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Impact of Mental Toughness Training on Psychological and Physical Predictors of Illness and Injury

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**IMPACT OF MENTAL TOUGHNESS TRAINING ON PSYCHOLOGICAL AND
PHYSICAL PREDICTORS OF ILLNESS AND INJURY**

A Thesis Presented

by

AISHA VISRAM

Submitted to the Graduate School of the University of Massachusetts, Amherst
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Department of Kinesiology

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AISHA VISRAM

Approved as to style and content by:

Erin Snook, Chair

Brian Umberger, Member

Patty Freedson, Member

Patty Freedson, Department Head
Department of Kinesiology

ABSTRACT

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MASTER OF SCIENCE

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AISHA VISRAM, BScH, UNIVERSITY OF GUELPH

M.S., UNIVERSITY OF MASSACHUSETTS AMHERST

UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Professor Erin M. Snook

Intense training for prolonged periods of time without adequate recovery can result in psychological problems and increased susceptibility to illness and injury in collegiate athletes. The Cognitive-Affective Model of Athletic Burnout (Smith, 1986), a framework for understanding the relationships among stressors, identifies cognitive appraisal as the mediating factor between negative or positive health outcomes, and therefore could be a target of interventions to reduce overtraining, burnout, injury, and illness. Mental toughness, the ability to perform at one's best regardless of the circumstances, is a modifiable psychological construct that may influence cognitive appraisal. Altering an athlete's interpretation of stressful situations through mental toughness training could change how the athlete evaluates his/her ability to handle the stressors of training and competition, and may attenuate negative psychological outcomes associated with increased illness and injury risk. The purpose of this study was to establish cross-sectional relationships among mental toughness and psychological and physical variables,

implement an online Mental Toughness Training Program, and evaluate the impact of the training on changes in mental toughness, mood disturbances, athlete burnout, coping ability, depression, physical symptoms, and perceived stress before, during, and after the intervention program. Female student athletes from a private Division III institution on the varsity Field Hockey (N=19) and Soccer (N=28) teams participated in this study. All participants (N=47) provided cross-sectional data demonstrating that mental toughness was significantly correlated with total mood disturbance ($\rho=-0.51, p\leq.01$), depression ($\rho=-0.49, p\leq.01$), perceived stress ($\rho=-0.53, p\leq.01$), and athlete burnout ($\rho=-.46, p\leq.01$). Thirty-seven athletes (N= 16 Field Hockey, N=21 Soccer) were randomly assigned by team to the six-week Mental Toughness Training Program, involving psychological skills training, or control condition, and had longitudinal data available for analysis. Mental toughness levels were significantly increased in the intervention group from pre- to post-training. The training led to significant attenuations in levels of athlete burnout, depression, physical symptoms, and perceived stress. These findings show that mental toughness is associated with psychological variables, and mental toughness training had a positive impact on variables that have been associated with increased risk of injury in collegiate athletes.

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CHAPTER 1

INTRODUCTION

The benefits of sport participation are numerous and well discussed in the literature. Sport participation can contribute to the development of social skills and self-esteem, emotional well-being, social connectedness, and lead to a reduction in stress and improved mental health (Steptoe & Butler, 1996; Bailey, 2006; Asztalos et al., 2008; Armstrong & Oomen-Early, 2009). However, at higher levels of athletics, and in collegiate settings where pressures placed on the athlete are not just sport-related, athletes may be at risk for developing emotional and psychological problems. In 2007, there were 370,470 college students participating in NCAA sports in all divisions (United States Government Accountability Office, 2007), and from 1988 to 2004, NCAA varsity sport participation increased in both sexes (Hootman, Dick, & Agel, 2007).

Athletes must be exposed to high levels of physical training in order to elicit training adaptations and improve performance (Bompa, 1983). Inadequate recovery time combined with increased physical and psychological stressors can result in overtraining and burnout. Overtraining occurs when a cycle of high intensity, high volume training continues over weeks or months without enough time for the athlete to recover (Kraemer & Nindl, 1998). High levels of intense training for prolonged periods can predispose athletes to physical and psychological problems, illnesses, and injuries (Kuipers & Keizer, 1988). Symptoms of overtraining include mood changes, depression, an increased risk for developing infections, and increased susceptibility to injuries (Budgett, 1990; Kellmann, 2010).

Athletes subjected to high training loads may also experience burnout. Athlete burnout is a psychological syndrome characterized by emotional and physical exhaustion, reduced sense of accomplishment, and sport devaluation, and can be associated with the intense demands of training (Raedeke, 1997). Athletes suffering from burnout may have feelings of entrapment, lack of interest in training, and may withdraw from sport (Smith, 1986; Goodger, Gorely, Lavalley, & Harwood, 2007). Symptoms of athlete burnout include lack of enthusiasm and depression (Smith, 1986; Raedeke, 1997).

Strong connections have been documented between overtraining and various psychological variables, including coping ability and mood states. The Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) is used to monitor mood disturbances associated with overtraining because increases in training levels are associated with corresponding increases in mood disturbances (Morgan, Brown, Raglin, O'Connor, & Ellickson, 1987). Research has shown that individuals experiencing lower amounts of mood disturbances in response to high training loads have more adaptive coping skills than those with greater disturbances in mood states (Goss, 1994). Main and colleagues (2010) reported that across a 45-week triathlete training season, psychological stressors had greater associations with signs and symptoms of illness and injury than physical training stressors. Ford, Eklund, and Gordon (2000) reported that a greater ability to handle psychological stressors, due to better coping ability, was associated with reduced injury vulnerability and faster recovery rates in athletes. Overall, the research suggests that psychological, physical, and environmental stressors combined with prolonged training periods and inadequate recovery can lead to adverse psychological changes and increased susceptibility to physical symptoms, illness, and injury.

Smith's Cognitive-Affective Model of Athletic Burnout (1986) provides a framework for understanding the relationships among stressors, cognitive appraisal, behavior, and burnout. A key component of the model is cognitive appraisal, which refers to how a person interprets stressful situations. Cognitive appraisals are influenced by personal factors such as emotional status, coping ability, and physical strength.

Modifying a person's interpretation of stressful situations could potentially change how the person evaluates his/her ability to handle the physical and psychological stressors of training and competition. Because these stressors are often associated with overtraining syndrome and burnout, modifying the interpretation of the stressor could affect the stress response, and possibly result in decreased susceptibility to physical symptoms, illnesses, and injury. In a previous study, athletes completing a Cognitive-Behavioral Stress Management Program, which included cognitive restructuring exercises, had a reduction of the number of illness and injury days compared to a control group (Perna, Antoni, Bum, Gordon, & Schneiderman, 2003). This study provides initial evidence suggesting intervention programs focused on modifying variables that are associated with cognitive appraisal could positively affect the stress response and risk of injury and illness. A potential variable that might influence cognitive appraisals made by athletes is mental toughness.

Mental toughness is the ability to perform at the upper range of one's ability regardless of the circumstances, and is one of the most important characteristics that an athlete can possess (Loehr, 1986). Because of the importance of the mental aspect to successful athletic performance, focus has been directed at measuring and improving mental toughness. The Mental, Emotional, and Bodily Toughness Inventory

(MeBTough; Mack & Ragan, 2008) was developed to assess mental toughness in athletes based on Loehr's views of mental toughness consisting of 3 areas: physical (assessed with two components: Being Well Prepared and Acting Tough), emotional (four components: Emotional Flexibility, Emotional Resiliency, Emotional Strength, and Emotional Responsiveness), and mental (three components: Coping, Creating an Optimal Performance State, and Accessing Empowering Emotions). This is a valid and reliable measure of mental toughness in collegiate athletes (Mack & Ragan, 2008).

A recent cross-sectional pilot study (Welch, 2010) of 145 NCAA Division I athletes assessed the relationships among mental toughness, mood disturbances, and burnout. Athletes with higher levels of mental toughness reported lower levels of burnout ($\rho=-0.65, p \leq .01$) and fewer mood disturbances ($\rho=-0.46, p \leq .01$). These results indicate that the MeBTough effectively assesses the emotional aspect of mental toughness, and that burnout and mood disturbances are inversely associated with mental toughness. These relationships suggest that mental toughness may be a key psychological variable that could be targeted in an attempt to attenuate mood disturbances and burnout.

Based on Smith's Cognitive-Affective Model of Athletic Burnout (Smith, 1986), modifying psychological variables that influence cognitive appraisals associated with overtraining and burnout will positively influence physical and psychological responses to training stress, and reduce overtraining and burnout. A mental toughness training intervention focusing on improving an athlete's ability to handle mental, emotional, and bodily stress should increase the physical and psychological resources of that athlete. This increase in resources should positively influence cognitive appraisals made about

stressful situations by increasing the athletes' confidence in their ability to deal with any physical or psychological stressors encountered. Improved ability to handle stressors should reduce overtraining, resulting in a lower incidence of mood disturbances, physical symptoms, illnesses, and injuries in collegiate athletes.

A six-week Mental Toughness Training Program has been developed and is based on Loehr's definition of mental toughness and the results from the MeBTough (see Literature Review for more information about the program). This training program is individualized and provides psychological and physical skills training based on the each athlete's MeBTough score. The Mental Toughness Training Program has been shown to increase collegiate athletes' mental toughness levels and improve athletic performance (Measuremental LLC, 2010). The Mental Toughness Training Program was being tested in Division I Track and Field athletes, as well as the military, but had yet to be used in a research study and had not been tested in a Division III population.

1.1 Purpose

The purpose of this study was to a) evaluate the cross-sectional associations between mood disturbances, athlete burnout, coping ability, depression, physical symptoms, perceived stress, and mental toughness in Division III athletes, b) implement the Mental Toughness Training Program, and c) evaluate the impact of the mental toughness training on changes in mood disturbances, athlete burnout, coping ability, depression, physical symptoms, perceived stress, and mental toughness before, during, and after the intervention program.

1.2 Specific Aims

1. Examine the baseline relationships among mood disturbances, athlete burnout, coping ability, depression, physical symptoms, perceived stress, and mental toughness in Division III athletes.
2. Determine if the Mental Toughness Training Program increases mental toughness in Division III athletes.
3. Measure and compare the impact of mental toughness training, versus no training, on levels of mood disturbance, athlete burnout, coping ability, depression, physical symptoms, and perceived stress before, during, and after the training program.

1.3 Hypotheses

1. Consistent with the literature, baseline mental toughness will be negatively correlated with mood disturbances, athlete burnout, depression, physical symptoms, and perceived stress, and positively correlated with coping ability.
2. The Mental Toughness Training Program will result in increased levels of mental toughness as compared to the control group where no changes in mental toughness levels are expected.
3. Improved mental toughness resulting from the training will attenuate levels of mood disturbances, athlete burnout, depression, physical symptoms, and perceived stress in the training group as compared to the control group.

CHAPTER 2

LITERATURE REVIEW

Chapter 2 provides a review of the literature that supports the rationale for conducting this research study. The chapter focuses on the primary topics of relevance for this research including: (1) sport injury, (2) overtraining syndrome and burnout, (3) the Cognitive-Affective Model of Athletic Burnout, (4) stress and coping, and (5) mental toughness. After reviewing these topics, the chapter concludes with a brief summary of important concepts and hypotheses for this research study.

2.1 Sport Injury

In 2007, a total of 370,470 college students participated in NCAA sports in all divisions (United States Government Accountability Office, 2007). From 1988 to 2004, NCAA varsity sport participation increased in both sexes, with an 80% increase in participation in women and 20% increase in men (Hootman et al., 2007). With such high numbers of individuals participating in collegiate sports, and the added trend of these numbers increasing over time, it is reasonable to be concerned that an increase in the number of injuries may occur.

Injuries are a significant problem facing collegiate athletes, and are one of the principle health hazards of sport (Requa, DeAvilla, & Garrick, 1993). From 1988 to 2004, in all divisions in the NCAA, there were 72,316 injuries during games and 109,160 injuries during practices reported to the Injury Surveillance System (Hootman et al., 2007). However, not all schools participate in contributing data to the Injury

Surveillance System, and not all schools report data for all their varsity teams, so this may be an underestimation. Although prevention programs for specific injuries and joints have been designed (Mandelbaum et al., 2005; Niederbracht, Shim, Sloniger, Paternostro-Bayles, & Short, 2008), injury continues to be a concern in athletics.

There are outcomes to being injured as an athlete other than inability to compete and disruption of training schedules. Because there are many negative health consequences associated with being injured, utilizing strategies, both physical and psychological in nature, to attenuate injury risk could be beneficial for the athletic population. Research suggests that psychological and physical variables associated with overtraining syndrome and burnout are predictors of injury and illness. These predictors of injury and illness will be discussed in this literature review and mental toughness, a modifiable construct, will be presented as a potential mediator of these variables.

2.2 Predictors of Injury/Illness

2.2.1 Overtraining Syndrome

There is currently much confusion in the literature regarding the definition of overtraining and related conditions (Kuipers & Keizer, 1988; Budgett, 1990), and uniform terminology has not been established (Fry, Morton, & Keast, 1991). In the current study, the following definitions will be used. Overreaching is the process of subjecting an athlete to heightened training loads and under-recovery in the short-term. Overreaching is a deliberate part of the training cycle that results in better athletic performance, provided that there is adequate recovery time after this process (Kuipers & Keizer, 1988). Overtraining occurs when the cycle of high intensity, high volume

training continues over weeks or months without enough time for the athlete to recover, and is the process that can lead to the development of the overtraining syndrome.

Overtraining syndrome is the maladaptive response to prolonged and excessive training without appropriate recovery that persists for weeks to months (Kraemer & Nindl, 1998).

2.2.1.1 The Effects of Training and Overtraining

Athletes must be exposed to high levels of physical training in order to elicit training adaptations and improve performance (Bompa, 1983). Training to improve performance is based on the principle of progressive loading, or overload, which states that a system can adapt when subjected to loads that exceed the system's current capacity (Bompa, 1983), or that disturbs homeostasis (Fry et al., 1991). With adequate rest, the same load in the future will not exceed the body's capacity. During any type of training, responses occur at the cellular and tissue levels in the body in effort to adapt. For example, there is an upregulation of enzymes and increased protein synthesis in response to training stimuli (Booth, Tseng, Fluck, & Carson, 1998). Well-designed training cycles include sufficient time for the normal healing processes in the body to occur to maximize training gains.

While overload is necessary for adaptation to occur, without adequate time between training sessions, the regeneration process becomes dysfunctional. The body is unable to keep up with the amount of breakdown occurring from physical stress due to high training loads, and adaptation fails. Excessive training can therefore affect the musculoskeletal system, leading to changes in strength, range of motion, and stress reactions in bones. Over time, this can lead to injury from chronic tissue disruption (Kibler & Chandler, 1998). When this occurs, the system is placed in a state of

mechanical disadvantage.

Overtraining, in terms of its physiological effects on the body, is a series of biomechanical, anatomical, and physiological stresses that eventually lead to overload on the weakened and compromised musculoskeletal system (Kibler, Chandler, & Stracener, 1992). It has been suggested that the above changes may predispose the musculoskeletal system to injury with continued use (Kibler & Chandler, 1998). For example, stress fractures can occur from inappropriate and repetitive loading to the musculoskeletal system, and therefore may result from overtraining. High levels of intense training for prolonged periods without adequate recovery can negatively affect performance (Kibler & Chandler, 1998) and predispose athletes to psychological problems, illnesses, and injuries (Kuipers & Keizer, 1988).

2.2.1.2 Treatment of Overtraining Syndrome

The current treatment for overtrained athletes is rest to allow the body time to heal and regenerate (MacKinnon, 2000; Purvis, Gonsalves, & Deuster, 2010), and participation in stress management activities that may include relaxation therapy and counseling (Budgett, 1990). The amount of rest needed to reverse overtraining can vary from weeks to months (Kuipers & Keizer, 1988). One suggestion in the literature states that overtrained athletes should rest for one month, and training can resume in short, low intensity bouts as the athlete starts to recover (Budgett, 1990). Training can gradually increase as tolerated, building up to full training in a progressive manner that could take up to three months (Budgett, 1990). Other literature suggests that complete cessation of activity is not necessary, and light aerobic activity can continue, with a slow increase in intensity over 6-12 weeks (Budgett, 1998). Sport-specific recommendations have not yet

been developed. The majority of the literature discussing treatment strategies for overtrained athletes emphasizes preventing the onset of the syndrome in the first place (Budgett, 1990; Eichner, 1995; Budgett, 1998; MacKinnon, 2000).

2.2.1.3 Prevalence of Overtraining Syndrome

The exact prevalence of overtraining syndrome is difficult to estimate. The amount of high-intensity training that results in overtraining differs between individuals, and symptoms experienced by overtrained athletes vary (MacKinnon, 2000). It has been estimated that the career prevalence of overtraining syndrome in elite female long distance runners is 60% (Morgan, O'Connor, Sparkling, & Pate, 1987). It has also been reported that the percentage of long distance swimmers completing more than 14000m per day suffering from overtraining syndrome per season is, on average, 10% (Morgan, Brown, et al., 1987). Using data collected from previously published research, MacKinnon (2000) estimated that between 7 and 20% of athletes at any time in their training cycles may be exhibiting the signs and symptoms of overtraining.

2.2.1.4 Monitoring Overtraining

Given that the main treatment strategy for the overtraining syndrome is rest and time off from training (Budgett, 1990; MacKinnon, 2000; Purvis et al., 2010), preventing the athlete from reaching this point is imperative to avoid disruptions in their training plan, competitive schedule, athletic careers, and well-being. Markers of overtraining include the typical signs and symptoms experienced by overtrained athletes, physiological markers, and psychological variables.

2.2.1.4.1 Signs and Symptoms of Overtraining

The signs and symptoms of overtraining syndrome vary from person to person.

Some common signs and symptoms include mood changes, depression, increased resting heart rate, increased risk for developing infections, increased susceptibility to injuries (Budgett, 1990; Kellman, 2010), and decreased athletic performance (Budgett, 1998). Fry and colleagues (1991) cited 85 sign and symptoms that have been documented in overtrained athletes. Because of the variety of ways the syndrome may present, it is difficult to diagnose athletes with overtraining syndrome.

2.2.1.4.2 Physiological Markers of Overtraining

When the body is in an overtrained state, physiological processes, as discussed previously, become affected. It has been suggested that monitoring the alterations in levels of certain biomarkers, for example hormones, can be used to diagnose overtrained athletes. Mucosal immune responses (MacKinnon & Hooper, 1994), glutamine levels (Walsh, Blannin, Robson, & Gleeson, 1998), creatine kinase levels (Flynn et al., 1994), cytokine production (Main, Dawson, Grover, Landers, & Goodman, 2009), and altered neuroendocrine levels (Urhausen, Gabriel, & Kindermann, 1995) have been investigated as potential indicators of overtraining. However, the duration and intensity of training in these studies varies and may be more indicative of overreaching than overtraining. There are also inconsistencies in the effectiveness of the above-mentioned markers in the literature (MacKinnon, 2000).

2.2.1.4.3 Psychological Markers of Overtraining

As physiological measures of monitoring overtraining require further investigation and thus far have demonstrated unclear relationships, it is more common to use psychological markers to track an athlete's responses to training. Strong connections have been documented between overtraining and mood state.

Morgan, Brown, and colleagues (1987) found that there was a dose-response relationship between mood state disturbances and increased training load in 400 collegiate-level competitive swimmers over the course of a season. As the training load increased, mood state disturbances increased as well, and mood disturbances returned to baseline levels when training was reduced. In a study by Raglin, Morgan, and O'Connor (1991), 186 female and male swimmers were followed for 4 years with mood states being evaluated at regular intervals. Findings from this study were similar to those obtained by Morgan, Brown, and colleagues (1987), and mood disturbances increased in response to increases in training. There is support for tracking mood changes to monitor reactions to increases in training volume in the short-term as well. In 12 male college-aged swimmers, 10 days of increased training significantly increased mood disturbance scores (Morgan, Costill, Flynn, Raglin, & O'Connor, 1988). Because negative mood states have consistently been shown to be inversely associated with training volume, tracking mood over time may be the most effective way to identify athletes that may be overtrained.

2.2.1.4.4 Measuring Mood States

Studies that evaluate mood states in order to monitor adaptation to heavy training loads and identify athletes experiencing overtraining commonly use the Profile of Mood States questionnaire (POMS; McNair et al., 1971). The shortened version of the POMS (POMS-30) contains 30 items in 6 subscales (containing 5 items each): Tension, Depression, Anger, Fatigue, Confusion, and Vigor. The individual is asked to rate a series of adjectives based on the way he/she feels at that moment. The subscales are scored by summing the items and a Total Mood Disturbance (TMD) score is calculated by summing the negative mood subscale scores and subtracting the positive mood

(Vigor) subscale score. A major strength of using the POMS for evaluating mood state is the ability to plot the subscale scores in order to evaluate the shape, or POMS profile, resulting from the plotted scores.

The subscale scores are often standardized into *t*-scores and then plotted on a graph. The mean *t*-score for each of the POMS subscales in the general population is approximately 50. In contrast to the general population, elite athletes have a "better" POMS score profile, often referred to as the "iceberg profile" (Morgan, 1985) because the subscales representing negative constructs, such as Depression and Tension, have scores lower than the population average, and the score on the Vigor subscale is greater than the general population (see Figure 1).

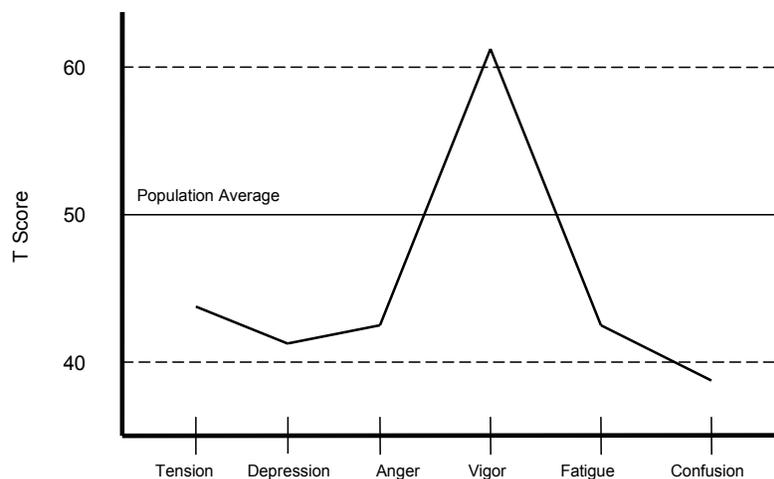


Figure 1: POMS subscale profile representing optimal mood state, or the "iceberg profile" (adapted from Morgan, Brown, et al. (1987))

The iceberg profile is considered the ideal or optimal mood profile and is commonly seen in elite athletes (primarily at the start and the end of competitive

seasons). There is substantial research evidence showing that as training load increases, the POMS profile changes with Vigor scores decreasing and the negative mood subscales scores increasing. The change associated with increased training is even more pronounced in athletes with overtraining syndrome and results in an inversion of the “iceberg profile” (Morgan, Brown, et al., 1987; see Figure 2)

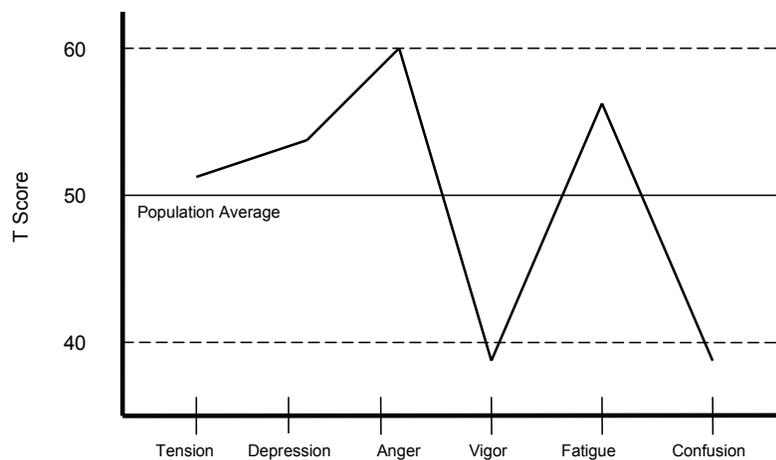


Figure 2: POMS subscale profile in an overtrained athlete, or the inverted “iceberg profile” (adapted from Morgan, Brown, et al. (1987))

2.3 Athlete Burnout

2.3.1 Definition of Athlete Burnout

Athlete burnout is a psychological syndrome of emotional and physical exhaustion, reduced sense of accomplishment, and sport devaluation, and can be associated with the intense demands of training (Raedeke, 1997). Burnout has also been defined as the process of wearing out, failing, or becoming extremely fatigued, due to

excessive demands being placed on the individual's energy, strength, or resources (Freudenberger, 1974). Burnout results from chronic stress exposure, and is influenced by motivation (Smith, 1986).

2.3.2 Athlete Burnout versus Overtraining Syndrome

There are similarities between athlete burnout and overtraining syndrome, but these are two distinct conditions. Overtraining results primarily from excessive levels of a physical stressor (training load). There are psychological attributes associated with this condition as well, but the causes of overtraining are predominantly physical in nature, and overtraining causes the observed changes in mood states. Athlete burnout results mainly from chronic psychological stress. Additionally, overtrained athletes do not lose motivation to train and participate in sport, which occurs in burnout (Smith, 1986). Conversely, overtrained athletes who experience reductions in performance often do not decrease their training and may actually increase training loads in an effort to compensate for the performance decrements being experienced. Athletes who experience burnout lose the motivation to maintain their training routines, and may only continue to participate due to pressures from external sources (Peterson, 2005)

2.3.3 Process of Burning Out

Burnout is a potential outcome when an athlete is exposed to chronic stress, physical or psychological in nature (Smith, 1986). Lack of control and feelings of entrapment may put athletes at risk for developing burnout (Coakley, 1992; Schmidt & Stein, 1991). Burnout is linked with high effort being put in to sport and training, but low satisfaction being the outcome (Iacovides, Fountoulakis, S. Kaprinis, & G. Kaprinis, 2003). Motivation to train and continue sport participation decreases (Smith, 1986). The

end result of athletic burnout can be quitting the sport. Athletes discontinue sport participation when the costs outweigh the benefits compared to other activities. Costs include negative experiences, depression, and fear of failure (Smith, 1986). In athletes, burnout has been correlated with perceived stress (Raedeke & Smith, 2001; Smith, Gustafsson, & Hassmen, 2010). However, not every athlete subjected to chronic stress burns out (Raedeke, 1997).

2.3.4 Symptoms of Athlete Burnout

Symptoms of athlete burnout vary on an individual basis. In a review of the general burnout literature by Schaufeli and Buunk (2003), five categories of symptoms were associated with the condition: affective (e.g. depressed mood), cognitive (e.g. impaired memory and attentional deficits), physical (e.g. exhaustion), behavioral (e.g. impaired performance), and motivational (e.g., lack of enthusiasm). These symptoms are observed in athlete burnout as well (Goodger et al., 2007).

To an athlete experiencing burnout, both sport and performance may no longer be of importance (Gould, Udry, Tuffey, & Loehr, 1996), and he/she may withdraw from sport (Raedeke, 1997). Athletes suffering from burnout may also feel that their expectations have not been met, and feel that they lack the ability to achieve the goals they set for themselves (Gould et al., 1996). Professional male rugby players in Australia displaying early signs of athlete burnout at the start of a season, such as viewing training as a hassle, had a significantly higher chance of experiencing athlete burnout over the course of a season (Cresswell, 2009).

2.3.5 Treatment for Athlete Burnout

Similar to overtraining, individuals suffering from burnout require rest

(Sonnenschein, Sorbi, van Doornan, Schaufeli, & Maas, 2007). In a study conducted by Grylls and Spittle (2008), 264 competitive Australian athletes were studied, and it was found that athletes currently injured had lower levels of burnout as a group than uninjured athletes. This was attributed to having time off from competition to rest and a necessary reduction in training in response to injury.

2.3.6 Impact of Overtraining and Burnout on Illness and Injury Risk

There is evidence in the literature to support that overtraining and burnout, and the psychological and physical stressors associated with them, can result in an increased susceptibility to illness and injury. Main and colleagues (2010) followed 30 well-trained triathletes across a 45-week triathlete training season, and found that psychological stressors had greater associations with signs and symptoms of illness and injury than physical training stressors. Ford and colleagues (2000) reported that a greater ability to handle psychological stressors, due to better coping ability, was associated with reduced injury vulnerability and faster recovery rates in athletes. Overtraining and burnout may lead to an increased risk of illness and injury, and the Cognitive-Affective Model of Athletic Burnout (Smith, 1986) will be used to outline the relationships between variables contributing to this.

2.4 Cognitive-Affective Model of Athletic Burnout

The Cognitive-Affective Model of Athletic Burnout (Smith, 1986; see Figure 3) provides a framework for understanding the many variables, both physical and psychological, that influence an individual's response to stress. This model breaks the stress response into four components: the situation, cognitive appraisal, the physiologic

response, and associated behavior.

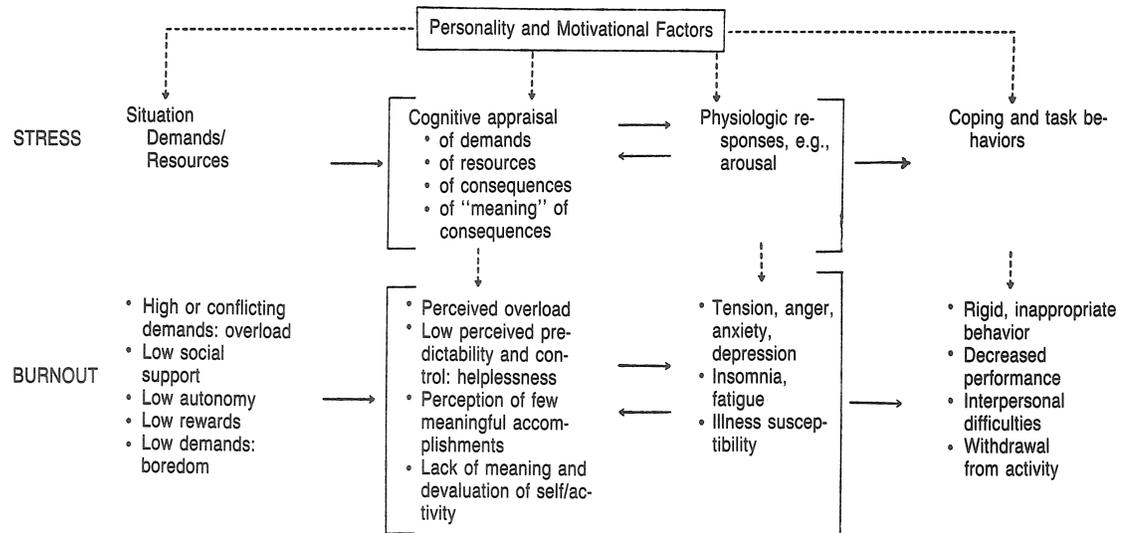


Figure 3: Smith's (1986) Cognitive-Affective Model of Athletic Burnout

The situational component, the first stage, includes the interactions that take place between an athlete's physical and psychological resources and the demand from the environment, either internal or external. The second component is cognitive appraisal of the situation. If the result of the appraisal is the perception of a threat, a physiological stress response (component three) occurs. Then coping behaviors (fourth stage) are initiated in an attempt to deal with the stress responses that have occurred. In addition, each of these four components can be influenced by personality and motivational factors.

The component of cognitive appraisal plays a central role in this framework. Cognitive appraisal includes the perception of four elements: demands, resources available to deal with those demands, nature and likelihood of consequences of demands not being met, and the importance of those demands to the individual. Cognitive

appraisal is what leads to the physiological and attentional responses. Excessive stress responses are the result of the perception that demands exceed the resources available to deal with the situation. Burnout represents the consequences of the four components of stress. If there is a longstanding imbalance between demands and resources, the result is the perceived overload of stress, which can increase levels of psychological variables that are predictors of injury and illness.

It is the appraisal of the situation and the athlete's perception of their ability to cope with that situation that determines the stress response. Based on this framework (Smith, 1986), modifying cognitive appraisal could change an athlete's interpretation of potentially stressful situations. Therefore, modifying psychological variables that influence cognitive appraisal could lead to a reduction in the stress response. This might ultimately lead to a reduction in overtraining, burnout, and injury and illness in athletes.

2.5 Stress and Coping Ability

College athletes, when compared to their non-athlete counterparts, experience stressors that are not associated with academics and are not part of general life stressors. Athletes experience stress in response situations such as competition, athletic injuries, and competing for starting positions that non-athlete students do not face. This can lead to higher stress levels in athletes (Ntoumanis, Biddle, & Haddock, 1999).

2.5.1 Stress and Injury

Stressful situations in sport, such as an important game or psychologically demanding practice, can contribute to the potential for sustaining an injury if the athlete perceives these situations as threats. When a situation is perceived as threatening,

anxiety levels are increased, changing muscle tension or causing a distraction.

Attentional disruptions can increase the risk for injury. For example, if an athlete is distracted, they may not notice a hole on the field, step into it, and injure their ankle (Williams, Tonymon, & Andersen, 1991). Stress can also lead to increased muscle tension, which can interfere with normal coordination and increase the chance of injury (Nideffer, 1983).

Research supports the notion that a higher level of stress in an athlete leads to a greater risk of being injured. Smith, Smoll, and Ptacek (1990) showed that athletes experienced more injuries when they had high stress levels combined with low levels of coping ability and low social support. Thus, physical stress from training is not the only cause of negative outcomes for athletes. Ford and colleagues (2000) studied 121 athletes in varying sports and competitive levels. The researchers reported that a greater ability to handle psychological stressors was associated with reduced injury vulnerability and faster recovery rates in athletes. One of the reasons for the reduced risk of injury was due to better abilities to cope with life stressors. Main and colleagues (2010) followed 30 well-trained triathletes across a 45-week triathlete training season. They reported that psychological stressors had greater associations with signs and symptoms of illness and injury than physical training stressors.

2.5.2 Stress and Illness

The relationship between stress and illness in athletes is less clear. While there is evidence in the literature that does not demonstrate a relationship between higher levels of stress and increased risk for illness (Cohen & Williamson, 1991), there is also evidence to support the notion that higher levels of stress result in increased risk for

illness. A recent study (Moreira et al., 2011) examined the relationship between stress, training load, and upper respiratory illness in 15 basketball players across four weeks. Increased training load and stress were associated with an increase in upper respiratory track infections. A study by Brink and colleagues (2010) involved tracking training load, perceived stress, and injuries of 53 elite soccer players across two years. Physical stress (i.e. training load) was related to illness and injury rates, and psychological stress was associated with illnesses.

2.5.3 Moderating Stress

There have been studies examining ways to moderate the effect of stressors that athletes experience, both in training and in their everyday lives. Athletes receiving a Cognitive-Behavioral Stress Management Program, which included cognitive restructuring exercises, experienced reductions in the number of injury and illness days compared to a control group (Perna et al., 2003). In a study conducted by Maddison and Prapavessis (2005), a stress management program during the pre-season caused a reduction in time-lost due to injury in the intervention group during the season when compared to the control group. These researchers included somatic and cognitive-based relaxation strategies, such as progressive relaxation and imagery, in this stress management program. Also included were goal setting tasks, planning, and activities for home completion. This evidence suggests that providing strategies for athletes to deal with stress more effectively would result in decreased risk of injury and illness.

2.5.4 Coping Ability

Coping refers to a process of constantly changing cognitive and behavioral efforts to manage specific external or internal demands or conflicts appraised as distressing or

exceeding one's resources. Coping strategies are dynamic, conscious efforts on the part of the individual to eliminate or manage situations that are perceived as stressful (Lazarus & Folkman, 1984). Athletes with effective coping strategies will be better able to manage the stress and demands of athletic pursuits.

The coping strategy used by an athlete depends on individual and situational factors (Bouffard & Crocker, 1992). Coping strategies may be divided into two categories: problem-focused and emotion-focused coping. In problem-focused coping, the individual tries to alter or manage the problem that is causing the stress. This could include information gathering, time-management, or goal setting. Emotion-focused coping involves changing emotions evoked by the problem that is causing the stress for the individual. Examples of this include meditation and cognitive effort to change the meaning of the situation to that individual (Lazarus & Folkman, 1984). A third category, avoidance coping, was created in which the individual does not confront the stressor directly, but focuses on something else (Endler & Parker, 1994). In previous studies, it was shown that athletes use a variety of coping strategies in both competitive and everyday situations (Nicholls & Polman, 2007).

2.5.5 Coping Ability, Stress, and Burnout

A study conducted by Hanson, McCullagh, and Tonymon (1992) compared coping abilities to injury risk in 181 Division I Track and Field athletes. Athletes who had more coping strategies to deal with stress did not experience injuries during their seasons. Raedeke and Smith (2004) conducted a study in athletes 14-19 years of age to determine the effects of perceived stress, coping, and social support on the incidence of burnout. Higher burnout scores were significantly correlated with higher levels of stress

and lower levels of coping ability. They concluded that, in regards to stress and coping abilities, high stress and low ability to cope made athletes susceptible to burnout.

Hill, Hall, and Appleton (2010) found that the type of coping strategy used influenced the relationship between coping and athlete burnout in junior athletes.

Athletes using problem-focused coping strategies had lower levels of athlete burnout, while the use of avoidance-focused coping was related to higher levels of athlete burnout. This study suggested that athletes using problem-focused coping strategies had lower risks of burning out. Research has also shown that individuals with more adaptive coping skills experience lower amounts of mood disturbances in response to high training loads than those with greater disturbances in mood states (Goss, 1994).

It is clear that there are associations between injury and illness risk and psychological variables based on the evidence from the literature. Overtraining and athlete burnout may also increase the potential for experiencing an injury. The framework of the Cognitive-Affective Model of Athletic Burnout (Smith, 1986) suggests that interventions aimed at modifying the stress response can reduce the potential for experiencing an injury. Modifying psychological constructs that affect cognitive appraisal may attenuate the stress response. One such construct is mental toughness.

2.6 Mental Toughness

Mental toughness is a concept commonly referred to in the sporting world. Coaches and athletes indicate that 50% of performance is mental, and that the concept of being mentally-tough is one of the most important characteristics that an athlete can possess (Loehr, 1986). At elite levels of athletics, differences in physical ability between athletes

are minimal (Moran, 2004). Psychological attributes play a key role, regardless of the sport, in linking athletes with success (Williams & Krane, 2001).

Much of the initial research done in the area of mental toughness involved interviewing athletes and coaches on their opinions of the characteristics of mentally-tough performers. These individuals often cited similar qualities, and these were compiled to create profiles of mentally-tough performers (Jones, Hanton, & Connaughton, 2002; Bull, Shambrook, James, & Brooks, 2005). In the literature, mental toughness has been used interchangeably with other concepts in some instances, for example, with the concepts of resiliency and determination (Moran, 2004). However, mental toughness is a distinct construct.

2.6.1 Definition of Mental Toughness

Mental toughness is the ability to perform at the upper range of one's ability regardless of the circumstances (Loehr, 1986). Loehr's (1986) framework for mental toughness consisted of self-confidence, negative energy control, attention control, visualization and imagery control, motivation, positive energy, and attitude control. Loehr later added that mental toughness depended on mental, physical, and emotional attributes (Loehr, 1994). Other researchers have expanded on Loehr's framework, and have added that athletes that are mentally-tough have the ability to cope better than their opponents with the demands of sport, and remain determined, focused, confident, and in control under pressure (Jones et al., 2002). A mentally-tough individual has the capacity to deal effectively with stressors, pressures, and challenges (Clough, Earle, & Sewell, 2002). Fletcher (2005) added that mental toughness can be viewed as a moderator of stress, helping an individual to manage the demands of stressors in his/her environment.

The effect of environmental stressors is mediated by cognitive appraisal and perception of those stressors, and the coping ability that the individual possesses. Fletcher (2005) suggested that the mental toughness level of an athlete would influence how that athlete responds behaviorally, emotionally, and cognitively to stressors. Therefore, mentally-tough individuals would be less affected by stressors in their environment.

2.6.2 Assessment of Mental Toughness

Because of the large impact of the mental aspect on performance, focus has been directed at measuring and improving mental toughness. Many tools exist to measure the construct of mental toughness. Several attempts have been made to develop a psychometrically sound and theoretically relevant measure but most have been unsuccessful. A recently developed measure, the MeBTough (Mack & Ragan, 2008), which has good psychometric properties and is grounded in relevant theoretical framework, will be discussed.

2.6.2.1 Sport Performance Inventory

The Sport Performance Inventory (SPI; Jones, Neuman, Altmann, & Dreschler, 2001) is an 83-item measure of sport specific attitudes with 6 subscales: Competitiveness, Team Orientation, Emotional Control, Positive Attitude, Safety Consciousness, and Mental Toughness. The 17-item Mental Toughness subscale assesses components of Loehr's mental toughness framework, however it does not provide a comprehensive evaluation of mental toughness. An initial study provided evidence of reliability (Jones et al., 2001), but further evidence for its validity and reliability is needed (Sheard, 2010).

2.6.2.2 Mental Toughness 48

The Mental Toughness 48 (MT48; Clough et al., 2002) consists of 48 items, and has

six subscales: Challenge, Commitment, Interpersonal Confidence, Confidence in Own Abilities, Emotional Control, and Life Control. The theoretical framework for this questionnaire is based on Kobasa's (1979) model of hardiness. This measure has an overall Cronbach's alpha of 0.87 and test-retest coefficient of 0.90 (Clough et al., 2002). However, there is limited data on its psychometric properties, and little explanation of the association between mental toughness and hardiness, on which the scale is based (Sheard, 2010), and thus lacks relevance to the construct of mental toughness (Connaughton, Wadey, Hanton, & Jones, 2008).

2.6.2.3 Sport Mental Toughness Questionnaire

The Sport Mental Toughness Questionnaire (SMTQ; Sheard, Golby, & van Wersh, 2009) is a 14-item measure of mental toughness and includes the subscales of Confidence, Constancy, and Control. This scale was developed by pooling common themes from the literature on mental toughness. Through validation studies, the measure showed good construct validity and internal reliability, with one study providing reliability coefficients for the subscales of 0.71 or higher (Sheard et al., 2009). However, the scale lacks grounding in a theoretical framework.

2.6.2.4 Mental, Emotional, and Bodily Toughness Inventory

Because existing inventories for mental toughness had poor psychometric properties, the Mental, Emotional, and Bodily Toughness Inventory (MeBTough) was developed (Mack & Ragan, 2008). The MeBTough is a unidimensional measure that assesses mental toughness in athletes based on Loehr's (1994) views of mental toughness consisting of 3 areas: physical, emotional, and mental. *Physical toughness* is assessed through two components: Being Well Prepared and Acting Tough. *Emotional toughness*

is assessed through four components: Emotional Flexibility, Emotional Resiliency, Emotional Strength, and Emotional Responsiveness. *Mental toughness* is assessed through three components: Coping, Creating an Optimal Performance State, and Accessing Empowering Emotions.

Undergraduate students at a Midwestern university (N=261) participated in the study leading to the development of this measurement tool. In the initial questionnaire, five questions in each the nine components were included. The items were rated on a seven-point Likert scale, ranging from 1= almost never, 4 = sometimes, and 7 = almost always. Through Rasch analysis, 43 of the items had good fit, and thus comprised the final version of the MeBTough. The Rasch method, part of modern measurement theory, was selected in this study because it does not have the same limitations as exploratory and confirmatory analysis techniques (Zhu Timm, & Ainsworth, 2001). There are several advantages to using the Rasch model over more traditional forms of analysis. Using the Rasch model leads to more precise measurement, and ordinal data can be converted into a linear scale. Comparisons can be made across studies, and as a result, groups tested at different times can be compared. Items can be examined for spread, redundancy, and gapping, and it can be used to uncover components of the measurement scale that are insufficient (Mack & Ragan, 2008).

Based on the results of the Rasch analysis, the MeBTough is a valid and reliable measure in collegiate athletes. It had an item separation index of 6.31, showing that it has six levels of item difficulty, and separation reliability statistic of 0.98 (Mack & Ragan, 2008). These results indicate that this measure has good psychometric properties. The rating scale for the MeBTough was changed to a four-point Likert scale, with

response options ranging from 1= almost never and 4 = almost always.

2.6.3 Mental Toughness and Injury

Mental toughness has been associated with injury. Levy, Clough, Polman, Marchant, and Earle (2005) evaluated mental toughness levels in 40 elite swimmers, using the MT48 (Clough et al., 2002) and self-reported incidence of injury. Levy and colleagues found that swimmers with higher levels of mental toughness reported fewer injuries than their less mentally-tough counterparts.

2.6.4 Association of Mental Toughness with Coping Ability

In a study conducted by Nicholls, Polman, Levy, and Backhouse (2008), significant associations were found between mental toughness levels and coping abilities in 677 athletes of varying ages and sports. The Coping Inventory for Competitive Sports (CISC; Gaudreau & Blondin, 2002) was used to measure coping skills, and the MT48 (Clough et al., 2002) was used to measure mental toughness. There were significant correlation between mental toughness and eight out of 10 of the subscales in the CISC. Stronger associations were found between mental toughness and problem-focused coping when compared to emotion-focused coping (Nicholls et al., 2008).

Kaiseler, Polman, and Nicholls (2009) found that mental toughness levels, as measured by the MT48, were associated with coping and coping effectiveness. All of the subscales in the MT48 as well as total score were able to predict coping ability and coping effectiveness in athletes. Higher levels of mental toughness were seen in individuals who used more problem-focused coping strategies.

2.6.5 Association of Mental Toughness with Mood State and Burnout

A cross-sectional pilot study (Welch, 2010) of 145 NCAA Division I athletes

assessed the relationships among mental toughness, measured by the MeBTough, mood disturbances, assessed by the POMS questionnaire, and burnout, measured by the Athlete Burnout Questionnaire. Mental toughness was strongly negatively correlated with burnout ($r=-0.65, p\leq.01$), and had an inverse relationship with total mood disturbances ($r=-0.46, p\leq.01$). Mental toughness scores from the participants were separated into intervals, and the average total mood disturbance scores for each interval was graphed (see Figure 4).

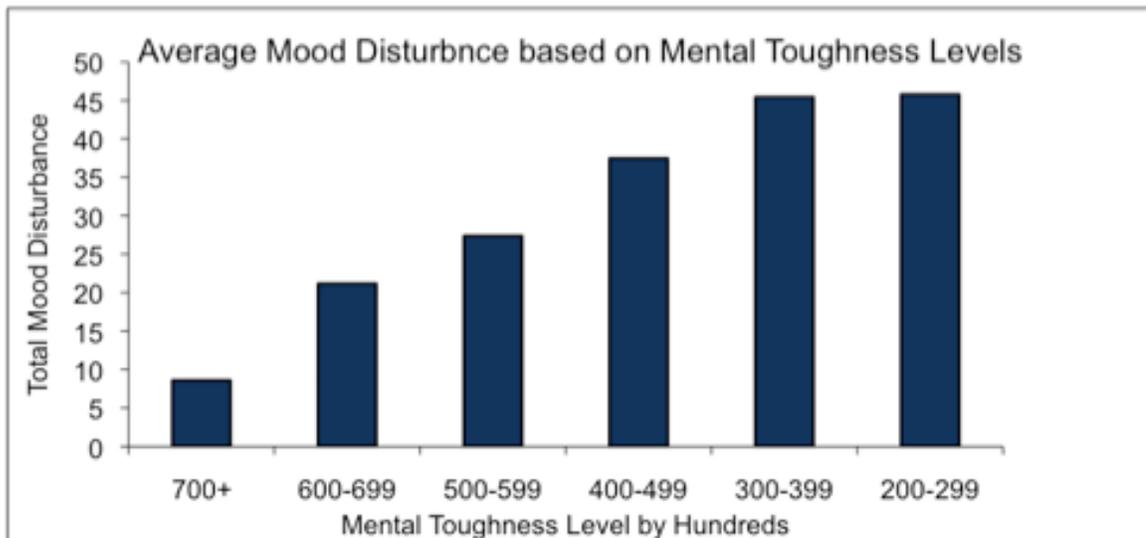


Figure 4: Average mood disturbance based on mental toughness levels (from Measuremental, LLC (2010))

The impact of mental toughness on mood disturbances can also be demonstrated by comparing the “iceberg profile” to mood state profiles associated with different levels of mental toughness. Average POMS subscale scores for the mental toughness score intervals demonstrated that as mental toughness scores decreased, the mood state profiles

deviated further from the optimal “iceberg profile” (see Figure 5). These data show that athletes with higher levels of mental toughness were experiencing lower levels of mood disturbances. This relationship suggests that increasing mental toughness levels could have a positive impact on mood states.

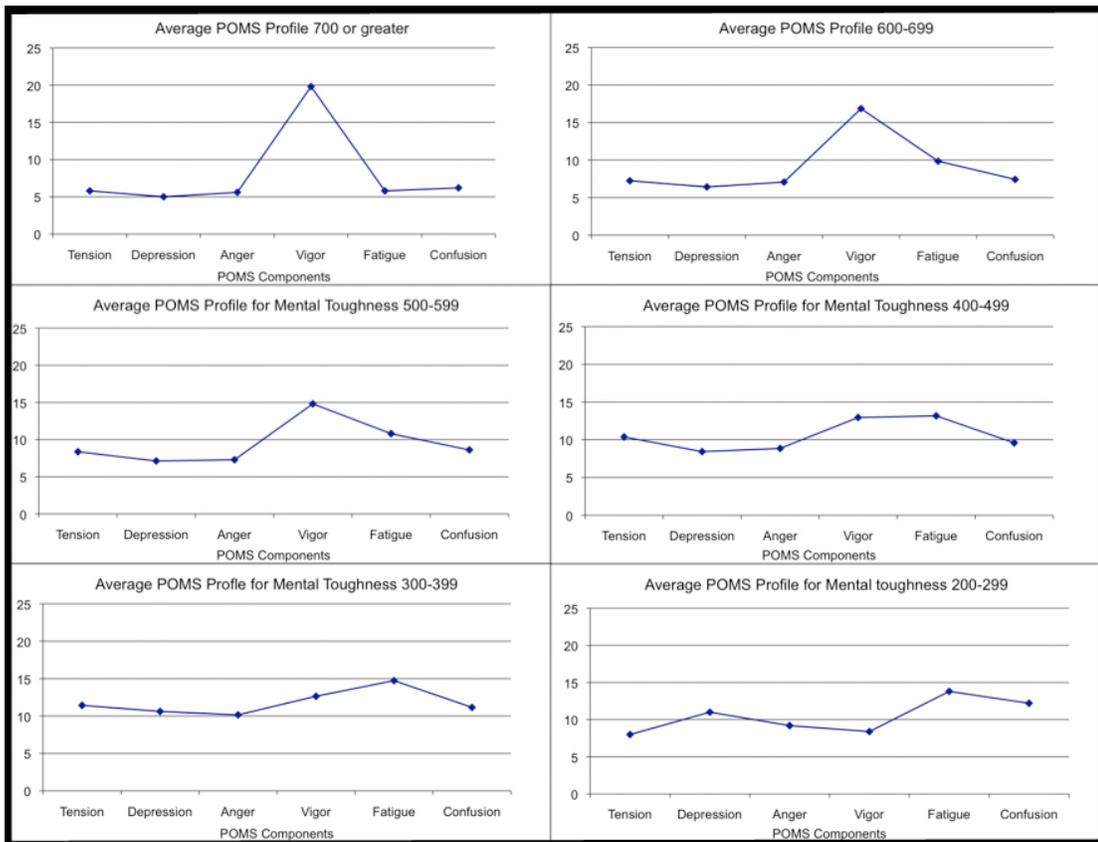


Figure 5: Mental toughness scores and their impact on POMS profiles (from Measurement LLC (2010))

These results also indicate that the MeBTough effectively assesses the emotional aspect of mental toughness, and that burnout and mood disturbances are associated with mental toughness. Another finding from this study was that higher levels of mood

disturbances was associated with higher levels of burnout ($r=.64, p\leq.01$).

2.6.6 Mental Toughness and Cognitive Appraisal

Mental Toughness is a modifiable construct. Mental toughness can change the way in which an individual perceives a situation, and therefore relates to cognitive appraisal. Based on the discussion of the framework of the Cognitive-Affective Model of Burnout (Smith, 1986), modifying cognitive appraisal would attenuate responses to stressful situations. Interventions to modify the stress response, based on the model, would lead to a reduction in the risk of injury and illness (see Figure 6). The Mental Toughness Training Program, an intervention, may be able to moderate the stress response in athletes. Improved ability to handle stressors could decrease the incidence of injuries in collegiate athletes.

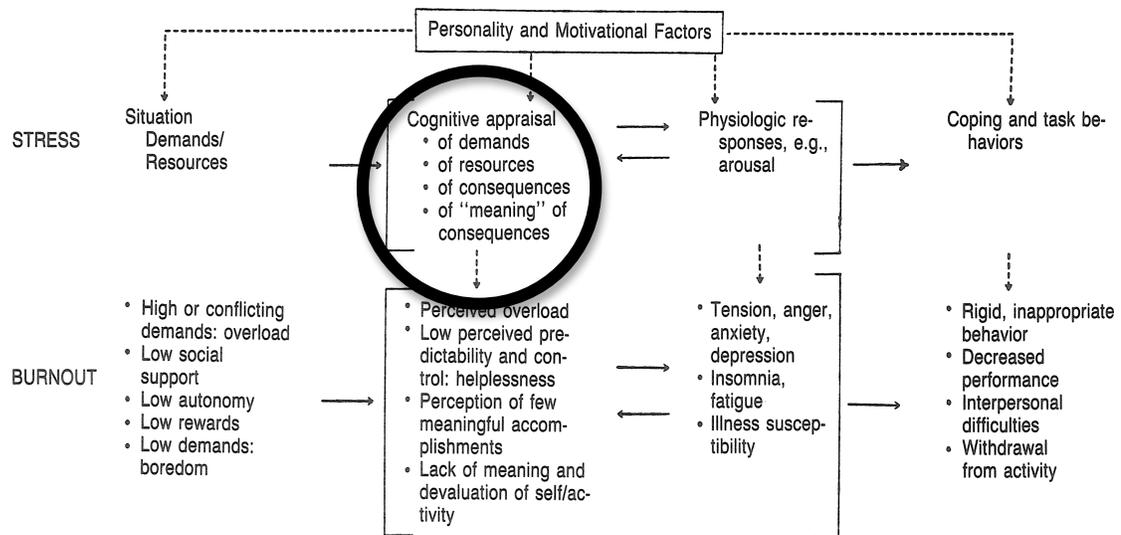


Figure 6: Mental toughness and the Cognitive-Affective Model of Athletic Burnout (Smith, 1986)

2.6.7 Mental Toughness Training

A Mental Toughness Training Program was developed by Measurement, LLC (2010) based on the framework used when creating the MeBTough assessment tool. The Mental Toughness Training Program is unique because it provides a personalized training program based on the athlete's overall MeBTough score. Based on the overall score, a complex statistical model predicts how the athlete should have performed on each of the nine components of the measure. The athlete's actual scores on the nine components are then compared with the expected scores to identify strengths and weakness. A strength indicates the athlete has a higher score on a component than expected, and a weakness is a lower than expected score. A personalized training program is developed based on the athlete's overall mental toughness score, primary strength, and primary weakness (see Figure 7).

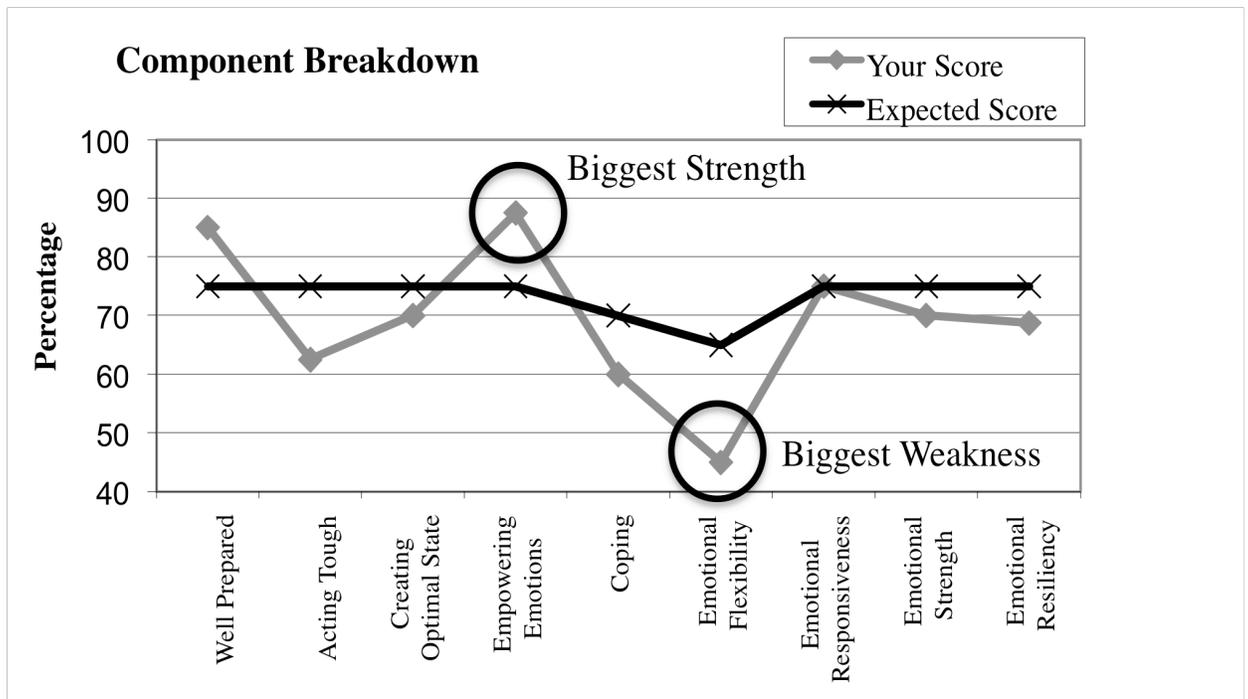


Figure 7: Actual mental toughness component scores for an athlete compared to expected scores (from Measurement LLC (2010))

Individuals can have the same score but have differing mental toughness profiles. For example, two people may have a total score of 482, but one may be weaker in Emotional Flexibility while the other is weaker in Emotional Responsiveness (see Figure 8).



Figure 8: Mental toughness profile of two athletes with the same total score but differing strengths and weaknesses (from Measuremental LLC (2010))

Conversely, two athletes may have the same weakness but have different total scores and different profiles (see Figure 9).

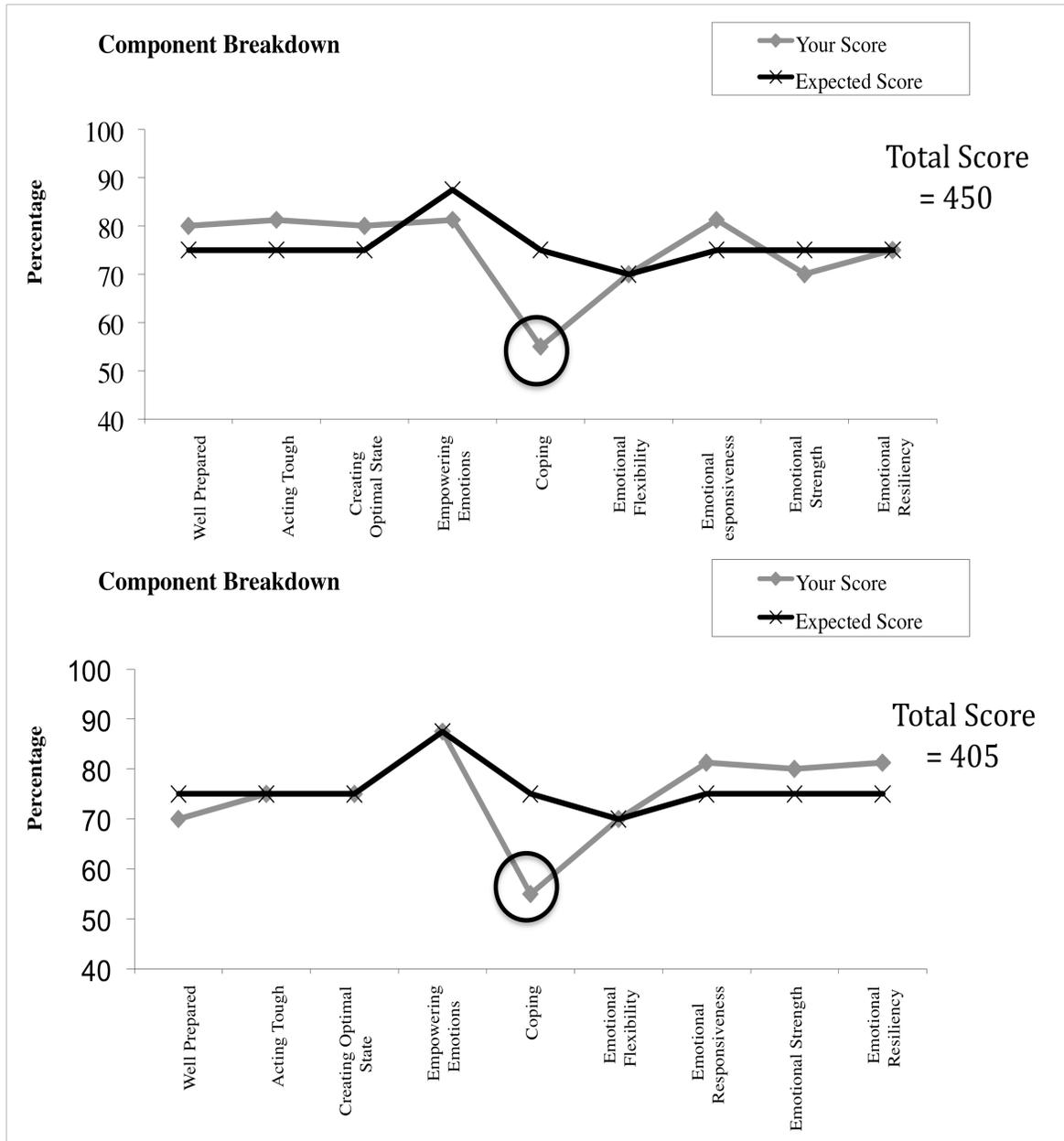


Figure 9: Mental toughness profiles for two athletes with differing total scores but the same weakness (coping) (from Measurement LLC (2010))

The Mental Toughness Training Program was originally developed to be administered by a sport psychologist in a one-on-one format with athletes, but was modified into a six-week, online, self-guided psychological skills training program. The training program is administered online via Measuremental's website. During the six-week program, the athlete receives daily emails with feedback and mental toughness training exercises to complete. An online performance journal is used for some of the training exercises and for daily reflection about the training experience.

A mental toughness training intervention is expected to improve athletes' abilities to handle mental, emotional, and bodily stress. The sport psychologist directed format of the Mental Toughness Training Program was tested in a NCAA Division I tennis team. Changes in mental toughness and winning percentage from before to after the training were examined. A 23% increase in mental toughness scores was seen after the completion of the Mental Toughness Training Program, with a comparable increase in winning percentage (see Figure 10).

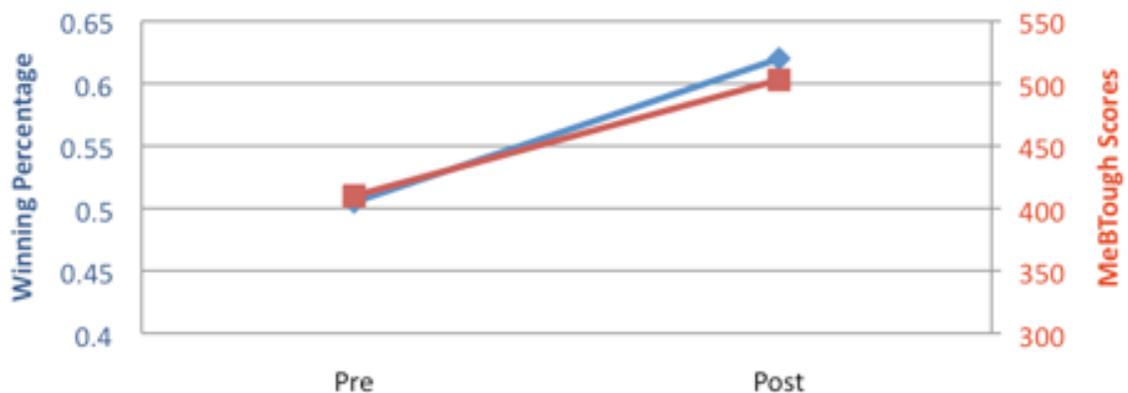


Figure 10: Comparison of team winning percentage before and after the training program (from Measuremental LLC (2010))

The Mental Toughness Training Program had been used in other in other NCAA Division I athletes, and was being tested Marine Corps Recruits. However, the Mental Toughness Training Program had yet to be used in a research study, and had not been tested in Division III athletes.

2.7 Summary

High numbers of college students are participating in NCAA sports (United States Government Accountability Office, 2007). Collegiate athletes experience stressors that non-athlete students do not, such as the physical and psychological stress that can be associated with training and competition, and therefore may be at risk for developing emotional and psychological problems. High levels of intense training for prolonged periods without adequate rest can lead to the development of overtraining syndrome (Kraemer & Nindl, 1988). Chronic stress, both psychological and physical in nature, can lead to the development of athlete burnout (Raedeke, 1997). Psychological, physical, and environmental stressors combined with prolonged training periods and inadequate recovery can lead to adverse psychological changes and increased susceptibility to illness and injury. The Cognitive-Affective Model of Athletic Burnout (Smith, 1986) provides a framework for understanding the relationships among stressors, cognitive appraisal, behavior, and negative health outcomes. Modifying a person's interpretation of stressful situations could potentially change how the person evaluates his/her ability to handle the physical and psychological stressors of training and competition. Because these stressors are associated with overtraining syndrome and burnout, modifying the interpretation of them could lead to decreased susceptibility to illnesses and injury.

Mental toughness is the ability to perform at the upper range of one's ability regardless of the circumstances (Loehr, 1986), and may influence how that athlete responds behaviorally, emotionally, and cognitively to stressors (Fletcher, 2005). The Mental, Emotional, and Bodily Toughness Inventory (MeBTough; Mack & Ragan, 2008) was developed to assess mental toughness, and a Mental Toughness Training Program, designed to compliment this measure, was developed to increase mental toughness levels in athletes. Based on Smith's (1986) Cognitive-Affective Model of Athlete Burnout, modifying psychological variables that influence cognitive appraisals should positively influence physical and psychological responses to training stress. Mental toughness is a modifier of cognitive appraisal, and therefore a mental toughness training intervention should improve athletes' abilities to handle mental, emotional, and bodily stress. This should positively influence cognitive appraisals made about stressful situations by increasing the athletes' confidence in their ability to deal with any stressors encountered. Improved ability to handle stressors could decrease the incidence of overtraining and burnout, ultimately reducing the incidence of illnesses and injuries in collegiate athletes.

CHAPTER 3

METHODOLOGY

3.1 Design and Setting

This study used a randomized nested design with team being randomized for treatment. The study was conducted in the Department of Kinesiology at the University of Massachusetts Amherst. Data collection took place at an NCAA Division III private institution. Study approval was obtained from the Institutional Review Board at both institutions.

3.2 Participants

3.2.1 Recruitment and Eligibility

Participants for this study were female Division III athletes (ages 17-23) recruited from the Varsity Field Hockey and Soccer teams at a private college. All participants were medically cleared to participate in sport as per NCAA requirements, and volunteered to participate in the study with the informed consent document (see Appendix A) obtained prior to testing. Underage athletes completed assent documents and provided parental consent to participate (see Appendix A). The Field Hockey and Soccer teams from this Division III institution were chosen to participate in this study because of the similarities in their schedules, team composition, 2010 records (soccer: 4-11-1; field hockey: 4-12-1), and because they were both fall outdoor team sports. Both teams began training camp in mid-August 2011, started their competitive schedules the second week of September 2011, and played 16 regular season games each. The Field

Hockey team had a roster size of 19 at the start of training camp, while the Soccer team started with 28, which was reduced to 21 at the start of the season. This yielded 47 potential participants during training camp for baseline data collection, and 40 potential participants for the duration of the study. One team was randomly selected to complete the Mental Toughness Training Program while the other served as the control. Randomization by team rather than individual was done to help reduce condition contamination that was likely to occur if teammates discussed the intervention at practice. Ill or injured participants were allowed to continue to participate in the study, unless advised otherwise for medical reasons.

All 47 potential participants during training camp consented to participate in baseline data collection for Hypothesis 1#. From the 40 potential participants on the finalized team rosters, all 40 consented to participate. However, data from two athletes was not used in the study because they each experienced concussions that affected their ability to participate in the intervention program and data collection. One participant dropped out of the study. Therefore, data from 37 participants were used in the data analysis for Hypothesis #2 and #3.

3.2.2 Power Analysis and Sample Size.

A power analysis was conducted based on the reported highest and lowest correlations among mental toughness, mood disturbances, and burnout, an alpha level set at 0.05, and an obtained power of 0.8. This yielded sample sizes of $N = 16$ and $N = 33$. A sample size of approximately 40 participants was used because of the necessity of using two teams for the intervention, and because it would ensure that the study was adequately powered even if participant attrition occurred. The study had a final sample size of 37

and was therefore adequately powered.

3.3 Measures

See Appendix B for the measures used in this study.

3.3.1 Demographics Questionnaire

All participants completed a brief demographics questionnaire. Questions on age, year in school, year of eligibility in NCAA sport, medications, prior or present chronic physical or psychological conditions, and the number of years of participation in sport were asked.

3.3.2 Mental, Emotional, and Bodily Toughness Inventory

The Mental, Emotional, and Bodily Toughness Inventory (MeBTough; Mack & Ragan, 2008) was used to measure mental toughness, and consisted of 41 items (divided into nine components) rated on a four-point scale, with response options ranging from 1 = almost never and 4 = almost always. It assessed physical (assessed with two components: Being Well Prepared and Acting Tough), emotional (four components: Emotional Flexibility, Emotional Resiliency, Emotional Strength, and Emotional Responsiveness), and mental (three components: Coping, Creating an Optimal Performance State, and Accessing Empowering Emotions) toughness. Example items from this measure: “During stressful times, I have the ability to act tough”, which is from the Acting Tough subscale, and “I have the ability to cope with crisis and adversity”, from the Coping subscale. The MeBTough was scored using a computer algorithm, with higher scores indicating that an individual had a higher level of mental toughness. Rasch analysis showed that this questionnaire is a valid and reliable measure of mental

toughness in collegiate athletes. It had an item separation index of 6.31, indicating that it had six levels of item difficulty, and separation reliability statistic of 0.98 (Mack and Ragan, 2008).

3.3.3 Profile of Mood States-30

The short form version of the Profile of Mood States-30 (POMS; McNair et al., 1971) questionnaire had 30 mood-related adjectives (for example: happy, full of pep) that represented six subscales: Tension, Depression, Anger, Vigor, Fatigue, and Confusion. Participants responded to the items based on how they were feeling “at this time” and the items were scored on a five-point scale, with response options of 1= not at all to 5 = extremely. Scores for each subscale were calculated by summing the responses from the items in that subscale. A total mood disturbance score was calculated by subtracting scores on the Vigor subscale from the sum of the scores from all the other subscales. A higher total score indicated a greater magnitude of mood disturbance. The POMS is a valid and reliable measure of mood state (Bourgeois, Meyers, & LeUnes, 2010).

3.3.4 Athlete Burnout Questionnaire

The Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) is a 15 item measure of athlete burnout that has three subscales with five items each: Reduced Sense of Accomplishment, Devaluation, and Emotional/Physical Exhaustion. The ABQ uses a five-point scale with response options ranging from 1 = almost never to 5 = most of the time. Example item from this measure are as follows: “I feel “wiped out” from [sport]”, “I’m not into [sport] like I used to be”, and “I feel physically worn out from [sport]”. A total score as well as subscale scores were calculated by summing the item responses. Higher scores on the ABQ indicated a greater magnitude of burnout. Construct validity

has been established for the ABQ, it has good internal reliability, and the subscales have high test-retest reliability (Raedeke & Smith, 2001).

3.3.5 BriefCOPE

The BriefCOPE (Carver, 1997) is an abbreviated version of the COPE Inventory (Carver, Scheier, & Weintraub, 1989). It has 28 items organized into 14 subscales with two items each – Self-Distractive, Active Coping, Denial, Substance Use, Use of Emotional Support, Use of Instrumental Support, Behavioral Disengagement, Venting, Positive Reframing, Planning, Humor, Acceptance, Religion, and Self-Blame. The measure uses a four-point Likert scale with response options ranging from 1 = I haven't been doing this at all to 4 = I've been doing this a lot. Sample items from this measure are as follows: Active Coping: "I've been concentrating my efforts on doing something about the situation I'm in", Use of Instrumental Support: "I've been getting help and advice from other people", and Religion: "I've been trying to find comfort in my religion or spiritual beliefs". There is no overall score for this measure, each subscale is scored separately and indicated the individual's use of those strategies. The subscales have reliability values ranging from 0.50 to 0.90 (Carver, 1997). The original COPE Inventory from which this measure is adapted has discriminant and convergent validity (Carver et al., 1989).

3.3.6 Beck Depression Inventory

The Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) contained 21 items and assessed the existence and severity of depressive symptoms over the previous two weeks. Items are scored on a 0-3 scale, with 0 corresponding to not experiencing the symptom and 1, 2, and 3 indicating increasing

levels of severity. Example items from this measure are “sadness”, “pessimism”, and “past failure”. A total score was calculated from the sum of the items, and a score of 0-13 indicated minimal depression, 14-19 mild depression, 20-28 moderate depression, and 29-63 severe depression. The BDI is a valid and reliable (Cronbach’s alpha = 0.93) measure of depression in college students (Beck & Steer, 1984).

3.3.7 Cohen-Hoberman Inventory of Physical Symptoms

The Cohen-Hoberman Inventory of Physical Symptoms (CHIPS; Cohen & Hoberman, 1983) assesses the degree to which an individual is bothered or distressed by 33 physical symptoms during the previous two weeks. The symptoms are rated on a five-point scale ranging from 0 = not bothered by it to 4 = extremely bothered by it. Example symptoms listed in this measure are “back pain”, “diarrhea”, and “headache”. CHIPS was scored by adding up the value assigned to each item, with lower scores indicating that an individual was less bothered by physical symptoms. CHIPS is a reliable measure of physical symptoms (Cohen & Hoberman, 1983).

3.3.8 Perceived Stress Scale

The Perceived Stress Scale (PSS; Coehn, Kamarch, & Mermelstein, 1983) has 10 items that measure the degree to which situations in an individual’s life are perceived as stressful in the last month. A modified response time frame of two weeks was used for this study. The PSS is scored on a five-point scale, with response options ranging from 1 = never to 5 = very often. Example items from this measure are as follows: “In the last month, how often have you felt that things were going your way?” and “In the last month, how often have you felt that you were on top of things?”. Higher scores indicated higher levels of perceived stress. The PSS is a valid and reliable measure of perceived stress

(Cohen et al., 1983).

3.3.9 Illness and Injury Reports

All illnesses and injuries reported to the team athletic trainer were recorded using the standard injury reporting protocol used by the college's athletic trainers. For the purpose of this study, an injury was defined based on the NCAA Injury Surveillance System guidelines: a condition that occurred during participation in an organized intercollegiate practice or competition, required attention from a team certified athletic trainer or physician; and resulted in restriction of the athlete's participation in sport for at least one day (Hootman et al., 2007). An instance of illness was defined as a condition of the body or mind that required medical attention and was diagnosed by a physician or other qualified health professional. All injuries and instances of illness were documented on the Injury Assessment Summary forms used by the college (see Appendix B10). Although the study sample was not large enough to determine incidence rates, the number and type of illnesses and injuries were recorded because those qualitative data could have provided interesting information.

3.4 Protocol

3.4.1 Study Orientation and Informed Consent

A brief letter with information about this study was provided to the athletes of the Soccer and Field Hockey teams at a Division III private institution prior to the start of their pre-season training. At the first team practice, the researcher discussed the study, answered any questions, and obtained written informed consent from the athletes volunteering to participate in the study. Assent and parental consent was also obtained

from athletes who were underage and volunteered to participate in the study.

3.4.2 Baseline Testing

Data collection for Hypothesis #1 took place during 2011 season training camp in August for both the Soccer (N=28) and Field Hockey (N=19) teams. As such, data were collected from some athletes who did not make the final rosters and was used in the analyses for Hypothesis #1. Baseline testing was scheduled for the second day of practice, and data were collected in between the morning and afternoon training sessions for both teams, two hours after the morning session and two hours prior to the afternoon session. Prior to starting the Mental Toughness Training Program, all participants completed the Demographic Questionnaire, MeBTough, POMS, ABQ, Brief COPE, BDI, CHIPS and PSS. Questionnaires were completed in a paper/pencil format. Data collection took place in a classroom on the college's campus. Lunch was provided for the athletes after they have completed the testing.

After completing the baseline MeBTough, the researcher scored the MeBTough and developed each athlete's individualized training program. The training program began on the first day of the second week of practice. Baseline data was also used to establish correlations among the measures for Hypothesis #1.

3.4.3 Implementation of the Mental Toughness Training Program

The training program used for this study was developed by Measuremental LLC and was administered via Measuremental's online training website. As previously discussed, the Mental Toughness Training Program (©Measuremental LLC, 2010) is a personalized training program based on the athlete's overall mental toughness score, primary strength, and primary weakness. During the six-week program, the athlete

received daily emails containing feedback and mental toughness training exercises to complete. An online performance journal was used for some of the training exercises and for daily reflection about the training experience.

3.4.4 Testing during the Intervention Program

Over the course of the six-week intervention program, both the Soccer (N=21) and Field Hockey (N=16) teams completed the POMS, Brief COPE BDI, CHIPS, and PSS at the end of the second week (\pm one day) of mental toughness training and the end of the fourth week (\pm one day) of the training. Data were collected from only those athletes who made the final rosters. Data were collected prior to practice and at least one day before or after a game day in paper/pencil formats.

3.4.5 Post-Testing

After the completion of the six-week training program, all participants (N=37) completed the MeBTough, POMS, ABQ, Brief COPE, BDI, CHIPS and PSS to assess for significant changes of the scores from these measures. All testing was completed two days \pm four days following the completion of the training program. Testing took place in a reserved classroom at the college and data was collected using paper/pencil format.

3.4.6 Follow-Up Testing

All participants completed the MeBTough two weeks after the final game of the competitive season, which corresponded to three weeks after the conclusion of the Mental Toughness Training Program, \pm one day. Data was collected in a reserved classroom at the college. Dinner was provided to all participants after completing the questionnaires.

3.5 Data Analysis

SPSS 18.0 was used for data analyses. Data was examined to determine if all of the variables were distributed normally and descriptive statistics for all of the outcome measures were expressed as mean \pm standard deviation and range. For all comparisons an intent-to-treat approach was used. Significance level for all analyses was set at $p \leq .05$.

3.5.1 Data Analysis Hypothesis 1

The baseline data from all participants was combined for this analysis. Spearman-rho correlation coefficients (ρ) were used to assess the cross-sectional relationships among mental toughness, mood disturbances, burnout, coping ability, depression, physical symptoms, and perceived stress. The classification system that was used for the correlations generated among the scores from the measures in this study was based on Cohen's (1988) guidelines for interpreting correlations in social science research. In this classification system, a ρ value of 0.1 to 0.3 was considered a small or weak correlation, a ρ value of 0.31 to 0.5 a moderate correlation, and a ρ value of 0.51 or greater was interpreted as a large or strong correlation.

3.5.2 Data Analysis Hypothesis 2

The effectiveness of the training program was analyzed using the Baseline and Post Testing MeBTough data. A one-tailed dependent t-test was used to determine if the MeBTough scores were significantly higher after the training program. A repeated measures ANOVA was used to determine if the post-testing and follow-up testing scores for the MeBTough were significantly different from each other.

3.5.3 Data Analysis Hypothesis 3

A series of repeated measures ANOVAs with main effects for group (treatment,

control) and time (Baseline, After Week 2, After Week 4, Post-Test) were used to analyze the outcome measures. Data was collected from the ABQ at only two time points, and a repeated measures ANOVA with main effect for group (treatment, control) and time (Baseline, Post-Test) was conducted.

3.6 Human Hazards Precautions

The potential hazards associated with this study were minimal. Participants might have experienced fatigue while completing the battery of questionnaires or experienced mild psychological discomfort when answering questions about their psychological states (for example: depression, stress, and mental toughness level). Psychological discomfort should have dissipated rapidly after completion of the questionnaires. Additional discomfort could have occurred with some of the mental toughness training exercises that required the participant to think about a previous unsuccessful athletic performance in order to focus on actions that could have been taken to alter the situation. The goal of the exercises was to teach the participant how to evaluate previous negative performance situations differently so that they would be better able to handle similar situations in the future. No physical hazards beyond those normally experienced by participants on a daily basis were expected.

3.7 Study Timelines

The approval, preparation, data collection, data analysis, and manuscript preparation timelines for the study are shown in Table 1. The intervention in this study, the Mental Toughness Training Program, was administered over six weeks. The

baseline, intermittent, and post-program data collection timelines are shown in Figure 11.

Table 1
Study Timelines

Task	Month											
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	
IRB Approval	█											
Study Preparation		█										
Data Collection				█								
Data Analysis							█					
Manuscript Preparation										█		

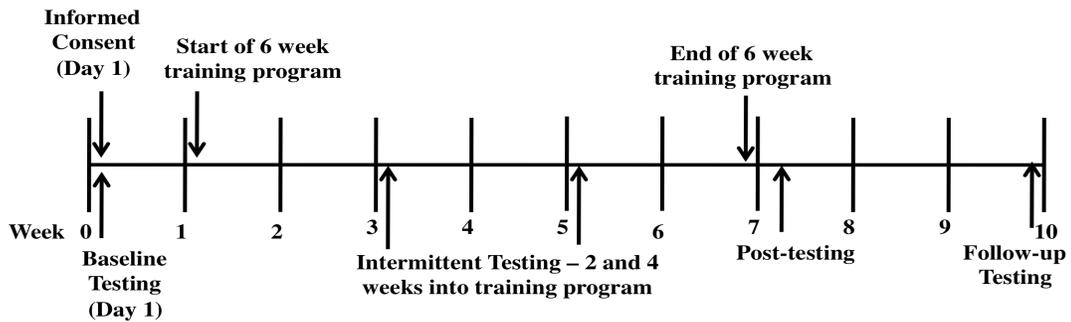


Figure 11: Intervention timeline for the study

The timeline for data collection in this study is presented in Table 2.

Table 2
Data Collection Timeline

Measure	STUDY WEEK									
	1 (Baseline Testing)	2 (Week 1 of program)	3	4	5	6	7 (Week 6 of program)	8 Post- Testing	10 Follow-up Testing	
MeBTough	X							X	X	
POMS	X			X		X		X		
ABQ	X							X		
Brief COPE	X			X		X		X		
BDI	X			X		X		X		
CHIPS	X			X		X		X		
PSS	X			X		X		X		

Note: MeBTough=Mental, Emotional, and Bodily Toughness Inventory, POMS=Profile of Mood, ABQ=Athlete Burnout Questionnaire, BDI= Beck Depression Inventory, CHIPS=Cohen-Hoberman Inventory of Physical Symptoms, PSS=Perceived Stress Scale

CHAPTER 4

RESULTS

In this study, both cross-sectional (Hypothesis #1) and longitudinal (Hypotheses #2 and #3) hypotheses were tested. A total of 47 athletes participated in the baseline, cross-sectional data collection, while 37 athletes had longitudinal data available. Data were pooled for the analyses of Hypothesis #1, and were split by team for Hypotheses #2 and #3 analyses.

4.1 Hypothesis #1 Results: Cross-Sectional Relationships

Hypothesis #1: Consistent with the literature, baseline mental toughness will be negatively correlated with mood disturbances, athlete burnout, depression, physical symptoms, and perceived stress, and positively correlated with coping ability.

4.1.1 Participant Characteristics

Demographic information from the 47 participants that provided data for Hypothesis #1 are provided in Table 3. Participants were between the ages of 17 and 23, with a mean age of 19.3 ± 1.4 years. Two participants were under the age of 18. In this sample, 95.7% of the participants had played their sport for more than five years. The majority of the sample was in their first or second year of NCAA eligibility. Twelve participants stated that they suffered from chronic health conditions, which included: asthma (N=4), chronic back conditions (N=4), lupus (N=3), heart conditions (N=1), and Crohn's disease (N=1). Seven participants suffered from a psychological condition, which included: depression (N=4) and anxiety (N=3).

Table 3
Participant Demographic Information for Hypothesis #1 (N=47)

Demographic Variable		N	%
Sex			
	Female	47	100
Age			
	17	2	4.3
	18	15	31.9
	19	13	27.7
	20	6	12.8
	21	9	19.1
	22	1	2.1
	23	1	2.1
Sport			
	Field Hockey	19	40.4
	Soccer	28	59.6
Years Playing Sport			
	1-5	2	4.3
	6-10	24	51.1
	11-15	19	40.4
	16-20	2	4.3
Year in School			
	Freshman	13	27.7
	Sophomore	18	38.3
	Junior	6	12.8
	Senior	10	21.3
NCAA Eligibility			
	1	15	31.9
	2	17	36.2
	3	7	14.9
	4	8	17.0
Chronic Health Conditions			
	Yes	12	25.5
	No	35	74.5
Psychological Conditions			
	Yes	7	14.9
	No	40	85.1

4.1.2 Descriptive Statistics

Descriptive statistics for the scores from all the measures (MeBTough, POMS, ABQ, BDI, CHIPS, PSS, and BriefCOPE) at baseline are provided in Table 4A-C. The majority of the scores from the measures were normally distributed, with only a few skewness and kurtosis values deviating greatly from the acceptable range of ± 2 and ± 7 respectively (Curran, West, & Finch, 1996). The BriefCOPE subscale Substance Use (skewness=2.81, kurtosis=8.64) was the only measure that had both skewness and kurtosis outside the acceptable ranges.

Table 4A
Descriptive Statistics for the Total Scores of MeBTough, ABQ, BDI, CHIPS, and PSS (N=47) at Baseline

Measure	N	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis
MBTTOTAL	47	475.5	81.6	293-670	.37	.00
ABQTOTAL	47	30.0	9.0	17-55	.88	.40
BDI	47	6.5	4.6	0-17	.58	-.23
CHIPS	47	16.6	11.1	1-40	.44	-1.06
PSS	46	14.5	5.6	3-24	.10	-.95

Note: MBTTOTAL=Mental, Emotional, and Bodily Toughness Inventory total score, ABQTOTAL=Athlete Burnout Questionnaire total score, BDI= Beck Depression Inventory, CHIPS=Cohen-Hoberman Inventory of Physical Symptoms, PSS=Perceived Stress Scale

4.1.3 Correlation Analyses

Spearman Rho correlations were calculated among the total scores of the MeBTough, POMS, ABQ, BDI, CHIPS, and PSS and presented in Table 5. A correlation ranging from 0.1 to 0.3 was considered a small or weak correlation, between 0.31 to 0.5 a moderate correlation, and 0.51 or greater was interpreted as a large or strong correlation (Cohen, 1988).

Table 4B
Descriptive Statistics for the Total Score and Subscales of POMS (N=47) at Baseline

Measure	N	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis
Total Mood Disturbance	46	29.8	10.8	8-64	.77	1.14
Tension	47	9.2	3.5	5-21	1.02	1.21
Depression	47	7.1	2.6	5-15	1.42	1.54
Anger	47	5.8	1.2	5-11	2.16	6.63
Vigor	47	12.5	3.8	7-25	.97	1.24
Fatigue	47	12.2	3.7	6-21	.35	-.70
Confusion	46	7.9	1.7	5-12	.42	-.44

Table 4C
Descriptive Statistics for the Subscales of BriefCOPE (N=47) at Baseline

Measure	N	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis
Self-Distraction	47	5.0	1.7	2-8	-.25	-.54
Active Coping	46	5.6	1.5	2-8	-.15	-.49
Denial	47	2.2	.4	2-3	1.45	.11
Substance Use	47	2.3	.8	2-6	2.81	8.64
Use of Emotional Support	47	5.7	1.5	3-8	.10	-1.13
Use of Instrumental Support	47	5.4	1.7	2-8	-.07	-.77
Behavioral Disengagement	47	2.5	.9	2-6	2.17	4.90
Venting	47	3.9	1.4	2-8	.62	.18
Positive Reframing	47	5.5	1.9	2-8	-.13	-1.09
Planning	47	5.7	1.7	2-8	-.27	-.81
Humor	47	3.7	1.8	2-8	1.08	.50
Acceptance	47	6.1	1.7	2-8	-.91	.04
Religion	47	2.8	1.4	2-8	2.00	3.72
Self-blame	47	4.2	1.6	2-8	.70	.39

Significant relationships were observed between mental toughness (MeBTough) and the psychological variables measured at baseline. Specifically, significant moderate to strong negative correlations ($\rho = -0.46$ to -0.53 , $p \leq .05$) were found between mental toughness and total mood disturbance (POMS), athlete burnout (ABQ), depression (BDI),

and perceived stress (PSS). A significant relationship was not found between mental toughness and physical symptoms (CHIPS). Only one subscale of the BriefCOPE, Self-Blame ($\rho=-0.56, p\leq.01$), was significantly associated with mental toughness. All other subscales of the BriefCOPE were not significantly correlated with MeBTough scores, with Spearman Rho correlations ranging from $\rho=-0.29$ to 0.17 ($p=.06$ to $.93$). Because scores from only one subscale of the BriefCOPE were significantly correlated with scores from the MeBTough, the BriefCOPE was not used in any further analyses in this study.

Significant correlations were also found among the scores of the psychological and physical measures. Physical symptom scores, while not significantly associated with mental toughness, had significant positive relationships with all the other variables ($\rho=0.40$ to $0.61, p\leq.0.1$) used in this study. Significant positive correlations were also seen among all the psychological variables.

Table 5
Spearman Rho Correlations Among the Total Scores of MeBTough, POMS, ABQ, BDI, CHIPS, and PSS

	1	2	3	4	5	6
1. MBTTOTAL	-----					
2. POMSTMD	-.51**	-----				
3. BDI	-.49**	.56**	-----			
4. ABQTOTAL	-.46**	.59**	.50**	-----		
5. CHIPS	-.16	.40**	.61**	.43**	-----	
6. PSS	-.53**	.54**	.59**	.44**	.45**	-----

Note: *= $p\leq.05$ **= $p\leq.01$

Note: MBTTOTAL=Mental, Emotional, and Bodily Toughness Inventory total score, POMSTMD=Profile of Mood States Total Mood Disturbance, BDI= Beck Depression Inventory, ABQTOTAL=Athlete Burnout Questionnaire total score, CHIPS=Cohen-Hoberman Inventory of Physical Symptoms, PSS=Perceived Stress Scale

4.2 Hypothesis #2 Results: Changes in Mental Toughness

Hypothesis #2: The Mental Toughness Training Program will result in increased levels of mental toughness as compared to the control group where no changes in mental toughness levels are expected.

4.2.1 Participant Characteristics

Participant demographic information for Hypothesis #2 is provided in Table 6. The mean age of the sample for this hypothesis was 19.4 ± 1.4 years. In this sample, 94.6% of the participants had played their sport for over five years. Nine participants indicated that they suffered from chronic health conditions, including lupus (N=3), back conditions (N=3), asthma (N=2), and heart conditions (N=1). Six participants suffered from a psychological condition, including depression (N=4) and anxiety (N=2).

4.2.2 Descriptive Statistics

Descriptive statistics for the scores of MeBTough at baseline, post-intervention, and at follow-up are provided in Table 7. All of measures were normally distributed, with skewness and kurtosis values within an acceptable range of ± 2 and ± 7 respectively (Curran et al., 1996). MeBTough scores increased in the training group by approximately 17 points from baseline to post-intervention. At baseline, the training group scores differed from the overall mean by 19.6 points, and post-intervention, differed from the overall mean by 39.9 points. The MeBTough scores demonstrated good reliability at baseline ($\alpha = 0.73$), post-intervention, ($\alpha = 0.84$), and at follow-up ($\alpha = 0.84$).

Table 6
Participant Demographic Information for Hypothesis #2 (N=37)

Demographic Variable		N	%
Sex			
	Female	37	100
Age			
	17	2	5.4
	18	10	27.0
	19	10	27.0
	20	5	13.5
	21	8	21.7
	22	1	2.7
	23	1	2.7
Sport			
	Field Hockey	16	43.2
	Soccer	21	56.8
Years Playing Sport			
	1-5	2	5.4
	6-10	20	54.1
	11-15	13	35.1
	16-20	2	5.4
Year in School			
	Freshman	11	29.7
	Sophomore	12	32.5
	Junior	5	13.5
	Senior	9	24.3
NCAA Eligibility			
	1	12	32.4
	2	12	32.4
	3	6	16.3
	4	7	18.9
Chronic Health Conditions			
	Yes	9	24.3
	No	28	75.7
Psychological Conditions			
	Yes	6	16.2
	No	31	83.8

Table 7
Descriptive Statistics for the Total Scores of MeBTough at Baseline, Post-Intervention, and at Follow-Up (N=37)

Measure		<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis
Pre-Training Intervention	MBTTOTAL Overall (N=37)	490.3	79.9	339-670	.40	-.28
	MBTTOTAL Training Group (N=16)	509.9	84.3	339-670	.15	.56
	MBTTOTAL Control Group (N=21)	475.4	75.0	381-621	.59	-.68
Post-Training Intervention	MBTTOTAL Overall (N=37)	487.3	90.1	348-670	.42	-.65
	MBTTOTAL Training Group (N=16)	527.2	100.9	348-670	.14	-.98
	MBTTOTAL Control Group (N=21)	456.9	68.8	348-583	.41	-.55
After Follow-Up Period	MBTTOTAL Overall (N=37)	519.8	114.0	320-809	.75	.25
	MBTTOTAL Training Group (N=16)	571.3	130.6	352-809	.12	-.45
	MBTTOTAL Control Group (N=21)	480.6	82.7	320-710	.96	2.10

Note: MBTTOTAL=Mental, Emotional, and Bodily Toughness Inventory total score

4.2.3 Repeated Measures ANOVA

A 2 (Sport) x 3 (Time) repeated measures ANOVA was conducted to compare the MeBTough scores at baseline, post-intervention, and at follow-up and the results are provided in Table 9. There were main effects for Sport $F(1,35) = 5.78, p = .02$ and Time $F(2,70) = 6.03, p = .004$. There was a significant Sport X Time interaction $F(2,70) = 3.25, p = .045$. There were no differences between sports at baseline. Significant differences were observed at post-test and follow-up. The MeBTough scores in the intervention and control group are shown in Figure 12. The difference between post-intervention scores and follow-up scores for the MeBTough were significant in the

intervention group, and scores from the measure in the intervention group continued to improve after the conclusion of the training program.

Table 8
2 (Sport) X 3 (Time) Repeated Measures ANOVA Comparing Pre- and Post-Intervention MeBTough Scores (N=37)

Source	SS	df	MS	F	p	Observed Power
Sport	38571.62	1	38571.62	5.78	.02	.65
Time	27354.33	2	13677.16	6.03	.00	.87
Sport X Time	14751.73	2	7375.87	3.25	.045	.60
Error	158747.04	70	2267.82			

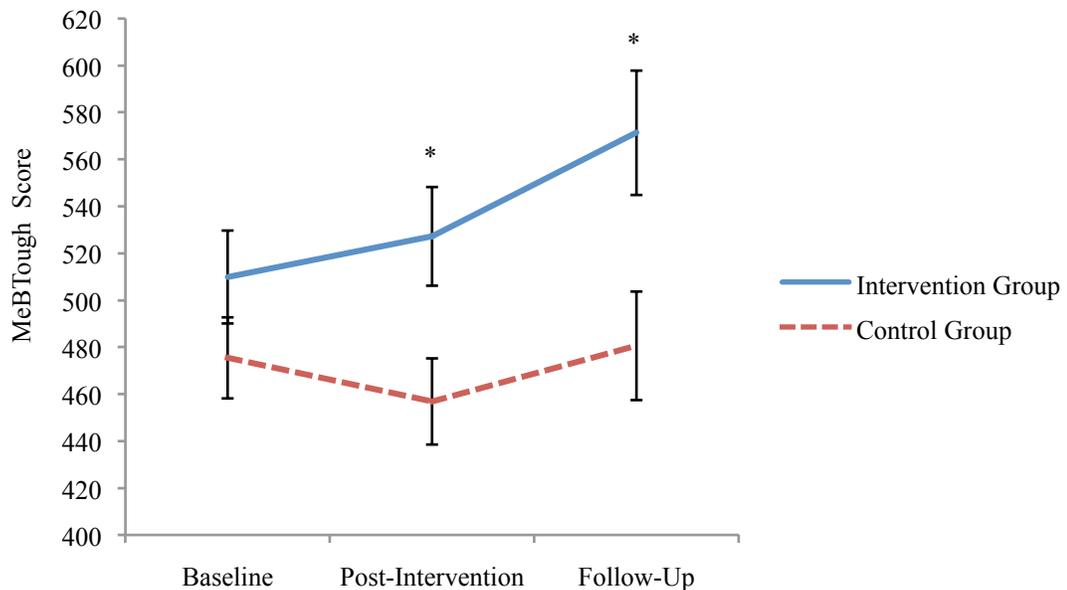


Figure 12: Mean mental toughness scores at baseline, post-intervention, and follow-up (* indicates $p \leq .05$)

Table 9 provides the number of exercises completed by each participant in the Mental Toughness Training Program with their pre-training program and post-training program total scores, as well as the difference between their total scores. There was a 3.9% increase in mean mental toughness scores when comparing pre- and post-training scores in the intervention group. There was a strong positive correlation between the number of sessions completed in the training program and the change in MeBTough score from pre-intervention to post-intervention ($\rho=0.60, p\leq.05$).

Table 9
Sessions Completed in the Training Intervention, Pre-Intervention Scores, Post-Intervention Scores, and Difference Between Pre- and Post-Intervention Scores (N=16)

Participant	Number of intervention exercises done	MBT score pre-intervention	MBT score post-intervention	Change in MBT score from pre- to post-intervention
F1	36	576	576	0
F2	0	520	445	-75
F4	32	520	557	37
F5	6	445	482	37
F6	10	526	570	44
F7	5	670	658	-12
F8	3	498	482	-16
F10	11	570	639	69
F12	10	339	348	9
F13	0	430	425	-5
F15	34	658	658	0
F16	0	470	461	-9
F17	0	503	381	-122
F18	15	503	670	167
F19	14	515	520	5
U1	8	415	563	148
MEAN	11.5	509.87	527.19	17.31

Note: MBT=Mental, Emotional, and Bodily Toughness Inventory total score, F=Field Hockey, U=underage Field Hockey participant

4.3 Hypothesis #3 Results: Changes in Psychological and Physical Variables

Hypothesis #3: Improved mental toughness resulting from the training will attenuate levels of mood disturbances, athlete burnout, depression, physical symptoms, and perceived stress in the training group as compared to the control group.

4.3.1 Participant Characteristics

The same group of participants provided data for both Hypothesis #2 and #3. For participant demographic information for Hypothesis #3 refer to Table 6. Due to incomplete data (N=4) resulting from skipped items in questionnaires, data from all 37 participants were not used in the final analyses for Hypothesis #3.

4.3.2 Descriptive Statistics

Descriptive statistics for mood disturbance, perceived stress, physical symptoms, depression, and athlete burnout at baseline, at the end of the second week and at the end of the fourth week of the intervention, and post-intervention in Table 10. As the athlete burnout was only measured at two time points, descriptive statistics for baseline and post-intervention are presented. Three measures were not normally distributed, with skewness and kurtosis values deviating greatly from the acceptable range of ± 2 and ± 7 respectively (Curran et al., 1996). Skewness and kurtosis values for POMS after week four in the Intervention group (skewness=2.60, kurtosis=7.69), BDI after week four in the Intervention group (skewness=2.52, kurtosis=7.12), and CHIPS after week four in the Intervention group (skewness=2.76, kurtosis=8.97) fell outside the acceptable range suggesting they may not be normally distributed. Cronbach alpha reliability coefficients (see Table 11) were calculated for each measure across time points. All measures demonstrated adequate reliability across all measurement time points.

Table 10
 Descriptive Statistics for the Total Scores of POMS, ABQ, BDI, CHIPS, and PSS at
 Baseline, After Week 2, After Week 4, and Post-Intervention (N=35)

Measure	Time Point	Group	N	M	SD	Range	Skewness	Kurtosis
POMS	Baseline	Total	34	28.8	8.6	8-47	-.10	-.24
		Intervention	14	26.1	9.9	8-44	.10	-.61
		Control	20	30.7	7.3	21-47	.41	-.49
	After week 2	Total	34	28.1	14.7	8-72	1.20	1.92
		Intervention	14	25.3	19.9	8-72	1.78	2.37
		Control	20	30.1	9.6	10-52	.11	.77
	After week 4	Total	34	27.4	16.2	6-83	1.57	3.09
		Intervention	14	23.1	19.3	6-83	2.60	7.69
		Control	20	30.5	13.2	15-58	.77	-.31
	Post-Intervention	Total	34	25.9	13.4	3-56	.64	-.16
		Intervention	14	18.2	9.2	3-37	.76	.32
		Control	20	31.3	13.3	9-56	.34	-.47
ABQ	Baseline	Total	35	28.9	8.4	17-55	.91	1.03
		Intervention	15	26.3	6.5	20-43	1.50	1.92
		Control	20	30.8	9.4	17-55	.54	.51
	Post-Intervention	Total	35	29.6	11.5	17-59	1.02	.46
		Intervention	15	22.9	6.5	17-39	1.59	1.71
		Control	20	34.6	12.1	18-59	.57	-.20
BDI	Baseline	Total	35	6.2	4.3	0-17	.69	.27
		Intervention	15	4.9	4.2	0-1	.69	.13
		Control	20	7.2	4.2	1-1	.88	.57
	After week 2	Total	35	5.9	5.7	0-19	.84	.40
		Intervention	15	3.6	4.5	0-14	1.35	.74
		Control	20	7.6	6.0	1-19	.56	-.10
	After week 4	Total	35	6.0	7.4	0-29	1.60	2.00
		Intervention	15	3.4	5.6	0-21	2.52	7.12
		Control	20	8.0	8.1	0-29	1.30	1.04
	Post-Intervention	Total	35	5.3	6.9	0-26	1.64	1.99
		Intervention	15	1.5	2.0	0-7	1.68	2.84
		Control	20	8.2	7.8	0-26	.97	-.09
CHIPS	Baseline	Total	35	17.1	11.1	1-40	.34	-1.08
		Intervention	15	16.3	11.7	3-33	.40	-1.66
		Control	20	17.6	10.9	1-40	.34	-.52
	After week 2	Total	35	15.1	11.6	1-43	1.06	.50
		Intervention	15	12.9	13.0	1-42	1.57	1.63
		Control	20	16.7	10.5	1-43	.84	.64

Measure	Time Point	Group	N	M	SD	Range	Skewness	Kurtosis
CHIPS	After week 4	Total	35	13.4	12.6	0-49	1.52	1.84
		Intervention	15	8.3	10.9	0-44	2.76	8.97
		Control	20	17.3	12.7	1-49	1.29	1.21
	Post-Intervention	Total	35	15.2	12.2	0-51	1.08	.83
		Intervention	15	10.3	10.0	0-39	1.92	4.21
		Control	20	18.9	12.7	0-51	.78	.62
PSS	Baseline	Total	34	14.6	5.7	3-24	.07	-.98
		Intervention	14	3.0	6.4	3-22	.22	-.136
		Control	20	15.8	5.1	9-24	.37	-1.15
	After week 2	Total	34	13.7	5.8	5-25	.22	-.97
		Intervention	14	13.1	4.6	6-20	-.05	-1.40
		Control	20	14.2	6.5	5-25	.17	-1.22
	After week 4	Total	34	15.0	6.2	3-28	.00	-.29
		Intervention	14	14.4	6.9	3-28	.28	.24
		Control	20	15.5	5.8	6-27	-.21	-.43
	Post-Intervention	Total	34	15.6	7.0	0-29	.02	-.47
		Intervention	14	12.1	6.1	0-22	-.13	-.14
		Control	20	18.0	6.7	6-29	-.14	-.68

Note: POMS=Profile of Mood States Total Mood Disturbance score, ABQ= Athlete Burnout Questionnaire total score, BDI=Beck Depression Inventory, CHIPS=Cohen-Hoberman Inventory of Physical Symptoms, PSS=Perceived Stress Scale.

Table 11
Reliability Coefficients for POMS, BDI, CHIPS, ABQ, PSS, and BriefCOPE

Measure	Baseline		After Week 2		After Week 4		Post-Intervention		Follow-up	
	N	α	N	α	N	α	N	α	N	α
POMS	46	.79	40	.85	37	.92	39	.87	38	.90
BDI	47	.76	41	.94	38	.94	38	.92	38	.93
CHIPS	47	.82	40	.86	38	.88	39	.85	38	.86
ABQ	47	.89	---	---	--	---	39	.93	38	.94
PSS	46	.82	39	.85	38	.84	39	.86	38	.87
Brief COPE	46	.86	39	.85	38	.93	39	.84	38	.88

Note: POMS=Profile of Mood States, BDI= Beck Depression Inventory, CHIPS=Cohen-Hoberman Inventory of Physical Symptoms, ABQ=Athlete Burnout Questionnaire, PSS=Perceived Stress Scale, BriefCOPE= BriefCOPE Questionnaire

4.3.3 Repeated Measures ANOVAS

For the analysis of Hypothesis #3, repeated measures ANOVAs were conducted. Data were collected for some measures only pre- and post-training intervention (ABQ), and a 2 (Sport) X 2 (Time) repeated measures ANOVA was conducted to analyze scores from ABQ. For other measures, data were collected at four time points: pre-intervention, after two weeks, after four weeks, and post-intervention (POMS, BDI, PSS, and CHIPS). Multiple 2 (Sport) X 4 (Time) repeated measures ANOVAs were conducted to analyze scores from the POMS, BDI, CHIPS, and PSS.

4.3.3.1 2 (Sport) X 2 (Time) Repeated Measures ANOVA: ABQ

The results of the 2 (Sport) X 2 (Time) repeated measures analyses for the scores from the ABQ at baseline and post-intervention are provided in Table 12. There was no main effect of Time. A main effect of Sport was observed $F(1,33) = 8.32, p = .01$ and there was a significant Sport X Time interaction $F(1,33) = 5.87, p = .02$. ABQ scores at baseline and post-intervention are shown in Figures 13.

Table 12
2 (Sport) X 2 (Time) Repeated Measures ANOVA Comparing Baseline and Post-Intervention Total Scores for ABQ (N=35)

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Observed Power
Sport	554.30	1	554.30	8.32	.01	.80
Time	.53	1	.53	.01	.91	.05
Sport X Time	219.10	1	219.10	5.87	.02	.65
Error	1232.68	33	37.35			

Note: ABQ= Athlete Burnout Questionnaire

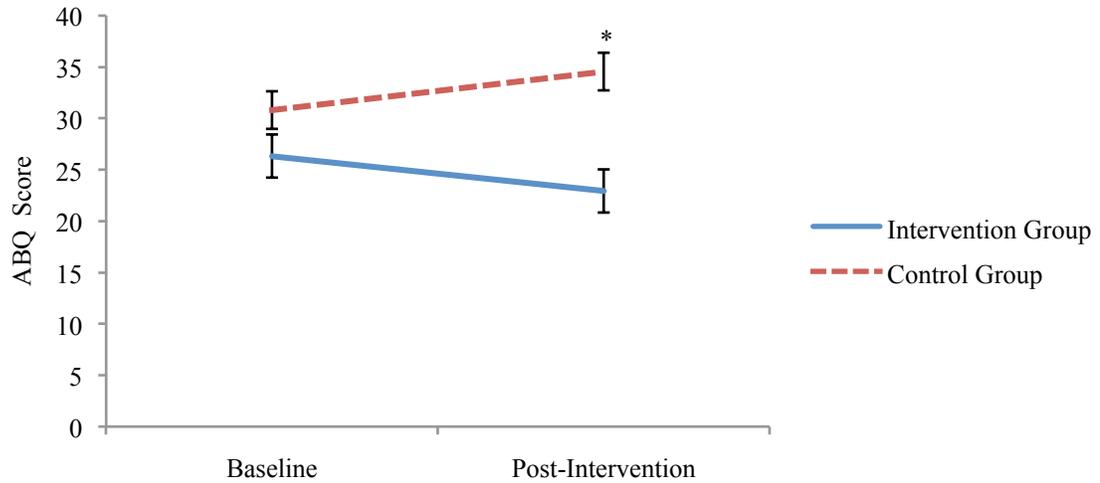


Figure 13: Athlete Burnout Questionnaire (ABQ) scores at baseline and post-intervention (* indicates $p \leq .05$)

4.3.3.2 2 (Sport) X 4 (Time) Repeated Measures ANOVA: POMS

A main effect of Sport was observed $F(1,32) = 4.92, p = .03$, but there was not a Time main effect or a Sport X Time interaction for the POMS scores (see Table 13).

POMS scores across the four measurement time points are shown in Figure 14.

Table 13
2 (Sport) X 4 (Time) Repeated Measures ANOVA Comparing POMS Total Mood Disturbance Scores at Baseline, After 2 and 4 Weeks into the Intervention, and Post-Intervention (N=33)

Source	SS	df	MS	F	p	Observed Power
Sport	454.45	1	454.45	4.92	.03	.58
Time	246.07	3	82.02	.785	.51	.21
Sport X Time	390.25	3	130.08	1.24	.30	.32
Error	10034.80	96	104.53			

Note: POMS=Profile Of Mood States

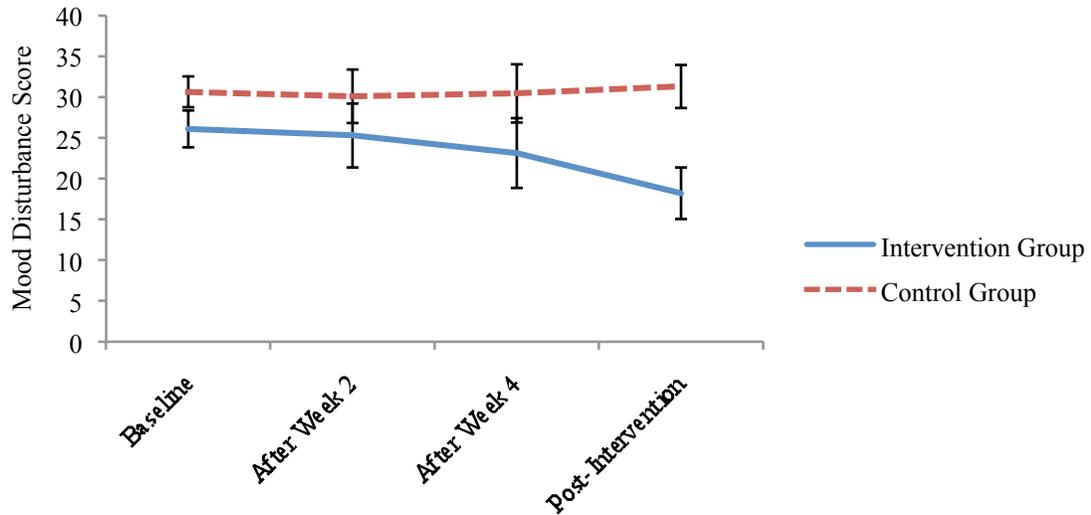


Figure 14: Total Mood Disturbance scores from the Profile of Mood States (POMS) at baseline, after week 2 and 4, and post-intervention

4.3.3.3 2 (Sport) X 4 (Time) Repeated Measures ANOVA: BDI

There was not a Time main effect for the BDI. There was a significant Sport main effect $F(1,32) = 6.55, p = .02$ and a significant Sport X Time interaction $F(3,99) = 2.67, p = .05$ (see Table 14). Follow-up comparisons demonstrated that there were significant differences in mean BDI scores between the Field Hockey and Soccer teams at baseline, after Week 2 and Week 4, and at Post-Intervention as shown in Figure 15.

4.3.3.4 2 (Sport) X 4 (Time) Repeated Measures ANOVA: CHIPS

There was not a Time or Sport main effect for the CHIPS. There was a significant Sport X Time interaction $F(3,99) = 2.90, p = .04$ (see Table 15). Follow-up comparisons demonstrated that there were significant differences in mean CHIPS scores between the Field Hockey and Soccer teams after Week 4, and at Post-Intervention (see Figure 16).

Table 14
 2 (Sport) X 4 (Time) Repeated Measures ANOVA Comparing BDI Scores at Baseline, After 2 and 4 Weeks into the Intervention, and Post-Intervention (N=33)

Source	SS	df	MS	F	p	Observed Power
Sport	165.94	1	165.94	6.55	.02	.70
Time	27.62	3	9.21	.84	.47	.23
Sport X Time	87.39	3	29.13	2.67	.05	.64
Error	1080.67	99	10.92			

Note: BDI=Beck Depression Inventory

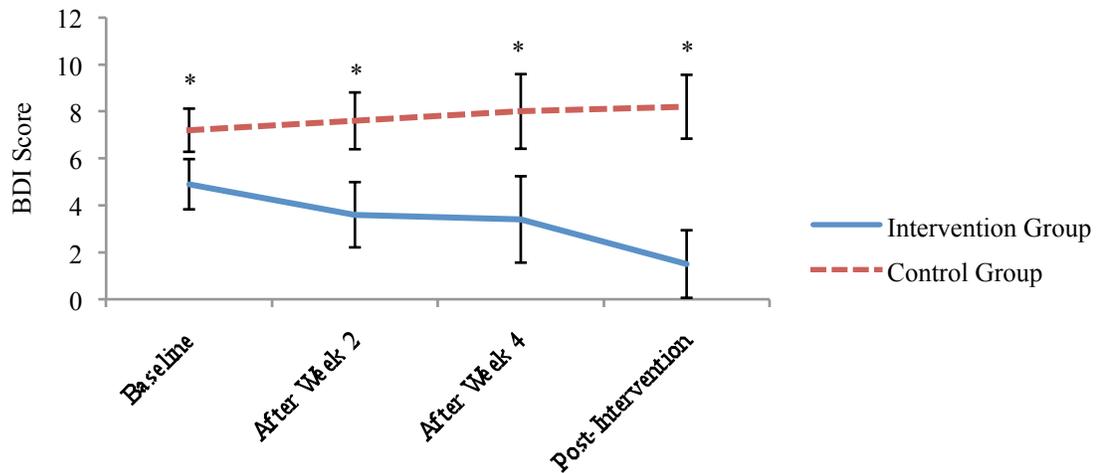


Figure 15: Beck Depression Inventory (BDI) scores at baseline, after week 2, after week 4, and post-intervention (* indicates $p \leq .05$)

Table 15
 2 (Group) X 4 (Time) Repeated Measures ANOVA Comparing CHIPS Scores at Baseline, After 2 and 4 Weeks into the Intervention, and Post-Intervention (N=33)

Source	SS	df	MS	F	p	Observed Power
Sport	270.40	1	270.40	2.61	.12	.35
Time	300.39	3	100.13	2.41	.07	.59
Sport X Time	361.07	3	120.36	2.90	.04	.68
Error	4110.90	99	41.52			

Note: CHIPS=Cohen-Hoberman Inventory of Physical Symptoms

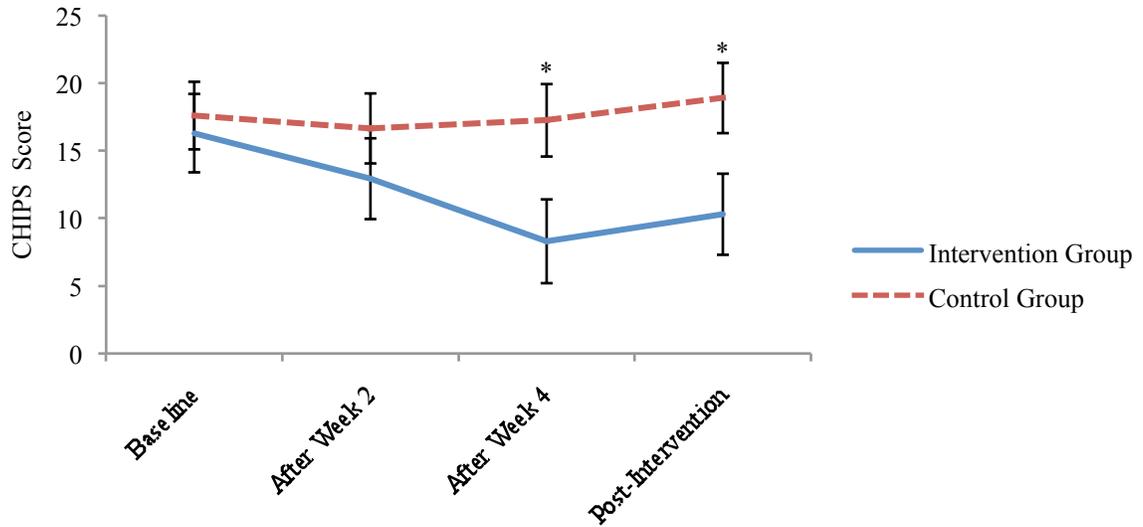


Figure 16: Cohen-Hoberman Inventory of Physical Symptoms (CHIPS) scores at baseline, after week 2 and 4, and post-intervention (* indicates $p \leq .05$)

4.3.3.5 2 (Sport) X 4 (Time) Repeated Measures ANOVA: PSS

There was not a Time or Sport main effect for the PSS. There was a significant Sport x Time interaction $F(3,96) = 3.71, p = .01$ (see Table 16). Follow-up comparisons demonstrated that there were significant differences in mean PSS scores between the Field Hockey and Soccer teams at Post-Intervention (see Figure 17).

Table 16

2 (Group) X 4 (Time) Repeated Measures ANOVA Comparing PSS Scores at Baseline, After 2 and 4 Weeks into the Intervention, and Post-Intervention (N=33)

Source	SS	df	MS	F	p	Observed Power
Sport	60.35	1	60.35	2.16	.15	.06
Time	39.15	3	13.05	1.11	.35	.29
Sport X Time	130.79	3	43.60	3.71	.01	.79
Error	1129.50	96	11.77			

Note: PSS=Perceived Stress Scale

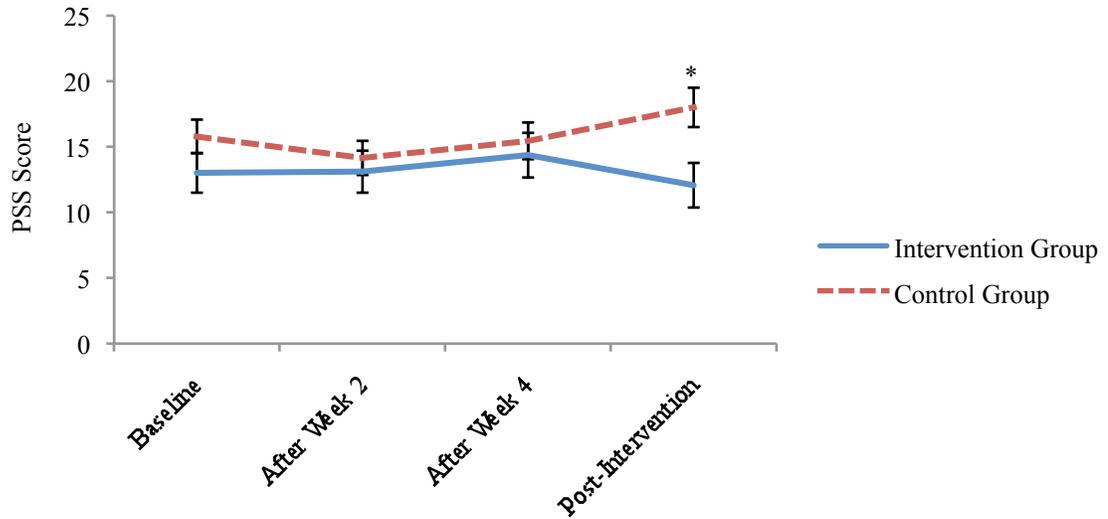


Figure 17: Perceived Stress Scale (PSS) scores at baseline, after week 2 and 4, and post-intervention (* indicates $p \leq .05$)

4.4 Injury and Illness Data

Injuries and illnesses were recorded from baseline testing to post-intervention data collection (see Table 17). No analyses were run based on these data because the sample size was too small. The control group experienced more injuries and illness than the intervention group over the course of the study.

4.5 Additional Analyses

Graphs were generated from the scores of the POMS subscales at different intervals of mental toughness in this study, and compared to the “iceberg profile” (see Figure 1). Average POMS subscale scores and the post-training mental toughness scores for each team in this study were plotted, shown in Figures 18 and 19.

Table 17
 Occurrences of Injury and Illness and Number of Days Missed for each Occurrence in the
 Intervention and Control Group (N=37)

Group	Participant	Injuries		Illness		
		Number	Days Missed	Number	Days Missed	
Intervention Group	F1					
	F2					
	F4					
	F5					
	F6					
	F7					
	F8	1	5			
	F10	1	3			
	F12					
	F13					
	F15					
	F16					
	F17					
	F18					
	U1	1	21			
	TOTAL	3	29	0	0	
	Control Group	S2	3	2,1,4		
		S4	1	1		
		S5	3	4, 10, 12		
S6		1	1			
S9		1	11			
S10		2	1,8			
S11						
S12						
S14				1	1	
S16						
S17		1	4			
S18		2	2,5			
S19		1	3			
S20						
S21						
S22		1	2			
S23		1	6			
S25	3	2,10,1				
S26						

Group	Participant	Injuries		Illness	
		Number	Days Missed	Number	Days Missed
Control Group	S27	1	2		
	S28				
	U2	1	2		
	TOTAL	22	94	1	1

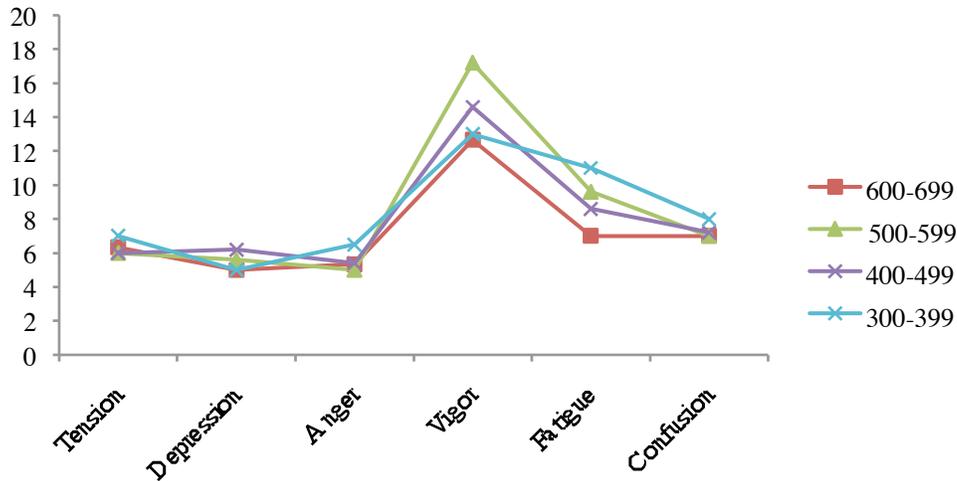


Figure 18: POMS profile plots for mental toughness scores in intervals in the intervention group post-intervention

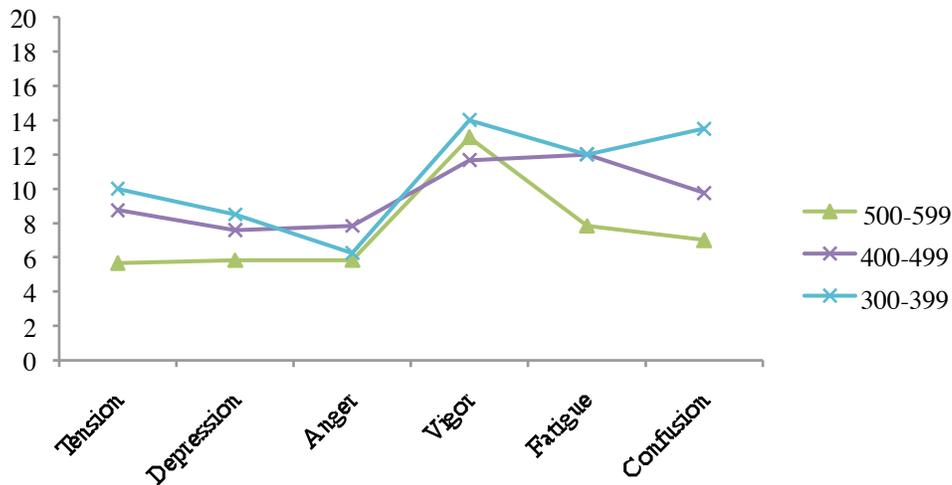


Figure 19: POMS profile plots for mental toughness scores in intervals in the control group post-intervention

CHAPTER 5

DISCUSSION

Undergoing high levels of physical training is necessary for elite athlete development. Athletes prepare for the demands of high-level competition by training to be able to perform at their best. However, when continued long term, this can predispose athletes to physical and psychological problems, illnesses, and injuries (Kuipers & Keizer, 1988). Smith's Cognitive-Affective Model of Athletic Burnout (1986) is a framework for understanding the relationships among stressors. Based on this model, the modification of an individual's interpretation of stressful situations could change the individual's evaluation of his/her ability to handle the physical and psychological stressors of training and competition. This, in turn, could modify the stress response, and could result in decreased susceptibility to illness, injury, overtraining syndrome, and burnout. The mental toughness training intervention used in this study targeted the component of cognitive appraisal in this model, or how a person interprets stressful situations, highlighted in Figure 20. Improved ability to handle stressors may reduce overtraining, which may result in a lower incidence of mood disturbances, physical symptoms, illnesses, and injuries in collegiate athletes.

The purpose of the current study was to a) evaluate the cross-sectional relationships between mental toughness and mood disturbances, athlete burnout, coping ability, depression, physical symptoms, and perceived stress in Division III athletes, b) implement a six-week online Mental Toughness Training Program, and c) evaluate the impact of the mental toughness training on changes in mood disturbances, athlete

burnout, coping ability, depression, physical symptoms, perceived stress, and mental toughness before, during, and after the intervention program. In this chapter, the results of this study will be interpreted and discussed, and compared with the literature. Each of the three hypotheses will be discussed separately. Limitations, study implications, and future directions will also be addressed.

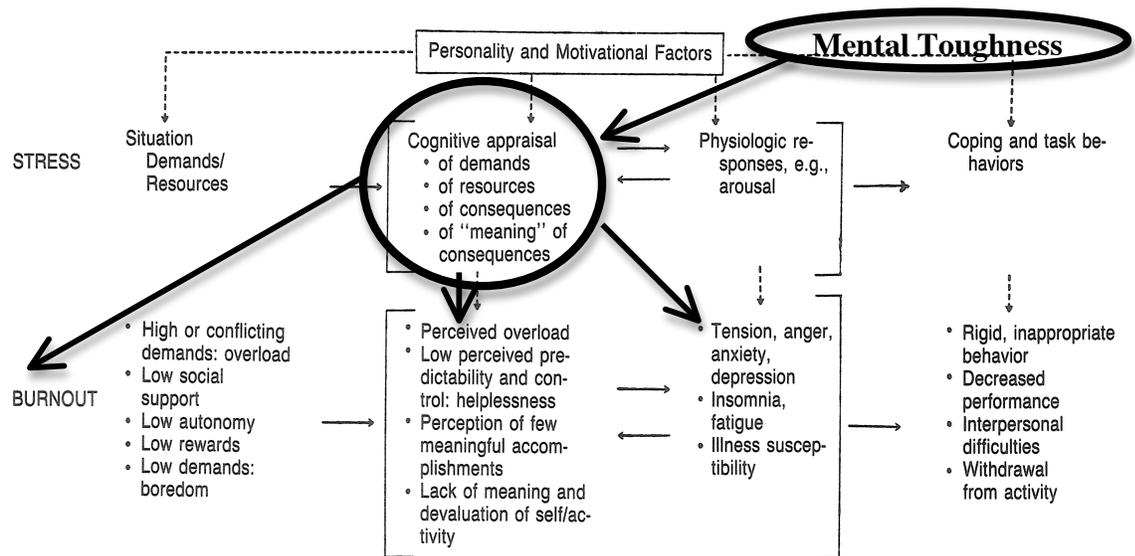


Figure 20: Modifying cognitive appraisal through mental toughness training in Smith's (1986) Cognitive-Affective Model of Athletic Burnout

5.1 Hypothesis #1 Discussion

Hypothesis #1: Consistent with the literature, baseline mental toughness will be negatively correlated with mood disturbances, athlete burnout, depression, physical symptoms, and perceived stress, and positively correlated with coping ability.

The results of the study partially supported Hypothesis #1. Higher levels of mental toughness were significantly associated with lower levels of mood disturbance,

athlete burnout, depression, and perceived stress at baseline. Mental toughness was not, however, significantly associated with physical symptoms.

5.1.1 Variables Correlated with Mental Toughness

In this study, mental toughness was associated with mood state and burnout at baseline. The correlation between mental toughness and mood state in this study was $\rho = -.51$ ($p \leq .01$), and the correlation between mental toughness and athlete burnout was $\rho = -.46$ ($p \leq .01$). The inverse relationship observed between mental toughness with mood state and burnout is consistent with previous research conducted among 145 Division I collegiate athletes (Welch, 2010) that used the same instruments to measure mental toughness (MeBTough), mood disturbance (POMS), and levels of athlete burnout (ABQ). Prior research showed that higher levels of mental toughness were moderately correlated with lower levels of mood disturbance ($r = -.46$, $p \leq .01$), and strongly correlated with lower levels of athlete burnout ($r = -.65$, $p \leq .01$; Welch, 2010). The difference in the strength of the correlations between these results may be reflective of the much larger sample size (approximately 100 more participants) of the study conducted by Welch (2010). The associations among the scores from these measures at baseline in this study are similar to the relationships found in the literature

Higher mental toughness scores were significantly correlated with lower perceived stress scores and lower depression scores from data collected at baseline. The relationship between mental toughness and depression in this study was of moderate strength ($\rho = -.49$, $p \leq .01$), and the relationship between mental toughness and perceived stress was strong ($\rho = -.53$, $p \leq .01$). Based on the framework of the Cognitive-Affective Model of Athletic Burnout (Smith, 1986), perceived stress should be dependent on the

cognitive appraisal of a situation. Therefore, perceived stress was expected to be negatively correlated with mental toughness levels, as mental toughness can modify cognitive appraisal (see Figure 21). Prior to this study, the relationship between mental toughness and perceived stress had not been demonstrated in the literature in athletes. It had been previously stated in the literature that a mentally-tough individual has the capacity to deal effectively with stressors, pressures, and challenges (Clough et al., 2002), which would again suggest that mental toughness and perceived stress would be associated. Depression is also part of the framework of the Cognitive-Affective Model of Athletic Burnout (Smith, 1986), and can be a physiological consequence of perceiving overload, or an imbalance of resources and demands (see Figure 21). Therefore, as expected, it was negatively correlated with mental toughness, a relationship also not previously addressed in the literature. Perceived stress and depression were associated with mental toughness, and fit within the framework of the Cognitive-Affect model (Smith, 1986).

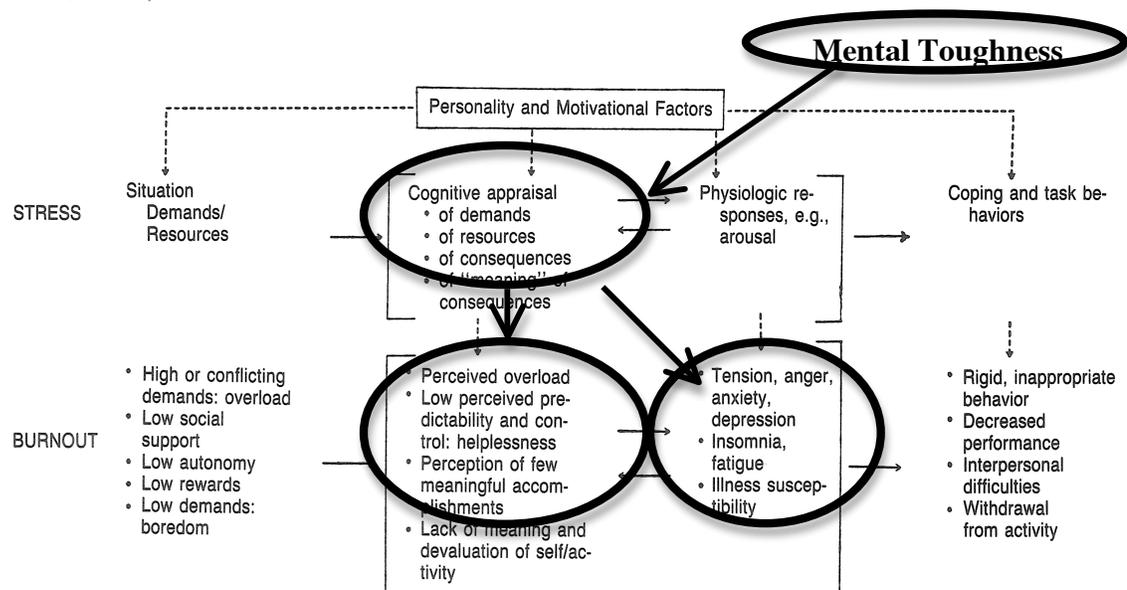


Figure 21: Depression and perceived stress in Smith’s (1986) Cognitive-Affective Model of Athletic Burnout

5.1.2 Variables Not Correlated with Mental Toughness

A cross-sectional relationship between mental toughness and physical symptoms at baseline was not found. It was originally hypothesized that there would be an association between these two variables, based on the Cognitive-Affective Model of Athletic Burnout (Smith, 1986). In the framework of this model, the stress response results in a physiological response, for example, arousal. Prolonged stress could lead to these physiological responses culminating into physical symptoms. As mental toughness can affect cognitive appraisal, it could mediate the stress response, and could affect the physiologic response. Additional support for a relation between mental toughness and perceived stress came from Clough and colleagues (2002) who stated that mentally-tough athletes have the ability to handle stressors better than their less mentally-tough counterparts. Therefore, athletes who are mentally-tough would be expected to be less bothered by physical symptoms.

However, a significant association between mental toughness and physical symptoms was not found in this study at baseline. This could have occurred because the mean score from CHIPS, the measure used to evaluate physical symptoms, at baseline was 16.6 ± 11.1 , with scores ranging from 1 - 40. The maximum score on the CHIPS is 132, thus the scores from CHIPS at baseline were low. Participants were not reporting many physical symptoms, or were reporting low severity of symptoms at baseline. Because these data were collected at the start of the season, it is possible that a significant correlation between the scores from the measures was not found because participants, regardless of mental toughness score, were reporting low levels of physical symptoms. It is possible that not enough symptoms were being experienced for symptom levels to vary

at different mental toughness levels. When the correlational analyses were conducted with scores from a different time point, the relationship between physical symptoms and mental toughness varied. At the end of the intervention program, towards the end of the season, higher mental toughness levels were significantly associated with lower levels of physical symptoms ($\rho = -.49$, $p \leq .01$).

5.1.3 Relationships Among Psychological Variables

Although the primary focus of this hypothesis focused on the relationship between mental toughness and the psychological variables, it should be noted that the relationships among mood state, athlete burnout, and perceived stress were consistent with expectations. The results from this study supported relationships among the psychological variables of mood state, athlete burnout, and perceived stress from prior research. A strong association between mood disturbance (measured by POMS) and athlete burnout (measured by ABQ) was found in this study ($\rho = .59$, $p \leq .01$). A previous study conducted in 145 Division I collegiate athletes also showed a strong relationship between mood disturbance and athlete burnout ($r = .64$, $p \leq .01$; Welch, 2010), using the same measures, POMS and ABQ respectively. In this study, higher burnout scores (measured by ABQ) were significantly positively correlated with higher levels of perceived stress (measured by PSS) moderately ($\rho = .44$, $p \leq .01$). Raedeke and Smith (2004) found that higher burnout scores, measured by the ABQ, were significantly correlated with higher levels of perceived stress, measured by the PSS, in 244 teenaged senior level elite swimmers ($r = .63$, $p \leq .01$).

Other findings from the correlational analysis at baseline were significant. Depression was strongly associated with perceived stress ($\rho = .59$, $p \leq .01$). Depression was

also strongly associated with athlete burnout ($\rho=.50, p\leq.01$). These relationships had not been previously reported in athletes.

5.1.4 Variables Correlated with Physical Symptoms

While a relationship between mental toughness and physical symptoms at baseline was not found in this study, physical symptom scores were associated significantly with mood state, depression, athlete burnout, and perceived stress. A moderate correlation was found in the current study between the physical symptom scores, measured by CHIPS, and perceived stress, measured by PSS ($\rho=.45, p\leq.01$). In previous research, physical symptoms and perceived stress, measured by CHIPS and PSS respectively, were shown to be strongly correlated ($r=.54, p\leq.01$; Pbert, Doerfler, & DeCosimo, 1992). This was found in a study conducted by Pbert and colleagues (1992) involving intervention programs in two clinical populations: a cardiac rehabilitation group and general health promotion group. Both men and women ($N=100$) with a mean age of 39.0 years participated.

In the current study, a strong correlation was found between physical symptom scores and depression ($\rho=.61, p\leq.01$). In prior research, physical symptom scores have also been correlated with depression, measured by the BDI, ($r=.34, p\leq.01$; Lawler-Row & Piferi, 2006). This association was found in a study conducted by Lawler-Row and Piferi (2006) in older adults ($N=425$) from the general population with a median age of 59.5 years.

The results of the current study show that physical symptom scores were not correlated significantly with any of the subscale scores of the POMS, but were significantly moderately correlated with total mood disturbance, the combined score of

the POMS subscales ($\rho=.40, p\leq.01$). In prior research, scores from CHIPS have been correlated positively with all six subscales of the POMS questionnaire (Lawler & Younger, 2002). In a study conducted by Lawler and Younger (2002) with 80 men and women from the general population, physical symptom levels were strongly associated with higher scores from all subscales of POMS ($r=.34$ to $r=.73, p\leq.01$). A correlation between total mood disturbance and physical symptoms was not reported by Lawler and Younger (2002). It is important to note that these previously established correlations in the literature were not from studies conducted in athletes.

5.1.5 Hypothesis #1 Discussion Summary

The results from cross-sectional data collected in this study show that higher levels of mental toughness are significantly associated with lower levels of mood disturbance, athlete burnout, depression, and perceived stress. The associations between mental toughness and the psychological variables of mood state, depression, athlete burnout, and perceived stress, are consistent with the Cognitive-Affective Model of Athletic Burnout (Smith, 1986). This supports the identification of mental toughness as a modifiable variable that could alter cognitive appraisal, the mediating component between the situation (demands vs. resources) and the negative or positive outcomes. Thus, the next steps in this study were to first implement a six-week mental toughness training program, and then to determine if it can 1) increase mental toughness, and 2) attenuate negative psychological variables.

5.2 Hypothesis #2 Discussion

Hypothesis #2: The Mental Toughness Training Program will result in increased levels of mental toughness as compared to the control group where no changes in mental toughness levels are expected.

5.2.1 Effectiveness of the Mental Toughness Training Program

The results of the study supported Hypothesis #2 and showed that the Mental Toughness Training Program significantly increased mental toughness levels in the participants in the intervention group when compared with the control group from baseline to post-intervention testing. Mental toughness levels continued to rise after the program had ended, as demonstrated by the increase in scores of the MeBTough between post-intervention and follow-up data collection. This increase after the conclusion of the program was significant, showing that the Mental Toughness Training Program had continued effects on mental toughness levels. Additionally, baseline scores and scores at the follow-up period (three weeks after the conclusion of the training program) were significantly different in the intervention group ($F(2,70)=3.25, p\leq.05$), supporting that the program had significantly impacted mental toughness levels even after its conclusion. Mental toughness levels in the control group did fluctuate from baseline to post-intervention, but after the follow-up period, returned to baseline levels. These results showed that the program had both long-term and continued effects on mental toughness levels, as measured by the MeBTough, and that the program was effective in this population.

This is the first occasion that this six-week, personalized, online mental toughness training intervention has been implemented in a research study. Therefore, there are no

comparisons to be made between the results of this intervention and previous research. In this study, a 3.9% increase in mental toughness scores was seen in the intervention group, or a 17-point increase in MeBTough scores. At baseline, the training group scores differed from the overall mean by 19.6 points, and post-intervention, differed from the overall mean by 39.9 points, further demonstrating this increase. Additionally, this research has demonstrated that the training intervention resulted in mental toughness levels continuing to rise after the completion of the program, with MeBTough scores increasing by approximately 44 points higher than post-intervention mental toughness scores.

The Mental Toughness Training Program is a six-week, online, personalized intervention involving daily psychological skills training. Participants were given one exercise to complete every day for the duration of the program. The number of exercises completed in the intervention program was strongly associated with the improvement or change in mental toughness score ($\rho=0.60, p\leq.05$). This relationship demonstrated that those participants who completed more exercises in the program had greater improvements in mental toughness scores than participants who completed fewer. This supports the hypothesis, and shows that the six-week, online Mental Toughness Training Program is effective at increasing mental toughness levels.

5.2.2 Challenges Associated with Intervention Implementation

As with all intervention programs, challenges arose with the implementation of the Mental Toughness Training Program. Participant compliance, tracking participant compliance, and the format of the training program were three areas that caused challenges with the implementation of this training intervention.

5.2.2.1 Participant compliance

As with any intervention, participants could not be forced to adhere to the program or made to participate consistently. All participants were encouraged to complete the Mental Toughness Training Program exercises by research administrators and coaches, and reminder notices to complete the daily exercise were posted in locker rooms. Raffles were held weekly for those individuals who had completed six out of the seven exercises for that week as an additional incentive to participate consistently. However, some participants did not complete training intervention exercises on a regular basis, and some did not complete any exercises.

5.2.2.2 Problems with Tracking Compliance

To track program compliance, the number of sessions completed in the online performance journal on the intervention program website were counted for each athlete in the intervention group. In 40 out of the 42 exercises given to the participants, they were asked to either complete an exercise and write an entry about it in the performance journal, or post an entry in the performance journal recording their progress in the program. Therefore, counting the number of entries in the performance journal should have been an accurate way to track how compliant the participants were with the training program. The advantage of using this method was that a researcher could log into the study website and count the number of entries, rather than having participants keep track and self-report their progress to the researcher. The disadvantages to using this method were that it was time consuming to count how many entries each participant had posted to the journal, and participants did not always indicated which exercises they were completing.

There were a few reasons why the total number of completed program exercises counted may not have been an accurate representation of how involved a participant was in the program. Some participants who fell behind in the program attempted to catch up by combining exercises from different days together into a single journal entry, and then did not indicate which exercises they were completing in that entry. This made it difficult to determine which exercises they were completing and how many times to count this combined entry towards their total number of exercises completed. This could have led to the possibility of both an underestimation or overestimation of sessions completed. Some participants commented that it was easier to think about what they would put in their journal entry rather than actually creating an entry in their journal, which would translate to an underestimation of the total sessions completed. There were also qualitative differences in entries posted, with some participants entering large quantities of detailed information in their performance journal, and others posting a few sentences. It is also possible that a participant could have skipped an exercise but continued to repeat her affirmation statement to herself, possibly contributing to improving her mental toughness even though there was no record of completing the exercise in the journal. In some stages of the Mental Toughness Training Program, exercises were repeated over a few days. Participants may have completed an exercise on the first day and felt that they had mastered it, and may have not continued to complete that exercise each following day.

Finally, as all the participants in the intervention group were part of the same team, regardless of how many sessions they each actually completed individually, intervention group participants were not independent of each other. Some of the athletes

spearheaded a group mental toughness activity, where each member of the team wrote her personal affirmation statement on her arms before a few games. If a participant had not done any exercises in the training program, this group activity would require them to complete at least one exercise in the program: creating an affirmation statement. While there may be no record of this in a participant's performance journal, this activity was completed and done on three separate occasions as a group.

5.2.2.3 Format

The Mental Toughness Training Program was administered online, and exercises were emailed daily in the morning to each participant. This was to ensure that each participant received one exercise per day and that the exercise was targeted to that individual's specific strength or weakness. The email also served as a reminder to complete the exercise for that day. However, this system operates under the impression that participants would be checking their campus emails daily. During the administration period, there were some Internet outages on campus, and on those occasions, participants did not receive their emails until later in the day. This could have affected participant adherence to the program.

5.2.3 Mental Toughness Training Program Feedback

An evaluation form was given to all participants (N=18) in the intervention group to provide feedback on the training program, and asked the participants to comment on the program exercises, length, and format. Fifteen participants completed this form.

5.2.3.1 General Feedback

The majority of the participants in the intervention group who completed the training program evaluation commented that they found the program to be a worthwhile

experience. A common complaint was that it was difficult to balance physical training, competition, academic responsibilities, and the Mental Toughness Training Program. In general, the participants felt that if they had more time during the fall semester (during which the program was administered) to allocate towards completing the daily exercises they would have put more effort into the program. Based on the feedback received, the affirmation statement was the activity that the participants found most useful.

5.2.3.2 Length

Majority of the participants commented that they felt the length of the intervention program and the number of exercises was adequate. However, few completed all the exercises in the program. In future, an “off” or “rest” day could be added to the program, similar to an “off” or “rest” day in their physical training schedules. This would allow participants to either catch up on the exercises missed or take a break from the program. Some comments were made about the duration of the program being too lengthy and that some of the exercises were repetitive. Seven exercises per week over six weeks may be too great a number for student athletes to complete successfully. If implemented again in a Division III population, the Mental Toughness Training Program could be modified to have five or six exercises per week instead of seven, and be shortened to four weeks instead of six, spending one week on the strength and three weeks on the weakness.

5.2.3.3 Format

A few participants indicated that the email format of the program was difficult for them to follow. Some participants indicated that the emails would get mixed in with the other emails in their inbox and that they would forget to read them. Another comment

was that some of the emails were too long and tedious to read. In the future, emails or exercises that involve a lot of reading could be turned into a reading assignment.

Participants could be given a reading assignment as an exercise on one day, and then be given an exercise to complete the next day based off of the information or instructions provided in the reading.

The performance journal format could also be improved. When the program was administered in this study, the online performance journal was set up similar to a blog. Everything written at one time point and then submitted was counted as the entry for that day. A section could be added to the journal to enter the program day number corresponding to the exercise being entered. Alternatively, links could be added for each “day” in the performance journal for participants to click on and then record their entry for that day. The latter would also make it easier to count how many entries participants had done to track program compliance.

5.2.4 Hypothesis #2 Discussion Summary

The results of this study demonstrated that the Mental Toughness Training Program, a personalized online training program created using an individual’s baseline scores on the MeBTough (Mack & Ragan, 2008), increased levels of mental toughness in Division III female athletes. Mental toughness levels increased immediately following the program, and continued to increase when measured three weeks after the program was completed at the conclusion of the competitive season. The results show that the Mental Toughness Training Program does have a continued effect on mental toughness levels. The Mental Toughness Training Program had previously been implemented in Division I populations successfully (Measurement LLC, 2010), but had not been tested

in a research study, and had never been used in Division III athletes. The results showed that this program is a successful intervention in Division III athletes, and suggest that the Mental Toughness Training Program may also be an effective intervention in other athletic populations. The results also demonstrate that an online psychological skills training program is an effective mode of intervention in collegiate level athletes. However, the program was administered in female athletes in this study and should be repeated in male athletes to further test if implementation is successful in non-elite athletes.

5.3 Hypothesis #3 Discussion

Hypothesis #3: Improved mental toughness resulting from the training will attenuate levels of mood disturbances, athlete burnout, depression, physical symptoms, and perceived stress in the training group as compared to the control group.

The results of this study partially supported Hypothesis #3. The mental toughness training led to an attenuation of levels of athlete burnout, depression, physical symptoms, and perceived stress in participants in the intervention group when measured at different time points during and after the season. These variables were measured at baseline, 2 weeks into the intervention program, 4 weeks into the program, and post-intervention. Levels of athlete burnout were attenuated when measured at baseline and post-intervention. Levels of depression, physical symptoms, and perceived stress were attenuated when measured at baseline, 2 weeks into the intervention, 4 weeks into the intervention, and post-intervention. Differences in scores of mood state were not significant across the timepoints.

5.3.1 Variables Attenuated by Mental Toughness Training

This study showed that the Mental Toughness Training Program attenuated levels of burnout, depression, physical symptoms, and perceived stress across different time points throughout the season. Based on the Cognitive-Affective Model of Athletic Burnout (Smith, 1986), the framework used for this study, modifying cognitive appraisal through mental toughness training would reduce the imbalance of demands and resources, reducing burnout, depression, the occurrence of physical symptoms, and perceived stress (see Figure 20). This is the first study to implement the Mental Toughness Training Program in Division III athletes and collect longitudinal data on psychological and physical variables during the intervention. Therefore, there are no studies in the literature to compare the findings from this study for Hypothesis #3.

5.3.2 Variables Not Attenuated by Mental Toughness Training

It was expected that the training intervention program would significantly attenuate levels of mood disturbance, which was not found in this study. Based on the Cognitive-Affective Model of Athletic Burnout (see Figure 20), modifying mental toughness levels would have effected cognitive appraisal, and resulted in lower levels of mood disturbance from the optimal “iceberg” POMS profile (see Figure 1). The results of Hypothesis #1 also supported this, as mental toughness had a significant negative relationship with mood state, demonstrating that the variables were associated. It is possible that mood disturbances were not attenuated because of the wide range of scores seen in from the POMS. The range of scores from the POMS in the intervention group at all time points was much wider than the range of some of the other measures. It is possible that the wide range of scores influenced the results, as the mean total mood

disturbance scores in the intervention group did decrease over the six weeks. However, this decrease was not significant.

5.3.3 Hypothesis #3 Discussion Summary

Mental toughness training attenuated levels of athlete burnout, depression, physical symptoms, and perceived stress. As these psychological and physical variables are predictors of illness and injury, this suggests that mental toughness training may be able to reduce the number of injuries or illnesses experienced by athletes. Consistent with Smith's (1986) Cognitive-Affective Model of Athletic Burnout, by balancing the demands placed on athletes and resources available to them to deal with this, the negative outcomes associated with burnout and overtraining may be avoided or reduced.

5.4 Injury and Illness Rates

In addition to the primary outcome measures of this study, the Athletic Training department at the institution where this study was conducted kept records of the occurrence of illness and injury during the study. The control group experienced more injuries than the training group, and also had more days missed due to injury and illness. The control group had 22 injuries and missed 94 days due to injury, and one illness and one day missed due to that illness. The intervention group had three injuries, and 29 days missed due to injury. The sample size used in this study was not large enough to make conclusions based on these injury and illness data collected, and it is unknown whether the intervention group sustained fewer injuries and illnesses than the control group due to the intervention program. The injury rates between groups may have also differed because the groups were not playing the same sport. Making conclusions based on injury

and illness data was not one of the purposes of this study, but this data was collected because of its availability, its potential for serving as pilot data for future research, and to see if any interesting “trends” resulted from it. The control group experienced more injuries towards the end of the season than the intervention group, which experienced fewer. Without comparing this data to injury data from previous years, no conclusion can be made about the effectiveness of the program in reducing injuries or illnesses directly in the intervention group. Based on the Smith (1986) model, variables that mental toughness were associated with and that mental toughness training attenuated have been associated with illness and injuries. Therefore, the findings from this study support an indirect relationship between injury/illness and mental toughness.

5.5 Mental Toughness Levels and Mood State

Graphs were generated from the scores of the POMS subscales at different intervals of mental toughness scores in this study, and compared to the “iceberg profile” (See Figure 1). Average POMS subscale scores and the post-training mental toughness scores for each team in this study were plotted in Figures 18 and 19. Those results can be compared with POMS profile plots associated with different levels of mental toughness from a previous study done in 145 Division I athletes (Welch, 2010) in Figures 22 and 23. The POMS profile plots from the literature show that as mental toughness scores decline, the POMS profile plot deviates further from the “iceberg profile”. At lower intervals of mental toughness, the POMS profile plot resembles the inverted iceberg profile associated with overtraining (see Figure 2). In Figure 22, POMS profile plots from the intervention group post-intervention are compared with plots from previous

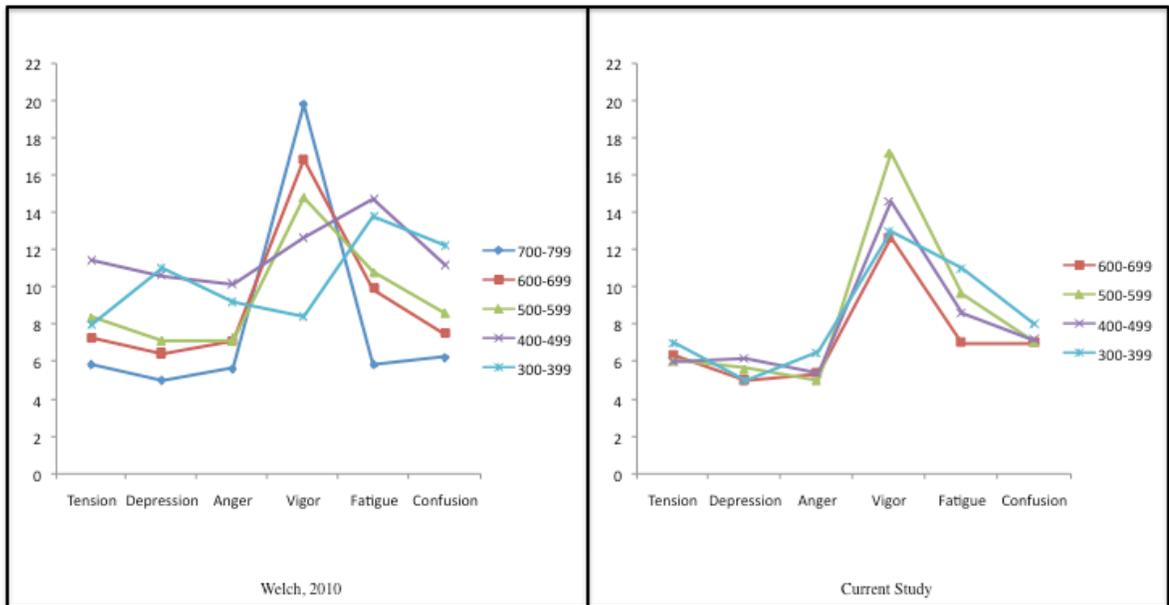


Figure 22: Comparing POMS profile plots for mental toughness scores in intervals from the literature (Welch, 2010) to the intervention group post-intervention

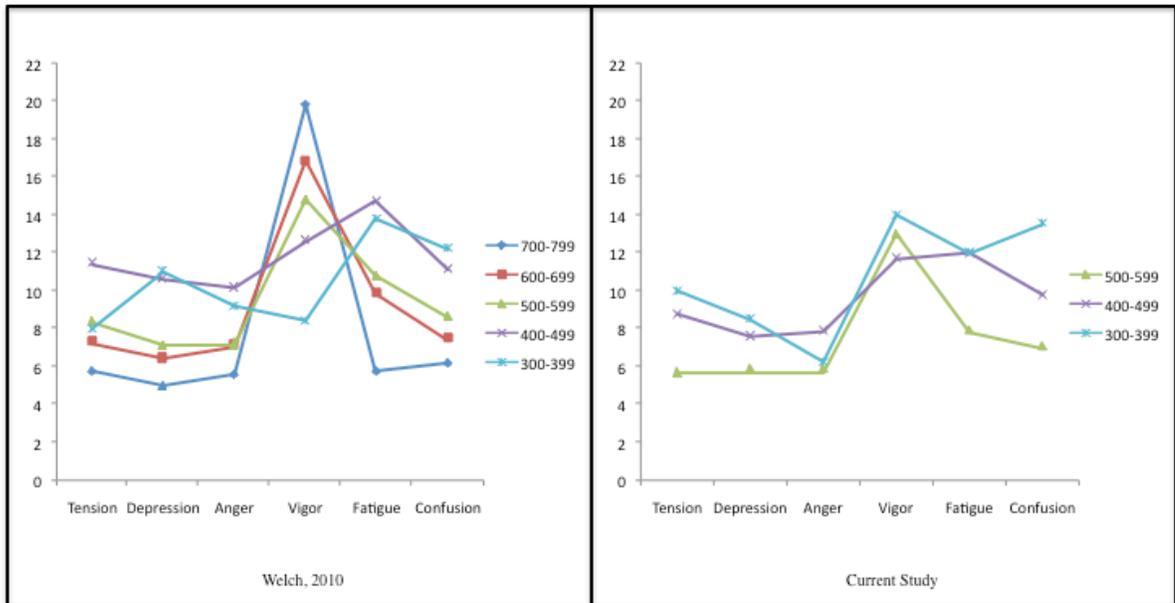


Figure 23: Comparing POMS profile plots for mental toughness scores in intervals from the literature (Welch, 2010) to the control group post-intervention

research (Welch, 2010). The profiles for the majority of the subgroups follow the same general pattern of increased deviation from the ideal profile as mental toughness levels decrease. The deviations from the ideal profile in the intervention group are less pronounced than the deviations seen in the literature. This finding is likely due to the difference in sample sizes between the current study (N=15 in the intervention group) and the prior study (N=145). In Figure 23, POMS profile plots from the control group post-intervention are compared to plots from previous research (Welch, 2010). The graph generated for the control group generally follows the pattern of increased deviation from the “iceberg profile” as mental toughness scores decrease. These graphs further support the relationship between mental toughness and mood state that was found at baseline in this study.

5.6 Implications

These results have noteworthy implications in the field of sport psychology. This study showed that there are relationships between mental toughness and the psychological variables of mood state, athlete burnout, depression, and perceived stress. The Mental Toughness Training Program was found to be an effective intervention in Division III athletes. This study is novel in that it not only measured changes in mental toughness after implementation of the training program, but it also examined the program’s impact on changes in important psychological and physical outcomes related to injury and illness. It was also demonstrated that psychological skills training can mediate levels of negative psychological and physical variables that have been associated with illness and injury, and provides another potential avenue for reducing illness and

injury susceptibility. If mental toughness training can attenuate variables associated with injury and illness, then the training may be able to reduce illness and injury rates directly.

The results of the study supports Smith's (1986) model of athlete burnout. It showed that mentally-tough athletes have a more positive mood state, reduced levels of athlete burnout, lower levels of depressive symptoms, and would perceive less stress than an athlete with lower levels of mental toughness. Based on the model, lower levels of perceived demands, or higher levels of resources to cope with demands, would lead to less occurrences of burnout. Illnesses and injuries can increase demands placed on the athlete, and increase susceptibility to burnout. By reducing illness and injury susceptibility, an athlete may be less likely to experience burnout.

5.7 Study Limitations

There were several limitations of this study. Baseline testing took place during training camp for both the intervention and control groups. In the control group, several athletes were in the process of trying out for the final roster, and the added stress of trying to make the team may have affected the results. The entire intervention group already knew they had made the final roster.

While data was collected at the same time points for all the participants in both groups, exam schedules and stress levels varied individually, and could not be controlled for. A participant with a heavy academic load during a data collection time point could have answered items more negatively than a participant who did not have added academic stress. General life stressors could have varied between participants at the same points.

Data were collected for this study primarily from self-reported measures. Self-reported measures have limitations, and it is possible that individual interpretations and perceptions of items on the questionnaires may have affected responses. Because the same measures were used multiple times in the study, participants may have memorized items on the questionnaires and then responded the same way each time.

The results of the study also have limited applicability because of the population used. Female Division III athletes at a private, academically elite institution would not be expected to have the same level of mental toughness as elite Division I athletes, or on the opposite end of the spectrum, the general active population. While Division III athletes could be closer to the general population than Division I athletes, psychological and physical variables may have different associations with mental toughness and may be influenced differently by an intervention program in the general population.

5.8 Future Directions

In this study, participants were followed-up after the conclusion of the competitive season. However, long-term assessment was not incorporated into the study design. In the future, another study could be conducted involving long-term follow up with participants of the Mental Toughness Training Program to see if effects of the program last over months or years.

Because this was the first study to evaluate the impact of the training program on psychological variables, the protocol should be repeated in athletic populations other than Division III athletes. The study should be repeated in male athletes or athletes in other divisions to determine its effectiveness across different athlete populations. The training

program also needs to be conducted with athletes in other team sports, for example in hockey or football, and among athletes in individual-level sports, such as swimming or track and field.

This study took place during the competitive or traditional season for the teams involved. It would be interesting to see if the same associations between measures existed in the non-traditional season, or if the Mental Toughness Training Program is effective when administered in the off-season when athletes are not specifically training for their sport.

The measures could be changed if this study was repeated. It was difficult to analyze the relationship between mental toughness and coping in this study due to the measure of coping used. The BriefCOPE questionnaire (Carver, 1997) did not have a total score. The 28-item questionnaire had 14 subscales with two items each and provided scores for each subscale to indicate the individuals' use of that particular coping strategy. However, no formula or method existed to calculate a total coping score. Each subscale score had to be analyzed separately. The data from the BriefCOPE was used in the correlational analyses for Hypothesis #1 and a significant correlation was found between only one subscale of the BriefCOPE (Self-Blame) and mental toughness. For this reason, the BriefCOPE was not included in further analyses in this study, and in the future a coping questionnaire with a total score would provide more useful information for this type of study. If this study was repeated, a more appropriate coping questionnaire that provides a total or overall score could be used to support the hypothesis that mental toughness and coping are associated. The psychological variables of mood state, depression, perceived stress, and coping, and physical measures of physical symptoms

were used in this study. In future, other psychological variables, such as emotional support, locus of control, or anxiety, could be measured to establish or support associations between these variables and mental toughness, and determine if a mental toughness training intervention attenuates levels of these psychological variables.

The mental toughness training intervention used in this study was individualized, and was based on participants' strengths and weaknesses, as determined from the results of the MeBTough. This study could be repeated in a randomized control trial format comparing the personalized Mental Toughness Training Program and a generic, non-individualized mental toughness program and its impact on mental toughness levels. This would help to determine if the program is effectively targeting participants' strengths and weakness, and if mental toughness levels are increasing due to improvements in strengths and weakness, or non-specific overall improvement.

5.9 Conclusion

Intense physical training is an inherent part of being an elite athlete, and is meant to improve performance through training adaptations (Bompa, 1983). However, insufficient recovery time and physical and psychological stressors associated with training over the long-term can result in overtraining and burnout, and results in increased susceptibility to injuries, illnesses, and psychological conditions (Kuipers & Keizer, 1988). The Cognitive-Affective Model of Athletic Burnout (Smith, 1986) demonstrates the consequences of the imbalance in demands placed on athletes and the resources available to them to cope. The results of long-term imbalance between demands and resources can result in psychological problems, overtraining, burnout, illness, and injury

(Kuipers & Keizer, 1988; Raedeke, 1997). However, the progression to these negative outcomes is dependent on cognitive appraisal, or how one interprets a situation. Mental toughness is a modifier of cognitive appraisal, and therefore, modifying mental toughness levels would impact psychological variables associated with negative health outcomes.

In this study, it was found that higher levels of mental toughness were associated with lower levels of mood disturbance, athlete burnout, depression, and perceived stress in Division III athletes. A six-week, online Mental Toughness Training Program (Measuremental LLC, 2010) was successfully implemented in this same population and was effective at increasing mental toughness levels. This intervention program attenuated levels of athlete burnout, depression, physical symptoms, and perceived stress. The results of the study showed that mental toughness is associated with psychological variables that are predictors of illness and injury in athletes. The Mental Toughness Training Program was able to mediate levels of variables associated with illness and injury. Mental toughness training, therefore, may have the potential to reduce overtraining, burnout, illness, and injury in Division III collegiate athletes.

APPENDICES

Appendix A – INFORMED CONSENT DOCUMENTS

Appendix B – STUDY INSTRUMENTS

APPENDIX A

INFORMED CONSENT DOCUMENTS

- A1. Consent Form for Participation in a Research Study
- A2. Parental Consent Form for Participation in a Research Study
- A3. Assent Form for Participation in a Research Study

A1. Consent Form for Participation in a Research Study

Consent Form for Participation in a Research Study

University of Massachusetts Amherst

Principal Investigators: Aisha Visram ATC, Erin Snook PhD
Study Title: Impact of Mental Toughness Training on psychological and physical predictors of illness and injury

1. WHAT IS THIS FORM?

This form is called a Consent Form. It will give you information about the study so you can make an informed decision about participation in this research study.

2. WHO IS ELIGIBLE TO PARTICIPATE?

You have been asked to participate in this study because you are a healthy female athlete on the soccer or field hockey team and are of ages 18-23 years of age. Participants should be medically cleared as per NCAA procedures to participate in varsity sport in the 2011-2012 season.

Participation in this study is voluntary.

3. WHAT IS THE PURPOSE OF THIS STUDY?

The purposes of this research study are 1) to determine if there are associations between mental toughness levels and mood disturbances, burnout, stress, coping ability, depression, and physical symptoms experienced, 2) to evaluate the effectiveness of a Mental Toughness Training Program at increasing mental toughness levels in Division III athletes, and 3) to compare levels of mood disturbances, burnout, stress, coping ability, depression, and physical symptoms experienced before, during, and after the Mental Toughness Training Program. This will provide information not only about improving mental toughness in Division III athletes, but also about what other variables may affect and be affected by mental toughness in this population.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

The study will take place over the fall competitive season. The study will take place at the college at the start of the 2011 training camp in August. The time commitment for the study will depend on whether you are assigned to the intervention or control group. Both groups will spend 30-45 minutes completing questionnaires at the beginning and end of the study period, and at the end of the competitive season. All participants will be asked to fill out questionnaires on two occasions midway through the study, which will take 15-30 minutes each time. In addition, participants in the intervention group will complete daily activities requiring 10-15 minutes per day for 6 weeks.

5. WHAT WILL I BE ASKED TO DO?

The procedure for this research study is as follows:

1) The first part involves filling out questionnaires relating to various concepts in sports psychology. You will be asked to fill out questionnaires about demographic information, mental toughness, athlete burnout, mood state, depression, perceived stress, coping ability, and physical symptoms. These questionnaires will be fairly straightforward, and will ask you to evaluate yourself in various areas. This process should take 30-45 minutes to complete. Over the course

of the study, you may be asked to fill out some of these questionnaires again.

2) After filling out these questionnaires, you will be assigned to either the training group or control group. Participants in the training group will be enrolled in an online Mental Toughness Training Program, lasting 6 weeks. This program will ask you to complete activities daily, such as writing a small entry in a journal, requiring 10-15 minutes per day.

3) During the study period, you will be asked to fill out questionnaires on two occasions on mood state, depression, perceived stress, coping ability, and physical symptoms. This should take 15-30 minutes to complete.

4) After completing the 6 week training program, you will be asked to fill out questionnaires on mental toughness, athlete burnout, mood state, depression, perceived stress, coping ability, and physical symptoms. This should take 30-45 minutes to complete.

5) At the end of the competitive season, you will be asked to fill out the above questionnaires for one final time.

6) At the conclusion of the competitive season, the control group will be given the opportunity to take the Mental Toughness Training Program.

6. WHAT ARE THE BENEFITS OF BEING IN THIS STUDY?

There are potential benefits to participating in this study. Since the Mental Toughness Training Program is designed to improve levels of mental toughness, after completing the training program participants may have higher levels of mental toughness, which may improve sport performance.

Your participation may help with the improvement of the Mental Toughness Training Program for use in Division III athletes. It will also aid in the understanding of mental toughness and its relationship with other psychological variables.

7. WHAT ARE THE RISKS OF BEING IN THIS STUDY?

There are minimal risks associated with being involved in this study. You may experience negative feelings when filling out questionnaires asking you to evaluate different aspects about yourself, but these feelings should be temporary. You may experience some fatigue filling out questionnaires or completing the Mental Toughness Training Program. You may experience some inconvenience when being asked to complete activities for the Mental Toughness Training Program. However, the training program can be completed at your own pace and at a time of your choosing each day to minimize the amount of inconvenience you will experience.

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

The following procedures will be used to protect the confidentiality of your study records. The researchers will keep all study records (including any codes to your data) in a secure location in a locked file cabinet, and only the researchers will have access to the data. Records will be labeled with a code. A master key that links names and codes will be maintained in a separate and secure location. Data will be kept for 7 years. All electronic files (e.g., database, spreadsheet, etc.) containing identifiable information will be password protected. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research staff will have access to the passwords. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and you will not be identified in any publications or presentations. Your results will not be shared with other athletes, coaches, athletics staff, etc.

9. WILL I RECEIVE ANY PAYMENT FOR TAKING PART IN THE STUDY?

Participants will not directly be receiving any payment for taking part in this study. However, they will receive the opportunity to take the Mental Toughness Training Program, which normally costs \$199, for free. Both the intervention and control groups will be eligible to win prizes for completing certain sections of the study. There will be periodic raffles with prizes for

participants in the intervention group for completing certain sections of the training program.

There will be periodic raffles with prizes for participants in the control group for participating in filling out questionnaires. Prizes include restaurant vouchers and movie tickets. There will be no cost to you to participate in the study.

10. WHAT IF I HAVE QUESTIONS?

Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact Aisha Visram at avisram@kin.umass.edu or Dr. Erin Snook at esnook@kin.umass.edu. If you have any questions concerning your rights as a research subject, you may contact the University of Massachusetts Amherst Human Research Protection Office (HRPO) at (413) 545-3428 or humansubjects@ora.umass.edu.

11. CAN I STOP BEING IN THE STUDY?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

12. WHAT IF I AM INJURED?

The University of Massachusetts, Amherst does not have a program for compensating subjects for injury or complications related to human subjects research, but the study personnel will assist you in getting treatment.

13. SUBJECT STATEMENT OF VOLUNTARY CONSENT

I have read this form and decided that I will participate in the project described above. The general purposes and particulars of the study as well as possible hazards and inconveniences have been explained to my satisfaction. I understand that I can withdraw at any time.

Participant Signature:

Print Name:

Date:

By signing below I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

Signature of Person
Obtaining Consent

Print Name:

Date:

A2. Parental Consent Form for Participation in a Research Study

Parental Consent Form for Participation in a Research Study

University of Massachusetts Amherst

Principal Investigators:	Aisha Visram ATC, Erin Snook PhD
Study Title:	Impact of Mental Toughness Training on Psychological and Physical Predictors of Illness and Injury
Funding Agency:	National Athletic Trainers Association Research and Education Foundation

1. WHAT IS THIS FORM?

This form is called a Consent Form. It will give you information about the study so you can make an informed decision about your child's participation in this research study.

2. WHO IS ELIGIBLE TO PARTICIPATE?

Your child has been asked to participate in this study because she is a healthy female athlete at Smith College on the soccer or field hockey team. Participation in this study is voluntary and your decision about whether or not you want your child to participate in it will not influence your child's coach in any way.

3. WHAT IS THE PURPOSE OF THIS STUDY?

The purposes of this research study are 1) to determine if there are associations between mental toughness levels and mood disturbances, burnout, stress, coping ability, depression, and physical symptoms experienced, 2) to evaluate the effectiveness of a Mental Toughness Training Program at increasing mental toughness levels in Division III athletes, and 3) to compare levels of mood disturbances, burnout, stress, coping ability, depression, and physical symptoms experienced before, during, and after the Mental Toughness Training Program. This will provide information not only about improving mental toughness in Division III athletes, but also about what other variables may affect and be affected by mental toughness in this population.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

The study will take place over the fall competitive season at Smith College at the start of the 2011 training camp in August. The time commitment for the study will depend on whether your child is assigned to the intervention or control group. Both groups will spend 30-45 minutes completing questionnaires at the beginning and end of the study period, and at the end of the competitive season. All participants will be asked to fill out questionnaires on two occasions midway through the study, which will take 15-30 minutes each time. In addition, participants in the intervention group will complete daily activities requiring 5-15 minutes per day for 6 weeks.

5. WHAT WILL MY CHILD BE ASKED TO DO?

The procedure for this research study is as follows:

1) The first part involves filling out questionnaires relating to various concepts in sports psychology. Your child will be asked to fill out questionnaires about demographic information, mental toughness, athlete burnout, mood state, depression, perceived stress, coping ability, and physical symptoms. These questionnaires will be fairly straightforward, and will ask your child to evaluate herself in various areas. Participants may skip any questions that they feel uncomfortable answering. This process should take 30-45 minutes to complete. Over the course of the study, your child may be asked to fill out some of these questionnaires again. The time

commitment for completing all of the questionnaires during the study is expected to be approximately 4-5 hours in total.

2) After filling out these questionnaires, your child will be assigned to either the training group or control group. Participants in the training group will be enrolled in an online Mental Toughness Training Program, lasting 6 weeks. This program will ask your child to complete activities daily, such as writing a small entry in a journal, requiring 5-15 minutes per day.

3) During the study period, your child will be asked to fill out questionnaires on two occasions on mood state, depression, perceived stress, coping ability, and physical symptoms. This should take 15-30 minutes to complete.

4) After completing the 6 week training program, your child will be asked to fill out questionnaires on mental toughness, athlete burnout, mood state, depression, perceived stress, coping ability, and physical symptoms. This should take 30-45 minutes to complete.

5) At the end of the competitive season, your child will be asked to fill out the above questionnaires for one final time.

6) At the conclusion of the competitive season, the control group will be given the opportunity to take the Mental Toughness Training Program.

6. WHAT ARE THE BENEFITS TO MY CHILD FOR BEING IN THIS STUDY?

There are potential benefits to your child for participating in this study. Because the Mental Toughness Training Program is designed to improve levels of mental toughness, after completing the training program participants may have higher levels of mental toughness, which may improve sport performance. Your child's participation may help with the improvement of the Mental Toughness Training Program for use in Division III athletes. It will also aid in the understanding of mental toughness and its relationship with other psychological variables.

7. WHAT ARE THE RISKS OF MY CHILD BEING IN THIS STUDY?

There are minimal risks associated with being involved in this study. Participants may experience negative feelings when filling out questionnaires asking them to evaluate different aspects about themselves, but these feelings should be temporary. Your child may experience some fatigue filling out questionnaires or completing the Mental Toughness Training Program. Your child may experience some inconvenience when being asked to complete daily activities for the Mental Toughness Training Program. However, the training program can be completed at your child's own pace and at a time of your child's choosing each day to minimize the amount of inconvenience experienced.

8. HOW WILL MY CHILD'S PERSONAL INFORMATION BE PROTECTED?

The following procedures will be used to protect the confidentiality of your child's study records. The researchers will keep all study records (including any codes to your child's data) in a secure location in a locked file cabinet, and only the researchers will have access to the data. Records will be labeled with a code. A master key that links names and codes will be maintained in a separate and secure location. Data will be kept for 7 years. All electronic files (e.g., database, spreadsheet, etc.) containing identifiable information will be password protected. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research staff will have access to the passwords. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and your child will not be identified in any publications or presentations. Your child's results will not be shared with other athletes, coaches, athletics staff, etc.

9. WILL MY CHILD RECEIVE ANY PAYMENT FOR TAKING PART IN THE STUDY?

Participants will not directly be receiving any payment for taking part in this study. However, they will receive the opportunity to take the Mental Toughness Training Program, which

normally costs \$199, for free. Everyone in the control group will have the opportunity to do the Mental Toughness Training Program when the study is finished. Both the intervention and control groups will be eligible to win prizes for completing certain sections of the study. There will be periodic raffles with prizes for participants in the intervention group for completing certain sections of the training program. There will be periodic raffles with prizes for participants in the control group for participating in filling out questionnaires. Prizes include restaurant vouchers and movie tickets. There will be no cost to your child to participate in the study.

10. WHAT IF I HAVE QUESTIONS?

Take as long as you like before you make a decision about your child participating. We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact Aisha Visram at avisram@kin.umass.edu or Dr. Erin Snook at esnook@kin.umass.edu. If you have any questions concerning your child’s rights as a research subject, you may contact the University of Massachusetts Amherst Human Research Protection Office (HRPO) at (413) 545-3428 or humansubjects@ora.umass.edu. Alternatively, if you have any problems or concerns that occur as a result of your child’s participation, you may contact Phil Peake, the Co-chair of the Smith College Institutional Review board at (413) 585-3914. Concerns can also be reported by completing a Participant Complaint Form, which can found on the IRB website at www.smith.edu/irb/compliance.htm.

11. CAN MY CHILD STOP BEING IN THE STUDY?

Your child does not have to be in this study if you do not want your child to participate. If you agree to have your child participate in the study, but later change your mind, you may have your child discontinue participation at any time. There are no penalties or consequences of any kind if you decide that you do not want your child to participate.

12. WHAT IF MY CHILD IS INJURED?

The University of Massachusetts, Amherst does not have a program for compensating subjects for injury or complications related to human subjects research, but the study personnel will assist your child in getting treatment. It is not expected that your child will be injured by participating in the Mental Toughness Training Program, as all activities are computer-based. Should your child be injured during Smith College Athletics practices or games, your child will still receive appropriate care from the Smith College Athletic Training Department.

13. SUBJECT STATEMENT OF VOLUNTARY CONSENT

I have read this form and decided that I do want my child to participate in the project described above. The general purposes and particulars of the study as well as possible inconveniences and hazards have been explained to my satisfaction. I understand that my child can withdraw at any time. There are two copies of this form. I will keep one copy and return the other to the researchers.

Parent/legal guardian Name (Print)

Parent/legal guardian Signature

Child’s Name (Print)

Date

A3. Assent Form for Participation in a Research Study

Assent Form for Participation in a Research Study
University of Massachusetts Amherst

Principal Investigators: Aisha Visram ATC, Erin Snook PhD
Study Title: Impact of Mental Toughness Training on Psychological and Physical Predictors of Illness and Injury
Funding Agency: National Athletic Trainers Association Research and Education Foundation

1. WHAT IS THIS FORM?

This form is called an Assent Form. It will give you information about the study so you can make an informed decision about participation in this research study.

2. WHO IS ELIGIBLE TO PARTICIPATE?

You have been asked to participate in this study because you are a healthy female athlete at Smith College on the soccer or field hockey team. Participants should be medically cleared as per NCAA procedures to participate in varsity sport at Smith College in the 2011-2012 season. Participation in this study is voluntary and your decision about whether or not to participate in it will not influence your coach in any way.

3. WHAT IS THE PURPOSE OF THIS STUDY?

The purposes of this research study are 1) to determine if there are associations between mental toughness levels and mood disturbances, burnout, stress, coping ability, depression, and physical symptoms experienced, 2) to evaluate the effectiveness of a Mental Toughness Training Program at increasing mental toughness levels in Division III athletes, and 3) to compare levels of mood disturbances, burnout, stress, coping ability, depression, and physical symptoms experienced before, during, and after the Mental Toughness Training Program. This will provide information not only about improving mental toughness in Division III athletes, but also about what other variables may affect and be affected by mental toughness in this population.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

The study will take place over the fall competitive season. The study will take place at Smith College at the start of the 2011 training camp in August. The time commitment for the study will depend on whether you are assigned to the intervention or control group. Both groups will spend 30-45 minutes completing questionnaires at the beginning and end of the study period, and at the end of the competitive season. All participants will be asked to fill out questionnaires on two occasions midway through the study, which will take 15-30 minutes each time. In addition, participants in the intervention group will complete daily activities requiring 5-15 minutes per day for 6 weeks.

5. WHAT WILL I BE ASKED TO DO?

The procedure for this research study is as follows:

1) The first part involves filling out questionnaires relating to various concepts in sports psychology. You will be asked to fill out questionnaires about demographic information, mental toughness, athlete burnout, mood state, depression, perceived stress, coping ability, and physical symptoms. These questionnaires will be fairly straightforward, and will ask you to evaluate yourself in various areas. You may skip any questions you feel uncomfortable answering. This process should take 30-45 minutes to complete. Over the course of the study, you may be asked

to fill out some of these questionnaires again. The time commitment for completing all of the questionnaires during the study is expected to be approximately 4-5 hours in total.

2) After filling out these questionnaires, you will be assigned to either the training group or control group. Participants in the training group will be enrolled in an online Mental Toughness Training Program, lasting 6 weeks. This program will ask you to complete activities daily, such as writing a small entry in a journal, requiring 10-15 minutes per day.

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5) At the end of the competitive season, you will be asked to fill out the above questionnaires for one final time.

6) At the conclusion of the competitive season, the control group will be given the opportunity to take the Mental Toughness Training Program.

6. WHAT ARE THE BENEFITS OF BEING IN THIS STUDY?

There are potential benefits to participating in this study. Since the Mental Toughness Training Program is designed to improve levels of mental toughness, after completing the training program participants may have higher levels of mental toughness, which may improve sport performance.

Your participation may help with the improvement of the Mental Toughness Training Program for use in Division III athletes. It will also aid in the understanding of mental toughness and its relationship with other psychological variables.

7. WHAT ARE THE RISKS OF BEING IN THIS STUDY?

There are minimal risks associated with being involved in this study. You may experience negative feelings when filling out questionnaires asking you to evaluate different aspects about yourself, but these feelings should be temporary. You may experience some fatigue filling out questionnaires or completing the Mental Toughness Training Program. You may experience some inconvenience when being asked to complete activities for the Mental Toughness Training Program. However, the training program can be completed at your own pace and at a time of your choosing each day to minimize the amount of inconvenience you will experience.

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

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9. WILL I RECEIVE ANY PAYMENT FOR TAKING PART IN THE STUDY?

Participants will not directly be receiving any payment for taking part in this study. However, they will receive the opportunity to take the Mental Toughness Training Program, which normally costs \$199, for free. Everyone in the control group will have the opportunity to do the

Mental Toughness Training Program when the study is finished. Both the intervention and control groups will be eligible to win prizes for completing certain sections of the study. There will be periodic raffles with prizes for participants in the intervention group for completing certain sections of the training program. There will be periodic raffles with prizes for participants in the control group for participating in filling out questionnaires. Prizes include restaurant vouchers and movie tickets. There will be no cost to you to participate in the study.

10. WHAT IF I HAVE QUESTIONS?

Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact Aisha Visram at avisram@kin.umass.edu or Dr. Erin Snook at esnook@kin.umass.edu. If you have any questions concerning your rights as a research subject, you may contact the University of Massachusetts Amherst Human Research Protection Office (HRPO) at (413) 545-3428 or humansubjects@ora.umass.edu. Alternatively, if you have any problems or concerns that occur as a result of your participation, you may contact Phil Peake, the Co-chair of the Smith College Institutional Review board at (413) 585-3914. Concerns can also be reported by completing a Participant Complaint Form, which can found on the IRB website at www.smith.edu/irb/compliance.htm.

11. CAN I STOP BEING IN THE STUDY?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

12.WHAT IF I AM INJURED?

The University of Massachusetts, Amherst does not have a program for compensating subjects for injury or complications related to human subjects research, but the study personnel will assist you in getting treatment. It is not expected that you will be injured by participating in the study intervention, as all activities are computer-based. Should you be injured during Smith College Athletics practices or games, you will still receive appropriate care from the Smith College Athletic Training Department.

13. SUBJECT STATEMENT OF VOLUNTARY CONSENT

I have read this form and decided that I want to participate in the project described above. The general purposes and particulars of the study as well as possible hazards and inconveniences have been explained to my satisfaction. I understand that I can withdraw at any time.

Participant Signature

Print Name

Date

By signing below I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

Signature of Person
Obtaining Consent

Print Name

Date

APPENDIX B
STUDY INSTRUMENTS

- B1. Demographics Questionnaire
- B2. Profile of Mood States (POMS)
- B3. Athlete Burnout Questionnaire (ABQ) – Field Hockey
- B4. Athlete Burnout Questionnaire (ABQ) - Soccer
- B5. BriefCOPE
- B6. Beck Depression Inventory (BDI)
- B7. Perceived Stress Scale (PSS)
- B8. Cohen-Hoberman Inventory of Physical Symptoms (CHIPS)
- B9. Mental Toughness Training Program Evaluation Form
- B10. Injury Assessment Summary Forms

B1. Demographic Questionnaire

1. Date of Birth ____ Age ____

2. Sport (circle one) Soccer Field Hockey

3. How long have you been playing this sport? _____

4. Year in school _____

5. Year of NCAA eligibility _____

6. Do you have any chronic health conditions?
(circle one) Yes No

If yes, please list _____

7. Do you have a history of suffering from depression or any other psychological conditions? (circle one) Yes No

If yes, please list _____

8. Do you take any medications regularly?
(circle one) Yes No

If yes, please list _____

B2. POMS

PROFILE OF MOOD STATES QUESTIONNAIRE

Below is a list of words that describe feelings people have. Please read each one carefully. Then circle the one number to the right which best describes how you feel *right now, at this minute*.

RESPONSE KEY

NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
1	2	3	4	5

1. Tense....	1	2	3	4	5
2. Angry....	1	2	3	4	5
3. Worn out....	1	2	3	4	5
4. Lively....	1	2	3	4	5
5. Confused....	1	2	3	4	5
6. Shaky....	1	2	3	4	5
7. Sad....	1	2	3	4	5
8. Active....	1	2	3	4	5
9. Grouchy....	1	2	3	4	5
10. Energetic....	1	2	3	4	5
11. Unworthy....	1	2	3	4	5

RESPONSE KEY

NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
1	2	3	4	5

12. Uneasy....	1	2	3	4	5
13. Fatigued....	1	2	3	4	5
14. Annoyed....	1	2	3	4	5
15. Discouraged...	1	2	3	4	5
16. Nervous....	1	2	3	4	5
17. Lonely....	1	2	3	4	5
18. Muddled....	1	2	3	4	5
19. Exhausted....	1	2	3	4	5
20. Anxious....	1	2	3	4	5
21. Gloomy....	1	2	3	4	5
22. Sluggish....	1	2	3	4	5
23. Weary....	1	2	3	4	5
24. Bewildered....	1	2	3	4	5

RESPONSE KEY					
NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY	
1	2	3	4	5	
25. Furious....	1	2	3	4	5
26. Efficient....	1	2	3	4	5
27. Full of pep....	1	2	3	4	5
28. Bad-tempered...	1	2	3	4	5
29. Forgetful....	1	2	3	4	5
30. Vigorous....	1	2	3	4	5

B3. ABQ – Field Hockey

ATHLETIC BURNOUT QUESTIONNAIRE – Field Hockey

Directions: A number of statements that athletes have used to describe their feelings about field hockey are given below. By entering a number from the scale below for each item, please indicate the degree to which you are experiencing each feeling now, at this point in time.

RESPONSE KEY				
1	2	3	4	5
almost never	rarely	sometimes	frequently	almost always

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

B4. ABQ - Soccer

ATHLETIC BURNOUT QUESTIONNAIRE - Soccer

Directions: A number of statements that athletes have used to describe their feelings about soccer are given below. By entering a number from the scale below for each item, please indicate the degree to which you are experiencing each feeling now, at this point in time.

RESPONSE KEY				
1	2	3	4	5
almost never	rarely	sometimes	frequently	almost always

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

B5. BriefCOPE

Brief COPE

These items deal with ways you've been coping with the stress in your life. There are many ways to try to deal with problems. These items ask what you've been doing to cope with this one. Obviously, different people deal with things in different ways. Each item says something about a particular way of coping. I want to know to what extent you've been doing what the item says. How much or how frequently. Don't answer on the basis of whether it seems to be working or not—just whether or not you're doing it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

1 = I haven't been doing this at all

2 = I've been doing this a little bit

3 = I've been doing this a medium amount

4 = I've been doing this a lot

___ 1. I've been turning to work or other activities to take my mind off things.

___ 2. I've been concentrating my efforts on doing something about the situation I'm in.

___ 3. I've been saying to myself "this isn't real".

___ 4. I've been using alcohol or other drugs to make myself feel better.

___ 5. I've been getting emotional support from others.

___ 6. I've been giving up trying to deal with it.

___ 7. I've been taking action to try to make the situation better.

___ 8. I've been refusing to believe that it has happened.

___ 9. I've been saying things to let my unpleasant feelings escape.

___ 10. I've been getting help and advice from other people.

___ 11. I've been using alcohol or other drugs to help me get through it.

- ___ 12. I've been trying to see it in a different light, to make it seem more positive.
- ___ 13. I've been criticizing myself.
- ___ 14. I've been trying to come up with a strategy about what to do.
- ___ 15. I've been getting comfort and understanding from someone.
- ___ 16. I've been giving up the attempt to cope.
- ___ 17. I've been looking for something good in what is happening.
- ___ 18. I've been making jokes about it.
- ___ 19. I've been doing something to think about it less, such as going to movies,
watching TV, reading, daydreaming, sleeping, or shopping.
- ___ 20. I've been accepting the reality of the fact that it has happened.
- ___ 21. I've been expressing my negative feelings.
- ___ 22. I've been trying to find comfort in my religion or spiritual beliefs.
- ___ 23. I've been trying to get advice or help from other people about what to do.
- ___ 24. I've been learning to live with it.
- ___ 25. I've been thinking hard about what steps to take.
- ___ 26. I've been blaming myself for things that happened.
- ___ 27. I've been praying or meditating.
- ___ 28. I've been making fun of the situation.

B6. BDI

BECK DEPRESSION INVENTORY

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during the **past two weeks, including today**. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time
- 2 I am sad all the time
- 3 I am so sad or unhappy that I can't stand it

2. Pessimism

- 0 I am not discouraged about my future
- 1 I feel more discouraged about my future than I used to be
- 2 I do not expect things to work out for me
- 3 I feel my future is hopeless and will only get worse

3. Past Failure

- 0 I do not feel like a failure
- 1 I have failed more than I should have
- 2 As I look back, I see a lot of failures
- 3 I feel I am a total failure as a person

4. Loss of Pleasure

- 0 I get as much pleasure as I ever did from the things I enjoy
- 1 I don't enjoy things as much as I used to
- 2 I get very little pleasure from the things I used to enjoy
- 3 I can't get any pleasure from the things I used to enjoy

5. Guilty Feelings

- 0 I don't feel particularly guilty
- 1 I feel guilty over many things I have done or should have done
- 2 I feel quite guilty most of the time
- 3 I feel guilty all the time

6. Punishment Feelings

- 0 I don't feel I am being punished
- 1 I feel I may be punished
- 2 I expect to be punished
- 3 I feel I am being punished

7. Self-Dislike

- 0 I feel the same about myself as ever
- 1 I have lost confidence in myself
- 2 I am disappointed in myself
- 3 I dislike myself

8. Self-Criticalness

- 0 I don't criticize or blame myself more than usual
- 1 I am more critical of myself than I used to be
- 2 I criticize myself for all of my faults
- 3 I blame myself for everything bad that happens

9. Suicidal Thoughts or Wishes

- 0 I don't have any thoughts of killing myself
- 1 I have thoughts of killing myself, but I would not carry them out
- 2 I would like to kill myself
- 3 I would kill myself if I had the chance

10. Crying

- 0 I don't cry anymore than I used to
- 1 I cry more than I used to
- 2 I cry over every little thing
- 3 I feel like crying, but I can't

11. Agitation

- 0 I am no more restless or wound up than usual
- 1 I feel more restless or wound up than usual
- 2 I am so restless or agitated that it's hard to stay still
- 3 I am so restless or agitated that I have to keep moving or doing something

12. Loss of Interest

- 0 I have not lost interest in other people or activities
- 1 I am less interested in other people or things than before
- 2 I have lost most of my interest in other people or things
- 3 It's hard to get interested in anything

13. Indecisiveness

- 0 I make decisions about as well as ever
- 1 I find it more difficult to make decisions than usual
- 2 I have much greater difficulty in making decisions than I used to
- 3 I have trouble making any decisions

14. Worthlessness

- 0 I do not feel I am worthless
- 1 I don't consider myself as worthwhile and useful as I used to
- 2 I feel more worthless as compared to other people
- 3 I feel utterly worthless

15. Loss of Energy

- 0 I have as much energy as ever
- 1 I have less energy than I used to have
- 2 I don't have enough energy to do very much
- 3 I don't have enough energy to do anything

16. Changes In Sleeping Pattern

- 0 I have not experienced any change in my sleeping patterns
- 1a I sleep somewhat more than usual
- 1b I sleep somewhat less than usual
- 2a I sleep a lot more than usual
- 2b I sleep a lot less than usual
- 3a I sleep most of the day
- 3b I wake up 1-2 hours early and can't get back to sleep

17. Irritability

- 0 I am no more irritable than usual
- 1 I am more irritable than usual
- 2 I am much more irritable than usual
- 3 I am irritable all the time

18. Changes in Appetite

- 0 I have not experienced any change in my appetite
- 1a My appetite is somewhat less than usual
- 1b My appetite is somewhat greater than usual
- 2a My appetite is much less than before
- 2b My appetite is much greater than usual
- 3a I have no appetite at all
- 3b I crave food all the time

19. Concentration Difficulty

- 0 I can concentrate as well as ever
- 1 I can't concentrate as well as usual
- 2 It's hard to keep my mind on anything for very long
- 3 I find I can't concentrate on anything

20. Tiredness or Fatigue

- 0 I am no more tired or fatigued than usual
- 1 I get more tired or fatigued more easily than usual
- 2 I am too tired or fatigued to do a lot of things I used to do
- 3 I am too tired or fatigued to do most of the things I used to do

21. Loss of Interest in Sex

- 0 I have not noticed any recent change in my interest in sex
- 1 I am less interested in sex than I used to be
- 2 I am much less interested in sex now
- 3 I have lost interest in sex completely

B7. PSS

PERCEIVED STRESS SCALE

The questions in this scale ask you about your feelings and thoughts during the last two weeks. In each case, please circle how often you felt or thought a certain way.

Mark your answer by circling the appropriate number.

RESPONSE KEY

0	1	2	3	4
NEVER	ALMOST NEVER	SOMETIMES	FAIRLY OFTEN	VERY OFTEN

1. In the last two weeks, how often have you been upset because of something that happened unexpectedly?

0 1 2 3 4

2. In the last two weeks, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

3. In the last two weeks, how often have you felt nervous and "stressed"?

0 1 2 3 4

4. In the last two weeks, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

5. In the last two weeks, how often have you felt that things were going your way?

0 1 2 3 4

6. In the last two weeks, how often have you found that you could not cope with all the things that you had to do?

0 1 2 3 4

RESPONSE KEY

0	1	2	3	4
NEVER	ALMOST NEVER	SOMETIMES	FAIRLY OFTEN	VERY OFTEN

7. In the last two weeks, how often have you been able to control irritations in your life?

0 1 2 3 4

8. In the last two weeks, how often have you felt that you were on top of things?

0 1 2 3 4

9. In the last two weeks, how often have you been angered because of things that were outside of your control?

0 1 2 3 4

10. In the last two weeks, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

B8. CHIPS

COHEN-HOBERMAN INVENTORY OF PHYSICAL SYMPTOMS (CHIPS)

Mark the number for each statement that best describes HOW MUCH THAT PROBLEM HAS BOTHERED OR DISTRESSED YOU DURING THAT PAST TWO WEEKS INCLUDING TODAY. Mark only one number for each item.

RESPONSE KEY

At one extreme, **0 means that you have not been bothered by the problem.**

At the other extreme, **4 means that the problem has been an extreme bother.**

HOW MUCH WERE YOU BOTHERED BY:

1. Sleep problems (can't fall asleep, wake up in middle of night or early in morning)	0	1	2	3	4
2. Weight change (gain or loss of 5 lbs. or more)	0	1	2	3	4
3. Back pain	0	1	2	3	4
4. Constipation	0	1	2	3	4
5. Dizziness	0	1	2	3	4
6. Diarrhea	0	1	2	3	4
7. Faintness	0	1	2	3	4
8. Constant fatigue	0	1	2	3	4
9. Headache	0	1	2	3	4
10. Migraine headache	0	1	2	3	4
11. Nausea and/or vomiting	0	1	2	3	4
12. Acid stomach or indigestion	0	1	2	3	4
13. Stomach pain (e.g., cramps)	0	1	2	3	4
14. Hot or cold spells	0	1	2	3	4
15. Hands trembling	0	1	2	3	4
16. Heart pounding or racing	0	1	2	3	4

RESPONSE KEY

At one extreme, **0 means that you have not been bothered by the problem.**

At the other extreme, **4 means that the problem has been an extreme bother.**

HOW MUCH WERE YOU BOTHERED BY:

17. Poor appetite	0	1	2	3	4
18. Shortness of breath when not exercising or working hard	0	1	2	3	4
19. Numbness or tingling in parts of your body	0	1	2	3	4
20. Felt weak all over	0	1	2	3	4
21. Pains in heart or chest	0	1	2	3	4
22. Feeling low in energy	0	1	2	3	4
23. Stuffy head or nose	0	1	2	3	4
24. Blurred vision	0	1	2	3	4
25. Muscle tension or soreness	0	1	2	3	4
26. Muscle cramps	0	1	2	3	4
27. Severe aches and pains	0	1	2	3	4
28. Acne	0	1	2	3	4
29. Bruises	0	1	2	3	4
30. Nosebleed	0	1	2	3	4
31. Pulled (strained) muscles	0	1	2	3	4
32. Pulled (strained) ligaments	0	1	2	3	4
33. Cold or cough	0	1	2	3	4

B9. Mental Toughness Training Program Evaluation Form

Please indicate what your biggest strength was (e.g., coping etc.):

Please indicate what your biggest weakness was:

1. Which exercises did you find were most useful to you or more beneficial? Why?
2. Which exercises did you find were least beneficial to you? Why?
3. Were the exercises challenging enough for you? Too difficult? At the right level?
4. If you completed the exercises on a consistent basis, did you feel that they were applicable to your sport and your competition level?
5. If you did not complete the exercises on a consistent basis, was there something about the program that made it difficult to do so (eg too many exercises, took too much time, poor explanations in the email, etc)?
6. What did you think about the amount of exercises and the length of the program – is having one exercise per day for 6 weeks too much/too little/the right amount?
7. After completing the program, did you feel that it had been a worthwhile experience? Why or why not? Do you feel that the exercises helped tackle your specific weakness or improve your specific strength?
8. If you were to do this program again, is there anything about the program itself that you change?
9. If you were to do this program again what would you do differently (if anything)?
10. Additional comments (use back of paper if necessary):

B10. Injury Assessment Summary

Athlete's Name: _____ **Class:** _____ **Team:** _____

Today's Date: _____ **Date of Injury:** _____

Clinical Impression:

Most Likely Cause:

- | | |
|---|--|
| <input type="checkbox"/> Trauma | <input type="checkbox"/> Training Error |
| <input type="checkbox"/> Muscle Weakness | <input type="checkbox"/> Joint Instability |
| <input type="checkbox"/> Muscle Tightness | <input type="checkbox"/> Footwear |
| <input type="checkbox"/> Other: | |

Immediate Management (next 24-48 hours):

- Ice 15 min/hr when able
- Use compression wrap as instructed* (remove for sleeping)
- Elevate the injured part above your heart whenever able
- Use crutches (non-weight bearing)
- Use crutches (weight bear as tolerated)
- Avoid stretching
- Stretch the following muscles as instructed _____ times daily:
- Keep covered with clean, dry bandage and antibiotic ointment
- Avoid painful activities
- Monitor for signs of infection** (swelling, fever, redness, pus, pain, odor)
- Other:

Referral Plan:

- Not at this time
- X-Rays
- Orthopedist
- Emergency Room
- Health Services
- Other:

* Compression wrap should be applied starting at the area away from the heart and wrapping towards the heart. Monitor for signs of compromised circulation (change in color compared to the other limb, numbness/tingling, swelling). Remove bandage if these signs occur and re-apply more loosely.

**If any signs of infection are noted, contact Health Services at numbers listed below.

Participation/Restrictions through _____ :

Return to Athletic Training Room:

- If your symptoms do not improve significantly by _____, return for re-evaluation.
- Return for re-evaluation and/or further treatment on _____.

Recommendations provided by: _____ **Date:** _____ **Time:** _____

Feel free to contact me if you have any questions. I can be reached at: _____

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