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Mental Toughness Training Intervention for Collegiate Track and Field Athletes

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Graduate Program in Kinesiology
A thesis submitted in partial fulfillment of the requirements for the degree in Master of Arts
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MENTAL TOUGHNESS TRAINING INTERVENTION FOR COLLEGIATE
TRACK AND FIELD ATHLETES

(Thesis format: Monograph)

by

Amanda A., Truelove

Graduate Program in Kinesiology

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts

The School of Graduate and Postdoctoral Studies
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ABSTRACT

Mental toughness has been recognized as a key component necessary for optimal athletic achievement. The use of mental toughness training programs has been found to help athletes develop specific psychological skills associated with mental toughness, such as goal setting, positive self-talk, mental imagery, and relaxation. By developing these skills, athletes are better able to control levels of competition anxiety, increase levels of self-confidence, and ultimately, improve performance results. The main purpose of this study was to determine the effects of a specifically designed mental toughness training program for varsity level track and field athletes. Participants included 4 varsity track and field athletes from Western University (Mage = 20.27; SD = 1.26). Although results did not specifically indicate that the mental toughness training intervention positively influenced performance results, all participants reported that the intervention was effective for controlling levels of competition anxiety, increasing self-confidence, as well as improving performance in practice. Additionally, all participants reported high satisfaction with the intervention. Results from this study highlight the importance of mental toughness training for varsity athletes, and can furthermore encourage both coaches and athletes to devote an appropriate amount of training time to the development of psychological skills essential to success in sport.

Keywords: mental toughness, competition anxiety, self-confidence, track and field

CO-AUTHORSHIP

I would like to acknowledge my co-author on this research project. I would like to acknowledge my supervisor Dr. Craig Hall.

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Mental Toughness Training Intervention for Collegiate Track and Field Athletes

The term mental toughness is widely used in the realm of athletics. Both coaches and athletes alike acknowledge that athletic success stems from not only one's physical ability, but the ability to develop and maintain a strong state of mind as well. According to Greg Dale (2010), an accredited sport psychologist, most athletes admit that anywhere from 50-90% of their success in sport is attributed to psychological factors. However, when asked how much time athletes actually spend developing and practicing their mental game, most admit to committing only 5-10% of their total training time to the development of key psychological skills essential to sport (Dale, 2010). Phrases such as 'focus', 'relax', 'have confidence', 'stay composed', and 'be tough', are commonly heard in the sporting environment. However, although these phrases are widely used, the majority of athletes are never actually taught how to focus, how to relax, how to be confident, how to stay composed, and how to be tough. Most coaches and athletes simply focus their time and effort on technical and physical training, as opposed to mental skills training. However, it is the combination of both physical and mental strength that is essential for optimal athletic achievement. Yogi Berra, a former American Major League Baseball player, is famous for his statement that "90% of the game is half mental" (Dale, 2010). This quote simply highlights the significance and the importance of the mind in athletics.

Although the importance of mental toughness for achieving optimal performance results has been acknowledged, this concept is often overlooked, and there is much ambiguity surrounding the actual definition of the term mental toughness as it relates to sport. "The general lack of clarity and precision surrounding the term mental toughness

is unfortunate, since it is arguably one of the most important psychological attributes in achieving performance excellence” (Jones et al., 2002, p. 206). Identifying a clear definition of mental toughness may help both coaches and athletes alike to develop a better understanding of the concept, while gaining insight on the significance and importance of devoting both time and effort to enhancing mental toughness. With the ultimate goal of achieving performance excellence in mind, it is important to uncover the ambiguity surrounding mental toughness, while encouraging both coaches and athletes to devote appropriate training time to the development of such a key psychological skill.

Defining Mental Toughness

According to James Loehr, a renowned sport psychologist, mental toughness is defined as the ability to consistently maintain an ideal performance state during the heat of competition (Loehr, 1986). Since then, Goldberg (1998) has defined mental toughness as the ability to stand tall in the face of adversity, and being able to rebound from repeated setbacks and failures. Fletcher and Fletcher (2005) defined mental toughness as the ability to cope with various environmental stressors. More recently, Jones, Hanton, and Connaughton (2007) conducted a study investigating the definition of mental toughness, the identification of its essential attributes, and the development of a mental toughness framework. Specifically, the study involved a panel of elite athletes, coaches, and sport psychologists. In the first component of the study, three participants formed a focus group, where they were asked to define mental toughness in their own words, and additionally formulate key attributes and qualities of a mentally tough performer. In the second stage of the study, the remaining participants were interviewed based on the information obtained from the focus group, to determine the extent to which these

participants agreed with the definition created in Stage 1, and the corresponding qualities and attributes of mental toughness. As a result of this study, and in accordance with the definition generated from a previous study by Jones, Hanton, and Connaughton (2002), the panel of elite athletes, coaches and sport psychologists concluded that mental toughness is defined as:

Having the natural or developed psychological edge that enables you to, generally, cope better than your opponents with the many demands (competition, training, lifestyle) that sport places on a performer and, specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure. (Jones et al., 2007).

Mental Toughness Framework

With regards to the development of the mental toughness framework, participants in the Jones et al. (2007) study identified 30 distinct attributes essential to a mentally tough performer. The 30 identified attributes were separated into 4 distinct dimensions, including attitude/mindset, training, competition, and post-competition. The attributes associated with each of the 4 dimensions were further divided into subcomponents, including belief and focus for the attitude/mindset dimension; using long term goals as the source of motivation, controlling the environment, and pushing yourself to the limit for the training dimension; handling pressure, belief, regulating performance, staying focused, awareness and control of thoughts and feelings, and controlling the environment for the competition dimension; and last but not least, handling both failure and success for the post-competition dimension. The full mental toughness framework is depicted in Appendix A.

The mental toughness attributes identified by the participants in the Jones et al. (2007) study directly corresponded with, and were an extension of, the 12 distinct attributes previously generated by the earlier study conducted by the same researchers (Jones et al., 2002), which included:

1. Having an unshakable self-belief in your ability to achieve your competition goals.
2. Having an unshakeable self-belief that you possess unique qualities and abilities that make you better than your opponents.
3. Having an insatiable desire and internalized motives to succeed.
4. Bouncing back from performance set-backs as a result of increased determination to succeed.
5. Thriving on the pressure of competition.
6. Accepting that competition anxiety is inevitable and knowing that you can cope with it.
7. Not being adversely affected by others' good and bad performances.
8. Remaining fully-focused in the face of personal life distractions.
9. Switching a sport focus on and off as required.
10. Remaining fully focused on the task at hand in the face of competition-specific distractions.
11. Pushing back the boundaries of physical and emotional pain, while still maintaining technique and effort under distress (in training and competition).

12. Regaining psychological control following unexpected, uncontrollable events (competition specific).

The fact that both the studies by Jones and his colleagues generated similar findings adds support to the formation of a universal definition of mental toughness, as well as the key attributes associated with a mentally tough performer. Being able to clearly define the term mental toughness is essential in order to design and develop effective mental toughness training programs, with the ultimate goal of enhancing optimal athletic performance. Furthermore, designing such mental toughness training programs is essential for actually teaching athletes how to develop and implement the specific psychological skills associated with mental toughness, which are essential for success in sport. By gaining an understanding of the concept of mental toughness, in addition to the associated mental toughness attributes, and through the implementation of a mental toughness training program, athletes will be more likely to achieve optimal performance results.

Importance of Mental Toughness in Sport

Willie Mays, a Hall of Fame baseball player, proclaimed that “it isn’t hard to be good from time to time in sports. What is tough is being good every day” (Dale, 2010, p. 1). In line with the definition of mental toughness, as previously stated above, this quote highlights the importance of consistency and resiliency in sport, despite the competitive situation, or other prominent demands and pressures that an athlete may face. More subtly, this quote signifies that mental toughness is an important and essential element contributing to performance excellence over time. An abundance of studies have supported the idea that mental toughness is essential to consistent success in sport

(Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013). Developing and enhancing the psychological skills associated with mental toughness has been shown to help athletes control their thoughts, words, actions, and emotions, which will ultimately lead to optimal athletic achievement (Loehr, 1994). According to Loehr, individuals have complete control over what they say, think, and do. By learning to control one's words, thoughts, and actions, athletes will be more likely to achieve the ideal performance state, which is essential for optimal performance results.

Furthermore, Loehr (1994) has gone on to describe 4 key markers of mental toughness, including emotional flexibility, emotional responsiveness, emotional strength, and emotional resiliency, which have each been deemed as important for contributing to success in sport. Emotional flexibility refers to the ability to cope with the various situations in competition, in a balanced or non-defensive manner. Emotional responsiveness refers to the ability to be emotionally engaged during competition, as opposed to withdrawn. Emotional strength refers to the ability to handle the various emotions associated with sport, and to furthermore always put forth a valiant effort no matter the situation. Last but not least, emotional resiliency refers to the ability to face adversity, and to quickly recover from various setbacks. Each of these markers of mental toughness plays a role in helping athletes to consistently perform to the upper range of their talent and skills. Through the development of these key components associated with mental toughness, performance excellence will become more achievable (Loehr).

Why Some Athletes Lack Mental Toughness

Although the importance of mental toughness in sport has received a great amount of attention (Blakesless & Goff, 2007; Loehr, 1994; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013), there are numerous cases in which athletes experience a decrease in athletic performance due to a lack of mental toughness. Uncovering the reason why some athletes seem to lack mental toughness may help these athletes develop such key psychological skills in the future. According to Loehr, there are an abundance of reasons for why an athlete may lack mental toughness, which include too much stress, too little stress, weak thinking skills, weak imagery skills, weak acting skills, and a weak emotional response. More specifically, too much stress, in the form of school, work, training, hunger, or fatigue, can weaken both one's body and one's mind. When an individual has unmet needs, and when the body and mind are not in balance, that individual will be unable to focus on the challenges of competition, thus preventing optimal performance results. The case of too little stress often affects athletes who grow up with overprotective parents, or in unchallenging environments. If parents are overprotective of their children, or if children are never faced with challenges, the toughening process may be impeded, which can cause a weakened sense of self. This in turn can limit the child's ability to handle the demands and challenges of competition. Our emotions require stress to develop and grow, just like our muscles (Loehr). With practice, an athlete can work on and improve their thinking, imagery, acting, and emotional response skills. It takes hard work and practice to develop mental skills, just like physical skills. The athletes who are willing to

spend the time practicing and developing both physical and mental skills will be better prepared to achieve optimal athletic success.

Mental Toughness Training Programs

In order to effectively teach athletes how to become mentally tough, and to furthermore help athletes develop and enhance the specific attributes associated with such a construct, the implementation of mental toughness training programs, within an athlete's regular training regimen, are gaining increasing amounts of support and attention in the world of athletics. Specifically, mental toughness training programs are focused on developing and improving the key psychological skills associated with mental toughness, and have been shown to be an effective strategy for improving and maximizing athletic performance. There have been many studies that have looked at the impact and effectiveness of a specifically designed mental toughness training program for a variety of sports, including equestrian (Blakesless & Goff, 2007), tennis (Mamassis & Doganis, 2004), distance running (Patrick & Hrycaiko, 1998), gymnasium triathlon (Thelwell & Greenless, 2001), and cricket (Turner & Barker, 2013) to name a few. Each of the mental toughness training programs employed in these studies were found to be effective for enhancing performance, and were furthermore highly appraised by all of the participants, based on the results of a social validation questionnaire.

Support for Single Case Multiple Baseline Design

As is commonly the case with applied sport psychology research, each of the specific studies mentioned above employed a single-subject multiple baseline research design. Bryan (1987), and more recently Hrycaiko and Martin (1996), advocated the employment of this particular research method for examining treatment packages in

applied sport settings. A key benefit noted for using the single-subject multiple baseline research design was the use of a small sample size. Due to the fact that it is usually difficult to obtain a large sample size with the same issue, or with the same psychological skill needing enhancement in the athletic environment, single-subject multiple baseline research designs are beneficial as they typically only include 3-5 participants (Aeschelman, 1991). Additional noted benefits of this research design included the fact that subjects act as their own controls, all the participants receive the intervention and therefore have the potential of benefiting from the effects, and this design is also preferable for athletes who will typically not improve a great deal from the baseline phase to the intervention phase. “Small consistent changes may be seen in a single-subject design but not emerge significantly in a group design” (Wollman, 1986, p. 136). For athletes competing at a high level, small changes are often considered quite significant by both coaches and athletes. Furthermore, Bryan (1987) noted that this type of design also eliminates problems associated with group averages. Taken together, there has been substantial support for the benefits of the single-subject multiple baseline design for applied research in sport psychology (Aeschelman, 1991; Bryan, 1987; Hrycaiko & Martin, 1996; Wollman, 1986).

Determining the effectiveness of a mental toughness training program in applied sport psychology is primarily dependent on the observance of a treatment effect as a result of the mental toughness training intervention. Specifically, in single-subject multiple baseline research designs, subjects are tested in three separate phases: baseline phase, intervention phase, and post-intervention phase. The baseline phase refers to the period of time before the initiation of the mental toughness training program, the

intervention phase includes the period of time the participant is engaged in the mental toughness training program, and the post-intervention phase includes the period of time after the administration of the intervention is complete. An intervention effect is observed if there is a change in level from the baseline phase to the intervention phase for the dependent measure under consideration (e.g., performance). In research studies that are interested in determining the extent to which the intervention has an effect on performance, it is the optimal goal to observe a performance increase from the baseline phase to the intervention phase.

Participants typically first have their performance measured before the introduction of the intervention, and it is ideal if their performance during this baseline phase is stable. Upon obtaining relatively stable baseline results, the intervention is administered. Participants typically meet with the researcher on a one-on-one basis to learn and further develop each of the key psychological skills associated with mental toughness in a sequential order, through the completion of various lessons and exercises. Performance is continuously measured throughout this time to determine if the mental toughness training intervention is effective for enhancing performance results. Furthermore, after the termination of the intervention, performance continues to be measured in the post-intervention phase, to determine the lasting effects of the mental toughness training program.

Psychological Skills

The specific psychological skills that are most commonly taught and enhanced within a mental toughness training program, and the skills that were included in each of the studies mentioned above, include goal setting, positive self-talk, mental imagery, and

relaxation techniques. These four specific psychological skills are typically chosen as they have most commonly been identified to contribute to mental toughness and performance enhancement (Patrick & Hrycaiko, 1998). Furthermore, these skills have also been found to positively influence levels of pre-competition anxiety, as well as self-confidence, which are important factors associated with the achievement of performance excellence (Mamassis & Doganis, 2004). The skills of goal setting, positive self-talk, mental imagery, and relaxation techniques, are described in greater detail below.

Goal Setting

The process of goal setting provides direction, while also instilling a sense of purpose for every action (Dale, 2010). Setting goals can help athletes remember why they are doing what they are doing, and can furthermore help justify the amount of time, effort, and commitment that athletes devote to their sport. Goal setting has also been shown to be effective for enhancing feelings of perception and control, providing feedback mechanisms on one's progression, and instilling a sense of motivation to strive towards one's previously determined goals (Thelwell & Greenless, 2001). The process of goal setting usually includes the formation of both short-term and long-term goals. Short-term goals are used as stepping-stones, leading to the achievement of long-term goals. Furthermore, goal setting includes the development of outcome goals, performance goals, and process goals (Dale, 2010; Filby, Maynard, & Graydon, 1999; Kingston & Hardy, 1997). An athlete typically does not have control over outcomes goals. These goals provide direction, but no controllable action plan for achieving the set goal. An example of an outcome goal is winning an Olympic gold medal. Although the athlete can control their own thoughts, actions, and emotions, the athlete has no control

over the other competitors, or the actual outcome of the event. As such, for every outcome goal, an athlete should develop appropriate performance goals and process goals.

Performance goals are more within an athlete's control. For performance goals, the athlete measures their results against their own previous performances. An example of a performance goal is setting a personal best in a specific task or event. Lastly, process goals refer to the specific actions that an athlete must take in order to achieve their predetermined performance and outcome goals. It is important to note that athletes have complete control over process goals. An example of a process goal is to run five extra sprints at the end of every practice. It is important that athletes establish appropriate process and performance goals that are directly related to the achievement of their outcome goal (Dale, 2010; Thelwell & Greenless, 2001). Furthermore, when setting goals, it is important that athletes remember to utilize the S.M.A.R.T. principle. The S.M.A.R.T. principle helps ensure that goals are specific, measurable, attainable, realistic, and time oriented (Locke & Latham, 1985, 1990).

Positive Self-Talk

Hackfort and Schwenkmezger (1993) have defined self-talk as a “dialogue in which the individual interprets feelings and perceptions, regulates and changes evaluations and convictions, and gives him/herself instructions and reinforcement” (p. 355). The use of both instructional and motivational positive self-talk has been shown to enhance performance in a variety of sports, including cross-country skiing (Rushall, Hall, Roux, Sasseville, & Rushall, 1998), tennis (Landin & Hebert, 1999), and sprinting (Mallet & Hanrahan). Positive self-talk is believed to enhance performance by focusing

on and improving cognitive, motivational, behavioural, and affective factors (Tod, Hardy, & Oliver, 2011). More specifically, the use of positive self-talk has been found to improve levels of self-confidence and anxiety (Gould, Hodge, Peterson, & Giannini, 1989; Tod, Hardy, & Oliver, 2011), as well as motivation, which may ultimately enhance performance outcomes (Van Raalte et al., 1994). Furthermore, positive self-talk is beneficial in the sense that it can help to counter-balance negative statements, and additionally help athletes to focus on correct cues and on goals that they have set (Thelwell & Greenless, 2001). Interventions that include positive self-talk usually encourage athletes to develop personal cue words. These cue words are used by athletes to stop negative thoughts and negative self-talk, while also acting as reminders to help athletes focus and stay on task. By learning to terminate the negative internal dialogue that quite often impedes performance, athletes will be more likely to maintain a positive state of mind, which plays a critical role in the achievement of performance excellence (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Tod, Hardy, & Oliver, 2011; Turner & Barker, 2013).

Mental Imagery

According to White and Hardy (1998), mental imagery is defined as “an experience that mimics real experience. We can be aware of “seeing” an image, feeling movements as an image, or experiencing the real thing ... It differs from dreams in that we are awake and conscious when we form an image” (p. 389). The use of imagery is considered to be one of the most popular techniques used by elite athletes and sport psychologists, and it is a technique that is commonly used within mental training programs (Morris, Spittle, & Watt, 2005; Short, Bruggeman, Engel, Marback, Wang,

Willadsen, & Short, 2002), which could be due to the fact that this psychological tool has received great support for enhancing performance in a variety of sports (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013). According to Gregg, Hall, and Nederhof (2005), consistent practice of mental imagery leads to an increase in an athlete's imagery ability, which may subsequently increase performance. By allowing athletes to see themselves completing their respective events, the use of mental imagery instills a sense of confidence, and also serves as a motivational construct for helping athletes to achieve optimal performance results. Mental training interventions that employ the skill of imagery typically use specifically designed imagery scripts to help athletes visualize and imagine themselves successfully performing their respective sport (Morris, Spittle, & Watt, 2005; Patrick & Hrycaiko, 1998).

Relaxation Techniques

Relaxation techniques help athletes to focus on task relevant thoughts, as well as bodily feelings such as muscle tension and breathing patterns. Using relaxation techniques can help athletes maintain their optimal relaxation state, or optimal state of arousal, prior to, and during competition (Bull, Albinson, & Shambrook, 1996; Thelwell & Greenless, 2001). Common relaxation techniques employed in mental training programs include progressive muscle relaxation (PMR; Jacobson, 1938), where athletes are asked to first tense and then relax each of their muscles in a sequential order; centering (Hardy & Fazey, 1990), where athletes change their center of consciousness from their head to their center of gravity; and breathing strategies (Hogg, 1995), where athletes learn to monitor breathing and tension levels. The use of relaxation techniques

has primarily been found to be beneficial for helping athletes control levels of pre-competition anxiety, which ultimately will help lead to the enhancement of performance results (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013).

Taken together, these four psychological skills, goal setting, positive self-talk, mental imagery, and relaxation, as well as their corresponding attributes, have been found to play a significant role in enhancing athletic performance. Although earlier research focused on the development and enhancement of one psychological skill at a time, incorporating four different psychological skills into one mental toughness training program has been deemed as more efficient and highly effective for achieving desired performance results (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013).

Competition Anxiety and Self-Confidence

An additional mechanism by which the development and enhancement of psychological skills is thought to improve performance, is centered on the relationship between mental toughness, competition anxiety, self-confidence, and performance. The relationship between these constructs has attracted a great amount of research attention over the years, as researchers have attempted to clarify this relationship through several models and theories. Such models and theories include the multidimensional anxiety theory (Marten et al., 1990), catastrophe models (Hardy, 1990, 1996a), reversal theory (Apter, 1982; Kerr, 1990), and zones of optimal functioning models (Hanin, 1980, 1986). In general, these models and theories suggest that high levels of state anxiety negatively

affect performance, whereas, on the opposite side of the spectrum, high-levels of self-confidence lead to the enhancement of performance.

Multidimensional Anxiety Theory

More specifically, the multidimensional anxiety theory (Martins et al., 1990) suggests that anxiety has two components, cognitive anxiety and somatic anxiety. Cognitive anxiety refers to the mental component of anxiety, while somatic anxiety refers to the perception of the physiological response associated with anxiety. The multidimensional anxiety theory postulates that cognitive anxiety has a negative linear relationship with performance, while the relationship between somatic anxiety and performance is curvilinear, meaning that both lower and higher levels of somatic anxiety have a negative impact on performance. With regards to self-confidence, the multidimensional theory suggests that a positive linear relationship exists between self-confidence and performance (Martin).

Catastrophe Model

Like the multidimensional anxiety theory, the catastrophe model (Hardy, 1990) also suggests that anxiety has both a cognitive and physiological component. However, the catastrophe model takes a different approach by indicating that a series of four relationships exist between cognitive anxiety, physiological arousal, and performance. First, when levels of physiological arousal are high, such as the case on the day of an important competition, the catastrophe model implies that there is a negative relationship between cognitive anxiety and performance. Second, when physiological arousal is low, like in the days prior to an important event, cognitive anxiety has a positive relationship with performance. Third, the catastrophe model suggests that when levels of cognitive

anxiety are low, the predicted relationship between physiological arousal and performance follows the shape of the inverted-U. Finally, when levels of cognitive anxiety are high, an increase in physiological arousal leads to a significant decrease in performance. Once this drop in performance occurs, a large decrease in physiological arousal is required to once again increase performance. The catastrophe model, therefore, suggests that there is a difference in the path followed by performance when cognitive anxiety is high and physiological arousal is increasing, compared to the path followed when cognitive anxiety is high and physiological arousal is decreasing. This relationship is referred to as hysteresis (Hardy, Beattie, & Woodman, 2007; Hardy & Parfitt, 1991;).

Reversal Theory

The reversal theory (Kerr, 1990) is centered on the notion that performance is affected by an athlete's cognitive interpretation of arousal, which is determined by their present state. Specifically, athletes in the telic state are typically focused on a goal, and therefore interpret arousal as anxiety, which can negatively impact performance. On the other hand, athletes in the paratelic state are focused on their behavior, and thus tend to view their arousal as excitement, leading to an increase in performance. The reversal theory postulates that athletes have the ability to quickly alternate between telic and paratelic states, leading to a change in their interpretation of arousal, which will ultimately affect performance (Apter, 1982; Kerr).

Zone of Optimal Functioning Model

The zone of optimal functioning model (Hannin, 1986) implies that each individual has an optimal level of pre-competition anxiety for obtaining peak

performance results. If levels of pre-competition anxiety fall below or above the zone of optimal functioning, or in other words, the zone of optimal arousal, then performance will suffer.

Taken together, each of these models and theories suggest that there are clear relationships present between state anxiety, self-confidence, and performance. Furthermore, findings from the literature have added mental toughness into this relationship, by suggesting that the development of key psychological skills associated with mental toughness, such as goal setting, positive self-talk, mental imagery, and relaxation, will help athletes learn how to control and/or decrease competition anxiety, increase levels of self-confidence, and ultimately enhance performance results (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013). The relationship between these constructs (i.e., mental toughness, competition anxiety, self-confidence, and performance) is the primary focus of this study.

Purpose of the Present Study

Mental toughness training programs have been shown to be an effective strategy for improving and maximizing athlete performance (Blakeslee & Golf, 2007; Loehr, 1994; Mamassis & Doganis, 2004). The development of key psychological skills associated with mental toughness have been found to help athletes manage levels of competition anxiety, and also increase levels of self-confidence, which in turn helps produce optimal performance results. In competitive sport, the relationship between competition anxiety and performance, as well as the relationship between self-confidence and performance, is very well known (Mamassis & Doganis, 2004; Woodman & Hardy,

2003). In general, previous studies have supported the idea that performance improvements result from being able to decrease and/or control levels of competition anxiety, as well as increase levels of self-confidence (Mamassis & Doganis, 2004; Woodman & Hardy, 2003). Mental toughness training programs can help athletes to manage levels of anxiety, while increasing levels of self-confidence, by instilling in athletes key psychological skills such as goal-setting, positive self-talk, mental imagery, and relaxation. By decreasing/learning to control levels of competition anxiety, and increasing levels of self-confidence through mental toughness training programs, an improvement in performance outcomes has been found (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013). Although studies have shown positive results associated with mental skills training, the bulk of these studies have focused on elite athletes, or a very specific group of athletes, failing to determine the effects of a mental toughness training program on varsity level athletes. Furthermore, none of the studies conducted to date have considered the sport of track and field. With the main goal of maximizing athletic performance in mind, it is crucial that athletes of all levels, including varsity level track and field athletes, are aware of the importance and effectiveness of mental toughness training, to ensure that appropriate training time is allotted to the development of such key psychological skills. Athletes should be encouraged to focus not only on the technical and physical aspects of training, but to also understand the importance and significance of mental skills training for optimizing performance.

Therefore, the purpose of this present study was to determine the effectiveness of a specifically designed mental toughness training intervention as it relates to athletic

performance, competition anxiety, and self-confidence, in varsity level track and field athletes. The secondary purpose of this study was to bring awareness to the importance of mental skills training, especially for university level athletes, with the ultimate goal of optimizing athletic performance. It was hypothesized that the mental toughness training intervention employed in this study would be effective for helping athletes manage levels of competition anxiety, increase levels of self-confidence, and ultimately, improve performance results, through the development of key psychological skills associated with mental toughness, including goal-setting, positive self-talk, mental imagery, and relaxation.

Method

Participants

Participants were four varsity track and field athletes from Western University, in London, Ontario. Inclusion criteria required all participants to be over the age of 18, as well as be a current student-athlete competing on the Western University Track and Field team for the 2013-2014 season. Of the 4 participants selected to participate in the sample, 1 of the participants competed in the high jump (Participant 1), while the remaining 3 participants (Participant 2, Participant 3, and Participant 4) were distance runners, competing in track events ranging from the 1500m-3000m. All four participants were female. The mean age of the participants was 20.75 (SD = 1.26), with a mean 8.75 (SD = 5.06) years of experience competing in the sport of track and field. None of the participants had prior psychological skills training before the initiation of this intervention.

Measures

Competitive State Anxiety Inventory-2. The CSAI-2 (Martens, Vealey, & Burton, 1990) was used to measure each participant's state anxiety and level of self-confidence prior to competition. The CSAI-2 consists of 27 questions, pertaining to three different factors: cognitive anxiety, somatic anxiety, and self-confidence. Each of the three factors is represented by 9 questions. An example of a question pertaining to cognitive anxiety is "I am concerned about this competition". An example of a question pertaining to somatic anxiety is "I feel nervous". An example of a question pertaining to self-confidence is "I feel self-confident". Participants respond to the questions using a 4-point Likert Scale (1 = not at all, 4 = very much so).

Practice Measures. As adopted from Mamassis and Doganis (2004), performance in practice was measured using a self-report 6-item questionnaire, consisting of 6 different aspects of performance. Each participant was asked to appraise her performance in practice on a weekly basis, on a 5-point Likert scale (1 = not good at all, 5 = very good) on the following aspects: 1) physical performance; 2) mental attitude and thoughts; 3) concentration; 4) anxiety; 5) self-confidence; and 6) comparison of performance with expectations. An overall practice performance score was obtained from the sum of all these 6 items.

Performance Measures. Performance was measured based on each participant's competition results throughout the duration of the track and field season, using time (min/sec) for the distance runners, and height (m) for the high jumper. Competition results were recorded after each meet to monitor the impact of the mental toughness training intervention on performance outcomes.

Mental Skills Assessment Questionnaire. The Mental Skills Assessment Questionnaire (MSAQ; Patrick & Hrycaiko, 1998) was used to measure the use of mental skills by each participant both before and during competition. The MSAQ consists of eight yes or no questions pertaining to the use of mental skills learned through the mental toughness training intervention. Two questions pertained to goal setting (e.g. “Did you set any goals before/during your event?”), two questions pertained to positive self-talk (e.g. “Did you perform any positive self-talk prior to/during your event?”), two questions pertained to mental imagery (e.g. “Did you use imagery prior to/during your event?”), and 2 questions pertained to relaxation (e.g. “Did you perform a relaxation technique prior to/during your event?”). The percentage of mental skills reported by each participant was recorded to monitor the use of mental skills over time. Although the MSAQ is not a validated instrument, numerous previous studies have used this questionnaire to help remind and encourage participants to employ the four psychological skills learned through the mental toughness training intervention both before and during competition (e.g., Thelwell & Greenless, 2001; Thelwell & Maynard, 2003).

Social Validation Questionnaire. The Social Validation Questionnaire, developed by Thelwell and Greenless (2001), was used to assess each participant’s overall satisfaction with the mental toughness training intervention at the end of the track and field season. Using a 5-point Likert-type scale (1 = “not at all useful” and 5 = “extremely useful”), participants were asked to respond to a series of 13 questions pertaining to the importance and significance of the changes they experienced, the development of psychological skills related to mental toughness, their satisfaction with the mental toughness training intervention, and the overall effectiveness of the study.

Participants were also given the opportunity to add additional comments regarding their thoughts on the intervention. The Social Validation Questionnaire allowed the researcher to gain a better insight on the overall effectiveness of the intervention.

Procedure

Approval to conduct the present study was obtained from the Research Ethics Board at Western University. In order to recruit participants, members of the Western University varsity Track and Field team were contacted via email. The email included a letter of information describing the study, as well as an informed consent form. Athletes interested in participating in the study responded to the researcher's email. The first four eligible athletes to respond to the email were invited to participate in the study.

Experimental Design

This study involved a season long (16 week) mental toughness training intervention, following a single-case, staggered, multiple baseline across participants design. Participants were asked to meet with the researcher for 30-60 minutes in a one-on-one setting on a weekly basis for the duration of the track and field season. During the first meeting, baseline scores of each participant's competition anxiety and self-confidence were measured using the Competitive State Anxiety Inventory-2 (CSAI-2), by asking participants to recall their usual feelings before competition. Performance personal bests were also recorded, by obtaining the personal best time/height for each athlete's respective track and field event. After the initial baseline period, the mental toughness training intervention was administered to participants sequentially. The sequential administration of the intervention allowed changes in the dependent variables to be attributed to the intervention, as opposed to extraneous variables (Kazdin, 1982).

Participant 1 began the mental toughness training intervention during week 4 of the study. Participant 2 began the intervention in week 5, and Participant 3 began the intervention in week 6. Finally, participant 4 began the mental toughness training intervention in week 7. It was expected that only changes would be observed in participants undergoing the mental toughness training intervention, while the participants still undergoing baseline conditions would remain stable (Barker et al., 2011).

Intervention

The mental toughness training intervention focused on improving performance outcomes by decreasing levels of competition anxiety and improving self-confidence, by employing four different psychological skills: 1) goal setting; 2) positive self-talk; 3) mental imagery; and 4) relaxation. These four psychological skills were chosen as they had been found to be the most commonly identified for enhancing athletic performance (Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998). Using an approach similar to that employed by Patrick and Hrycaiko (1998), the four psychological skills were introduced to the athletes through various exercises. The four skills were introduced sequentially throughout the intervention, starting with goal setting (intervention week 1), then positive self-talk (intervention week 2), followed by mental imagery (intervention week 3), and concluding with relaxation techniques (intervention week 4). Once the researcher introduced each of the four psychological skills, the remaining weekly sessions were spent reviewing these skills, and performing various standardized exercises geared towards improving one's mental toughness. The athletes were also encouraged to work through the exercises on their own time to develop greater competence for the methods of goal setting, positive self-talk, mental imagery, and relaxation. In order to

perform each of the exercises, the participants were each given a mental toughness training workbook (see Appendix B), developed by the researcher, outlining each psychological skill, and the corresponding exercises. In addition, each participant was also given a personal journal, where they could record their thoughts on the intervention, and keep track of their training and performance results. The specific exercises for each of the four psychological skills included in the mental toughness training intervention are outlined in greater detail below:

Goal Setting

During the initial goal setting session, the researcher introduced the concept of outcome goals, performance goals, and process goals. Outcome goals were described as goals that the athlete has little control over. The researcher explained that outcome goals provide direction, but no controllable action to get one there. The example used to describe an outcome goal was winning nationals. Performance goals were described as goals that are more within an athlete's control, such as setting a personal best. Performance goals include measuring oneself against one's own performance. The researcher explained process goals as the specific actions that one must make in order to reach one's performance and outcome goals. Examples of process goals included doing 5 extra sprints at the end of every practice, spending an extra 15 minutes stretching every day, and taking a recovery ice bath three times per week. Once the participant indicated that they had a good understanding of the various types of goals, the researcher asked each athlete to write down a personalized process, performance and outcome goal for each week. The participants were asked to write their weekly goals on a cue card, and post it somewhere visible to review each day. The participants were also encouraged to

keep track of their goals in their personal journals. The researcher helped each participant to set goals for each week, ensuring that the S.M.A.R.T. principle was kept in mind, by following the example set by Thelwell and Greenless (2001). The S.M.A.R.T. principle helped ensure that the goals were specific measurable, attainable, realistic, and timely. An evaluation of whether or not the weekly goals were met was conducted at each weekly meeting.

Positive Self-Talk

For positive self-talk, participants were first asked to think about, and then write down a list of all of the negative thoughts that may enter their minds during competition. The goal of this first exercise was to allow the athletes to become aware of the negative thoughts that may be hindering their performance. Beside each negative statement written down, participants were then asked to write a positive statement that counterbalanced the negative statement. Writing a positive statement beside each negative statement allowed the participants to be better prepared to stop negative thoughts/negative self-talk by having a positive affirmation already established and rehearsed. Additionally, participants were also asked to think about, and then write down three cue words or positive affirmations on a cue card. Participants were asked to read this cue card prior to every practice and competition to help them establish and maintain a positive mindset. The athletes were also encouraged to recite one of their cue words when they began to experience negative thoughts/negative self-talk, to immediately terminate the negative internal dialogue. As a final exercise, the participants were encouraged to create a personal positive mantra to use throughout the season.

Mental Imagery

For mental imagery, the researcher helped the participants create a vivid image of them performing. The participants were asked to imagine specific details related to their performance, such as how they felt, how they ran/jumped, what the environment looked like, what the environment smelled like, and what the environment sounded like.

Participants could picture themselves looking through their own eyes, or from an external perspective. The researcher encouraged the participants' images to be as structured, controlled, and vivid as possible in order to be the most effective. Participants were encouraged to practice imagery on a nightly basis, prior to their regular training sessions, and ultimately, prior to competition.

Relaxation

For relaxation, the participants practiced, with the help of the researcher, using the techniques of progressive muscle relaxation (PMR; Jacobson, 1938), centering, as described by Hardy and Fazey (1990), as well as deep breathing exercises, as outlined by Hogg (1995), in order to calm nerves and lower levels of anxiety prior to competition.

After the researcher introduced each of these techniques, the participants were encouraged to practice using these relaxation methods during regular training sessions as well as during competition. It was also recommended that the participants practice these relaxation techniques on a nightly basis before bed, especially on the night before a competition.

After the four psychological skills had been introduced during the first four weeks of the intervention, the participants and the researcher continued to meet one-on-one on a weekly basis for the remainder of the track and field season to practice and review each

of the four skills. During each session, the researcher and the participants analyzed the previous week's goals, in addition to setting new outcome, performance, and process goals for the upcoming week. The researcher also had each participant continue to review their list of positive cue words and affirmations, practice creating mental images of competition situations, and the participants were encouraged to practice the various relaxation techniques. Each session was also conducted in a manner whereby each participant was given the time to speak openly about additional psychological issues that may have been affecting their practice or performance results. The main topics that were generated through these open conversations included the fear of failure, pressure to perform and meet expectations set by oneself and others, and stress associated with balancing the life of a Western University student-athlete.

Assessing the Dependent Variables

Competition Anxiety and Self-Confidence

In order to assess competition anxiety and self-confidence, each participant was asked to complete the CSAI-2 prior to each competition throughout the track and field season. Scores for the CSAI-2 were separated into three dimensions to determine each participant's cognitive state anxiety, somatic state anxiety, and overall self-confidence.

Performance

In order to determine the impact of the mental toughness training intervention on performance, competition results were recorded for each participant for the duration of the track and field season. Both the researcher and the participant were asked to record performance results after each competition for the entire track and field season, based on time, for the distance runners, or height, for the one participant who competed in the high

jump event. Due to the size of the Track and Field team, and the ability level of the participants, not all four participants were always competing at the same meets, and some participants had the opportunity to compete in more meets compared to other participants in the study. It should be noted that neither the researcher, nor the participants, had any indication of how many meets each participant would have the opportunity to compete in before the season, and before the initiation of this study. The opportunity to compete was dictated by the coaching staff, and was based on each participant's ability level in comparison to other members of the team competing in the same event.

Practice Measurement Scores

Due to the limited competition schedule for some of the participants, and in order to gain further insight on the impact of the mental toughness training intervention on physical performance, practice measures were also recorded throughout the duration of the season. Each week participants were asked to rate their performance in practice, based on their physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and their comparison of their performance with their expectations. Participants were asked to rate each of the six dimensions on a 5-point Likert scale (1 = not good at all, 5 = very good). These self-reported measures gave the researcher a better understanding of whether or not each participant was experiencing a positive effect as a result of the intervention.

Use of Mental Skills

In order to assess the use of mental skills learned through the mental toughness training intervention, each participant was asked to complete the MSAQ after each competition. This self-report questionnaire asked participants to state whether or not they

had used the skills of goal setting, positive self-talk, mental imagery, and relaxation both before and during competition.

Social Validation Questionnaire

Once each participant completed the mental toughness training intervention, each participant was asked to complete the Social Validation Questionnaire. The Social Validation Questionnaire was used to assess each participant's overall satisfaction with the Mental Toughness Training Intervention. Additionally, during the last session, the researcher and the participant discussed whether or not the participant was able to reach the goals that they set at the beginning of the intervention. Strategies for continuing to practice and develop psychological skills associated with mental toughness were also discussed, as each of the four participants were planning on competing in the outdoor track and field season during the summer months, and were therefore motivated, based on their satisfaction with the study, to continue mental skills training.

Data Analysis

Intervention Effects

In order to determine the possible treatment effects of the mental toughness training intervention, visual analysis was used to examine each participant's level of competition anxiety and self-confidence, as well as overall practice and performance results across baseline and experimental conditions (Kazdin, 2010). Specifically, scores from the CSAI-2, practice measurement scores, and performance results, were analyzed through five key features of the graphically displayed data: a) level, b) variability, c) trend, d) immediacy of effect, and e) overlap (Kratcohwil et al., 2010). With regards to visual analysis, level refers to the approximate mean within each phase, while variability

refers to the approximate deviation within each phase. The trend describes the slope of the phases, and immediacy of effect refers to the change in level from the baseline phase to the intervention phase. In addition to visual analysis, descriptive and statistical analyses were used to compliment visual inspection (Kinugasa, 2013). Specifically, the mean and standard deviation CSAI-2 scores, practice measurement scores, and performance results were calculated for each participant, in addition to the percentage of non-overlapping points (PND; Scruggs & Mastropieri, 1998), and Standardized Mean Difference (SMD_{all} ; Rosnow & Rosenthal, 1996).

In accordance with Martin and Pear (1996) the indication of a positive effect of the intervention employed in this study centered on: a) the baseline performance being in a stable or opposite direction to that of the predicted effects of the intervention; b) the greater number of times that an effect was replicated both within and across participants; c) a fewer number of overlapping data points between baseline and intervention phases, with a PND of 90% representing very effective treatment, 70%-89% representing effective treatment, and 50% or lower indicating ineffective treatment (Scruggs & Mastropiere, 2001), and d) a SMD_{all} of .25 indicating a large effect size, and 0.09 indicating a medium effect size (Cohen, 1988). However, in terms of SMD_{all} , it is important to note that when improvement is associated with a lower score in the intervention phase in comparison to the baseline phase, such as a decrease in cognitive and somatic anxiety, as well as a decrease in overall running time, SMD_{all} values less than zero indicate the degree to which the intervention is effective, while positive values indicate the degree to which the intervention is less effective than baseline measures.

Results

The graphed data for each participant's CSAI-2 scores, performance results, and practice measurement scores are presented in Figures 1, 2, and 3 respectively.

Additionally, results describing the level, variability, trend, and immediacy of effect of the intervention on each dependent variable are presented in Tables 1, 2, and 3. Results from the MSAQ are presented in Table 4, while results from the Social Validation Questionnaire are presented in Table 5.

CSAI-2.

Participant 1

Cognitive Anxiety. Based on the visual analysis of the graph depicting the results of the CSAI-2 scores (Figure 1A), Participant 1 had a relatively stable baseline trend for cognitive anxiety, and an intervention effect. The intervention effect was evidenced by a level decrease from the baseline phase to the intervention phase, and an immediate effect following the intervention. However, it must be noted that although an initial intervention effect was observed, Participant 1 returned to baseline levels of cognitive anxiety at the last meet of the season. Finally, the PND was 80%, while the SMD_{all} was -3.39, indicating that the treatment was effective for lowering levels of cognitive anxiety.

Somatic Anxiety. In terms of somatic anxiety, Participant 1 revealed a relatively stable baseline trend, and an intervention effect. The intervention effect was evidenced by a significant level (mean) decrease from the baseline phase to the intervention phase, an immediate effect following the intervention, and a decreasing intervention phase trend in comparison to baseline. Like the cognitive anxiety results, although an initial

intervention effect was observed, Participant 1 experienced an increase in somatic anxiety during the last meet of the season. However, the PND was 80%, and the SMD_{all} was -3.13, indicating that the treatment was effective for lowering levels of somatic anxiety.

Self-Confidence. Participant 1 revealed a relatively stable baseline trend, and an intervention effect. The intervention effect was evidenced by an immediate effect following the intervention, and a significant level (mean) increase from the baseline phase to the intervention phase. In line with the results regarding cognitive anxiety and somatic anxiety, Participant 1 returned to baseline levels of self-confidence at the last meet of the season, which was not an expected result of this intervention. The PND was 100%, and the SMD_{all} was 4.57, indicating that the treatment was very effective for enhancing levels of self-confidence.

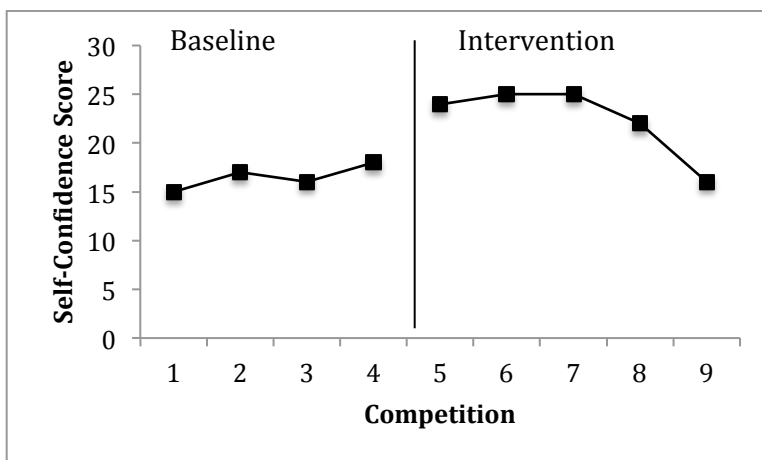
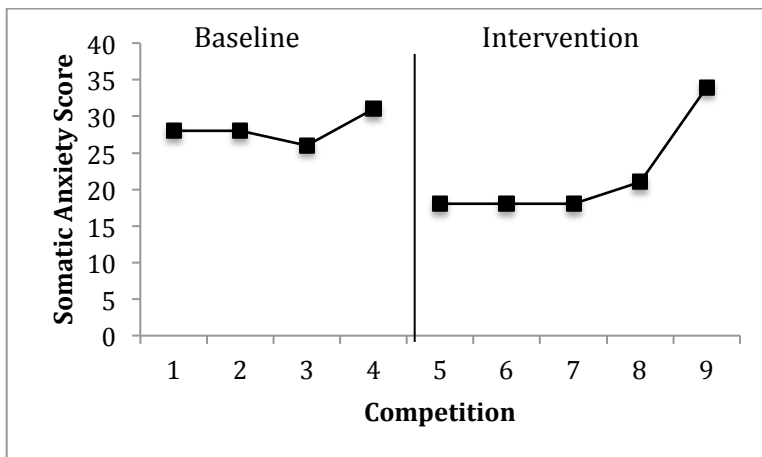
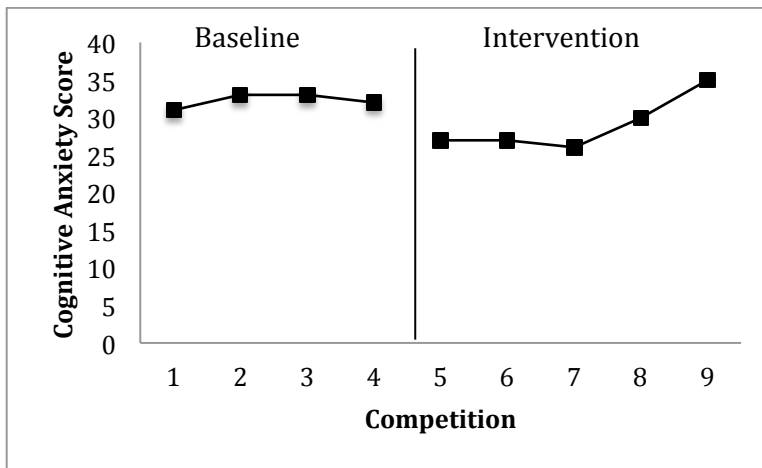
Additionally, Participant 1 recorded the highest baseline scores for both cognitive anxiety and somatic anxiety, and the lowest score for self-confidence. Furthermore, Participant 1 had the highest average scores for both cognitive anxiety (30.44), and somatic anxiety (24.67) over the course of the season, indicating the highest levels of pre-competition anxiety. Participant 1 also had the second lowest average score for self-confidence (19.78), indicating a low level of pre-competition self-confidence. As noted previously in the literature review, a high level of pre-competition anxiety, coupled with a low level of self-confidence, is not ideal for optimal performance results. As noted on the graph, Participant 1 did show an improvement in both cognitive anxiety and state anxiety, as well as self-confidence, immediately after the introduction of the intervention. However, although the mental toughness training intervention seemed to initially help Participant 1 decrease levels of pre-competition anxiety, and enhance levels of self-

confidence, during the last meet of the season Participant 1 experienced the greatest levels of both cognitive and somatic anxiety, and a decrease in self-confidence, which was the opposite result expected for this intervention.

This increase in pre-competition anxiety, coupled with a decrease in self-confidence at the final competition of the season, could possibly be explained by the fact that this was the first time that Participant 1 was competing at the OUA Championships. Therefore, because this was the biggest and most competitive meet that Participant 1 had ever competed in, she was unable to appropriately handle the additional stress and anxiety that is often times associated with such high-pressure competition situations. Although it was the goal of the intervention to prepare the participants to be able to control their levels of anxiety and self-confidence in such situations, it was clear that the amount of experience that one has competing at a high level cannot be overlooked. The more experience an athlete has competing in high-pressure situations, the more practice one will have at employing the specific psychological skills necessary to succeed in such an environment.

Figure 1A. Graphed results from the Competitive State Anxiety Inventory-2

Participant 1



Note: Results obtained from the Competitive State Anxiety Inventory-2. The solid vertical line on each graph indicates the point at which the intervention was implemented.

Participant 2

Cognitive Anxiety. Visual inspection of the graphical data for Participant 2 (Figure 1B) indicated that a stable baseline trend was not present with regards to cognitive anxiety. However, a decrease in level (mean) was noted from the baseline phase to the intervention phase, which was predicted for the effects of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was -0.65, indicating that the treatment was effective for lowering levels of cognitive anxiety.

Somatic Anxiety. Visual inspection of the data for Participant 2 did not demonstrate a change in trend from the baseline phase to the intervention phase with regards to somatic anxiety. There was a very slight level (mean) decrease from the baseline phase to the intervention phase. The PND was 100%, and the SMD_{all} was -1.00, indicating that the treatment was effective for lowering levels of somatic anxiety.

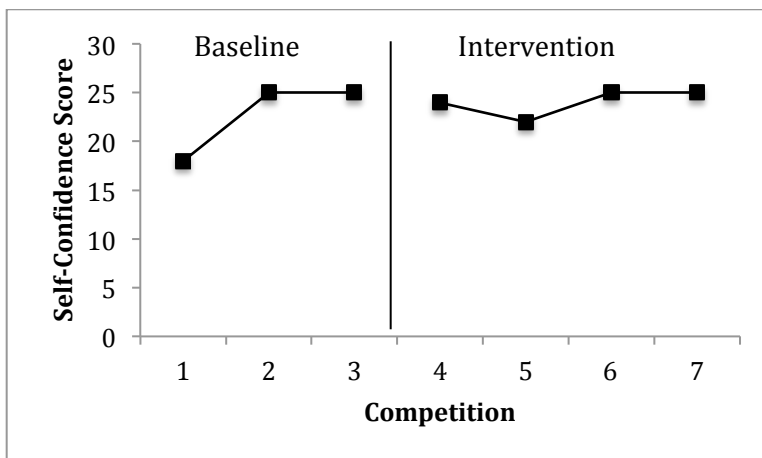
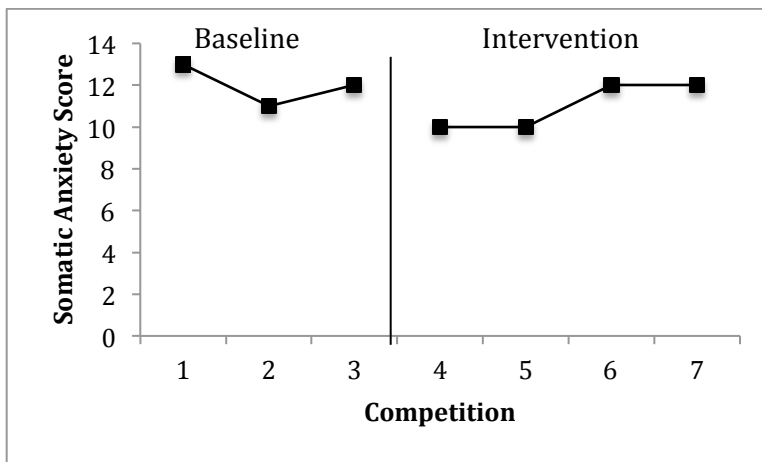
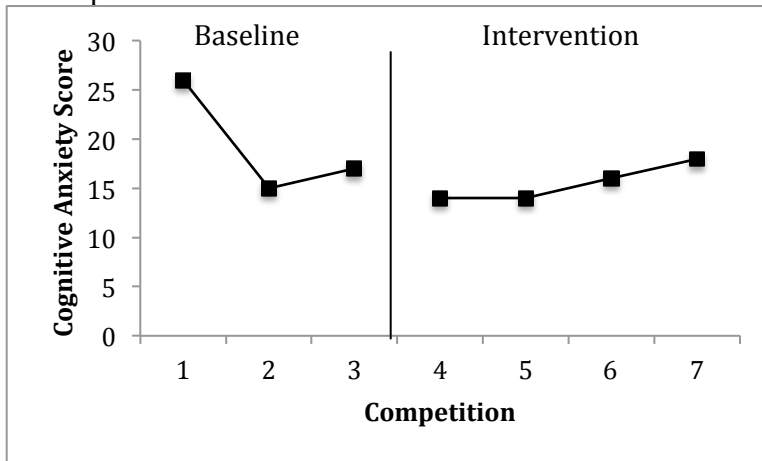
Self-Confidence. Visual inspection of the data for Participant 2 did not demonstrate a change in trend from the baseline phase to the intervention phase with regards to self-confidence. There was no immediate intervention effect observed. There was a very slight level (mean) increase from the baseline base to the intervention phase. Furthermore, the PND was 100%, and the SMD_{all} was 0.33, which indicated that the treatment was effective for increasing levels of self-confidence, although it was hard to detect based on visual analysis alone.

Additionally, it was noted that Participant 2 recorded the best initial baseline scores on the CSAI-2 for both cognitive anxiety (26) and somatic anxiety (13). Because Participant 2 reported such low levels of pre-competition anxiety in the baseline phase, it was a concern as to whether the mental toughness training intervention would have an

effect in comparison to the other participants. As noted on the graphs, Participant 2 was able to slightly improve and/or maintain levels of pre-competition anxiety and self-confidence from the baseline phase to the intervention phase. Participant 2 reported the best mean scores in all three domains compared to the other participants, indicating that this participant was best able to control levels of anxiety and self-confidence prior to competition, giving her an advantage in achieving optimal performance results.

Figure 1B. Graphed results from the Competitive State Anxiety Inventory-2

Participant 2



Note: Results obtained from the Competitive State Anxiety Inventory-2. The solid vertical line on each graph represents the point at which the intervention was implemented.

Participant 3

Cognitive Anxiety. Based on the visual analysis of the graphical data (Figure 1C), Participant 3 did not experience a significant intervention effect. There was a slight decrease in level (mean) between the baseline phase and the intervention phase. However, the PND was 100%, and the SMD_{all} was -0.32, which indicated that the treatment was effective, despite the results from the visual analysis.

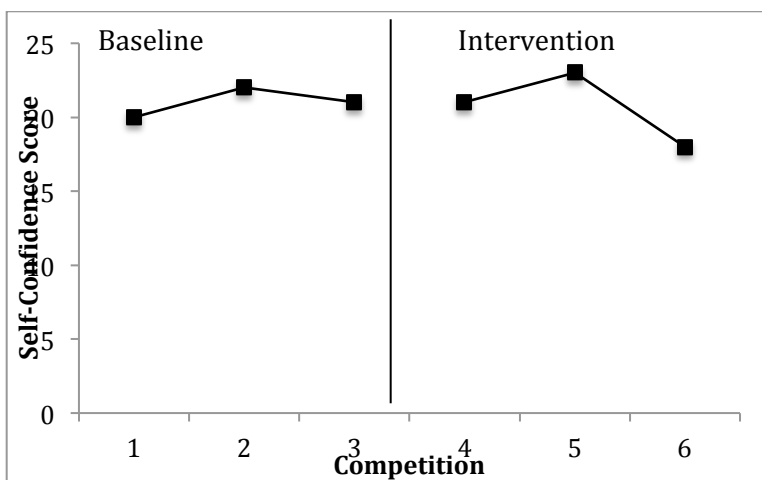
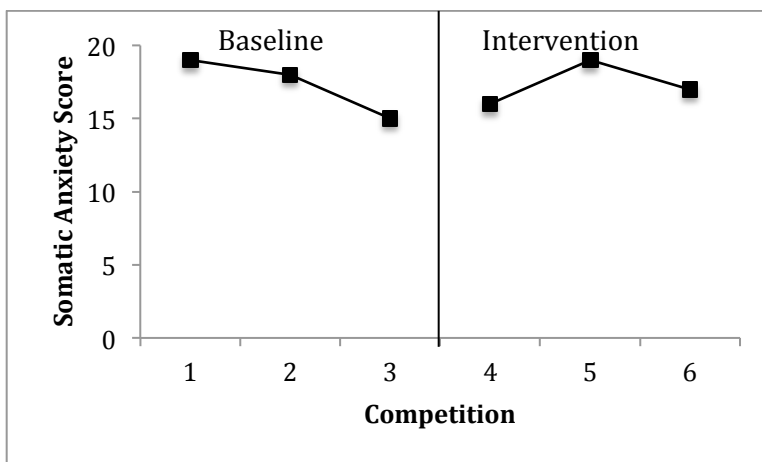
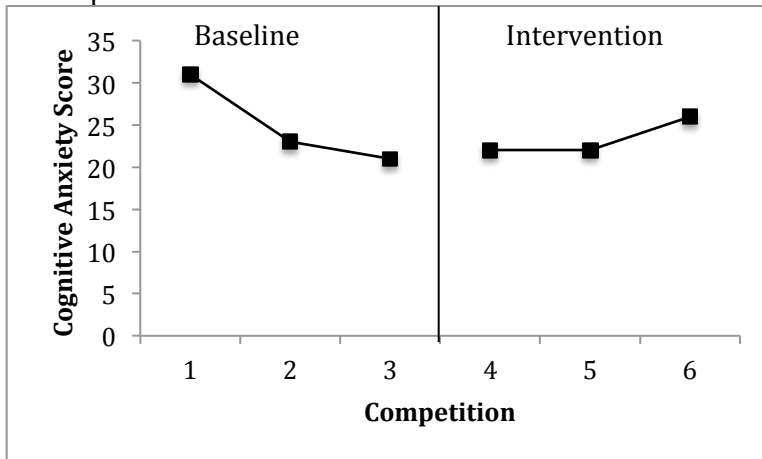
Somatic Anxiety. Visual analysis of the graphical data did not reveal an intervention effect for Participant 3 with regards to somatic anxiety. Participant 3 reported the same level (mean) between the baseline phase and the intervention phase. The PND was 67%, and the SMD_{all} was zero, indicating an ineffective treatment.

Self-Confidence. In line with both cognitive anxiety and somatic anxiety, visual analysis for Participant 3 did not reveal an intervention effect with regards to self-confidence. The PND was 67%, and the SMD_{all} was -0.33, indicating an ineffective treatment.

Based on the visual analysis for the graphs, Participant 3 did not experience any significant positive effects from the mental toughness training intervention with regards to pre-competition anxiety and self-confidence. Participant 3 experienced a slight improvement in cognitive anxiety from initial baseline testing to the intervention phase, but levels of somatic anxiety and self-confidence remained relatively stable throughout the study, which went against the predicted results for this intervention.

Figure 1C. Graphed results from the Competitive State Anxiety Inventory-2

Participant 3



Note: Results obtained from the Competitive State Anxiety Inventory-2. The solid vertical line on each graph indicates the point at which the intervention was implemented.

Participant 4

Cognitive Anxiety. Visual analysis of the graphical data (Figure 1D) revealed that Participant 4 experienced a significant intervention effect. The intervention effect was evidenced by a large level (mean) decrease from the baseline phase to the intervention phase, and an immediate effect following the introduction of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was -3.47, indicating that the treatment was very effective for lowering levels of cognitive anxiety.

Somatic Anxiety. Visual analysis of the graphical data for Participant 4 revealed a stable baseline phase, and an intervention effect. The intervention effect was evidenced by a significant level (mean) decrease from the baseline phase to the intervention phase, and an immediate effect following the intervention. The change in direction for somatic anxiety was predicted for the effects of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was -9.76, indicating that the treatment was very effective for lowering levels of somatic anxiety.

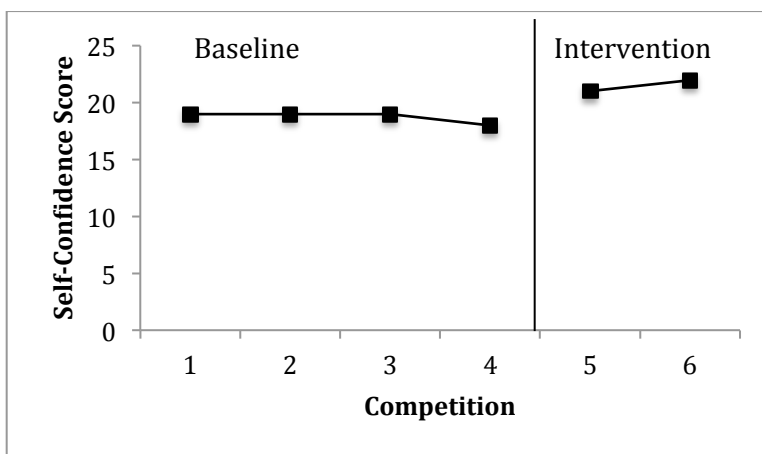
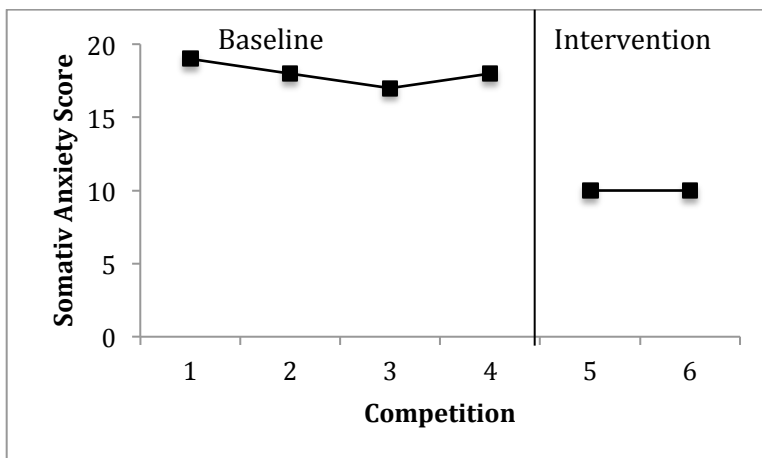
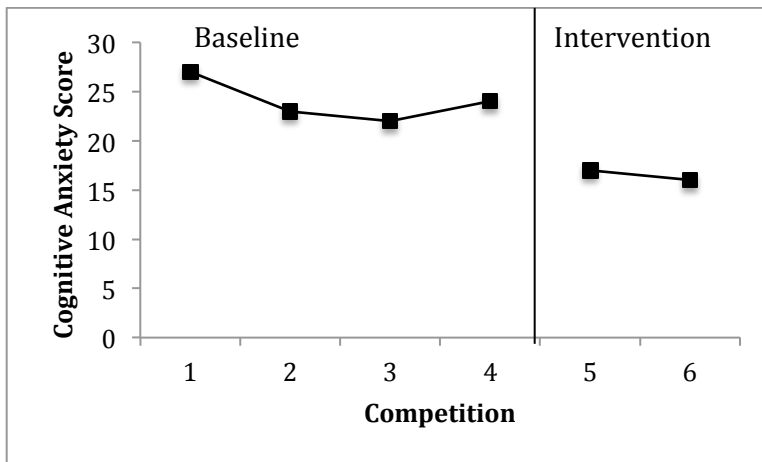
Self-Confidence. Participant 4 revealed a stable baseline, and an intervention effect. The intervention effect was evidenced by a level (mean) increase from the baseline phase to the intervention phase, an immediate effect following the introduction of the intervention, and an increasing intervention phase trend in comparison to the baseline phase. Furthermore, the PND was 100% and the SMD_{all} was 5.5, indicating that the treatment was very effective for enhancing levels of self-confidence.

Based on visual analysis, Participant 4 experienced the greatest improvements in cognitive anxiety, somatic anxiety, and self-confidence from the baseline phase to the intervention phase in comparison to the other three participants in the study. The trend of

the graph indicates that Participant 4 experienced a positive effect of the mental toughness training intervention, as was the aim of this study.

Figure 1D. Graphed results from the Competitive State Anxiety Inventory-2

Participant 4



Note: Results obtained from the Competitive State Anxiety Inventory-2. The solid vertical line on each graph indicates the point at which the intervention was implemented.

Table 1

*Results from the Competitive State Anxiety Inventory-2***Cognitive Anxiety**

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	32.25 (0.96)	29.00 (3.67)	Relatively Stable	Decreasing	Immediate
2	19.33 (5.86)	15.50 (1.19)	Decreasing	Decreasing	N/A
3	25.00 (5.29)	23.33 (2.31)	Decreasing	Slight Decrease	N/A
4	24.00 (2.16)	16.50 (0.71)	Decreasing	Decreasing	Immediate

Note: Levels of cognitive anxiety were measured before competition, using the Competitive State Anxiety Inventory-2. This table highlights the levels of cognitive anxiety during both the baseline and intervention phase for each participant.

Somatic Anxiety

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	28.25 (2.06)	21.80 (6.94)	Relatively Stable	Decreasing	Immediate
2	12.00 (1.00)	11.00 (1.15)	Relatively Stable	Slight Decrease	N/A
3	17.33 (2.08)	17.33 (1.53)	Decreasing	Stable	N/A
4	18.00 (0.82)	10.00 (0.00)	Stable	Decreasing	Immediate

Note: Levels of somatic anxiety were measured before competition, using the Competitive State Anxiety Inventory-2. This table highlights the levels of somatic anxiety during both the baseline and intervention phase for each participant.

Self-Confidence

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	16.50 (1.29)	22.40 (3.78)	Relatively Stable	Increasing	Immediate
2	22.67 (4.04)	24.00 (1.41)	Relatively Stable	Slight Increase	N/A
3	21.00 (1.00)	20.67 (2.52)	Stable	Slight Decrease	N/A
4	18.75 (0.50)	21.5 (0.71)	Stable	Increasing	Immediate

Note: Levels of self-confidence were measured before competition, using the Competitive State Anxiety Inventory-2. This table highlights the levels of self-confidence during both the baseline and intervention phase for each participant.

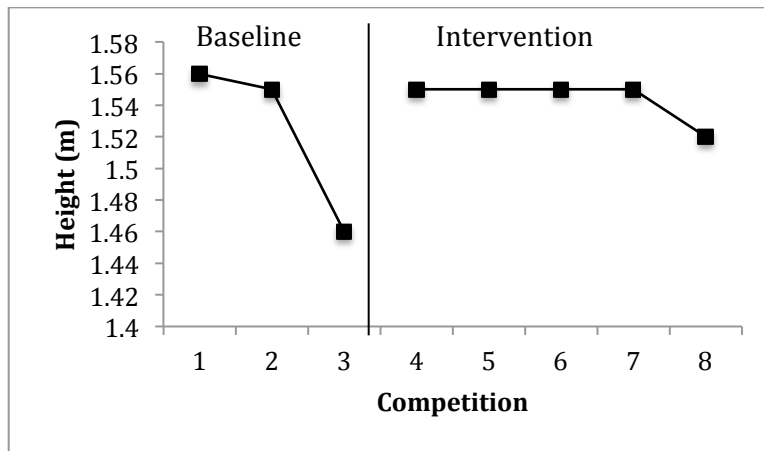
Performance Results.

Participant 1

Visual analysis of the graphical data for Participant 1 (Figure 2A) did not reveal an intervention effect with regards to performance results in the high jump event. Although the baseline performance trend was in an opposite direction to that of the predicted effect of the intervention, performance throughout the intervention phase remained stable. There were no observable improvements throughout the intervention phase, nor was there a change in trend in the direction predicted for the effects of the intervention. The PND was 0%, and the SMD was 0.33, indicating that overall, the treatment was ineffective for enhancing performance results.

Figure 2A. Graphed performance results

Participant 1



Note: Results from in-season high jump competitions. The solid vertical line on the graph indicates the point at which the intervention was implemented.

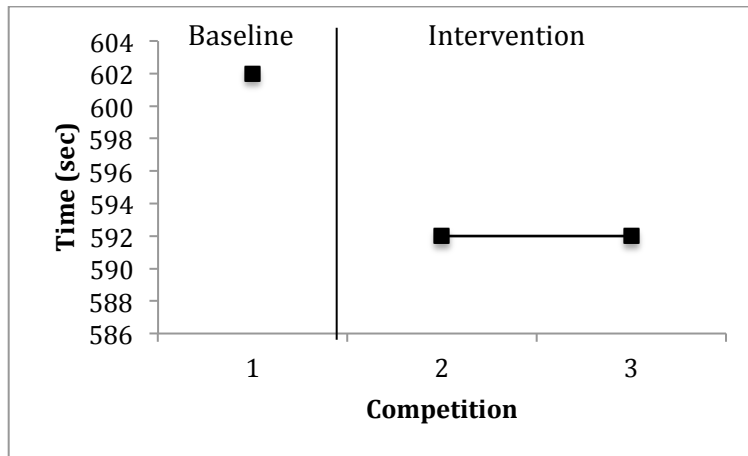
Participant 2

Due to the limited races that Participant 2 competed in during the track and field season, there was not enough concrete data collected to state the presence of an intervention effect on race performance results. However, based on visual analysis of the graphical data (Figure 2B), it was clear that Participant 2 recorded faster times in both the 1500m event, as well as the 3000m event, in the intervention phase compared to the baseline phase.

Figure 2B. Graphed performance results

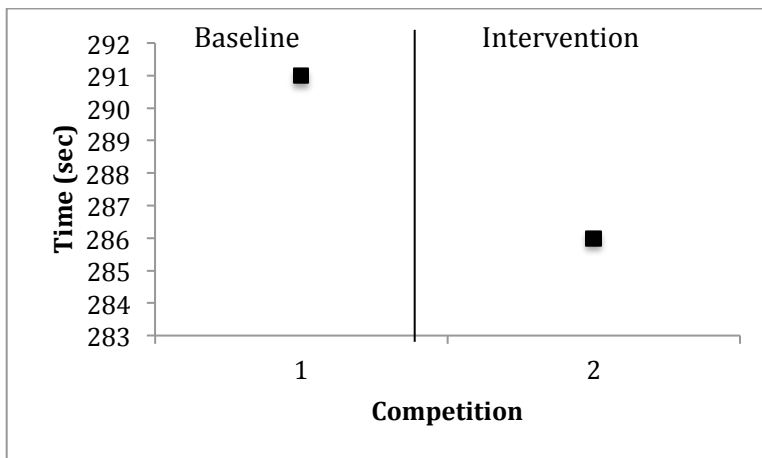
Participant 2

3km



Note: Results from in-season 3km track competitions. The solid vertical line on the graph indicates the point at which the intervention was implemented.

1500m



Note: Results from in-season 1500m track competitions. The solid vertical line on the graph indicates the point at which the intervention was implemented.

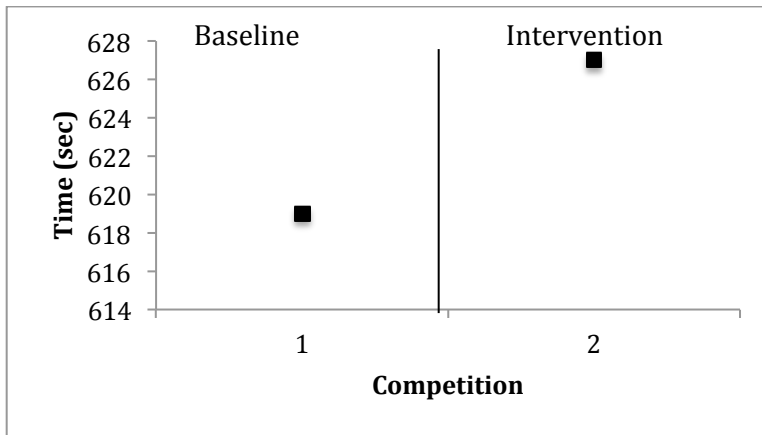
Participant 3

As with Participant 2, due to the limited races that Participant 3 competed in during the track and field season, there was not enough concrete data collected to state the presence of an intervention effect on race performance results. However, based on the visual analysis of the graphical data (Figure 2C), it was clear that Participant 3 recorded faster race times in the 1500m event in the intervention phase compared to the baseline phase.

Figure 2C. Graphed performance results

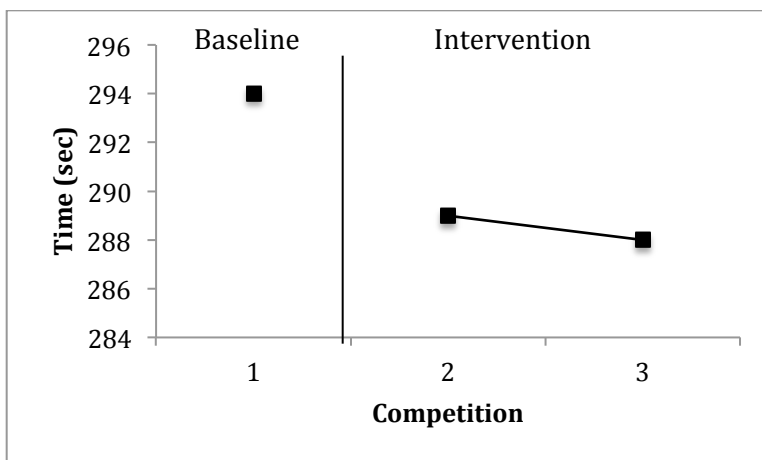
Participant 3

3km



Note: Results from in-season 3km track competitions. The solid vertical line on the graph indicates the point at which the intervention was implemented.

1500m



Note: Results from in-season 1500m track competitions. The solid vertical line on the graph indicates the point at which the intervention was implemented.

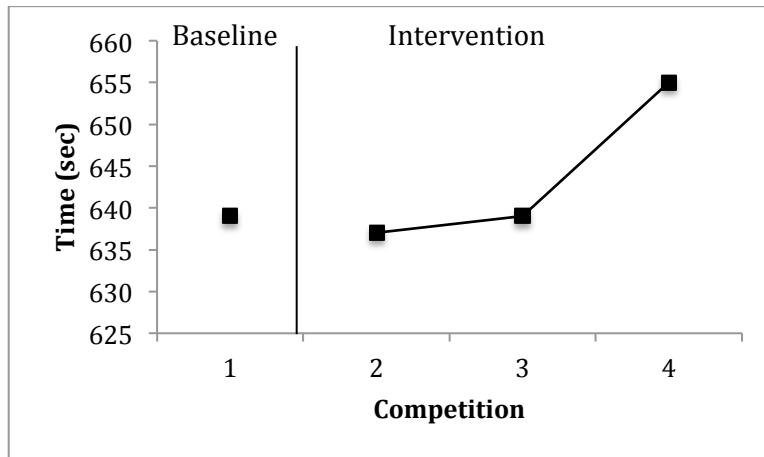
Participant 4

As with Participants 2 and 3, due to the limited races that Participant 4 competed in during the track and field season, there was not enough concrete data collected to state the presence of an intervention effect on race performance results. Based on the visual analysis of the graphical data (Figure 2D), Participant 4 maintained relatively stable performance results from the baseline phase to the intervention phase, which was not the predicted result of this intervention.

Figure 2D. Graphed performance results

Participant 4

3km



Note: Results from in-season 3km track competitions. The solid vertical line on the graph indicates the point at which the intervention was implemented.

Table 2

Performance Results

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	1.52 (0.06)	1.54 (0.01)	Decreasing	Increasing/ Stable	Immediate
2	3km - 10:02 (N/A)	9:52 (0.00)	N/A	Decreasing	Immediate
	1500m - 4:51 (N/A)	4:46 (N/A)	N/A	Decreasing	Immediate
3	3km – 10:19 (N/A)	10:27 (N/A)	N/A	Increasing	Immediate
	1500m – 4:54 (N/A)	4:48.5 (0.71)	N/A	Decreasing	Immediate
4	3km – 10:39 (N/A)	10:44 (9.87)	Stable	Increasing	Immediate

Note: Performance results were measured based on the time (min)/distance (m) recorded for each participant during competition. This table highlights the mean performance for each participant during the baseline and intervention phase.

Practice Measurement Scores

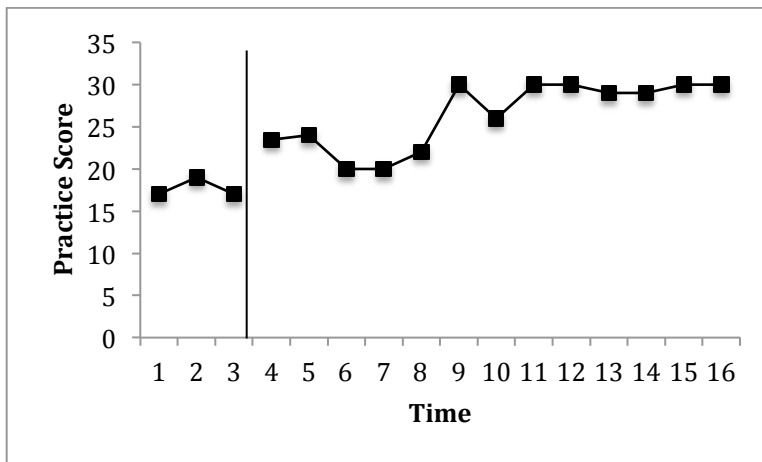
Participant 1

Based on the visual analysis of the graphical data (Figure 3A), Participant 1 had a relatively stable baseline, and an intervention effect. The intervention effect was evidenced by a sizable level (mean) increase from the baseline phase to the intervention phase, an immediate effect following the introduction of the intervention, and an increasing intervention phase trend in comparison to the baseline phase, in the direction predicted for the effects of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was 7.61, indicating that the treatment was very effective for improving performance in practice.

With regards to each specific component of the practice score, physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and comparison of performance with expectations, Participant 1 experienced a sizeable level increase from the baseline phase to the intervention phase for each of the six factors.

Figure 3A. Graphed practice measurement results

Participant 1



Note: Results obtained from the self-report practice measurement questionnaire. The solid vertical line on the graph indicates the point at which the intervention was implemented.

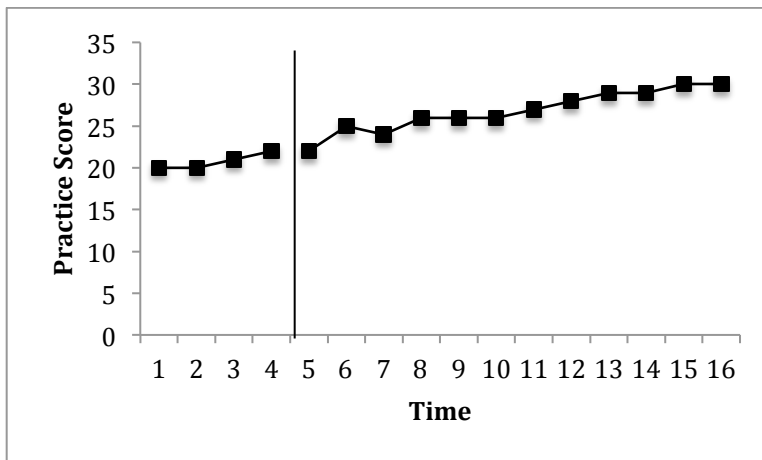
Participant 2

Visual analysis of the graphical data (Figure 3B) indicated that Participant 2 experienced an intervention effect with regards to practice measurement scores. The intervention effect was evidenced by a level increase from the baseline phase to the intervention phase, and an immediate effect following the introduction of the intervention. The trend of the intervention phase trend was in the direction predicted for the effects of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was 6.77, indicating that the treatment was very effective for enhancing practice measurement scores.

With regards to each of specific component of the practice score, physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and comparison of performance with expectations, Participant 2 experienced a sizeable level increase from the baseline phase to the intervention phase for each of the six factors.

Figure 3B. Graphed practice measurement results

Participant 2



Note: Results obtained from the self-report practice measurement questionnaire. The solid vertical line on the graph indicates the point at which the intervention was implemented.

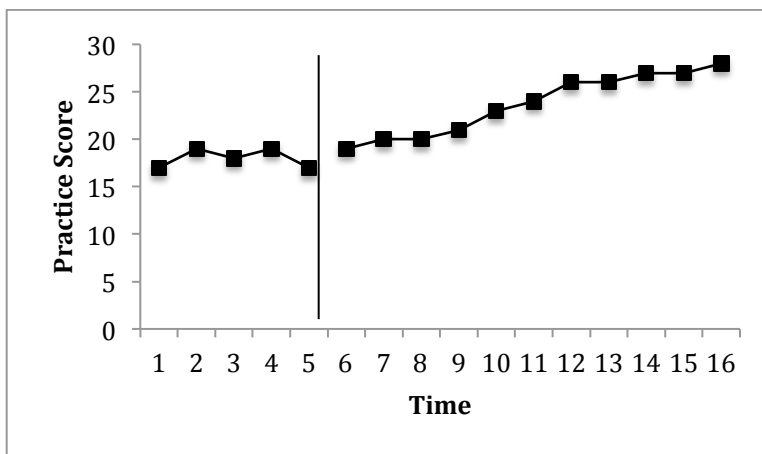
Participant 3

Visual inspection of the graphical data (Figure 3C) revealed that Participant 3 had a relatively stable baseline, and an intervention effect. The intervention effect was evidenced by a sizeable level increase from the baseline phase to the intervention phase, an immediate effect following the introduction of the intervention, and an increasing intervention phase trend in comparison to the baseline phase. The trend of the intervention phase was in line with the predicted results for the effects of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was 5.72, indicating that the treatment was very effective for enhancing practice measurement scores.

With regards to each specific component of the practice score, physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and comparison of performance with expectations, Participant 3 experienced a sizeable level increase from the baseline phase to the intervention phase for each of the six factors.

Figure 3C. Graphed practice measurement results

Participant 3



Note: Results obtained from the self-report practice measurement questionnaire. The solid vertical line on the graph indicates the point at which the intervention was implemented.

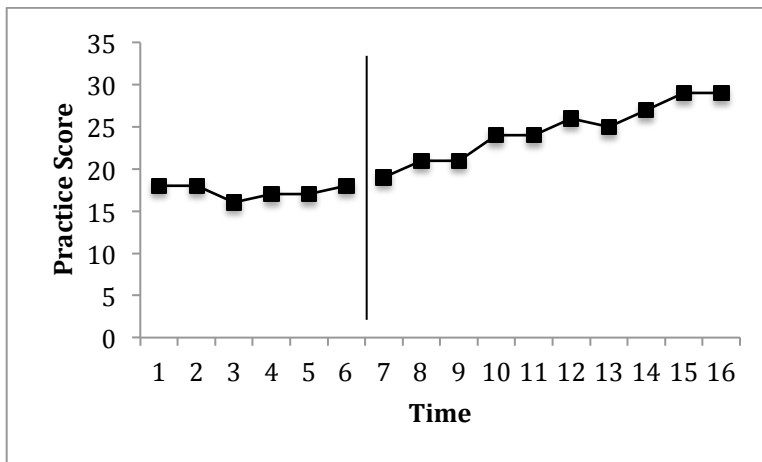
Participant 4

Based on the visual inspection of the graphical data (Figure 3D), Participant 4 revealed a relatively stable baseline, and an intervention effect. The intervention effect was evidenced by a sizeable level increase from the baseline phase to the intervention phase, an immediate effect following the introduction of the intervention, and an increasing intervention phase trend in comparison to the baseline phase. The intervention phase trend was in the direction predicted for the effects of the intervention. Furthermore, the PND was 100%, and the SMD_{all} was 8.74, indicating that the treatment was very effective for enhancing practice measurement scores.

With regards to each specific component of the practice score, physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and comparison of performance with expectations, Participant 4 experienced a sizeable level increase from the baseline phase to the intervention phase for each of the six factors.

Figure 3D. Graphed practice measurement results

Participant 4



Note: Results obtained from the self-report practice measurement questionnaire. The solid vertical line on the graph indicates the point at which the intervention was implemented.

Table 3

*Practice Measurement Score Results***Overall Practice Results**

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	17.67 (1.15)	26.42 (4.02)	Stable	Increasing	Immediate
2	20.75 (0.96)	27.25 (2.48)	Stable	Increasing	Immediate
3	18.00 (1.00)	23.72 (3.29)	Stable	Increasing	Immediate
4	17.33 (0.82)	24.50 (3.41)	Stable	Increasing	Immediate

Note: Overall practice results were obtained based on the sum of each participant's self-reported appraisal for each of the six aspects of performance, including physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and comparison of performance with expectations. This table reports the mean practice measurement scores during both the baseline and intervention phase for each participant.

Physical Performance

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	3.00 (0.00)	4.27 (0.78)	Stable	Increasing	Immediate
2	3.00 (0.00)	4.00 (0.74)	Stable	Increasing	Immediate
3	2.80 (0.45)	3.55 (0.52)	Stable	Increasing	Immediate
4	3.42 (0.49)	4.60 (0.52)	Stable	Increasing	Immediate

Note: Physical performance in practice was measured using a self-report appraisal questionnaire, using a 5-point Likert scale.

Mental Attitudes and Thoughts

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	3.00 (0.00)	4.46 (0.78)	Stable	Increasing	Immediate
2	2.50 (0.58)	4.33 (0.65)	Stable	Increasing	Immediate
3	2.20 (0.45)	3.64 (0.67)	Stable	Increasing	Immediate
4	2.67 (0.52)	4.10 (0.57)	Stable	Increasing	Immediate

Note: Mental attitudes and thoughts during practice were measured using a self-report appraisal questionnaire, using a 5-point Likert scale.

Concentration

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	3.00 (0.00)	4.54 (0.52)	Stable	Increasing	Immediate
2	4.00 (0.00)	4.50 (0.52)	Stable	Increasing	Immediate
3	2.80 (0.45)	4.27 (0.79)	Stable	Increasing	Immediate
4	3.00 (0.63)	4.10 (0.74)	Stable	Increasing	Immediate

Note: Concentration during practice was measured using a self-report appraisal questionnaire, using a 5-point Likert scale.

Anxiety

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	3.00 (1.00)	4.31 (0.85)	Stable	Increasing	Immediate
2	3.25 (0.50)	4.42 (0.51)	Stable	Increasing	Immediate
3	3.40 (0.55)	3.72 (0.47)	Stable	Increasing	Immediate
4	2.17 (0.41)	3.6 (0.97)	Stable	Increasing	Immediate

Note: Anxiety during practice was measured using a self-report appraisal questionnaire, using a 5-point Likert scale.

Self-Confidence

Part	Level and Variability		Trend		Immediacy off effect
	Baseline	Intervention	Baseline	Intervention	
1	3.00 (0.00)	4.31 (0.85)	Stable	Increasing	Immediate
2	4.00 (0.00)	5.00 (0.00)	Stable	Increasing	Immediate
3	3.00 (0.00)	3.91 (0.83)	Stable	Increasing	Immediate
4	2.67 (0.52)	3.50 (0.53)	Stable	Increasing	Immediate

Note: Self-confidence during practice was measured using a self-report appraisal questionnaire, using a 5-point Likert scale.

Comparison of Performance with Expectations

Part	Level and Variability		Trend		Immediacy of effect
	Baseline	Intervention	Baseline	Intervention	
1	2.67 (0.58)	4.54 (0.52)	Stable	Increasing	Immediate
2	4.00 (0.00)	5.00 (0.00)	Stable	Increasing	Immediate
3	3.80 (0.45)	4.64 (0.50)	Stable	Increasing	Immediate
4	3.42 (1.02)	4.60 (0.70)	Stable	Increasing	Immediate

Note: Comparison of performance with expectations during practice was measured using a self-report appraisal questionnaire, using a 5-point Likert scale.

Mental Skills Assessment Questionnaire

Results from the MSAQ are presented in Table 4. Each of the participants seemed to improve their use of mental skills throughout the duration of the track and field season, which was the anticipated result of this study.

Table 4

Percentage of Mental Skill Use During the Track and Field Season

Mental Skill	Participant			
	1	2	3	4
Pre-Event Relaxation	75%	100%	100%	100%
During Event Relaxation	75%	80%	40%	60%
Pre-Event Imagery	63%	60%	100%	80%
During Event Imagery	38%	0%	0%	0%
Pre-Event Self-Talk	63%	40%	100%	80%
During Event Self-Talk	100%	100%	60%	80%
Pre-Event Goal	100%	100%	100%	80%
Mental Skills Goal	50%	80%	100%	80%

Note: The Mental Skills Assessment Questionnaire (MSAQ) was used to measure the use of mental skills by each participant. This table highlights the percentage of time that each participant employed each of the specific psychological skills during the track and field season.

Social Validation Questionnaire

Results from the Social Validation Questionnaire are presented in Table 5. These results indicated that all 4 participants found the mental toughness training intervention to be highly effective and beneficial for improving levels of competition anxiety and self-confidence, as well as maximizing performance.

Table 5

Social Validation Questionnaire

	Participant			
	1	2	3	4
1) How important is it for you to improve performance	4	5	5	5
2) How important is it for you to decrease competition anxiety?	5	3.5	5	5
3) How important is it for you to improve self-confidence?	5	4	5	5
4) Did you see improvement in performance over the course of the season?	3	5	3	4
5) Did you see improvement in competition anxiety over the course of the season?	4	4	4	4
6) Did you see improvement in self-confidence over the course of the season?	4	4	3	4
7) Did you enjoy the mental toughness training intervention?	5	4	5	5
8) Did you enjoy the technique of relaxation?	4	4	5	5
9) Did you enjoy the technique of mental imagery?	3	4	5	4
10) Did you enjoy the technique of positive self-talk?	5	3	5	5
11) Did you enjoy the technique of goal setting?	4	4	5	4
12) Are you satisfied with the results of this intervention?	5	4	5	5
13) Did you consider this intervention to be useful?	5	4	5	5

Note: The Social Validation Questionnaire was used to assess each participant's overall satisfaction with the intervention, using a 5-point Likert type scale (1 = "not at all useful" and 5 = "extremely useful").

Discussion

The importance of mental toughness for achieving optimal success in sport has received a great amount of attention (Blakesless & Goff, 2007; Jones et al., 2002; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013). However, although both athletes and coaches acknowledge the importance of mental toughness, few admit to committing an appropriate amount of time and effort to psychological skills training (Dale, 2010). In an attempt to help athletes develop and improve the key psychological skills associated with mental toughness, mental toughness training programs have been gaining an increasing amount of support. Furthermore, current research has suggested that mental toughness training programs can be an effective strategy for improving and maximizing athletic performance (Blakeslee & Golf, 2007; Loehr, 1994; Mamassis & Doganis, 2004, Patrick & Hrycaiko, 1998). Through the development of key psychological skills associated with mental toughness, such as goal setting, positive self-talk, mental imagery, and relaxation techniques, athletes can learn how to appropriately manage levels of pre-competition anxiety, while improving levels of self-confidence. The ability to control levels of pre-competition anxiety and enhance levels of self-confidence is essential for performance excellence (Thelwell & Greenless, 2001).

The purpose of this present study was to determine the impact and effectiveness of a mental toughness training intervention, as it relates to competition anxiety, self-confidence, and athletic performance in varsity level track and field athletes. The secondary purpose of this study was to bring awareness to the importance of mental skills training, especially for university level athletes, with the ultimate goal of optimizing

athletic performance. It was hypothesized that the mental toughness training intervention employed in this study would be effective for helping athletes manage levels of competition anxiety, increase levels of self-confidence, and ultimately improve performance results through the development of key psychological skills associated with mental toughness including goal-setting, positive self-talk, mental imagery, and relaxation.

Results from this study provided considerable support for the effectiveness of the mental toughness training intervention. Specifically, in support of the hypothesis, the establishment of the key psychological skills associated with mental toughness, such as goal setting, positive self-talk, mental imagery, and relaxation techniques, were found to have a positive effect on levels of pre-competition anxiety and self-confidence. Each of the four participants experienced a level decrease for cognitive anxiety, from the baseline phase to the intervention phase. Participant 4 seemed to experience the greatest positive effect. For somatic anxiety, three out of the four participants experienced a decrease. Although Participant 3 was unable to improve her level of somatic anxiety from the baseline phase to the intervention phase, her scores remained stable. Again, Participant 4 experienced the greatest positive effect. With regards to self-confidence, three of the four participants experienced an increase in self-confidence as a result of the intervention. Participant 3 was the only participant who experienced a slight decrease from the baseline phase to the intervention phase. Participant 1 experienced the greatest positive effect for self-confidence. This result was not unexpected, due to the fact that Participant 1 reported the lowest baseline score for self-confidence, and thus had considerable room for improvement. Furthermore, Participant 1 consistently discussed her lack of self-

confidence with the researcher, so improving this component of the CSAI-2 was a main focus for this participant. Overall, the intervention was effective for increasing levels of self-confidence.

Results from the practice measurement scores provided additional support for the effectiveness of the intervention. Due to the fact that each of the four participants competed in limited competitions throughout the track and field season, it was necessary to obtain measures in practice to give the researcher additional insight on the extent to which the participants were benefiting from the mental toughness training intervention. Specifically, each of the four participants experienced a significant improvement in overall practice scores from the baseline phase to the intervention phase. When looking at each specific component of the overall practice measurement score, each participant reported an intervention effect for each of the six components, which included physical performance, mental attitude and thoughts, concentration, anxiety, self-confidence, and comparison of performance with expectations. Although these scores were self-reported, they are highly significant as they indicate that each participant experienced an improvement in the overall quality of practice as a result of the intervention.

Despite the positive results recorded for performance in practice, no clear intervention effect could be determined for actual performance in competition due to the limited data points for each participant. With regards to performance, it should be noted that prior to the start of the track and field season, and prior to the start of this study, neither the participants nor the researcher had any indication of how many competitions each participant would have the opportunity to compete in during the season. The opportunity to compete was primarily controlled by the coaching staff, and was largely

dictated by each participant's performance in practice, a comparison of each participant's performance and ability level to other members of the team, and the ability of each participant to run or jump the specific qualification standards for each specific competition during the season. Because the Western Track and Field team is so large, and of such a high caliber, many athletes were limited in their opportunities to compete in their respective events, as was the case for the participants in this study. This study did not discriminate between ability levels when recruiting participants for this mental toughness training intervention, as the researcher believed that athletes of any caliber could benefit from the development of psychological skills associated with mental toughness.

Based on the visual analysis of the performance results, Participant 1 did not experience an enhancement of performance as a result of the intervention. Participant 1 had her best performance during the first competition of the year. In total, Participant 1 competed in 8 high jump competitions over the duration of the track and field season. Based on her performance results from the 8 meets that she competed in this season, Participant 1 was relatively consistent with her results. Participant 1 recorded her lowest height of the season at meet 3. This result could possibly be explained due to the fact that the coaching staff was using this particular competition as a qualifying meet to select the team roster for the prestigious McGill Invitational meet the following weekend. Because Participant 1 had not yet started the mental toughness training intervention at this point in the season, the pressure associated with this meet may have potentially affected her performance in a negative way, as she had not yet developed the psychological skills necessary for controlling competition anxiety and self-confidence. After the initiation of

the mental toughness training intervention, no improvement in performance was observed in this participant. However, despite the fact that there was no observable improvement in performance, Participant 1 remained relatively consistent throughout the season, and additionally noted through verbal communication with the researcher that the mental toughness training intervention was enjoyable and beneficial for controlling nerves and levels of competition anxiety prior to and during competition, increasing self-confidence, and enhancing feelings of preparedness and optimism to succeed.

As previously stated, based on the strength of the Western University Track and Field Team, Participant 2, 3, and 4 were not given many opportunities to compete as preference in choosing the competition roster was typically given to athletes of a higher ability level who were more likely to score points for the team. Due to the limited opportunities to compete, it was difficult to obtain adequate performance data for each of these participants in order to determine the effect of the mental toughness training intervention on competition performance. Nonetheless, Participant 2, 3, 4 were each given the opportunity to compete in five competitions. Because each of these participants were distance runners, their competition events ranged from the 1500m to the 3000m, making it additionally more difficult to obtain enough concrete data in one event to determine the presence of an intervention effect.

Participant 2 competed in 3, 3000m races over the course of the season. An observable performance improvement was noted from the baseline phase to the intervention phase. Additionally, Participant 2 also competed in two, 1500m races, one during the baseline phase, and the second during the intervention phase. Participant 2 made a noticeable improvement in her 1500m time from the baseline phase to the

intervention phase. Although additional data points would have been helpful, it was clear that Participant 2 recorded faster race results in both her respective events in the intervention phase as compared to the baseline phase. Obtaining additional data points would help determine whether these performance improvements were a result of the intervention, or another factor such as physical training.

Participant 3 competed in two, 3000m races during the track and field season. No improvement was seen in this race distance from the baseline phase to the intervention phase. Participant 3 also competed in three 1500m races during the season, improving her time during the baseline phase, to a personal best time in her last race of the season. Participant 3 would have had the opportunity to compete in another 3000m at the end of the season, but a mild sickness caused her to end her season a week early.

Participant 4 competed in four, 3000m races during the track and field season. No improvement was observed. Participant 4 ran consistent times for her first three races. Participant 4 ran her slowest 3000m time in the last meet of the year, which could possibly be explained by the fact that this was her last race of the year, her body and mind were tired from a long track and field season, and she knew that she was not in a position to run a time fast enough to qualify to make the team roster competing at the OUA Championships the following weekend. Participant 4 was given only one opportunity to compete at the 1500m race distance. The performance results from Participant 4 did not support the hypothesis of the study, as the intervention showed no clear effect on performance.

Based on the results from the MSAQ, all four participants reported a high use of each of the four psychological skills developed throughout this intervention, which

included goal setting, positive self-talk, mental imagery, and relaxation. Specifically, all of the participants reported a high use of pre-competition goal setting, pre-competition and during competition positive self-talk, pre-event imagery, and pre-competition relaxation techniques. Although, in general, the utilization of mental skills was high, it was interesting to note that participants reported a lower use of relaxation techniques during competition. While being able to relax can be beneficial for events such as distance running and high jump, it is understandable that athletes may forget to employ relaxation techniques when they are in the heat of competition, and primarily focused on the execution of their physical performance, which requires an optimal level of arousal. However, although athletes need to obtain a certain degree of arousal for peak performance, the utilization of relaxation techniques during competition may help athletes maintain composure when they start to lose focus, or experience feelings fatigue. Being able to control and maintain levels of arousal is important not only prior to competition, but during competition as well (Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001). An additional significant result to note was the low reported use of mental imagery during competition. Specifically, Participant 1 reported using mental imagery only 38% of the time, while Participants 2, 3, and 4 reported zero use of mental imagery during competition. Again, although this was not the predicted result for the intervention, these results are not overly surprising. For Participant 1, who competed in the high jump event, using imagery during competition may be possible and helpful between jumps, as the athlete has time to think and refocus before each attempt at a specific height. However, in a sport such as distance running, it is understandable that the use of imagery while running a race may be difficult, and not overly effective. Taken

together, the results from the MSAQ were positive, and indicated that each of the four participants utilized the four psychological skills, goal setting, positive self-talk, mental-imagery, and relaxation, on a consistent basis throughout the season.

A key indicator of the overall effectiveness of the mental toughness training intervention was based on the results of the Social Validation Questionnaire. Findings from this questionnaire indicated that all four participants perceived the intervention to be highly effective and beneficial for lowering levels of pre-competition anxiety, increasing levels of self-confidence, and ultimately, improving performance results. Each participant also stated that they thoroughly enjoyed learning the techniques of goal setting, positive self-talk, mental imagery, and relaxation. Taken together, all four participants reported great satisfaction with the results of the intervention.

In summary, results from this study indicated that the mental toughness training intervention was beneficial and effective for each of the four participants. Although a significant improvement in performance was not observed, each of the participants experienced positive results with regards to levels of pre-competition anxiety, self-confidence, and self-reported practice results. It is important to note that although there were limited data points collected, the majority of participants did have better competition results in the intervention phase as compared to the baseline phase. Furthermore, the fact that each participant reported a high degree of satisfaction with the overall results of the study adds support for the overall effectiveness of this mental toughness training intervention.

There are several practical implications that stem from the present findings. First, as supported by earlier studies (Blakesless & Goff, 2007; Jones et al., 2002; Mamassis &

Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell & Greenless, 2001; Turner & Barker, 2013), the implementation of a mental toughness training program is an effective way to help athletes control/decrease levels of pre-competition anxiety, increase levels of self-confidence, and, ultimately enhance performance results. The findings from the present study add support to the previous research, and further demonstrate that mental training programs can be extremely effective for university level athletes, specifically in the sport of track and field. Findings from this study can help encourage coaches and athletes to devote an appropriate amount of time and effort to the development of not only physical skills, but psychological skills as well. This study also provides coaches and athletes with the knowledge of how to improve mental toughness through the development of key psychological skills such as goal setting, positive self-talk, mental imagery, and relaxation. Furthermore, the positive results from this study may encourage university administrators to adopt a mental toughness training program for their entire athletic department, which would help varsity athletes in all sports develop the psychological skills necessary to achieve performance excellence.

There are limitations to this study that must be considered when interpreting the results. First and foremost, the small number of data points collected was a major limitation of this study. By not obtaining a large number of data points, specifically with regards to competition performance results, it was difficult to detect an intervention effect. Measuring the performance of each participant on a more consistent basis would have been extremely helpful for determining the extent to which the intervention affected performance. However, although additional performance results would have been beneficial for the study, the attainment of additional performance data points was not

possible, due to the lack of competitions each participant competed in during the track and field season. In the future, finding a way to consistently measure performance on a weekly basis, in a competition specific setting, would be beneficial.

An additional limitation of this study was the calculation of the PND to examine the degree of variability from the baseline phase to the intervention phase. When calculating the PND, all baseline data is ignored except for one data point, which can be extremely unreliable, and can lead to a misinterpretation of the effect of the intervention (Scruggs, Mastropieri, Cook, & Escobar, 1986). This is why visual analysis was also used in the present study.

The calculation of effect size, using the SMD_{all} method, was another limitation of this study. When there is no variability in the baseline data, the effect size is zero. This result may occur even if there is an observable intervention effect based on the visual inspection of the data.

Last but not least, another major limitation of this study is that there is currently no valid tool available for measuring mental toughness (Mack & Ragan, 2008; Murphy & Tammen, 1998; Middleton, Marsh, Martin, Richards, Savis, & Perry, 2004). As a result, this study focused on the development and utilization of key psychological skills found to be associated with mental toughness, including goal setting, positive self-talk, mental imagery, and relaxation techniques. An actual measure of each participant's mental toughness was not obtained, but instead, this study focused on the relationship between the development of mental toughness skills, pre-competition anxiety, self-confidence, and performance. A positive intervention effect was determined based on results from the CSAI-2, practice performance scores, competition performance scores, the use of mental

skills, and an overall self-reported social validation questionnaire. Past research has alluded to a multitude of issues associated with trying to measure mental toughness (Mack & Ragan, 2008; Murphy & Tammen, 1998; Middleton, Marsh, Martin, Richards, Savis, & Perry, 2004), which may stem from the ambiguity associated with this term (Jones et al., 2002). It is therefore clear that the development of a valid tool to measure mental toughness is needed. Future research should attempt to establish a reliable and valid measurement of mental toughness, in order to give athletes an accurate measure of a construct that is so critical to optimal achievement in sport.

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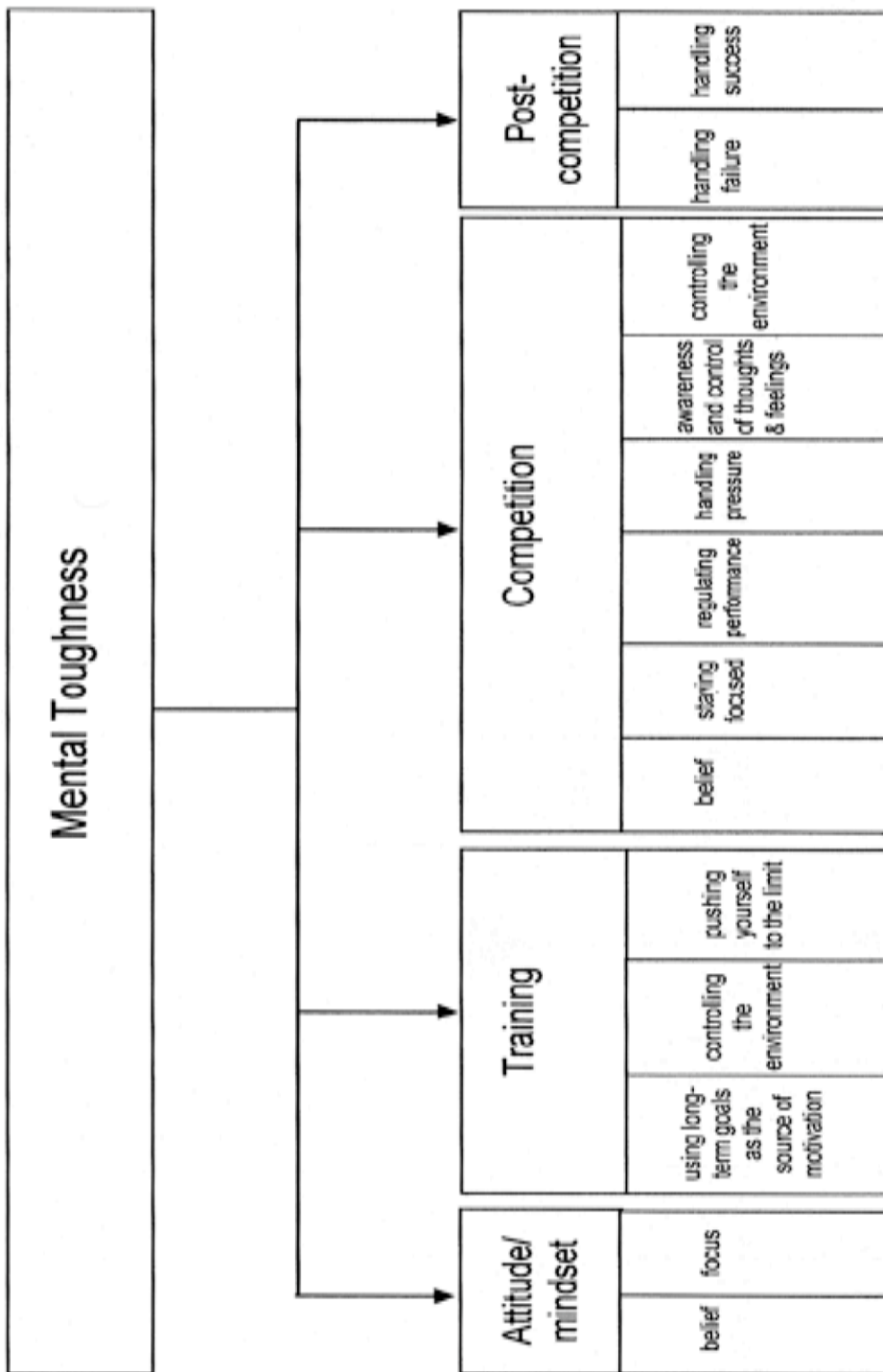
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APPENDIX A

Mental Toughness Framework



APPENDIX B

Mental Toughness Training Intervention Workbook

ID# _____

Outline:

- 1) Goal Setting
- 2) Positive Self-Talk
- 3) Mental Imagery
- 4) Relaxation

1) Goal Setting

Setting goals helps to give you direction, by motivating you to work towards the achievement of the set goal.

What are your long-term goals for this season?

-
-
-

What are some of your short-term goals that will help you achieve your ultimate long-term goals for this season?

-
-
-
-
-

Each week you will be asked to develop a specific outcome, performance, and process goal to work towards. You can keep track of your goals in your personal journal. It will also be helpful to write your goals on a cue card, and post them somewhere visible to review each day. At each weekly meeting we will assess whether or not you reached your goals.

Outcome Goals – Ultimately, these are goals that you have little control over.

Outcome goals provide direction, but no controllable actions to get you there.

Example: Winning CIS

Performance Goals – These goals are more within your control. Measure yourself against your own performance. Example: Set a personal best

Process Goals – The specific actions you must make to reach your performance and outcome goals. You have complete control over process goals. Example: Increase pace and distance of runs, take 5 extra jumps after every practice, stretch, roll, and ice bath every day.

Outcome Goals:

-
-
-

Performance Goals:

-
-
-

Process Goals:

-
-
-

In goal setting, it is important to remember the SMART Principle. The SMART principle reminds us that our goals should be Specific, Measureable, Attainable, Realistic, and Timely.

Are your goals SMART?

Review your goals to ensure that you are following the SMART Principle.

1) Positive Self-Talk

In your journal, make a list of all of the negative thoughts that enter your mind during training or competition.

Beside each negative thought, write a positive statement that counterbalances each negative statement on the list.

Develop three cue words or positive affirmations that you think will help you to stay focused and positive during training and competition. Copy your cue words/positive affirmations onto a cue card, and keep it in your track bag to refer to before every practice and competition.

Develop a positive personal mantra that you can say to yourself when the going gets tough during training or competition.

Negative	Positive

Cue Words:

1) _____

2) _____

3) _____

Positive Mantra: _____

3) Imagery

In your own mind, describe how you see yourself performing, both in practice and in competition.

Close your eyes. Try to create a vivid picture of yourself performing your event. Imagine how you feel. How do you feel physically? How do you feel mentally? How do you feel emotionally? How you will run/jump? What does the environment look like? What does the environment smell like? What does the environment sound like? Who is there? Do you feel stressed or anxious? Do you feel excited and energized? What do you like about this image? What do you want to change about this image?

Practice imagery on a nightly basis before bed, viewing yourself how you wish to perform both in practice sessions and in competition.

4) Relaxation

How do you relax before practices and competitions?

-
-
-
-

Do you have a pre-practice/pre-competition routine or ritual?

-
-
-

Practicing the same routine or ritual before every practice/competition will help you stay calm and comfortable.

Each day, try to incorporate various relaxation techniques into your training schedule, such as progressive muscle relaxation, deep breathing, and centering. Use your journal to keep track of your relaxation strategies, when they were performed, and how you felt before and after each session.

- Progressive Muscle Relaxation - Lie down in a quiet place. Slowly tense each muscle of your body, one at a time for a few seconds. Start with your toes, and slowly work all the way up to the muscles in your face. This will help to physically reduce muscle tension, while allowing you to relax and focus.
- Deep Breathing – Take a few big deep breaths to calm your mind, nerves, and lower your anxiety.
- Centering – Relocate your consciousness from your mind to your center of gravity. This will help promote task-relevant thoughts and enhance focus.

Additional Relaxation Techniques:

- Listening to music before your event
- Reading an inspirational book or quote
- Talking to teammates during warm-up

Personal Journal

Your personal journal will be used throughout this intervention to:

- Keep track of your workout/performance results
- Record how you are feeling each day
- Rate practice
- Confidence
- Anxiety
- Record long-term and short-term goals for the season
- Record weekly outcome, performance, and process goals
- Keep track of negative thoughts during training and competition
- List cue words and positive affirmations
- Record use of imagery
- Record relaxation techniques employed
- Record overall thoughts on the intervention

APPENDIX C

Practice Performance Measures

ID # _____

Rate your performance in practice on a scale from 1-5 (1 = not good at all, 5 = very good), based on the following factors:

Date:

Workout:

	1	2	3	4	5
Physical Performance					
Mental attitude and thoughts					
Concentration					
Anxiety					
Self-confidence					
Comparison of performance with expectations					

APPENDIX D

Competitive State Anxiety Inventory (CSAI - 2)

Directions: A number of statements that athletes have used to describe their feelings before competition are given below.

Read each statement and then tick the appropriate column to the right of the statement to indicate how you feel right now / at the moment. If there are no right answers, do not spend too much time on any one statement, but choose the answer which describes your feeling right now.

		Not at all	Some What	Moderately so	Very much so
1.	I am concerned about this competition				
2.	I feel nervous				
3.	I feel at ease				
4.	I have self doubts				
5.	I feel jittery				
6.	I feel comfortable				
7.	I am concerned that I may not do well in this competition				
8.	My body feels tense				
9.	I feel self-confident				
10.	I am concerned about losing				
11.	I feel tense in my stomach				
12.	I feel secure				

13.	I am concerned about choking under pressure				
14.	My body feels relaxed				
15.	I am confident I can meet challenges				
16.	I am concerned about performing poorly				
17.	My heart is racing				
18.	I am confident about performing well				
19.	I am concerned about reaching my goal				
20.	I feel my stomach sinking				
21.	I feel mentally relaxed				
22.	I am concerned that others will be disappointed with my performance				
23.	My hands are clammy				
24.	I am confident because I mentally picture myself reaching my goal				
25.	I am concerned I won't be able to concentrate				
26.	My body feels tight				
27.	I am confident of coming through under pressure				

APPENDIX E

The Mental Skills Assessment Questionnaire

ID #: _____ Date: _____

1. Did you perform a relaxation technique before your event?
Yes/No
2. Did you use a relaxation strategy during your event?
Yes/No
3. Did you mentally rehearse prior to your event?
Yes/No
4. Did you use imagery during your event?
Yes/No
5. Did you perform any self-statements during your warm-up?
Yes/No
6. Did you use positive self-talk or coping self-statements during your event?
Yes/No
7. Did you set any goals (personal or performance) before your event?
Yes/No
8. Did you have a particular mental skill(s) goal for today's event?
Yes/No

Percent of total skills used: (Yes) total / 8 x 100 = ____ %

APPENDIX F

Social Validation Questionnaire

ID #: _____ Date: _____

Please rate the following questions on a scale from 1-5, with 1 = not important/useful/enjoyable, 3 = somewhat important/useful/enjoyable, and 5 = very important/useful/enjoyable.

1. How important is it for you to improve performance?
2. How important is it for you to decrease competition anxiety?
3. How important is it for you to improve self-confidence?
4. Did you see improvement in performance over the course of the season?
5. Did you see improvement in competition anxiety over the course of the season?
6. Did you see improvement in self-confidence over the course of the season?
7. Did you enjoy the mental toughness training intervention?
8. Did you enjoy the technique of relaxation?
9. Did you enjoy the technique of mental imagery?
10. Did you enjoy the technique of positive self-talk?
11. Did you enjoy the technique of goal setting?
12. Are you satisfied with the results of this intervention?
13. Did you consider this intervention to be useful?

Additional Comments:

APPENDIX G

Timeline

August 2013 – October 2013

- Thesis research
- Ethical approval

October 2013

- Recruit study participants

November 2013 – March 2014

- Mental Toughness Training Intervention

Western Track and Field Competition Schedule

November 19, 2013 – Purple and White Meet

November 30, 2013 – Season Opener

January 10, 2014 – Windsor Can Am Meet

January 18, 2014 – Don Wright Meet

January 25, 2014 – McGill Meet

February 1, 2014 – York Meet

February 8, 2014 – Windsor Team Challenge/Notre Dame Invitational

February 15, 2014 – Guelph Meet/Toronto Meet/Spire Invitational

February 22, 2014 – OUA Championships

March 8, 2014 – CIS Championships

APPENDIX H



Letter of Information
Mental Toughness Training Intervention for University Track
and Field Athletes

As a member of the Western University track and field team, you are being invited to participate in a research study. This study will include a Mental Toughness Training Intervention, focusing on improving competition anxiety, self-confidence, and ultimately, athletic performance.

Purpose of the Letter

The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research.

Purpose of this Study

The purpose of this project is to determine the impact and outcome of a Mental Toughness Training Intervention as it relates to athletic performance, competition anxiety, and self-confidence in university track and field athletes. The Mental Toughness Training Intervention will focus on four psychological skills associated with mental toughness, including relaxation, mental imagery, positive self-talk, and goal setting.

Inclusion Criteria

Individuals are eligible to participate in this study if they are 18 years of age or older, and if they are a current competing member of the Western University track and field team.

Study Procedures

If you volunteer to participate in this study, you will be asked to participate in a season long Mental Toughness Training Intervention (12 weeks). You will be asked to meet with the researcher on a weekly basis for approximately 30-60 minute individual sessions. During each weekly session, you will be taught various psychological skills associated with mental toughness, such as relaxation, mental imagery, positive self-talk, and goal setting. The researcher will work with you one-on-one to develop these skills through various exercises. You will also be encouraged to practice these exercises during your own time, at practice, and during competition. Prior to each competition during the track and field season, you will be asked to fill out the Competitive State Anxiety

Inventory-2 (CSAI-2), to measure levels of competition anxiety and self-confidence before competing. After each competition, you will also be asked to fill out the Mental Skills Assessment Questionnaire, to record the use of any of the 4 psychological skills learned during the intervention. Performance results will also be recorded during the season. At the end of the intervention, you will be asked to fill out a Social Validation Questionnaire to assess your overall satisfaction with the Mental Toughness Training Intervention.

Possible Risks and Harms

There are no known risks associated with taking part in this study.

Possible Benefits

Possible benefits include an increase in self-confidence, a decrease in competition anxiety, and an overall improvement in athletic performance.

The goal of this study is for the subjects to positively benefit from the Mental Toughness Training Intervention, by teaching and instilling in the subjects the appropriate psychological skills necessary to improve self-confidence, manage competition anxiety, and optimally increase overall performance results. In addition, potential benefits to society include a raised awareness of the importance of mental toughness training with regards to self-confidence, competition anxiety, and overall athletic performance

Compensation

You will not be compensated for your participation in this research.

Voluntary Participation

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future academics or status on the track and field team.

Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. If the results are published, your name will not be used. If you choose to withdraw from this study, your data will be removed and destroyed from our database. All responses from the questionnaires will be kept in strict confidentiality. The information obtained from the study will not be used for any purpose other than the research and the communication of the results.

Contacts for Further Information

If you require any further information regarding this research project you may contact Amanda Truelove or Dr. Craig Hall.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics.

Publication

If the results of the study are published, your name will not be used. If you would like to receive a copy of any potential study results, please contact Dr. Craig Hall or Amanda Truelove.

This letter is yours to keep for future reference.

Consent Form

Project Title: Mental Toughness Training Intervention for University Track and Field Athletes

Study Investigator's Name: Amanda Truelove

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Participant's Name (please print): _____

Participant's Signature: _____

Date: _____

Person Obtaining Informed Consent (please print): _____

Signature: _____

Date: _____

APPENDIX I



Research Ethics

Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Craig Hall
 File Number: 104155
 Review Level: Full Board
 Protocol Title: Mental Toughness Training Intervention for Collegiate Track and Field Athletes
 Department & Institution: Health Sciences/Kinesiology, Western University
 Sponsor:
 Ethics Approval Date: September 30, 2013 Expiry Date: June 30, 2014

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Other	References	2013/07/31
Instruments	Social Validation Questionnaire (Adapted from Patrick & Hrycaiko, 1998)	1998/07/30
Instruments	The Mental Skills Assessment Questionnaire (Adapted from Patrick & Hrycaiko, 1998)	1998/07/30
Instruments	Performance Results	2013/08/01
Other	Goal Setting Exercise	2013/08/01
Other	Positive Self-Talk Exercise	2013/08/01
Western University Protocol		2013/08/06
Response to Board Recommendations	Response to Board Recommendations	2013/09/20
Recruitment Items	Email Script for Recruitment	2013/09/18
Instruments	Competitive State Anxiety Inventory (CSAI-2)	2013/09/16
Revised Letter of Information & Consent	Letter of Information and Consent	2013/09/16

This is to notify you that The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the applicable laws and regulations of Ontario has granted approval to the above named research study on the approval date noted above.

This approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the NMREB's periodic requests for surveillance and monitoring information.

Members of the NMREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussions related to, nor vote on, such studies when they are presented to the NMREB.

The Chair of the NMREB is Dr. Riley Hinson. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 0000941.

CURRICULUM VITAE

Name: Amanda Truelove

Post-Secondary Education:

2012-2014 Master of Arts in Kinesiology
Specialization in Coaching and Sport Psychology
University of Western Ontario, London, ON

2008-2012 Bachelor of Science in Psychology
Duke University
Durham, NC

Honours & Awards

2012-2013 Western Graduate Research Scholarship

2012-2013 Athletic Financial Award

2013-2014 Western Graduate Research Scholarship

2013-2014 Athletic Financial Award

Teaching Experience

2012-2013 *Graduate Teaching Assistant:* Kin 2276: Psychology of Exercise
Department of Kinesiology, University of Western Ontario.

2013-2014 *Graduate Teaching Assistant:* Kin 2276: Psychology of Exercise
Department of Kinesiology, University of Western Ontario.

Guest Lectures:

2013 *Mental Toughness in Sport.* Lecture for Sport Western.
University of Western Ontario

2013 *Sport Psychology.* Lecture for Sport Western.
University of Western Ontario.

2014 *APA Formatting.* Lecture for Kin 2276: Psychology of Exercise.
Department of Kinesiology, University of Western Ontario.

Related Experience

2012-2014 Graduate Assistant Coach: Western Cross Country Team
Head Coach: Bob Vigars
University of Western Ontario