5-2005

Psychometric Analysis of an Inventory Assessing Mental Toughness

Heather Leanne Cherry
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Heather Leanne Cherry entitled "Psychometric Analysis of an Inventory Assessing Mental Toughness." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Sport Studies.

Leslee Fisher, Major Professor

We have read this thesis and recommend its acceptance:

Craig Wrisberg, John Lounsbury

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a thesis written by Heather Leanne Cherry entitled "Psychometric Analysis of an Inventory Assessing Mental Toughness." I have examined the final paper copy of this thesis for form and content and recommended that it be accepted in partial fulfillment of requirements for the degree of Master of Science, with a major in Sport Studies.

Dr. Leslee Fisher, Major Professor

We have read this thesis
and recommend its acceptance:

Dr. Craig Wrisberg

Dr. John Lounsbury

Accepted for the Council:

Vice Chancellor and
Dean of Graduate Students

PSYCHOMETRIC ANALYSIS OF AN INVENTORY ASSESING MENTAL TOUGHNESS

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Heather Leanne Cherry
May 2005

ACKNOWLEDGEMENTS

I would like to acknowledge all those who helped with the completion of this thesis. I especially want to acknowledge Dr. Fisher and Dr. Wrisberg for all of their help with writing and editing. Thanks to Dr. Lounsbury for all of his help sorting through all the stats. Finally, thanks to all of my friends here at UT, especially to Camille. I couldn't have done this without you.

ABSTRACT

This study involved the development and psychometric validation of the Mental Toughness Questionnaire (MTQ). The MTQ is an 18-item questionnaire designed to evaluate an individual's competitive desire, focus, self-confidence, and resiliency. The responses of 117 varsity male and female athletes at a Division I-A university and Division II college were analyzed using a principal component factor analysis. The mean mental toughness score for males was significantly different from than the mean mental toughness score for females (M=2.07, SD=.54) and indicated that males self-reported being more mentally tough than females ($t[115] = -3.29$, $p < .001$). The mean mental toughness score for athletes in Division I-A (M=2.03, SD= .51) was significantly different from that for athletes in Division II (M=1.69, SD=.37) and indicated that the Division II athletes self-reported being more mentally tough than Division I-A athletes ($t[115] = 3.28$, $p < .001$). The mean mental toughness score on the Final MTQ was also significantly different between the eight different sports, $F(7,116) = 2.87$, $p = .009$. Post hoc analyses revealed that athletes in the sport of men's baseball self-reported being more mentally tough than athletes in the sport of women's swimming.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

Introduction

Coaches and athletes often recognize that success in sport cannot be accomplished without the necessary mental skills. Most coaches conservatively estimate that the mental aspects of sport constitute at least 50% of an athlete's performance (Loehr, 1982). Moreover, at the higher levels of competition, the importance of mental skills is notably salient due to the comparable physical skills of athletes and an increase in the frequency of stressful situations elite athletes experience. For example, one can only imagine the potential stress and anxiety U.S. Olympic gymnast Paul Hamm endured as he began his quest for the individual all-around title in the recent 2004 Summer Olympics. Even the most physically talented gymnast would need considerable mental strength to perform in this situation.

Because the physical abilities of most athletes at high levels (elite, college, or Olympic level) are more homogeneous than their mental abilities, the distinguishing feature of successful athletes competing at high levels is often their exceptional mental skills (Silva, 1984). Elite athletes and coaches have argued that successful athletes are not always the most physically talented, but rather the most mentally tough. Former Georgetown basketball coach and current NBA commentator John Thompson stated, "Being mentally tough is just as important as being physically tough," when analyzing the play of superstar Kevin Garnett in the 2002 NBA playoffs. The media and sport community also often address the importance of mental toughness and note its relation to successful performances (Loehr, 1982). However, given the amount of attention the term mental toughness is given in the popular literature, it is interesting to note the lack of

attention given to "mental toughness" to the scientific explanation of this phenomenon. In order to gain a better understanding of mental toughness, it is first necessary to identify some of its possible components. Once this is done, it would be possible to develop an inventory to assess the mental toughness of athletes. In this introductory chapter, a brief overview of the psychological constructs related to mental toughness is offered.

Psychology's Contribution to the Study of Mental Toughness

Although mental toughness is believed to be an extremely important part of successful performance in athletics, there are several different themes in general psychology that have been shown to be related to being mentally tough in life. The first theme is learned helplessness, which is a phenomenon characterized by the belief that one's actions have no effect on an outcome (Seligman & Maier, 1967; Seligman, 1975). This theme is in essence the opposite of mental toughness, since one who is mentally tough would not surrender control to the circumstances of life or of sport. The second theme is self-efficacy, which is the belief that one has the qualities necessary to produce a desired outcome (Bandura, 1977). A third theme is dispositional optimism, which is characterized by one's positive expectations about the future (Scheier & Carver, 1985). The final theme is resiliency, which is another positive quality that is the opposite of learned helplessness. Resiliency is the capacity to succeed and remain positive in the face of adversity (Lazarus & Folkman, 1984). These four themes along with the available research examining mental toughness in sport, such as Loehr's Mental Toughness Inventory for tennis players (Loehr, Retert, Brown, & Woods, 1992) and qualitative research by Jones, Hanton, and Connaughton (2002), all form the theoretical

basis for the current study.

Loehr (1982) defines mental toughness in sport as the ability to perform well under pressure. Mental toughness has been identified in several studies as an important quality for competitive athletes to possess (e.g., Gould, Medbery, Damarjian, & Lauer, 1999; Loehr, 1982). In essence, the mentally tough athlete is one who consistently performs up to his/her potential, even under adverse conditions. A problem for some competitive athletes is that they never know whether today will be a "good day" or a "bad day."

Many athletes say that they cannot understand why they are able to perform well in practice but not in competition (Loehr, 1982). In competition, some athletes cannot seem to control their emotions, as demonstrated by increased emotionality and indicators of increased physiological arousal (e.g., increased heart rate and respiration rate). This increased physiological arousal often negatively impacts performance (Loehr, et al., 1992). However, athletes who are more mentally tough approach competition with a positive attitude and controlled emotions. Instead of being overwhelmed by negative emotions and uncertainty about performing well, they feel confident and expect to succeed (Loehr, 1982).

Even though mental toughness is an extremely popular notion in sport, minimal research has been done to determine the components that comprise an athlete's mental toughness. In qualitative study by Jones et al. (2002), athletes were interviewed in an attempt to determine their concept of mental toughness and the qualities needed to be a mentally tough performer. In addition, Loehr et al. (1992) developed two measures of mental toughness for tennis players, the Competitive Adjective Profile (CAP) and the

Mental Toughness Inventory (MTI). Other measures designed to assess the "mental skills" of athletes, such as confidence, ability to handle emotions, and focus (Mahoney, Gabriel & Perkins, 1987) also represent possible component of mental toughness. Taken together, this research provides a good start in understanding the concept of mental toughness. However, there is presently no reliable and valid measure of mental toughness that could be administered to a general population of athletes.

Although there are some advantages to sport-specific measurements, a measure of mental toughness that can be applied to athletes in any sport would prove to be extremely useful, especially since mental toughness seems to be a skill that is beneficial to performance in a wide range of sports. A valid inventory for assessing mental toughness would contain the most important components of mental toughness, providing sport psychology consultants, coaches, and athletes with beneficial knowledge about this construct. The research community would be able to examine these components and expand on the implications of mental toughness for athletes and its relation to performance in sport. Coaches and athletes would also be able to use this inventory to rate the athlete's mental toughness. Such an inventory would indicate which components are a strength for the athlete and which need improvement. Although the term "mental toughness" continues to be a popular concept in the domain of competitive sport, the components of mental toughness clearly need to be identified and measured in order to advance research and enhance practice.

Conceptualizing Mental Toughness

Mental toughness seems to be an attribute that is learned rather than being an inherited biological trait. As an athlete proceeds throughout her/his career, (s)he presumably becomes more mentally tough and is better able to handle the many pressures of competition (Loehr, 1982). Based on the literature, feedback from sport psychology consultants, college, and professional coaches, Cherry (2003) conducted a study to develop a measure of mental toughness and found statistical support for a three-factor mental toughness model: Competitive desire, self-confidence, and resiliency. However, in light of a recent qualitative research study done by Jones, Hanton, and Connaughton (2002), a new model of mental toughness appears needed. This model includes the component of focus in addition to the three components Cherry (2003) found to be central to mental toughness. All of these four components have been demonstrated to be related to mental strength or health (Loehr, 1982; Loehr et al., 1992; Mahoney et al., 1987; Gould et al., 1999; Jones, et al., 2002), so it is reasonable to assume that a combination of these attributes would come close to comprising the global concept of mental toughness.

Competitive Desire: Competitive desire is defined as the will to win, a general passion for a competitive atmosphere where the athlete is be challenged and required to perform at his/her highest level at all times (Loehr, 1982). Pezer and Brown (1980) spoke of this will to win and defined it as a person's desire to reach a "standard of excellence." Competitive desire includes such characteristics as positive energy and enjoyment, which have been identified as central to performing well (Loehr, 1982).

Focus: Focus is defined as the ability to concentrate on the performance of a task even in the face of distraction (Jones et al., 2002). When an athlete is focused, (s)he does not notice the other things going on around her/him, whether they be positive or negative. An ability to block out distractions and remain focused on relevant task information has been associated with success in competition (Loehr, 1982; Loehr et al., 1992; Mahoney et al., 1987; Gould et al., 1999; Deaner & Silva, 2002; Jones et al., 2002).

Self-Confidence: Self-confidence or sport confidence is defined as an overall positive belief in one's own ability to control outcomes and be successful (Manzo, Silva, & Mink, 2001). The two component parts of self-confidence are self-competence and optimism. In essence, self-confidence in sport is a form of sport competence comprised of an athlete's successes and failures (Manzo, Silva, & Mink, 2001).

Resiliency: Resiliency is broadly defined as the ability of an individual to achieve success in the midst of adversity and negative experiences (Milgram & Palti, 1993). This general definition can be applied to sport as the ability of an athlete to endure negative outcomes, learn from mistakes and failure, remain positive, and go on to experience success (Loehr, 1982).

Purpose of the Study

The main purpose of this study was to revise the previous measure of mental toughness developed by Cherry (2003). That questionnaire was comprised of three components: Competitive desire, self-confidence, and resiliency. In this study the component of focus was added to this group of factors and an attempt was made to test and establish the revised inventory's validity and reliability. Therefore, the main purpose

of the current study was to test a four-factor model of mental toughness containing the following components: Competitive desire, self-confidence, resiliency, and focus. A secondary purpose was to explore the relationship between scores on the MTQ and demographic variables.

Limitations and Delimitations

One limitation of the study was the time of the season in which the athletes completed the questionnaire. Although mental toughness is viewed as a relatively stable psychological trait, participants who completed the questionnaire following a poor individual performance or devastating loss may have responded differently than those who completed the questionnaire following a recent success or during the off season.

A second possible limitation concerned has the internal validity of the MTQ. It was assumed that the MTQ would be a measure of mental toughness rather than some other related construct or dimension. However, since all the proposed components of mental toughness contained in the questionnaire were also identified by athletes as common characteristics of mentally tough performers in the (Jones, et al., 2002) qualitative study.

One final limitation or assumption of the study was that participants knew that they were part of an investigation and may have responded the way they thought a mentally tough athletes should respond (exhibit a positive response bias). In order to minimize this possibility, the researcher told the participants that the questionnaire was a measure of personal styles in competition rather than a measure of mental toughness.

The principal delimitation of the study was that the majority of the participants were from one Southeastern Division I-A university. Therefore, the resulting inventory may not be appropriate for athletes at other levels of collegiate competition or in other regions of the country.

CHAPTER II

Review of Literature

Mental toughness is undoubtedly an important ingredient of athletic success, whether athletes are in the pool, on the field, or on the court. Some concepts addressed in the literature that are related to mental toughness include learned helplessness, dispositional optimism, self-efficacy, and resiliency. These themes were used in previous research by Cherry (2003) to develop a mental toughness questionnaire comprised of three components: Competitive desire, self-confidence, and resiliency. In this chapter previous research on learned helplessness, dispositional optimism, self-efficacy, resiliency, and past measures of mental toughness are discussed.

Learned Helplessness

Learned helplessness is a psychological state of mind characterized by depressive symptoms where people begin to believe that their responses have no bearing on outcomes (Seligman & Maier, 1967; Seligman, 1975). According to the theory of learned helplessness, if one believes that failure is caused by a lack of talent or believes success is due to external factors, performance suffers. More successful outcomes occur when failure is attributed to external factors and success is attributed to internal causes (Miserandino, 1990). Therefore, the learned helplessness paradigm highlights the importance of healthy attributions for success and failure and also of maintaining optimistic views about oneself. This importance of believing in oneself is the basis for the self-confidence component in the proposed model of mental toughness. Learned helplessness is almost the opposite of self-confidence, and it is impossible for an athlete

to be mentally tough if (s)he believes that his/her actions have no effect on the outcome in athletic performances.

Dispositional Optimism

Learned helplessness indicates that the role of attributions may lead certain individuals to feeling helpless and give up, whereas a high level of dispositional optimism leads one to always believe that good things will happen to him/her. However, the belief that good things will happen does not necessarily mean that the person sees himself/herself as the explanation for the good things. Dispositional optimism represents a series of cognitive schemas, the most intense of which is positive expectations about the future. Optimism has been assessed in the past by using a person's choice of negative or positive statements about life events (Scheier & Carver, 1985). Therefore, dispositional optimism is presumed to be an attribute that a person normally carries with him/her in all dimensions of life (e.g., in the classroom at school, at work, and also in sport). For example, the Attributional Style Questionnaire (ASQ) - a measure of optimism- has predicted college grades and dropping out (Kamen & Seligman, 1986; Peterson & Barrett, 1987), sales productivity among salespeople (Seligman & Schulman, 1986), and performance among nationally ranked college swimmers (Seligman, Nolen-Hokesema, Thornton, & Thornton, 1990). Scheier & Carver (1987) reported that optimism was positively correlated with problem-solving skills. Individuals who are more optimistic have coping abilities characterized by a continuous striving for the positive and the ability to make the best of whatever condition they happen to be in. Moreover, Kass et al. (1991) developed an inventory to measure positive psychological attitudes, one of

which is self-confidence. They subsequently found that self-confidence was correlated with a positive life purpose (dispositional optimism), suggesting that dispositional optimism is highly related to self-confidence. This dispositional optimism is a characteristic that might also account for greater resiliency; if one is more optimistic, then negative experiences might be handled easier without becoming discouraged. Negative outcomes will not stop one who has high dispositional optimism from continuing to strive for and believe that success is possible. This continuous striving for success is also part of the proposed model of mental toughness.

Self-Efficacy

Another theme found in the research on learned helplessness and dispositional optimism is that of self-efficacy, which deals with one's own beliefs about one's capabilities for achieving a desired outcome. Even if someone is very capable of completing a task, (s)he may experience difficulty if (s)he does not believe that (s)he possesses the necessary skills to complete the task. Self-efficacy is a widely researched concept in the field of psychology, including sport psychology. Bandura (1977) describes self-efficacy as the belief that one possesses the necessary skills required to produce the desired outcome. Self-efficacy is highly related to the concept of self-confidence. In fact, the type of self-confidence that is very skill-specific, such as a basketball player's confidence in dunking a basketball can be labeled as self-efficacy. Thus it might be presumed that self-efficacy is necessary for an athlete to be mentally tough.

Self-efficacy is a dimension that has been studied in relation to athletic performance (Weinberg, Gould, & Jackson, 1979; Weinberg, Yukelson, & Jackson,

1980; Weinberg, Gould, Yukelson, & Jackson, 1981). Although self-efficacy has been examined in combination with many different factors presumed to influence success in sport, one factor in particular is thought control. It is believed that those athletes who are able to persevere and "weather the storm" are those who have the type of self-efficacy that enables them to block out distractions and control negative emotions. An example may be a gymnast who needs a certain score to win the all-around title. However, rather than focusing on the score (s)he needs, the crowd, or fear of failure, (s)he concentrates on the routine and the skill execution for a successful performance (Bandura, 1990). Such self-efficacy contributes to emotional control and is characteristic of successful athletes in a variety of different sports (Bandura, 1990; Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981; et al, Weinberg, Yukelson, & Jackson, 1980). Therefore, self-efficacy is related not only to self-confidence but also to focus and resiliency because self-efficacy allows an athlete to block out distractions, focus even in the midst of adversity, and bounce back from adversity.

Resiliency

In order to cope with negative outcomes, a person must believe that failure is not permanent and that the capability for successful performances still exists. This ability to understand that failure does not imply a permanent incapability is related to the concept of resiliency. A resilient person may fail on the first attempt at a task but continues to strive to succeed. Resiliency is a term that generally means achievement in the face of adversity (Lazarus & Folkman, 1984).

Some characteristics that appear to contribute to a person's resiliency in everyday life circumstances include self-confidence, initiative, and high frustration tolerance (Milgram & Palti, 1993). For example, if an athlete experiences many defeats, then self-confidence, initiative, and high frustration tolerance may enable the athlete to overcome negative experiences and proceed to experience successful outcomes. Resiliency also seems to be an important component of mental toughness, because most athletes experience defeat at some point, just as people experience failure and loss in life; however, successful athletes and people are able to cope with adversity, persevere, and remain optimistic about the future (Loehr, 1982). The concept of resiliency in the might also be related to competitive desire. Competition does not allow for every athlete to experience success, but those high in competitive desire want to keep competing even when they lose because they are resilient and believe that one loss is not permanent. Mentally tough athletes have a strong desire to compete because they do not get discouraged and they keep on striving to be successful in competition.

Past Measures of Mental Toughness

Although limited, there is some literature that has addressed concept of mental toughness. Past research has examined the role of mental skills in athletic performance (e.g., Loehr's 1982 investigation of the Ideal Performance State or IPS). However, to date, there has not been much research attention devoted to mental toughness as a construct in and of itself. Mahoney, Gabriel, and Perkins (1987) identified some of the psychological skills possessed by athletes at the elite, pre-elite, and non-elite competitive levels. Some important characteristics of successful athletes were identified using the Psychological Skills Inventory for Sport (PSIS); including anxiety management,

concentration, self-confidence, mental preparation, and motivation. These mental skills might also be related the concept of mental toughness, which has been argued to be a characteristic of successful performances (Mahoney, et al., 1987; Loehr, 1992; Jones et al., 2002).

Loehr (1982) also discussed the value of the Ideal Performance State (IPS) and its relevance to mental toughness. He examined the responses of three hundred athletes, both amateur and professional, and learned that most of them described their best performance in similar terms, which Loehr termed the IPS. Such an internal state is characterized by feelings of calmness, optimism, confidence, and control which Loehr suggests is also characteristic of a mentally tough performer. In a sport- specific study, gymnasts were interviewed about their peak performances and many identified similar characteristics as the IPS, including intense focus, concentration, confidence, and ease of performance (Unestahl, 1982).

Loehr et al. (1992) has developed two questionnaires to assess the mental skills of tennis players. These are the Mental Toughness Inventory (MTI) and the Competitive Adjective Profile (CAP). The MTI is of particular interest here because of its purpose is to identify components of mental toughness, including self-confidence control, negative energy control, attention control, visualization and imagery control, motivation control, positive energy control, and attitude control. While statistical analysis of the mental toughness scale proposed by Loehr et al. (1992) did not support his seven-factor model, but after negative energy control and attitude control were dropped from the model, support was found for the five-factor model.

Defining Mental Toughness

Mental toughness has been defined in different ways in the literature. For example, Tutko and Richards (1971) described a mentally tough person as a self-oriented person who accepts criticism and failure without getting discouraged. This ability to handle criticism and experience setbacks while remaining positive coincides with the resiliency component of mental toughness in the model proposed in the current study. However, Tutko and Richard's (1971) description seems to be lacking other important components of mental toughness. Loehr (1982) believes that mental toughness is the one factor that mediates the mind-body connection. He also describes some of the characteristics of a mentally tough athlete, including self-motivated, positive and realistic, emotional control, calmness, being highly energetic, determined, focused, self-confident, and responsible. Mental toughness is probably more than being resilient, and the other three components comprising the proposed model in the present study (competitive desire, focus, and self-confidence) are likely candidates.

The previous study by Cherry (2003) found statistical support for a three-factor model of mental toughness. These three proposed factors were competitive desire, self-confidence, and resiliency. Initially, these factors were chosen based on research in the psychological field (learned helplessness, dispositional optimism, self-efficacy, and resiliency) (Seligman & Maier, 1967; Seligman, 1975; Bandura,1977; Scheier & Carver, 1985; Lazarus & Folkman, 1984), previous research identifying mental skills related to successful performances in competition (Gould et al., 1999; Loehr, 1982; Mahoney et al., 1987) and Loehr and colleague's (1992) MTI & CAP. Pilot questionnaires given to coaches and sport psychology consultants where they were asked to list and rank the top

ten components of mental toughness were also consulted in developing this three-factor model. However, additional research by Jones et al. (2002) illuminated that this three-factor model may not be completely representative of how athletes view mental toughness. One cannot be sure that this model would parallel how athletes view mental toughness unless you go to the athletes themselves, which was not done in the Cherry (2003) study.

Rationale of Four-Factor Model of Mental Toughness

In the Jones et al. (2002) study, the athletes interviewed described the qualities they believed to be most characteristic of a mentally tough performer. Twelve qualities were identified and ranked by each athlete. The top five were "having an unshakable self belief in your ability to achieve competition goals, bouncing back from setbacks as a result of increased determination to succeed, having an unshakable self-belief that you possess the unique qualities and abilities that make you better than your opponents, having an insatiable desire and internalized motives to succeed, and remaining fully focused on the task at hand in the face of competition specific distractions" (Jones et al., 2002, p.209). The self-belief dimension is similar to the concept of self-confidence, bouncing back from setbacks is similar to resiliency, the desire to succeed parallels the competitive desire component, and remaining fully focused is obviously related to the focus component.

The definition of mental toughness used in the current study is based on the results of the interviews conducted by Jones, et al. (2002) with international elite athletes. Those results led the author to propose the following definition: An inherent or developed

psychological edge, which allows one to cope better than one's opponents with the demands of competition and "be more consistent and better than one's opponents in remaining determined, focused, confident, and in control under pressure (Jones et al., 2002, p.209). This definition characterizes mental toughness as a quality that allows athletes to cope better than her/his opponent with the demands of competition, which specifically relates to the notions of resiliency and competitive desire. The definition also speaks to being better at remaining both focused and confident under pressure, which parallels the proposed components of focus and self-confidence.

Although there are several other important mental skills in sport, these four components of mental toughness (competitive desire, focus, self-confidence, and resiliency) were chosen to represent the concept of mental toughness in the present study. Competitive desire was considered important because without a will to win and a desire to compete against others, then the reason for sport would be lost. One of the most central reasons for sport is competition and determining who is the best on a given day; without a strong desire to compete, it would be hard for an athlete to be the best (Pezer & Brown, 1980; Loehr, 1982; Jones et al., 2002). Focus was also considered to be a necessary component of mental toughness because of the many distractions that athletes face in competition. Part of mental toughness is, for example, learning to block out the crowd and focus on specific, performance-relevant tasks. If an athlete's focus shifts, even for just a second, then it is easy to make a mistake (Jones et al., 2002). Self-confidence was also considered to be crucial to mental toughness, because one must believe in oneself and one's abilities in order to achieve success in sport and other areas in life (Loehr, 1982; Mahoney, et al., 1987; Gould, et al., 1999; Jones et al., 2002).

While motivation could have been included as a component of mental toughness, motivation can sometimes come from outside sources (Loehr, 1982) but on the other hand self-confidence comes from within and involves both optimism and self-competence (Manzo, Silva, & Mink, 2001), whereas. Therefore, self-confidence was chosen as a component of mental toughness and not motivation. Finally, resiliency was also considered to be very important for mental toughness because mentally tough competitors are able to bounce back from failure and learn from their mistakes, whereas those who are not mentally tough may get discouraged and lose confidence (Jones et al., 2002; Loehr, 1982). Interestingly, nearly all of the coaches and sport psychology consultants in the previous pilot surveys by Cherry (2003) identified resiliency as more important to mental toughness than any of the other components.

In summary, past research has examined mental skills in athletics and the relation of these skills to successful performance. Moreover, some research has examined the construct of mental toughness with measures such as Loehr's (1992) MTI and the CAP for tennis players as well as through qualitative interviewing (Jones et al., 2002). Although mental toughness is a broad term that has been associated with a variety of mental skills, little has been done to quantify mental toughness for research and assessment purposes. The current four-factor model proposed in the present study is conceptually based on the available literature and previous concepts believed to be related to mental toughness. The next chapter describes the method used to establish a mental toughness questionnaire

CHAPTER III

Methodology

Questionnaire Development

Each of the items in the proposed inventory was intended to represent one of the four components of mental toughness found in the existing literature. They included competitive desire, focus, self-confidence, and resiliency. These four components were identified through previous research, feedback from sport psychology consultants working in the field, and also the opinions of knowledgeable coaches at the collegiate and professional level. A pilot study conducted by Cherry (2002) surveyed approximately twelve coaches and two sport psychology consultants to identify what they believed to be the most important aspects of mental toughness (See Appendix A). After examining all responses, a preliminary inventory was developed to measure mental toughness. The present study represented an extension of this inventory by adding item that addressed the focus component of mental toughness identified by Jones, et al (2002).

The actual questions for the Mental Toughness Questionnaire (See Appendix B) were developed based on the definitions of each component in past research, quotes from the qualitative research study by Jones et al. (2002), and the Mental Toughness Inventory (MTI) and Competitive Adjective Profile (CAP) developed by Loehr et al. (1992). Other general tools for assessing important mental skills were consulted (Mahoney et al., 1987; Gould et al., 1999).

Participants

The participants in this study were varsity athletes at a Division I -A university and Division II college. The athletes were recruited after contacting the head coaches of

each men's and women's sport and obtaining the coach's approval. Athletes were given a letter of information (See Appendix C) briefly explaining the research study and inviting them to participate. The athletes in this study included a number of athletes from both women's and men's as well as individual and team sports. Since some athletes were not actively competing at the time of the study, only those athletes who were active members of the team (e.g. currently playing) were asked to take part in the investigation.

Procedure

Athletes and coaches read and signed an informed consent form (see Appendix C) prior to participation and then the athletes completed the MTQ, which assessed the four components of mental toughness. The participants were instructed to read each statement and circle the response that best fit their own view of themselves. A five-point Likert scale was used to allow athletes to indicate how much they agreed or disagreed with the items in the MTQ. To minimize the possibility of social desirability in participant's ratings, the athletes were not told that the questionnaire was assessing mental toughness. The athletes were told that the questionnaire was a measure of "personal styles" and to answer each question as it related to them and their sport at the current time.

Statistical Analysis

In order to establish the validity of the MTQ, an exploratory factor analysis technique was performed on the data set (Thomas & Nelson, 2001). Factor extraction was conducted using the principal components method and an orthogonal varimax rotation was used to simplify the structure. This technique indicated the amount of variance accounted for by the four-factor model. Factors with eigen values of 1.0 or

higher were retained, and a factor –loading criterion of .40 was used to determine if an item loaded on a particular factor (Thomas & Nelson, 2001). If the initial factor analysis failed to either replicate the expected number of factors or the expected placement of specific items within the factor structure, then the identified factors and questions were re-evaluated for conceptual agreement. Questions that were found to be misleading or vague were identified and dropped from the MTQ. Following these removals, additional analyses were performed until a conceptionally rational factor structure was obtained. Cronbach's alpha was calculated for the MTQ as well as for the four components of mental toughness (Thomas & Nelson, 2001).

CHAPTER IV

Results

Sample Demographics

One hundred and seventeen undergraduate varsity student-athletes (46 male and 71 female) participated in this study. Eighty-nine of these student-athletes were from a large Division I-A southeast university and 28 were from a Division II southeast college. Twenty seven percent (n=32) were freshman, 33% (n=38) were sophomores (n=24), 21% (n=24) were juniors, 15% (n=18) were seniors, and 4% (n=5) were fifth-year seniors. Participants were an average age of 20 years, ranging from eighteen to twenty-four. Twenty-eight of the athletes were baseball players, 27 were rowers, 18 were tennis players, 16 were swimmers, 10 were soccer players, 9 were golfers, and 9 were volleyball players. Athletes reported that the average number of competitive years in their respective sports was ten years. Sixty-eight percent (n=80) reported themselves as starters, 20% (n=23) as non-starters, and 12% (n=14) as unsure of their starting status. Finally, 93% (n=109) reported themselves as part of the traveling team, 3% (n=3) reported they were not part of the traveling team, 3% (n=4) reported they were unsure if they were part of the traveling team, and 1% (n=1) reported traveling was not applicable to their team.

Mental Toughness Questionnaire- Descriptive Statistics

The eighteen questions of the MTQ (see Appendix B) assessed the competitive desire, focus, resiliency, and self-confidence of student-athletes. Participants read a statement and then circled the number that corresponded best to them according to the

sport they were currently involved in. A five-point scale was used, with "1" indicating that an athlete strongly agreed (more mentally tough) and "5" indicating that (s)he strongly disagreed with the statement (less mentally tough). The average score on the eighteen questions of the MTQ was 1.83 (*SD* =.46). The four a priori competitive desire questions (MTQ's 4, 9, 13, and 18) yielded a mean of 1.42 (median=1.25, mode=1, *SD*=.53). The five a priori focus questions (MTQ's 1, 5, 8, 15, and 17) yielded a mean of 2.20 (median=2, mode=1.4, SD =.76). The five a priori resiliency questions (MTQ's 7, 10, 11, 12, and 16) yielded a mean of 2.30 (median=2.4, mode=2.6, SD =.55). Finally, the a priori self-confidence questions (MTQ's 2, 3, 6, and 14) yielded a mean of 1.64 (median=1.75, mode=1.75, SD =.48).

Initial Exploratory Factor Analysis of MTQ

A factor analysis was applied to the MTQ in an attempt to identify the constructs being measured by the items (Thomas & Nelson, 2001). The factor extraction was accomplished using the principal components method to maximize the variance from the data set with each construct. Following the factor extraction, an orthogonal rotation (varimax) was used to simplify the component structure (Thomas & Nelson, 2001). Items with factor loadings of .40 or higher were retained for further analysis.

This analysis produced a five-factor solution; the factor loadings for each item are reported in Table 1 (all Tables are located in Appendix D). The competitive desire component emerged well in the analysis with all of the items designed to measure competitive desire (MTQ 4, 9, 13, and 18) loading on Factor One with only MTQ 9 cross-loading on to Factor Three. The focus component began to emerge in the analysis but there seemed to be a problem with the reverse scored items. All the reverse scored

items (MTQ 1, 5, and 12) loaded on Factor Two with a high factor loading of .6 or higher, with MTQ 1 cross-loading onto Factor Four. Even MTQ 12, which was a question designed to measure resiliency loaded with the other reverse scored items. Although the other items designed to measure focus (MTQ's 8, 15, and 17) loaded onto Factor Two with the three reverse scored items, the factor loadings were not very strong. MTQ 15 cross loaded onto Factor Five and MTQ 17 cross-loaded onto Factor One. It seemed that MTQ's 8, 15, and 17 may load on to the same factor with higher loadings if the reverse scored items were eliminated. The resiliency component began to emerge in the analysis with three of the five designed resiliency items (MTQ's 7, 10, and 11) all loading onto Factor Three with no cross loadings. MTQ12 was a reverse scored item and loaded onto Factor Two with the other reverse scored items and the focus items. MTQ16 loaded onto Factor Five with two of the designed self-confidence items. Finally, the self-confidence component did not emerge well in the analysis. Two of the self-confidence items (MTQ 2 and 3) loaded onto Factor Four with no cross- loadings. MTQ's 6 and 14 loaded onto Factor Five with MTQ 14 cross-loading onto Factor One.

Intermediate Factor Analysis of MTQ

While the items in the MTQ were designed to measure four specific components based on the conceptual framework for mental toughness, the initial exploratory factor analysis illuminated some possible overlap or vagueness in the items. For example, the reverse scored items all loaded together on to the same factor even though they were designed to measure focus and resiliency. Research suggests that reverse scored items can cause problems in factor analysis, since even if the items are measuring different

components the similar wording may cause reverse scored items to load together (Conrad et al., 2004). For this reason, the reverse scored items, MTQ 1, 5, and 12 were all eliminated.

Another problem was that certain items continued to cross-load onto other factors. MTQ 9 was eliminated because this item loaded on both Factor One and Factor Three with almost equal loadings. MTQ 9, which was designed to measure competitive desire, was not similar enough to the other competitive desire questions. The two reverse-scored items designed to measure focus were eliminated while the remaining items were retained even though MTQ 15 and 17 were cross-loading. These items were kept because if MTQ 15 and 17 were eliminated, only one focus question would be left. MTQ 2 and 3 loaded together onto Factor Four with no cross-loadings and both seemed to describe self-confidence. However, MTQ 6 and 14 (designed to measure self-confidence), as well as MTQ 16 (designed to measure resiliency) all loaded on to Factor Five with MTQ 14 cross-loading on to Factor One. When the meaning of these items (MTQ 6, 14, and 16) was analyzed, there was no interpretable theme. Therefore, MTQ 6, 14, and 16 were all eliminated.

Final Factor Analysis Model

Following a revision of the MTQ, a second factor analysis with varimax rotation was used to analyze the remaining items (Thomas & Nelson, 2001). This revised mental toughness scale had an alpha of .83, and all of the questions loaded with its a priori factor with no cross-loadings. The factor loadings for each item are reported in Table 2.

All of the correlations were significant at the .001 level except for the correlation between competitive desire and resiliency. The alpha coefficients for three of the four

components (competitive desire, focus, and self-confidence) approached or exceeded .80. See Table 3 for the alpha coefficients for each component.

Revised Mental Toughness Questionnaire- Descriptive Statistics

The Revised MTQ was composed of eleven items and the average mental toughness score of the Revised MTQ was 1.95 (*SD*=.50). Table 4 identifies the means and standard deviations of the average mental toughness scores by gender, year in school, school division, sport, starting status, and traveling team status.

Correlations between the mean mental toughness score on the Revised MTQ and each of the demographic variables are reported in Table 5. Mental toughness was significantly negatively correlated with age (r = -.21, p < .05) and year in sport (r = -.20, p < .05), meaning that older participants and participants with more years in their sport had higher levels of mental toughness. Mental toughness was also significantly negatively correlated with division level (r= -.29, p<.01). The mean mental toughness score for athletes in Division I-A (*M*=2.03, *SD*= .51) was significantly higher than the mean mental toughness score for athletes in Division II (*M*=1.69, *SD*=.37), indicating that the Division II athletes reported being more mentally tough than Division I-A athletes (t[115] = 3.28, p .001). On the other hand, mental toughness was positively related to sex (r = .29, p < .01), the mean mental toughness score for males (*M*=1.77, *SD*=.38) was statistically significantly lower than the mean mental toughness score for females (*M*=2.07, *SD*=.54), indicating that males reported being more mentally tough than females (t[115] = -3.29, p = .001).

The mean mental toughness score on the Revised MTQ was significantly different among the eight different sports, $F(7,116) = 2.87$, $p = .009$. Using Tukey's test of post hoc differences (SPSS manual) it was found that the following groups of teams (men's baseball, men's tennis, men's golf, women's volleyball, women's tennis, women's rowing and women's soccer) were not significantly different from each other. However, this group was different from a second group of teams that were not significantly different from each other (men's tennis, men's golf, women's volleyball, women's tennis, women's rowing, women's soccer, and women's swimming). Therefore, there were differenced between men's baseball and women's swimming but there were no differences between the other sports.

CHAPTER V

Discussion

The primary goal of this study was to revise a previous questionnaire by Cherry (2003) that had been developed to assess mental toughness and then use factor analysis to determine the psychometric properties of the revised MTQ. This MTQ was based on an a priori model that included four possible components of mental toughness: competitive desire, focus, resiliency, and self-confidence.

Psychometric Properties of the MTQ

Factor analysis conducted on the MTQ supported a five-factor model rather than the predicted four-factor model of mental toughness. However, inspection of the factor analysis results revealed that the items comprising each factor did not all meet the factor loading criterion of .40, and some loaded on different factors. Therefore, the MTQ was revised and a second factor analysis was conducted. The analysis revealed support for a four-factor model of mental toughness, and the Cronbach's alpha for the revised MTQ was acceptable. Each of the items proposed to measure competitive desire, focus, resiliency, and self-confidence loaded on the same factor, supporting the validation of this four-factor model of mental toughness. In addition, the Cronbach's alpha for three of the four components reached acceptable values.

As mentioned previously, the initial factor analysis revealed several problems with the factor loadings. For example, MTQ 9 stated "I always fight to win every minute of competition." This item was intended to measure competitive desire and although it loaded with the other competitive desire questions, it also cross-loaded with other

resiliency items. While MTQ 9 seemed to describe competitive desire, it also displays some of the characteristics of resiliency. Resiliency has been described as the ability of an athlete to endure negative outcomes, learn from mistakes and failure, remain positive, and go on to experience success (Loehr, 1982). If an athlete is fighting to win every minute of competition and displaying competitive desire, then this implies that (s)he continues to fight even when things do not go her/his way. Therefore, there are elements of this item which seem to be related to both the competitive desire and resiliency.

Another problem with the initial analysis seemed to deal with the reversed scored items (MTQ's 1, 5, and 12). The fact that these items were worded differently than the other items may have contributed to their high relationship to each other, even though two of the items described focus and the other described resiliency. Conrad et al. (2004) have suggested that reversed-scored items should be avoided when constructing scales because their wording can lead to problems when conducting factor analysis.

The revised MTQ did achieve simple structure and a desired overall reliability. This four factor model of mental toughness was also supported by the findings of Jones et al. (2002) that emerged from interviews they conducted with athletes. The attributes of mental toughness identified by those athletes included: self belief, desire and motivation, focus, and dealing with competition-related pressure and anxiety. The self-belief dimension appears to be similar to the self-confidence items in this study. The athletes in the Jones et al. (2002) study also described mentally tough competitors as having an "unshakable self-belief" (p. 210), which is very similar to items of the MTQ dealing with self-confidence. Self-confidence has also been described as an overall positive belief in one's own ability to control outcomes and be successful (Jones, et al., 2002; Manzo,

Silva, & Mink, 2001). Desire and motivation mentioned by athletes in the Jones et al. (2002) study can be equated with the resiliency component of mental toughness on the MTQ. The athletes said desire referred to the ability to use setbacks to bounce back with increased determination, which is very similar to the definition of resiliency proposed by Loehr (1982) used in the present study (ie., the ability of an athlete to endure negative outcomes, learn from mistakes and failure, remain positive, and go on to experience success). Obviously, the focus dimension which was identified by athletes in the Jones et al. (2002) study is similar to the focus component of the MTQ. Focus is described in much the same way in both studies (ie., the ability of an athlete to remain focused despite any distractions around them). Finally, dealing with competition-related pressure is mentioned by the athletes in the Jones et al. (2002) study is similar to the component of competitive desire on the MTQ. The central theme seems to be that the mentally tough athlete thrives on the pressures associated with competition (Loehr, 1982). In summary, the revised four-factor model of mental toughness appears to be both statistically reliable and valid, and also consistent with the limited previous research assessing athlete's perception of mental toughness.

Component Reliabilities

Although the revised MTQ achieved an acceptable overall reliability, only the competitive desire component reached the desired level of reliability. However, the focus and self-confidence components both approached the desired level. One reason that these components did not quite achieve the desired level may be due to the small number of items represented in each component, two for self-confidence and three for focus. With

the addition of more items, the reliabilities of these components would be expected to reach the desired level of reliability. The resiliency component had a very low reliability, which may be due to inconsistencies in wording of the three items comprising that component. Resiliency items should describe an athlete having some negative experience but not getting discouraged and bouncing back with positive results. MTQ 7 states that "making mistakes does not get me down." This statement seems to be missing the bouncing back aspect of resiliency that is reflected in MTQ 11, "I bounce back from setbacks and do not get too discouraged." Therefore, the addition of items that more concisely describe the resiliency component may lead to an increased reliability for that component

Support of the Revised MTQ

The Revised MTQ demonstrated the capacity to distinguish the mental toughness of different groups. For example, the mean mental toughness score of males was significantly higher than that of females. It is possible though that this difference was due to a social desirability factor. It has been suggested that men want to appear tough in order to be perceived as "real" athletes (Coakley, 2004). Therefore, this difference in mental toughness between males and females warrants further investigation.

The results also indicated that athletes from Division I-A reported being less mentally tough than athletes from Division II. Interestingly, all the athletes from the Division II school were male baseball players, so this finding is likely due to other factors in addition to the size of the institution. The same might be said for the differences in the mean mental toughness scores on the Revised MTQ among athletes in different sports. However, the fact that this Revised MTQ, which has been found to be

reliable and valid, distinguishes between gender, sports, and divisions adds to the potential uses of such an inventory.

Value of the MTQ for Researchers, Coaches, Athletes, and Sport Psychology Consultants

The Revised Mental Toughness Questionnaire measures athletes' competitive desire, focus, resiliency, and self-confidence in order to assess their mental toughness. This questionnaire and four-factor model of mental toughness will hopefully lead researchers to further investigate and understand this concept. Also, the MTQ would be a great tool for coaches and sport psychology consultants to use for interventions with athletes.

The uses of the MTQ in the applied setting of sport psychology are truly limitless. This questionnaire may prove to be extremely useful in allowing athletes to assess their level of mental toughness as well as identify specific components they need to address for improvement. This assessment could then be used to design an intervention that would enable the athlete to become more mentally tough. For example, it could be used to measure differences before and after an intervention program designed to increase resilience and mental toughness. Coaches could also use this tool to identify the mental toughness of their team as a whole, again so the weak areas could be identified and improved. The MTQ could also be used for further research by expanding construct validity and relating mental toughness to other constructs, seeing how mental toughness changes after injuries and setbacks, and whether mental toughness is higher for professional than amateur athletes.

References

References

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215.

Bandura, A. (1990). Perceived self-efficacy in the exercise of personal agency. *Journal of Applied Sport Psychology*, 2, 128-163.

Cherry, H. L. (2003). A Preliminary Psychometric Analysis of an Inventory Assessing Mental Toughness. Unpublished manuscript.

Coakley, J. (2004). Sports in society: Issues and controversies (8th edition). Boston, MA: McGraw Hill.

Conrad, K.J., Wright, B.D., McKnight, P., McFalls, M., Fontana, A., & Rosenbeck, R. (2004). Comparing Traditional and Rasch Analyses of the Mississippi PTSD Scale: Revealing Limitations of Reverse-Scored Items. *Journal of Applied Measurement, 5*(1), 15-30.

Deaner, H. & Silva, J.M. (2002). Personality and sport performance. In Silva, J.M. And Stevens, D.E. (Eds.). Psychological Foundations of Sport (pp. 48-65). Boston: Allyn and Bacon.

Gould, D., Medbery, R., Damarjian, N. & Lauer, L. (1999). A survey of mental skills training knowledge, opinions, and practices of junior tennis coaches. *Journal of Applied Sport Psychology*, 11, 28-50.

Jones, G., Hanton, S., & Connaughton, D. (2002). What is this thing called mental toughness? An investigation of elite sport performers. *Journal of Applied Sport Psychology, 34*, 205-218.

Kamen, L.P., & Seligman, M.E.P. (1986). Explanatory Style predicts college grade point average. Unpublished manuscript.

Kass, J.D., Friedman, R., Lesserman, J., Caudill, M., Zuttermeister, P.C., & Benson, H. (1991). An inventory of positive psychological attitudes with potential relevance to health outcomes: Validation and preliminary testing. *Behavioral Medicine*, Fall, 121-129.

Lazarus, R.S. & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.

Loehr, J. (1982). *Mental toughness training for sports.* New York: The Stephen Greene Press.

Loehr, J.E., Retert, E.P., Brown, S.W. & Woods, R.B. (1992). *The development of two instruments to assess mental toughness in tennis.* Paper presented at the American College of Sports Medicine Conference, Dallas, Texas.

Mahoney. M.J., Gabriel, T.J., & Perkins, T.S. (1987). Psychological skills and exceptional athletic performance. *The Sport Psychologist, 1*, 181-199.

Manzo, L.G., Silva, J.M., Mink, R. (2001). The Carolina sport confidence inventory. *Journal of Applied Sport Psychology, 13,* 260-274.

Milgram, N.A. & Palti, G. (1993). Psychosocial characteristics of resilient children. *Journal of Personality and Social Psychology, 27*, 2001.

Miserandino, M. (1998). Attributional retraining as a method of improving athletic performance. *Journal of Sport Behavior, 21*, 286-297.

Peterson, C. & Barrett, L. (1987). Explanatory style and academic performance among university freshmen. *Journal of Personality and Social Psychology, 53,* 603-607.

Pezer, V. & Brown, M. (1980). Will to win and athletic performance. *International Journal of Sport Psychology*, 11, 121-131.

Scheier, M.F., & Carver, C.S. (1985). Optimism coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology, 4,* 219-247.

Scheier, M.F., & Carver, C.S. (1987). Dispositional optimism and physical well-being: The influence of generalized outcome expectancies on health. *Journal of Health Personality, 55*, 169-210.

Seligman, M.E.P., & Maier, S.F. (1967). Failure escape to traumatic shock. *Journal of Experimental Psychology, 74,* 1-9.

Seligman, M.E.P. (1975). *Helplessness: On depression, development, and death.* New York: Freeman.

Seligman M.E.P. & Schulman, P. (1986). Explanatory Style as a factor of productivity and quitting among life insurance sales agents. *Journal of Personality and Social Psychology, 50,* 832-838.

Seligman, M.E.P., Nolen-Hokesema, N., Thornton, K.M., & Thornton, M. (1990). Exploratory style as a mechanism of disappointing athletic performance. *Psychological Science, 1*, 143-146.

Silva, J.M. (1984). Personality and sport performance: Controversy and challenge. In J.M. Silva & R.S. Weinberg (Eds.), *Psychological Foundations of Sport* (pp. 59-69). Champaign, IL: Human Kinetics.

Thomas, J.R., & Nelson, J.K. (2001). *Research Methods in Physical Activity Fourth Edition*. Champaign, IL: Human Kinetics.

Tutko, T.A. & Richards, J.W. (1971). *The Psychology of Coaching*. Boston: Allyn and Bacon, Inc.

Unestahl, L-E. (Ed.) (1982). *The Mental Aspects of Gymnastics*. Orebro, Sweeden: Veje Publ. Inc.

Wavo, E'nzuva-Ya-Tsuva. (2004). Honesty, Cooperation and Curiosity Achievement of Some Schools on Nanjing (China). *IFE-Psychologia:-An-International-Journal, 12(2)*, 178-187.

Weinberg, R.S., Gould, D., & Jackson, A. (1979). Expectations and performance: An empirical test of Bandura's self-efficacy theory. *Journal of Sport Psychology, 1*, 320-321.

Weinberg, R.S., Yukelson, D., & Jackson, A. (1980). Effect of public and private efficacy expectations on competitive performance. *Journal of Sport Psychology, 2*, 340-349.

Weinberg, R.S., Gould, D., Yukelson, D. & Jackson, A. (1981). The effect of preexisting self-efficacy on a competitive muscular endurance task. *Journal of Sport Psychology*, 4, 345-354.

Appendices

Appendix A: 2002 Pilot Survey

Dear Coach's/Sport Psychologist's Last Name,

My name is Leanne Cherry, I am an Exercise and Sport Science/ Psychology double major and I am currently in the process of working on my senior honors thesis. A major part of the thesis involves the development and psychometric testing of a questionnaire that will assess the mental toughness of athletes. At this point in my research, I am trying to determine the different components or qualities of mental toughness. For example, some experts say that confidence is a component of mental toughness. In order to come to the best possible decision about what qualities characterize mental toughness, my advisor, Dr. Silva, suggested that I ask some of the varsity athletic coaches/applied sport psychologists for their input. I would greatly appreciate any insight that you could provide given your expertise and experience working with athletes.

In the numbered blanks below, please list what you believe to be the ten most important components of mental toughness. Then beside each component please rank the component, with 1 being the most important and 10 the least important. If you could simply reply to my email by filling in the blanks below, that would be extremely helpful. It would be most helpful if you could email your responses by March 20, 2002.Thanks for your time and thought. If you are interested, I can send you a copy of my final questionnaire to assess mental toughness when I finish my thesis in the fall, simply write the word yes below.

Thank You,
H. Leanne Cherry

TOP TEN COMPONENTS OF MT	RANK
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____

Appendix B: 2004 Mental Toughness Questionnaire

Personal Styles and Performance Questionnaire

DIRECTIONS: Read each of the following statements and indicate your response to each statement based on the five-point scale below. Simply circle the number that corresponds best to your response to each statement each statement as it relates to you and the sport you are currently involved in. Try to respond as honestly and openly as you can to each statement as it pertains to your participation in sport right now.

1. **I get distracted and lose focus in competition. (F)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

2. **I feel positive about my abilities in competition. (SC)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

3. **I feel in control of my performance. (SC)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

4. **I really enjoy the thrill of competition. (CD)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

5. **My mind wanders during competition. (F)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

6. **If I compete up to my potential, I believe that I will be successful. (SC)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

7. **Making mistakes does not get me down. (R)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

8. **I am completely concentrated on the task at hand. (F)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

9. **I always fight to win every minute of competition. (CD)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

10. **I feel as though I can handle criticism well and use it to my advantage. (R)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

11. **I bounce back from setbacks and do not get too discouraged. (R)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

12. **Once I lose my cool in competition, it is hard for me to get it back quickly. (R)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

13. **I have a strong desire to compete, perform well, and win. (CD)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

14. **I feel as though my skills as an athlete will allow for success at the collegiate level. (SC)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

15. **As I perform, I am able to block out my own worries and fears. (F)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

16. **Even if I start out with some mistakes, I normally finish strong in the end. (R)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

17. **I block out the crowd and all other distractions in competition. (F)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

18. **I always give my best effort in competition. (CD)**

Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree
1	2	3	4	5

Appendix C: 2004 Athlete Information Letter and Informed Consent

The purpose of this study is to examine the personal styles athletes use in competition. By signing this form, you are agreeing to fill out a questionnaire that will ask questions about how you handle competition. You will circle the answer that best fits with your evaluation of yourself in your sport at the current time. The questionnaire is made up of 24 questions and should take you approximately 5-10 minutes. Your participation in this study is voluntary and all records relating to you will be kept confidential. Even if you agree to take part in the study you may discontinue your participation at any time without any penalty. This consent form will be stored in a locked file cabinet in the principal investigator's office (144 HPER) for a three-year period and then destroyed in accordance with research protocol.

This project has been approved by the Human Subject's Review Board at the University of Tennessee. If you have any questions for the review board regarding research regulations at the University of Tennessee, Knoxville, please call (865) 974-3466.

If you would like to know more about this project please contact Leanne Cherry at (865) 974-8768, or Dr. Leslee Fisher at (865) 974-1283.

H. Leanne Cherry
1914 Andy Holt Ave.
144 HPER
865.974.8768 (Office)
865.974.8981 (Fax)
Email: hcherry@utk.edu

Leslee A. Fisher, Ph.D.
1914 Andy Holt Ave.
336 HPER
865.974.9973 (Office)
865.974.8981 (Fax)
Email: lfisher2@utk.edu

I acknowledge that the research procedures for this study have been explained to me and that any questions that I have asked have been answered to my satisfaction. I have been informed that there are no possible risks as a result of participation in this study and all of the procedures involved in participation. I have been assured that records relating to me will be kept confidential and no information will be released, shown, or printed. I also know that at no time during the study or after the end of the project will my personal identity be disclosed without my permission. I understand that I am free to remove myself from the study at any time.

_____	_____	_____
(Printed Name of Participant)	(Signature of Participant)	(Date)

Appendix D: Tables

Table 1

Factor Loadings of Items on the Mental Toughness Questionnaire

Item	A priori factor	Factors				
		1	2	3	4	5
4	Competitive desire	.822				
9	Competitive desire	.451		.439		
13	Competitive desire	.862				
18	Competitive desire	.762				
1	Focus		-.749		-.482	
5	Focus		-.790			
8	Focus		.581			
15	Focus		.492			.437
17	Focus	.408	.571			
7	Resiliency			.685		
10	Resiliency			.581		
11	Resiliency			.845		
12	Resiliency		-.609			
16	Resiliency					.510
2	Self-confidence				.776	
3	Self-confidence				.789	
6	Self-confidence					.819
14	Self-confidence	.533				.553

Table 2

Factor Loadings of Items on Revised Mental Toughness Questionnaire

		Factors			
Item	A priori factor	1	2	3	4
4	Competitive desire	.869			
13	Competitive desire	.899			
18	Competitive desire	.728			
8	Focus		.724		
15	Focus		.815		
17	Focus		.799		
7	Resiliency			.678	
10	Resiliency			.678	
11	Resiliency			.855	
2	Self-confidence				.809
3	Self-confidence				.778

Table 3

Alpha Coefficients for Components of Mental Toughness

Components	Alpha
Competitive Desire	.834
Focus	.790
Resiliency	.636
Self-confidence	.784

Table 4

Means and Standard Deviations of Scores on Revised Mental Toughness Questionnaire by Subgroups

Groups	Mean	Standard Deviation
Male	1.77	.38
Female	2.07	.54

Groups	Mean	Standard Deviation
Freshmen	2.05	.44
Sophomore	2.04	.53
Junior	1.82	.47
Senior	1.75	.51
Fifth Yr Senior	1.93	.65

Groups	Mean	Standard Deviation
Division I-A	2.03	.51
Division II	1.69	.37

Table 4
continued

Groups	Mean	Standard Deviation
Women's Tennis	2.12	.68
Volleyball	1.90	.74
Swimming	2.31	.64
Soccer	2.13	.37
Rowing	1.94	.33
Golf	1.87	.44
Men's Tennis	1.91	.34
Baseball	1.69	.37

Groups	Mean	Standard Deviation
Starter	1.90	.50
Non-starter	2.13	.53
Unsure	1.97	.38

Table 4
continued

Groups	Mean	Standard Deviation
Traveling	1.93	.50
Not Traveling	2.06	.23
Unsure	2.18	.65
N/A	2.18	

Table 5

Correlations Between Mean Mental Toughness Scores on the Revised Mental Toughness Questionnaire and Demographic Variables

Variables	MT	Yr Sch	Age	Sex	Yr Sp	Travel	Starter	Div.
MT	---	-.202(*)	-.191(*)	.293(**)	-.152	.105	.113	-.293(**)

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
N=117 all correlations

Vita

My name is Leanne Cherry and I grew up in Greenville, NC. All my life I knew that sports were important to me. As I grew up, I was involved in the sport of gymnastics through high school. After I graduated high school, I went to the University of North Carolina at Chapel Hill. It was here that I discovered about sport psychology and graduated with a degree in psychology and exercise sport science. After graduation, I moved to Knoxville, Tennessee where I pursued a Master's Degree in sport psychology. This thesis is the culmination of my studies here at UT, and I have learned so much through the process of writing this, not only about research in sport psychology but also about myself.