



sport team. If the athlete indicated he or she was under 18 or suffering from a chronic injury, he or she was excluded from the study. A chronic injury, for the purpose of this study, was defined as an overuse injury with an insidious onset that did not occur due to one traumatic incident.

To recruit subjects for this study, the researcher or trained research assistant presented the opportunity to participate to any varsity, junior varsity, or sport club athlete seeking healthcare from a certified athletic trainer beginning in the Fall of 2015. Athletes were approached if they were being evaluated for an acute injury once the certified athletic trainer responsible for the team gave permission to the researcher to contact him or her. Other staff members in Stallings-Evans and other sports medicine facilities were briefed on the study and the inclusion/exclusion criteria in order to suggest participation in the study and contact the researcher or trained research assistant.

Once potential participants were identified, they were informed of the purpose of the present study, and it was explained that participation is completely voluntary. Moreover, any participant could discontinue participation at any point in time if he or she no longer felt comfortable completing it. Participants were given unique, coded IDs before completing the survey. Surveys were anonymous and no identifying information was requested. Only the researcher and trained research assistant knew each participant's individual ID. Interested participants were asked to sign a written consent form before beginning the first 8- to 10- minute survey. The athletes were told that the study would be focusing on factors of psychological health following injury until return to play. The initial survey and all subsequent surveys were accessed on a tablet or through the participant's personal mobile device. Every survey was computer-based and completed on Qualtrics.com. Additionally, participants were informed that participation would involve taking other shorter surveys once a week during his or her

rehabilitation sessions until he or she was cleared to fully participate. The follow-up survey could either be completed during the athlete's scheduled team treatment times, or on his or her own time through an emailed link sent by the researcher. If the athlete chose to complete the survey outside of treatment times, it must have been completed within 72 hours of receiving the link in order for the data to be utilized. Moreover, once the athlete returned to play, he or she would be asked to complete one final post return to play survey of study variables. An email would be sent to the athlete requesting the final survey be performed within 72 hours of receiving the email. A follow-up email would be sent to remind the participant after 24 hours had passed since the survey was released and again once 48 hours had past.

The initial survey consisted of a patient history questionnaire and the specific measures this study used to determine the participant's current psychological health. Demographic information was gathered using the patient history questionnaire and included: age, sex, race, academic status, sport at UNC-CH, total years of experience in current sport, total years of experience in all sports, and currently injury body part. Participants were selected based on inclusion criteria gathered from their patient history questionnaire. Demographic information was gathered in order to group participants into different categories based on age, sport, injury, and years of experience.

Following the demographic patient health questionnaire, the survey continued to measurements used for this study to test current psychological health and athletic identity (PSS-4, AIMS, I-PANAS-SF, GAD-7, PHQ-9, LOT, ABQ).

#### Subsequent Assessment Sessions

Once the first survey was completed, subsequent testing sessions were set up with the researcher or trained research assistant. Participants were asked to remember their participant ID;

however, the researcher and trained research assistant also had a record of the IDs. If the athlete missed an appointment or was unable to complete the survey on the chosen day, he or she was contacted through email and asked to complete the survey online within the next 72 hours. The link to the survey was sent out to the participant along with his or her unique ID in order to ensure proper entry of the ID code. Follow up emails would be sent every 24 hours if the participant failed to complete the survey. If the participant was still unable to complete the survey in 72 hours, the data for that week were no longer valid and were not used in the study. No participant completed any survey outside of the 72 hour window, so all data was included. During the subsequent testing sessions, participants only completed the psychological health measurements (PSS-4, I-PANAS-SF, GAD-7, PHQ-9, ABQ) and a brief question asking if the sport in which the athlete was initially participating in had changed. Testing sessions continued regularly once a week or until the athlete was cleared to fully participate in his or her current sport by the team's certified athletic trainer or team physician.

After the participant was cleared to fully participate in his or her sport by the team's certified athletic trainer or team physician, one more survey was completed. A comment box was added to the end of the final survey to give the participants a chance to comment qualitatively on their experience during study. The contact information of the researcher was also provided for participants to allow for discussion of results or to discuss any further questions.

INITIAL	FOLLOW-UP (1x/wk)	FINAL (RTP)
<ul style="list-style-type: none"> <li>• Demographics</li> <li>• AIMS (10)</li> <li>• LOT-SF (12)</li> <li>• PSS-4 (4)</li> <li>• I-PANAS-SF (10)</li> <li>• PHQ-9 (9)</li> <li>• GAD-7 (7)</li> <li>• ABQ (15)</li> </ul>	<ul style="list-style-type: none"> <li>• PSS-4 (4)</li> <li>• I-PANAS-SF (10)</li> <li>• PHQ-9 (9)</li> <li>• GAD-7 (7)</li> <li>• ABQ (15)</li> </ul>	<ul style="list-style-type: none"> <li>• PSS-4 (4)</li> <li>• I-PANAS-SF (10)</li> <li>• PHQ-9 (9)</li> <li>• GAD-7 (7)</li> <li>• ABQ (15)</li> </ul>
67 total questions (8-10 minutes)	45 total questions (6-8 minutes)	45 total questions (6-8 minutes)

Table 12: Study Timeline

#### Statistical Analysis

In this study, the dependent variables included perceived stress, positive and negative affect, anxiety, depression, and athlete burnout covariate. Perceived stress and dispositional characteristics including trait optimism and athletic identity were also examined as covariates to determine if their contribution to the dependent variables over time impacted other hypothesized associations.

Three time points were observed in this study: initial injury, rehabilitation (i.e. follow-up), and return to play. The rehabilitation variable consists of the data from the follow-up surveys completed by the participants that were injured for more than 7 days. This variable was calculated by averaging together the scores from all the follow-up surveys completed by each participant individually in order to generalize how he or she felt during the rehabilitation window (see Appendix A in appendix for means and SD).

Descriptive analyses were utilized first to assess the distribution of all the variables in the study sample at all time points. Correlation analyses were performed to identify any relationships

between the dispositional variables (athletic identity and trait optimism), markers of psychological health (affect, anxiety, depression, burnout), and perceived stress.

T-tests were utilized to test the hypothesis from our first research question and determine if there was a difference between the markers of psychological health (i.e. positive and negative affect, anxiety, depression, burnout) and perceived stress from initial injury to return to play.

Additionally, the data collected from the participants that completed the questionnaires at all three time points (initial, follow-up, and return to play) were analyzed using repeated analysis of variance (ANOVA) measures. The number of follow-up surveys completed by the subjects differed in number. In order to account for this difference, we averaged the data from each participant's questionnaires to create one follow-up data time point for each measure (i.e. PSS-4, I-PANAS-SF, GAD-7, PHQ-9 and ABQ).

Six separate ANOVAs were used to identify changes in stress, positive affect, negative affect, anxiety, depression, and athlete burnout at all three time points (i.e. initial, rehabilitation, and return to play). The ANOVAs were computed in order to further test our hypothesis from the first research question that stated markers of positive psychological health will be lowest at time of injury and increase until return to play is achieved as opposed to markers of negative psychological health which will be highest at injury and decrease until return to play. An alpha level of 0.05 was set a priori for the study. In addition, Bonferroni post-hoc tests were used on all six ANOVAs if statistical significance was initially found.

Finally, repeated measure analysis of covariance (ANCOVA) were completed to examine if perceived stress, days missed due to injury, and trait optimism affected the changes between positive and negative psychological health factors at injury, follow-up, and return to play at all three time points as well. The ANCOVAs were computed in order to examine our second

research question's hypothesis which stated that after controlling for perceived stress, markers of positive psychological health will increase and maladaptive factors will decrease from initial injury until return to play. A priori, and alpha level of 0.05 was selected and Bonferroni post hoc testing was performed to identify statistical significance at the different time points.

Because we were unable to get enough participants to run multilevel modeling, we needed to change our third research question to an exploratory research questions. Thus, for the exploratory research question, the ANCOVA data collected from every participant who completed at least one follow-up survey was used. If a participant completed more than one follow-up survey, the scores from each psychological health questionnaire were averaged together to get one mean score for the individual psychological health factors examined in this study (i.e. positive and negative affect, anxiety, depression, and burnout). These mean scores were used as the middle time point or the rehabilitation variable. To observe trends in the variables from initial injury, rehabilitation, to return to play variables, another mean score was produced by taking the scores from each questionnaire and averaging them together for every time point. This left us with one mean score for each psychological health variable at all three time points observed in the study. These values were then plotted on a graph to illustrate how each psychological health factor changed over the three time points and not note trends in the variables regardless of statistical significance.

## Results

Dependent variables at the initial testing assessment (athletic identity, optimism, stress, positive and negative affect, depression, anxiety, and athlete burnout) were analyzed among the 28 participants using a correlation analysis. Stress was significantly negatively correlated to optimism ( $p=0.05$ ) and significantly positively correlated with global athlete burnout ( $p=0.004$ ),

two of the specific dimensions of athlete burnout, exhaustion ( $p=0.018$ ) and depersonalization ( $p=0.002$ ), negative affect ( $p=0.036$ ), depression ( $p=0.040$ ), and anxiety ( $p=0.012$ ). The sport accomplishment and depersonalization dimensions of athlete burnout were both significantly negatively correlated to positive affect ( $p=0.044$  and  $p=0.004$ ), and depersonalization was significantly positively correlated to anxiety ( $p=0.002$ ). Athletic identity trended toward a significant negative correlation with the exhaustion burnout dimension ( $p=0.051$ )(Table 13).

Variables	1	2	3	4	5	6	7	8	9	10
1. PSS-4 <sup>1</sup>										
2. AIMS <sup>2</sup>	-0.01									
3. LOT <sup>3</sup>	-0.37*	-0.10								
4. ABQ <sup>4</sup>	0.52*	-0.21	-0.25							
5. ABQ_A <sup>5</sup>	0.27	0.12	-0.32	0.80*						
6. ABQ_E <sup>6</sup>	0.44*	-0.37	-0.07	0.81*	0.40*					
7. ABQ_D <sup>7</sup>	0.56*	-0.20	-0.25	0.80*	0.58*	0.43*				
8. N-PANAS <sup>8</sup>	0.40*	-0.06	-0.24	0.36	0.21	0.37	0.26			
9. P-PANAS <sup>9</sup>	-0.30	-0.04	0.35	-0.40*	-0.53*	-0.10	-0.38*	0.03		
10. PHQ-9 <sup>10</sup>	0.39*	-0.14	0.11	0.30	0.09	0.37	0.24	0.31	-0.11	
11. GAD-7 <sup>11</sup>	0.47*	-0.02	-0.07	0.38*	0.13	0.26	0.56*	0.24	-0.01	0.45*

Table 13: Correlations for initial assessment session (N=28); \* $p \leq 0.05$

A correlation analysis was also used to calculate bivariate correlations among the variables (stress, positive and negative affect, depression, anxiety, and athlete burnout) at the final return-to-play assessment (N=17). Because athletic identity and optimism were used as dispositional variables in this study and therefore were seen as stable personality traits, they too

<sup>1</sup> Perceived stress

<sup>2</sup> Athletic identity

<sup>3</sup> Trait optimism

<sup>4</sup> Global athlete burnout

<sup>5</sup> Decreased sport accomplishment dimension of athlete burnout

<sup>6</sup> Mental and physical exhaustion dimension of athlete burnout

<sup>7</sup> Sport devaluation dimension of athlete burnout

<sup>8</sup> Negative affect

<sup>9</sup> Positive affect

<sup>10</sup> Depression

<sup>11</sup> Anxiety

were included from the first assessment period to see if correlations between them and the dependent psychological health variables existed at return to play. Moreover, days missed due to injury was also included to assess if there was any correlation to psychological health. Unlike the initial assessment, stress was not significantly correlated to any other variable. Athletic identity was negatively correlated to the exhaustion dimension of athlete burnout( $p=0.047$ ); however optimism was not significantly correlated to any psychological health variables, but it did approach significance in its negative correlation to the accomplishment aspect of athlete burnout ( $p=0.063$ ). Days missed due to injury was also highly positively correlated with optimism ( $p=0.004$ ). Athlete burnout was significantly positively correlated to negative affect ( $p<0.0001$ ), depression ( $p=0.026$ ), and anxiety ( $p=0.042$ ). Negative affect was also significantly correlated to depression anxiety, athlete burnout, and all three dimensions of athlete burnout ( $p=0.006$ ,  $p=0.003$ ,  $p<0.000$ ,  $p=0.03$ ,  $p=0.004$ ,  $p=0.001$  respectively). Finally, depression and anxiety were highly positively correlated ( $p<0.000$ ;  $0.959$ ).



Variables	1	2	3	4	5	6	7	8	9	10	11
1. Days missed											
2. AIMS <sup>12</sup>	-0.37										
3. LOT <sup>13</sup>	0.67*	-0.39									
4. PSS-4 <sup>14</sup>	-0.15	0.02	-0.18								
5. P-PANAS <sup>15</sup>	0.19	-0.44	0.41	-0.32							
6. N-PANAS <sup>16</sup>	-0.23	-0.11	-0.16	0.04	-0.28						
7. PHQ-9 <sup>17</sup>	-0.09	0.03	-0.04	0.10	-0.19	0.63*					
8. GAD-7 <sup>18</sup>	-0.08	0.05	0.01	0.21	-0.26	0.68*	0.96*				
9. ABQ <sup>19</sup>	-0.09	-0.29	-0.28	-0.11	-0.13	0.81*	0.54*	0.50*			
10. A-ABQ <sup>20</sup>	-0.29	0.01	-0.46	-0.15	-0.35	0.53*	0.23	0.18	0.74*		
11. E-ABQ <sup>21</sup>	0.15	0.49*	-0.06	-0.23	0.19	0.66*	0.41	0.36	0.86*	0.36	
12. D-ABQ <sup>22</sup>	-0.31	0.09	-0.30	0.33	-0.47	0.74*	0.71*	0.75*	0.70*	0.58*	0.34

Table 14: Correlations for return-to-play assessment session (N=17); \*p≤0.05

A paired samples t-test was run that included only the participants that had completed both the initial psychological health survey and the final health survey (N=17). Stress, anxiety, athlete burnout, and the exhaustion and sport devaluation dimensions of athlete burnout proved to be statistically significant (p=0.002, p=0.047, p=0.031, p=0.009 respectively). Stress decreased while anxiety, athlete burnout and the exhaustion and sport devaluation dimensions of athlete burnout increased from initial injury to return to play.

<sup>12</sup> Athletic identity

<sup>13</sup> Trait optimism

<sup>14</sup> Perceived stress

<sup>15</sup> Positive affect

<sup>16</sup> Negative affect

<sup>17</sup> Depression

<sup>18</sup> Anxiety

<sup>19</sup> Global athlete burnout

<sup>20</sup> Decreased sport accomplishment dimension of athlete burnout

<sup>21</sup> Mental and physical exhaustion dimension of athlete burnout

<sup>22</sup> Sport devaluation dimension of athlete burnout

	Mean Difference	Std. Error Difference	2-Tailed Significance	Lower Bounds	Upper Bounds
PSS-4	0.559	0.169	0.002*	0.215	0.903
P-PANAS	2.412	1.675	0.160	-1.000	5.823
N-PANAS	2.294	1.144	0.054	-0.037	4.625
PHQ9	-1.117	0.550	0.051	-2.238	0.003
GAD-7	-1.882	0.912	0.052	-3.786	0.021
ABQ	-0.510	0.178	0.007*	-0.871	-0.147
A-ABQ	-0.382	0.210	0.080	-0.814	0.050
E-ABQ	-1.188	0.252	0.000*	-1.701	-0.676
D-ABQ	0.047	0.236	0.844	-0.443	0.537

Table 15: Paired samples t-test comparing initial to return-to-play (N=17) data; \* $p \leq 0.05$

Nine repeated measures ANOVAs were performed to identify differences in each psychological health variable (stress, negative affect, positive affect, depression, anxiety, and athlete burnout) across the initial, follow-up, and return to play assessment sessions among those who had all three time points (N=12). There was a statistically significant difference in perceived stress ( $F(2,10)=8.750$ ,  $p=0.006$ ), negative affect ( $F(2,10)=7.389$ ,  $p=0.008$ ), athlete burnout ( $F(2,10)=10.535$ ,  $p=0.003$ ), the devaluation dimension of athlete burnout ( $F(1.524,5.244)=11.065$ ,  $p=0.019$ ), and the exhaustion dimension of athlete burnout ( $F(2,10)=12.723$ ,  $p=0.002$ ) across the three assessment sessions. No other variables were significant.

Post-hoc pairwise analysis of the nine repeated measures ANOVAs indicated significant changes in perceived stress for the 12 participants from initial injury to return to play ( $p=0.045$ ), negative affect from initial injury to follow-up ( $p=0.042$ ) and initial injury to return to play ( $p=0.020$ ), total athlete burnout from initial injury to return to play ( $p=0.003$ ), and the exhaustion dimension of athlete burnout from initial injury to follow-up ( $p=0.005$ ) and initial injury to return to play ( $p=0.027$ ) (table 17). Changes in total athlete burnout from initial to return to play was approaching statistical significance ( $p=0.055$ ), as was the devaluations aspect of athlete burnout from initial injury to follow-up ( $p=0.053$ ).

Measure	Time point	Mean difference	Std. Error	Sig.	95% Confidence interval	
					Lower bound	Upper bound
PSS-4	1-2	0.458	0.160	0.106	-0.108	1.025
	1-3	0.729*	0.218	0.045	0.021	1.562
	2-3	0.333	0.187	0.406	-0.328	0.995
N-PANAS	1-2	1.833*	0.494	0.042	0.086	3.581
	1-3	2.000*	0.447	0.020	0.419	3.581
	2-3	0.167	0.691	1.000	-2.276	2.609
P-PANAS	1-2	1.583	0.898	0.415	-1.591	4.758
	1-3	0.333	0.494	1.000	-1.414	2.081
	2-3	-1.250	1.014	0.818	-4.835	2.335
PHQ-9	1-2	-1.500	0.619	0.180	-3.688	0.688
	1-3	-1.167	0.401	0.101	-2.585	0.252
	2-3	0.333	0.715	1.000	-2.193	2.860
GAD-7	1-2	-1.583	0.583	0.126	-3.645	0.478
	1-3	-1.833	0.980	0.361	-5.298	1.631
	2-3	-0.250	0.854	1.000	-3.268	2.768
ABQ	1-2	-0.542*	0.079	0.003	-0.821	-0.262
	1-3	-0.500	0.145	0.055	-1.013	0.013
	2-3	0.042	0.156	1.000	-0.511	0.594
ABQ-A	1-2	-0.067	0.102	1.000	-0.428	0.295
	1-3	-0.233	0.280	1.000	-1.223	0.756
	2-3	-0.167	0.226	1.000	-0.966	0.632
ABQ-E	1-2	-0.917*	0.147	0.005	-1.436	-0.397
	1-3	-0.667*	0.161	0.027	-1.234	-0.099
	2-3	0.250	0.242	1.000	-0.605	1.105
ABQ-D	1-2	-0.633	0.182	0.053	-1.276	0.010
	1-3	-0.600	0.186	0.070	-1.258	0.058
	2-3	0.033	0.033	1.000	-0.084	0.151

Table 16: Post-hoc Pairwise Comparisons for Repeated Measures ANOVA (N=12); \* indicates  $p \leq 0.05$

Trend graphs using the means for the nine repeated measures ANOVAS were also created to illustrate how the psychological health variables changed over the three assessment time points (figures 1-3). While only a few psychological health variables had statistically significant changes from one time point to another, the graphs visually represent how the variables generally trended from initial injury to return to play.

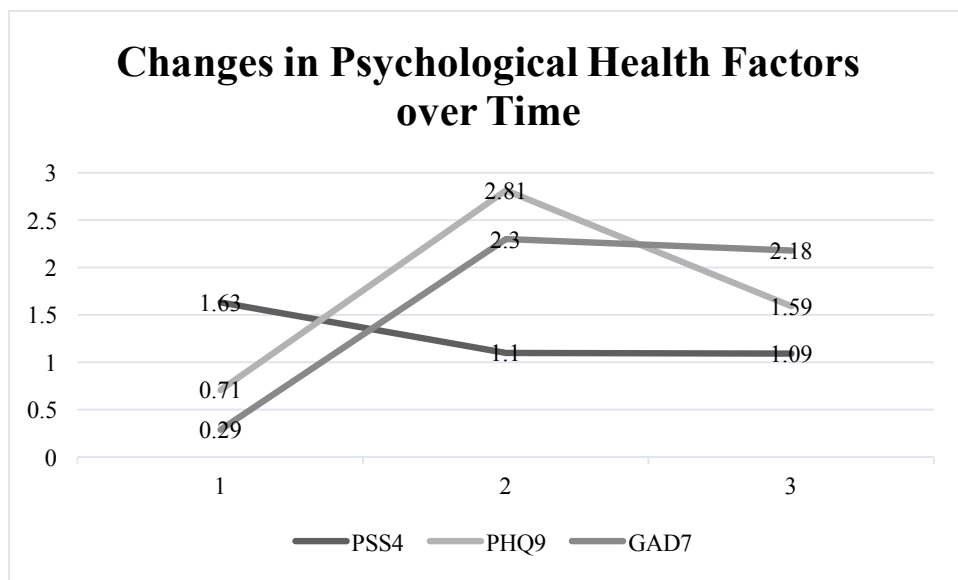


Figure 1: Changes in Mean Psychological Health Factors from Initial Injury to Return to Play (N=12)

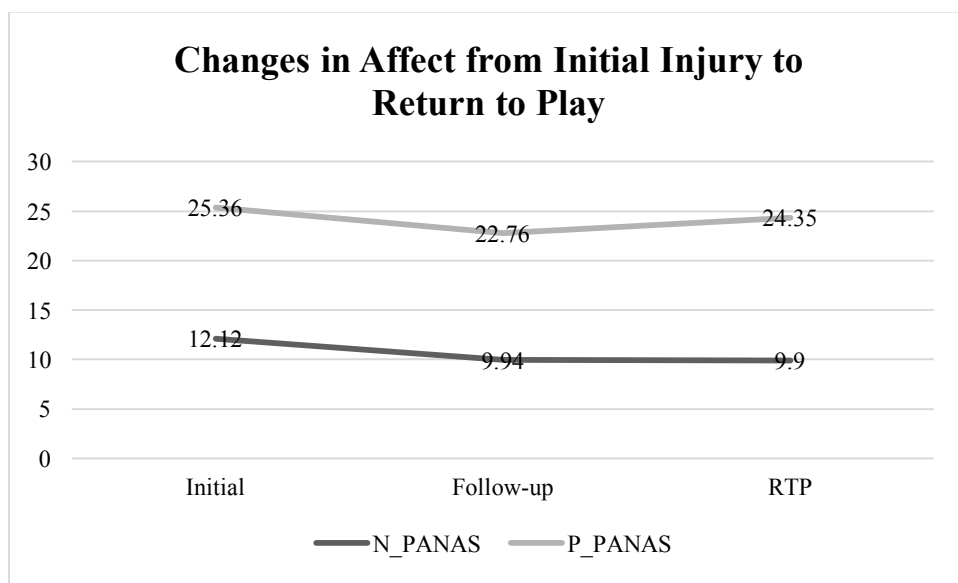


Figure 2: Changes in Mean Affect from Initial Injury to Return to Play (N=12)

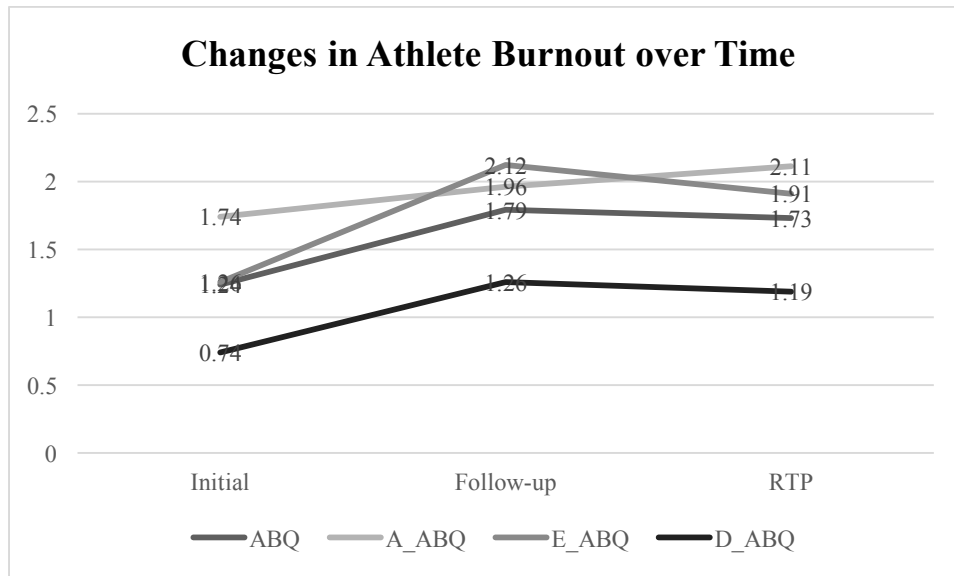


Figure 3: Changes in Mean Athlete Burnout From Initial Injury to Return to Play (N=12)

Along with repeated measures ANOVAs and the trend graphs above using that data, three separate nine-item analyses of covariance (ANCOVAs) were performed. Perceived stress, trait optimism, and days missed due to injury were used as the covariates. There were no significant changes in the psychological health variables over time once these three covariates were controlled for individually. For brevity, the pairwise comparison tables were not included. No tests of within-subjects effects yielded a significant p-value ( $p \leq 0.05$ ) with stress, optimism, or days missed as a covariate. Therefore, no pairwise comparison could be seen as statistically significant.

## Discussion

The aim of this study was to examine the relationship between psychological health variables (stress, positive and negative affect, depression, anxiety, and athlete burnout), dispositional characteristic (athletic identity and optimism), and how these might change following athletic injury until return to play. Correlations, descriptive and trends were examined between these different variables at three time points—initial injury, rehabilitation, and return to

play. Moreover, optimism, perceived stress, and days missed due to injury were used as covariates to examine if they affected how these psychological health variables change across study time points.

Correlation analyses using data from all participants at the initial assessment following injury indicated positive correlations between stress and negative affect, depression, anxiety, athlete burnout, and the exhaustion and devaluation dimensions of athlete burnout. Stress and negative affect were also positively associated. If an athlete presents following an injury with an increased stress level, it is likely that other negative psychological health factors will also be elevated (Brewer, 1994; Galambos et al., 2005; Nippert & Smith, 2008; Williams & Andersen, 1998). The current study supports the notion that stress, negative affect, depression, anxiety, and athlete burnout are all positively correlated. The relationship between these psychological health variables is not only statistically significant, it is also clinically significant. The athletic trainer or other health care professional assessing the athlete post injury should note if stress levels are high. If they are, it is likely other maladaptive responses to injury may also present. Maladaptive responses to injury have been shown to delay recovery time, which, in turn, can create more negative responses to the injury and recovery process (Bauman, 2005). This cyclical process can continue throughout rehabilitation and can linger once the athlete has returned to play. The increased stress and negative psychological state puts the athlete at risk for re-injury and athlete burnout (Albinson & Petrie, 2003; Clement et al., 2015; Grylls & Spittle, 2008; Raedeke & Smith, 2004; Wiese-Bjornstal, 2010). With this data, clinicians have further evidence to support psychological health monitoring and should refer athletes with increased negative psychological health factors to trained psychologists to reduce the chance of perpetuating his or her maladaptive response to injury.

Initially, stress was also negatively correlated to optimism ( $p=0.050$ ,  $r=-0.374$ ). These findings support previous data that optimism is negatively correlated with stress (Gustafsson & Skoog, 2012). If an athlete presents initially with higher levels of optimism, it is likely that he or she will adjust to the injury quicker, therefore having a less maladaptive response to injury (Gustafsson & Skoog, 2012). This data also relates to the earlier findings that high levels of perceived stress leads to increased negative psychological health variables. Because trait optimism is stable and does not change drastically during different situations, our findings suggest it could be an important piece of information to obtain prior to sports participation in order to predict an athlete's potential response to injury if injury occurs (Giltay et al., 2006; Kluemper et al., 2009). Therefore, if trait optimism levels are low, the athletic trainer and other health care professionals assisting the athlete during recovery should keep an eye out for maladaptive and negative responses.

Correlation analyses were also conducted on the psychological health variables at the final, return to play assessment period. Stress was not significantly correlated to any other variables, but negative affect displayed significant positive correlations to depression, anxiety, global athlete burnout, and all three of its dimensions separately. Therefore, negative affect is positively associated with depression, anxiety, and burnout at return to play. These findings are in line with current research (Bauman, 2005; Brewer et al., 1995; A. M. Smith et al., 1990), and are also clinically significant because increased negative psychological health at return to play can lead to re-injury and/or increased symptoms of athlete burnout. Increased levels of global burnout and its three dimensions (accomplishment, mental and physical exhaustion, and sport devaluation) can continue to exacerbate negative psychological health variables (Gustafsson & Skoog, 2012; A. R. Nicholls et al., 2009). If negative variables are still high, it could be helpful

for the athlete to learn techniques to decrease negative psychological health factors. In order for the athlete to learn these techniques in order to decrease negative psychological health factors, collaboration between certified athletic trainers and trained sports psychiatrists would be necessary. Based on the current data, a focus on decreased negative affect during rehabilitation may be particularly beneficial. The data from this study supports creating and maintaining a strong relationship between the two professions to keep athletes mentally and physically stable.

Athletic identity, another key dispositional variable in this study, was significantly negatively correlated to the mental and physical exhaustion dimension of athlete burnout at return to play, and was approaching a significant negative correlation at initial injury ( $p=0.051$ ). These results can be interpreted as when athletic identity is high, the exhaustion dimension of athlete burnout tends to be low, meaning that an athlete that identifies strongly with the athlete role is exhibit less symptoms of mental and physical exhaustion towards his or her sport. The correlation between athletic identity and the exhaustion dimension of burnout can be helpful in the clinical situation. Rehabilitation following injury can be intense and stressful. If an athlete's stress and negative psychological health factors continue to stay in a maladaptive range, burnout, especially the mental and physical exhaustion aspect, can also stay elevated (Grylls & Spittle, 2008). An athlete who expresses higher levels of athletic identity, therefore, may be less likely to suffer as greatly from exhaustion during rehab or once he or she has returned to play. When an athlete expresses high levels of athletic identity, his or her perception of self is as an athlete, and because of this, an athlete with high levels of athletic identity is less likely to feel the effects of the mental and physical exhaustion that coincides with participating at the collegiate level. An athletic trainer could identify athletes with high levels of athletic identity either by administering the AIMS during the pre-participation exam or being mindful and aware of how invested an



athlete is in his or her sport. This distinction can be very useful to a clinician when creating and implementing a rehabilitation program and a coach when pushing athletes at practice because individuals with this mindset can be pushed further without experiencing the same consequences as someone who does not have high levels of athletic identity.

When analyzing how psychological health variables changed from initial injury to return to play, group difference analyses revealed stress to significantly decreased from initial injury to return to play, while anxiety, depression, global burnout, and the exhaustion and devaluation dimensions of athlete burnout increased. These results are both statistically and clinically significant. When examined with the correlations in mind, it is critical to note the changes in the psychological health variables from injury to return to play. Anxiety, athlete burnout, and depression all increased. As mentioned above, increased anxiety can lead to re-injury and depression and burnout can prolong recovery and decrease an athlete's motivation to return to play (Gustafsson et al., 2013; Monsma, Mensch, & Farroll, 2009; A. R. Nicholls et al., 2009). Clinicians should be aware of the trends in psychological health variables and monitor the psychological health and well-being of the athlete from injury to reintroduction to his or her sport. The current data suggests continually checking in with injured athletes daily and referring them to counseling if negative psychological health factors increase. Making sure the athlete maintains a healthy, positive psychological state can help to ensure the athlete makes a solid recovery both mentally and physically.

Finally, nine repeated measures ANOVAs and three nine-item repeated measures ANCOVAs were computed. No significance arose from the three separate ANCOVAs when stress, trait optimism, and days missed were used as covariates. In other words, the covariates did not significantly alter the change in the psychological health variables over time. These finding

are inconsistent with previous literature and may be due to the small sample size of the current study (Albinson & Petrie, 2003; Gustafsson & Skoog, 2012; Wadey et al., 2013). With a larger sample size, these covariates could show statistical significance. Future research efforts should continue to evaluate their importance relative to athlete injury and psychological health.

The ANOVA analysis revealed that levels of stress significantly decreased from initial injury to return to play, but the differences in stress levels from initial injury to follow-up and follow-up to return to play were not significant. Negative affect also significantly decreased from initial injury to follow-up and from initial injury to return to play. It did not, however, significantly change from follow-up to return to play. While not statistically significant, these results are important to consider going forward because current research states that maladaptive responses to injury decrease over time (Brewer et al., 1995; A. M. Smith et al., 1990). If these maladaptive responses don't decrease injury could occur again.

Athlete burnout was also examined using a repeated measures ANOVA. When total burnout was assessed, it significantly increased from initial injury to return to play. The mental and physical exhaustion aspect of burnout also significantly increased from initial injury to follow-up and initial injury to return to play, but did not significantly change from follow-up to return to play. In general, burnout tended to increase from initial injury to follow-up, then decrease slightly from follow-up to return to play. These trends are in line with current research that has shown injury can increase levels of burnout initially, but once able to compete again, levels tend to decrease (Clement et al., 2015; Grylls & Spittle, 2008; Lemyre et al., 2006). This decrease is due to the fact that the athlete can now participate and no longer feel as if they are not contributing to the team and bettering themselves as athletes. This decrease can be important to

monitor because if burnout symptoms stay elevated, the athlete can suffer mentally and potentially physically.

There are several limitations to this study. Most notably, there is a very small participant pool that completed the initial testing session (N=28), an even smaller amount were able to complete the final session (N=17), and only twelve participants completed all three testing sessions. We aimed to recruit over 30 subjects, but recruitment for this study was difficult due to specific nature of the inclusion criteria and the dependence on athletic training staff to notify athletes about the study and researchers when an athlete was eligible. Attrition was also an issue due to the length and nature of the injury sustained. There was an attrition of 11 people from the initial testing session to the final testing session. Moreover, few participants were able to complete any follow up surveys due time of injury or attrition. This lack of follow up data (used as the rehabilitation variable) left an unclear picture of how psychological variables change between initial injury and return to play.

Another potential limitation of this study reliability of the participants to answer the psychological health questionnaires honestly. While it was stressed that all information was confidential and anonymous, some subjects could still have felt uncomfortable answering the questions honestly. This could lead the participants to answer how they think they should answer based on societal norms, and not how they truly feel. Mental health in today's society, while gaining more recognition and acceptance, is still somewhat stigmatized.

There is a great need for future studies that examine how psychological variables change from initial injury until return to play is achieved in collegiate and other athletics. Based on the limitation of the current study, future studies should aim for a larger sample size in order to more accurately identify significant changes in psychological health variables following injury and be

able to observe more generally how these factors can positively or negatively affect an athlete's response to injury. A larger sample size with participants that can complete the initial, final, and at least one follow up survey would increase the power of the study and allow for it be generalized to the student-athlete population. In order to obtain a larger sample size, future researchers should aim to obtain participation and buy-in from the athletic training staff. Any time an athlete comes in and is injured, he or she talks to a clinician. If the clinician identifies those who are qualify for the study, and immediately suggest participation, the sample size would grow.

Although there were several limitations to the current study, this study offers many meaningful contributions to the worlds of sports medicine and sports psychology. The results further indicate psychological health is affected following injury. Negative psychological health factors are high at initial injury, but decrease over the course of recovery. Stress also is highest at injury and closely correlated with the maladaptive changes in psychological health. Dispositional factors like athletic identity and optimism show promising results in this study. Studying these dispositional factors in a larger sample size and over a greater length of time could help clinicians understand why some athlete respond to injury in more adaptive ways. Future studies should build upon the results found in the current study to further show how stress, psychological health factors, and dispositional traits all affect and athlete's initial response to injury and his or her psychological health at return-to-play.

In the future, it could be significant to add brief psychological health surveys to pre-participation exams and initial injury evaluations in order to monitor an athlete's psychological wellbeing as well as physical health. A 2014 position statement released by the National Athletic Trainers' Association noted that it could be significant to as a few questions about an athlete's

mental health before participating in sports (Conley et al., 2014). The current study supports this notion. Stress, depression, and anxiety were seen to possess the most significant association with negative psychological responses to at both initial injury and at return to play. Accordingly, implementing a short psychological survey consisting of the PSS-4 (4 items), the PHQ-9 (9 items), and the GAD-7 (7 items) could make clinicians more aware of those individuals that are at risk for maladaptive responses to injury. These three surveys totaling in only 20 questions would take 5-7 minutes to complete and could be completed while the athlete waits for another section of the pre-participation exam to begin. To allow for baseline comparison data, it may also be beneficial to assess these three psychological constructs during the athletes' initial pre-participation exam (PPE). Ultimately, knowing in advance if an athlete is currently suffering from a mental illness will aid clinicians in noting the signs and symptoms of negative psychological health. If a close relationship to psychological counseling services is built, athletic trainers can make referrals when necessary. In 2015, the NATA released a consensus statement that listed psychological behaviors to look for and the appropriate ways to handle them in student-athletes (Neal et al., 2015). The current study continues to add to the growing body of knowledge on the importance of psychological health in athletes and how they can be altered following a time-loss injury.

The world of sports medicine is continuously changing and beginning to take note of the importance of psychological health as well as physical health. In 2014, the chief medical officer for the National Collegiate Athletics Association (NCAA), along with other top NCAA officials and medical professionals, released a paper outlining and emphasizing the impact and importance of mental wellness in collegiate sports (B. Hainline, E. Kroshus, & E. Wilfert, 2014). Moreover, the National Athletic Trainers' Association (NATA) released an updated position

statement in 2014 on pre-participation physical examinations. In this position statement, mental health and disorders are mentioned as an important piece of information to gather from an athlete before participation in sport (Conley et al., 2014). While it is not in the scope of practice for an athletic trainer to treat mental disorders, it is important to know the signs and symptoms, and to be able to refer an athlete when red flags are present. The current study shows the importance of taking mental health into consideration when evaluation and injury and creating a return to play timeline.

APPENDIX A: TABLE OF MEANS AND STANDARD DEVIATION FOR PARTICIPANTS WHO COMPETED THE FOLLOW-UP SURVEY MORE THAN ONCE (N=8)

ID	# of surveys completed	PSS4		N-PANAS		P-PANAS		PHQ-9		GAD-7		ABQ		A-ABQ		E-ABQ		D-ABQ	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
300	2	0.63	0.20	9.5	2.12	29	0	2	1.41	2.5	0.71	1.50	0.10	1.9	0.42	1.5	0.14	1	0
204	7	1.32	0.30	11	0.90	20	1.63	1.90	1.35	1.71	1.30	2.10	0.10	2.11	1.00	2.82	0.24	1.31	0.20
210	3	1.17	0.38	11.67	1.15	21.33	1.53	5.33	0.58	3	1	1.35	0.04	1.87	0.12	1.13	0.12	1.07	0.12
214	4	0.25	0	7	0.82	25.5	1.91	4.25	1.5	0	0	1.29	0.03	1.87	0.12	1	0	1	0
201	5	2.15	0.33	16	1.22	19.6	2.19	11	2.92	13	2.24	4.48	0.09	3.76	0.26	3.76	0.09	2.92	0.23
202	2	0.88	1.24	8.5	2.12	21.5	0.71	2	0	1	1.41	1.84	0.33	1.5	0.14	3	0.6	1	0
3	3	0.5	0.43	9.67	0.58	25.67	2.52	1.33	0.58	0.33	0.58	1.53	0.12	1.73	0.23	1.87	0.31	1	0
2	2	0.75	0.53	5.5	0.71	20.5	0.71	0	0	0	0	1	0	1	0	1	0	1	0

## APPENDIX B: PERCEIVED STRESS SCALE 4-ITEM MEASURE

### Perceived Stress Scale- 4 Item (PSS-4)

#### Instructions:

The questions in this scale ask you about your feelings and thoughts during the last week. In each case, please indicate how often you felt or thought a certain way based on the following scale:

- (0) = Never
- (1) = Almost never
- (2) = Sometimes
- (3) = Fairly often
- (4) = Very often

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

\_\_\_\_\_ (1) Over the last week, how often have you felt that you were unable to control the important things in your life?

\_\_\_\_\_ (2) Over the last week, how often have you felt confident in your ability to handle your personal problems?

\_\_\_\_\_ (3) Over the last week, how often have you felt that things were going your way?

\_\_\_\_\_ (4) Over the last week, how often have you felt difficulties were piling up so high that you could not overcome them?



APPENDIX C: ATHLETIC IDENTITY MEASUREMENT SCALE  
Athletic Identity Measurement Scale (AIMS)

Instructions:

Please answer the following questions that best reflects the extent to which you agree or disagree with each statement in relation to your own sports participation using the following scale:

- (1) = strongly disagree
- (2) = disagree
- (3) = slightly disagree
- (4) = neither agree nor disagree
- (5) = slightly agree
- (6) = agree
- (7) = strongly agree

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

1. I consider myself an athlete.
2. I have many goals related to sport.
3. Most of my friends are athletes.
4. Sport is the most important part of my life.
5. I spend most of my time thinking about sport than anything else.
6. I need to participate in my sport to feel good about myself.
7. Other people see me mainly as an athlete.
8. I feel bad about myself when I do poorly in sport.
9. Sport is the only important think in my life.
10. I would be very depressed if I were injured and could not compete in sport.

APPENDIX D: LIFE ORIENTATION TEST  
Life Orientation Test (LOT)

Instructions:

Please answer the following questions that best reflects the extent to which you agree or disagree with each statement in relation to your own sports participation using the following scale:

- (0) = Strongly disagree  
(1) = Disagree  
(2) = Neutral  
(3) = Agree  
(4) = Strongly Agree

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

- \_\_\_\_\_ (1) In uncertain times, I usually expect the best.
- \_\_\_\_\_ (2) It's easy for me to relax.
- \_\_\_\_\_ (3) If something can go wrong for me, it will
- \_\_\_\_\_ (4) I always look on the bright side of things.
- \_\_\_\_\_ (5) I'm always optimistic about my future.
- \_\_\_\_\_ (6) I enjoy my friends a lot.
- \_\_\_\_\_ (7) It's important for me to keep busy.
- \_\_\_\_\_ (8) I hardly ever expect things to go my way.
- \_\_\_\_\_ (9) Things never work out the way I want.
- \_\_\_\_\_ (10) I don't get upset too easily.
- \_\_\_\_\_ (11) I'm a believer in the idea that "every cloud has a silver lining."
- \_\_\_\_\_ (12) I rarely count on good things to happen to me.

## APPENDIX E: INTERNATIONAL POSITIVE AND NEGATIVE AFFECT SCALE SHORT FORM

### International Positive and Negative Affect Schedule Short Form (I-PANAS-SF)

#### Instructions:

Thinking about yourself and how you normally feel, to what extent do you generally experience the feelings below using the following scale:

- (1) = Never
- (2) = Rarely
- (3) = Sometimes
- (4) = Often
- (5) = Frequently
- (6) = Almost always
- (7) = Always

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

- \_\_\_\_\_ 1) Upset
- \_\_\_\_\_ 2) Hostile
- \_\_\_\_\_ 3) Alert
- \_\_\_\_\_ 4) Ashamed
- \_\_\_\_\_ 5) Inspired
- \_\_\_\_\_ 6) Nervous
- \_\_\_\_\_ 7) Determined
- \_\_\_\_\_ 8) Attentive
- \_\_\_\_\_ 9) Afraid
- \_\_\_\_\_ 10) Active

APPENDIX F: GENERAL ANXIETY DISORDER 7-ITEM MEASURE  
General Anxiety Disorder 7-Item Measure (GAD-7)

Instructions:

Thinking about yourself and how you've felt over the last week, how often have you been bothered by the following problems? Answer in accordance to the scale below:

- (0) = Not at all  
(1) = Several days  
(2) = More than half the days  
(3) = Nearly every day

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

- \_\_\_\_\_ 1) Feeling nervous, anxious, or on edge  
\_\_\_\_\_ 2) Not being able to stop or control worrying  
\_\_\_\_\_ 3) Worrying too much about different things  
\_\_\_\_\_ 4) Trouble relaxing  
\_\_\_\_\_ 5) Being so restless that it is hard to sit still  
\_\_\_\_\_ 6) Becoming easily annoyed or irritable  
\_\_\_\_\_ 7) Feeling afraid as if something awful might happen

If you checked off *any* problems, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- \_\_\_ Not at all      \_\_\_ Somewhat difficult      \_\_\_ Very difficult      \_\_\_ Extremely difficult

APPENDIX G: PATIENT HEALTH QUESTIONNAIRE 9-ITEM MEASURE  
Patient Health Questionnaire 9-Item Measure (PHQ-9)

Instructions:

Over the last week, how often have you been bothered by any of the following problems?  
Answer in accordance to the scale below:

- (0) = Not at all  
(1) = Several days  
(2) = More than half the days  
(3) = Nearly every day

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

- \_\_\_\_\_ 1) Little interest or pleasure in doing things  
\_\_\_\_\_ 2) Feeling down, depressed, or hopeless  
\_\_\_\_\_ 3) Trouble falling or staying asleep, sleeping too much  
\_\_\_\_\_ 4) Feeling tired or having little energy  
\_\_\_\_\_ 5) Poor appetite or overeating  
\_\_\_\_\_ 6) Feeling bad about yourself or that you are a failure or have let yourself or family down  
\_\_\_\_\_ 7) Trouble concentrating on things, such as reading the newspaper or watching television  
\_\_\_\_\_ 8) Moving or speaking so slowly that other people have noticed? Or the opposite – being so fidgety or restless that you have been moving around more than usual  
\_\_\_\_\_ 9) Thought that you would be better off dead or of hurting yourself in some way

If you checked off *any* problems, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- \_\_\_ Not at all      \_\_\_ Somewhat difficult      \_\_\_ Very difficult      \_\_\_ Extremely difficult

APPENDIX H: ATHLETE BURNOUT QUESTIONNAIRE  
Athlete Burnout Questionnaire (ABQ)

Instructions:

Please read each statement and decide if you ever feel this way about your current sport participation, which includes all the training you have completed this season. Please indicate how often you have had these specific feelings or thoughts this season based on the scale below:

- (1) = Almost never  
(2) = Rarely  
(3) = Sometimes  
(4) = Frequently  
(5) = Almost always

Be as honest as you can throughout the questionnaire. Try not to let your response to one question influence your response to another. There is no right or wrong answer.

- \_\_\_\_\_ 1) I'm accomplishing many worthwhile things in my sport
- \_\_\_\_\_ 2) I feel so tired from my training that I have trouble finding the energy to do other things
- \_\_\_\_\_ 3) The effort I spend in my sport would be better spend doing other things
- \_\_\_\_\_ 4) I feeling overly tired from my sport participation
- \_\_\_\_\_ 5) I am not achieving much in my sport
- \_\_\_\_\_ 6) I don't care as much about my sport performance as I used to
- \_\_\_\_\_ 7) I am not performing up to my ability in my sport
- \_\_\_\_\_ 8) I feel "wiped out" from my sport
- \_\_\_\_\_ 9) I'm not into my sport like I used to be
- \_\_\_\_\_ 10) I feel physically worn out from my sport
- \_\_\_\_\_ 11) I feel less concerned about being successful in my sport than I used to
- \_\_\_\_\_ 12) I am exhausted by the mental and physical demands of my sport
- \_\_\_\_\_ 13) It seems that no matter what I do, I don't perform as well as I should
- \_\_\_\_\_ 14) I feel successful at my sport
- \_\_\_\_\_ 15) I have negative feelings towards my sport

## APPENDIX I: DEMOGRAPHIC QUESTIONNAIRE

### Post Injury Psychological Health Survey

Q1 Participant ID:

Q2 Are you 18 years or older?

☐ Yes (1)

☐ No (2)

If No Is Selected, Then Skip To End of Survey

Q3 Age

☐ 18 (1)

☐ 19 (2)

☐ 20 (3)

☐ 21 (4)

☐ 22 (5)

☐ 23 (6)

☐ 24 (7)

☐ 25 (8)

☐ 26 (9)

☐ 27 (10)

Q4 Sex

☐ Male (1)

☐ Female (2)

Q5 Race

☐ White (1)

☐ Hispanic/Latino (2)

☐ Black or African American (3)

☐ Native American or American Indian (4)

☐ Asian/Pacific Islander (5)

☐ Other (6) \_\_\_\_\_

Q6 Class

- ☐ Freshman (1)
- ☐ Sophomore (2)
- ☐ Junior (3)
- ☐ Senior (4)
- ☐ 5th Year Senior (6)
- ☐ Graduate Student (5)
- ☐ Other (8)

Q7 Are you a varsity or a club athlete?

- ☐ Varsity (1)
- ☐ Club (2)

Display This Question:

If Are you a Varsity or a club athlete? Club Is Selected

Q8 Which UNC club sport team are you currently participating with?

- ☐ Baseball (1)
- ☐ Basketball (2)
- ☐ Cheerleading/Dance (3)
- ☐ Cross Country (15)
- ☐ Football (4)
- ☐ Gymnastics (5)
- ☐ Handball/Racquetball (6)
- ☐ Hockey (7)
- ☐ Karate/Judo (8)
- ☐ Lacrosse (20)
- ☐ Rowing (14)
- ☐ Rugby (9)
- ☐ Soccer (10)
- ☐ Softball (11)
- ☐ Swimming (12)
- ☐ Tennis (13)
- ☐ Track & Field (21)
- ☐ Ultimate Frisbee (18)
- ☐ Volleyball (16)
- ☐ Wrestling (17)
- ☐ Other (19) \_\_\_\_\_



Display This Question:

If Are you a Varsity or a club athlete? Varsity Is Selected

Q9 Which UNC varsity sport are you currently participating with?

- ☐ Baseball (1)
- ☐ Basketball (2)
- ☐ Cross Country (3)
- ☐ Fencing (4)
- ☐ Field Hockey (5)
- ☐ Football (6)
- ☐ Golf (7)
- ☐ Gymnastics (8)
- ☐ Lacrosse (9)
- ☐ Rowing (10)
- ☐ Soccer (11)
- ☐ Softball (12)
- ☐ Swimming and Diving (13)
- ☐ Tennis (14)
- ☐ Track & Field (15)
- ☐ Volleyball (17)
- ☐ Wrestling (16)

Display This Question:

If Currently, which UNC varsity sport are you participating with? Rowing Is Selected

Q10 Are you a novice or varsity rower?

- ☐ Novice (1)
- ☐ Varsity (2)

Q11 What season is your sport currently in?

- ☐ Pre-season (1)
- ☐ Regular season (2)
- ☐ Post season (3)
- ☐ Off season (4)

Q12 How many years have you been a part of your current team at UNC?

- ☐ 1 (1)
- ☐ 2 (2)
- ☐ 3 (3)
- ☐ 4 (4)
- ☐ 5 (5)

Q13 At what age did you begin to participating in your current sport?

Q14 At what age did you begin participating in other sports?

Q15 Roughly, how many days ago did you sustain your current injury?

- ☐ Today (1)
- ☐ Yesterday (2)
- ☐ 2 days ago (3)
- ☐ 3 days ago (4)

Q16 Are you being evaluated for more than one injury?

- ☐ Yes (1)
- ☐ No (2)

Display This Question:

If Are you currently being evaluated for more than one injury? No Is Selected

Q17 What body part are you currently having evaluated for an injury?

- ☐ Foot/Toes (1)
- ☐ Ankle (2)
- ☐ Lower Leg (Shin/Calf) (14)
- ☐ Knee (3)
- ☐ Thigh (Quad/Hamstrings) (15)
- ☐ Hip (4)
- ☐ Abdominal Area (5)
- ☐ Chest (6)
- ☐ Lower Back (12)
- ☐ Upper Back (13)
- ☐ Shoulder (7)
- ☐ Elbow (16)
- ☐ Forearm (17)
- ☐ Wrist (8)
- ☐ Hand/Fingers (19)
- ☐ Neck (10)
- ☐ Head (Face/Chin) (11)
- ☐ Head (Other) (18)

Display This Question:

If Are you currently being evaluated for more than one injury? Yes Is Selected

Q18 What body parts are you currently having evaluated for injuries?

- ☐ Foot/Toes (1)
- ☐ Ankle (2)
- ☐ Lower Leg (Calf/Shin) (14)
- ☐ Knee (11)
- ☐ Thigh (Quad/Hamstring) (15)
- ☐ Hip (3)
- ☐ Abdominal Area (12)
- ☐ Chest (4)
- ☐ Lower Back (13)
- ☐ Upper Back (5)
- ☐ Shoulder (6)
- ☐ Elbow (16)
- ☐ Forearm (17)
- ☐ Wrist (7)
- ☐ Hand/Fingers (19)
- ☐ Neck (9)
- ☐ Head (Face/Chin) (10)
- ☐ Head (Other) (18)

Q19 What type of injury or injuries are you being evaluated for?

- ☐ Ligament sprain (1)
- ☐ Muscle/tendon strain (2)
- ☐ Muscle spasm (12)
- ☐ Ligament/tendon rupture (6)
- ☐ Fracture (broken bone) (3)
- ☐ Stress reaction (13)
- ☐ Stress fracture (14)
- ☐ Dislocation (4)
- ☐ Subluxation (5)
- ☐ Contusion (bruise) (10)
- ☐ Other (11) \_\_\_\_\_

Display This Question:

If What body part are you currently having evaluated for an injury? Head (Other) Is Selected

Or What body part are you currently having evaluated for an injury? Head (Face/Chin) Is Selected

Or What body part are you currently having evaluated for an injury? Neck Is Selected

Or What body parts are you currently having evaluated for injuries? Neck Is Selected

Or What body parts are you currently having evaluated for injuries? Head (Other) Is Selected

Or What body parts are you currently having evaluated for injuries? Head (Face/Chin) Is Selected

Q20 Are you being evaluated for a possible head trauma or concussion?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Unsure (3)

Q21 Did your current injury cause immediate restriction from practice and/or other team activities?

- ☐ Yes (1)
- ☐ No (2)

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