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The Role of Cognitive Distortions in Predicting Mental Toughness in Athletes

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Philadelphia College of Osteopathic Medicine

Department of Psychology

THE ROLE OF COGNITIVE DISTORTIONS IN PREDICTING MENTAL
TOUGHNESS IN ATHLETES

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Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Psychology

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DEPARTMENT OF PSYCHOLOGY

Dissertation Approval

This is to certify that the thesis presented to us by Courtney Naughton
on the 8th day of May, 2017, in partial fulfillment of the
requirements for the degree of Doctor of Psychology, has been examined and is
acceptable in both scholarship and literary quality.

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Abstract

Mental toughness is one of the most commonly applied concepts in sports but also one of the least understood terms used by individuals in the athletic community (Jones, Hanton, & Connaughton, 2002). Mental toughness in sports is also characterized as the ability to be more consistent and better than opponents in remaining determined, focused, and confident under pressure (Jones et al., 2007). Despite the advancements in the cognitive understanding of mental toughness, little research has focused on evaluating the basis or rationality as to why or how mentally tough athletes possess the tendency to have an unshakeable confidence and belief in their abilities in the face of uncertainty. The purpose of the current study was to examine the possibility that mental toughness is related to the presence of specific cognitive distortions (e.g., minimization, magnification, all-or-nothing thinking, comparisons to others, emotional reasoning and decision making, should statements, and, particularly, perfectionism) after accounting for the factors already known to be related to mental toughness (i.e., age, gender, total years of playing experience). Results demonstrated that magnifications and comparisons to others were significantly, negatively correlated to mental toughness. Apparently, the less frequently athletes engage in blowing bad situations out of proportion to reality and comparing themselves unfavorably to others, the more mentally tough they are likely to be. These findings lend support to the integration of cognitive-behavioral interventions aimed at reducing athletes' engagement in these specific types of distortions in order to improve mental toughness and, potentially, athletic performance.

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Chapter 1: Introduction

Statement of the Problem

Mental toughness is one of the most commonly applied concepts in sports but also one of the least understood terms used by individuals in the athletic community (Jones, Hanton, & Connaughton, 2002). Mental toughness has been defined as “the natural or developed psychological edge that enables an athlete to cope better than his/her opponents with the many demands that sport places on a performer” (Jones, Hanton, & Connaughton, 2007, p. 247). Mental toughness in sports is also characterized as the ability to be more consistent and better than opponents in remaining determined, focused, and confident under pressure (Jones et al., 2007). According to the 4Cs (challenge, control, commitment, confidence) model of mental toughness (Clough, Earle, & Sewell, 2002), mentally tough individuals typically (a) view negative experiences (e.g., stress and anxiety) as a challenge that they can overcome, but also as a natural and essential catalyst for growth and development; (b) believe they are influential in dealing with and controlling negative life experiences; (c) are deeply involved in what they are doing and committed to achieving their goals; and (d) are confident in their ability to deal with and overcome negative life experiences (Gucciardi, Hanton, & Mallet, 2012). Despite these advancements in the cognitive understanding of mental toughness, little research has focused on evaluating the basis or rationality as to why or how mentally tough athletes possess this tendency to have an unshakeable confidence and belief in their abilities in the face of uncertainty.

In an effort to operationalize and better understand the cognitive components of

mental toughness, many studies have yielded information regarding the attitudinal styles and beliefs of mentally tough athletes. For instance, Jones et al. (2007) identified 30 attributes of mental toughness, which fall within four separate dimensions (attitude/mindset, training, competition, and post competition), that demonstrate how athletes use these positive attitudes to perform successfully while dealing with the pressure, anxiety, and pain/hardship associated with top-level performance. For example, mentally tough athletes believe that success is achievable and that they can achieve any goal they set for themselves (Jones et al. 2007). Apparently, one's beliefs regarding whether mental toughness can be developed, regardless of the accuracy of such a belief, also affects mental toughness. For example, people who believe that mental toughness can be developed, regardless of whether they have evidence to substantiate their beliefs, are typically more motivated to make an effort on tasks and are more likely to view setbacks, as well as their abilities to handle stressful situations, in a more positive way than those who do not hold this belief (Gucciardi, Jackson, Hodge, Anthony, & Brooke, 2014). These findings suggest that the cognitive component of mental toughness has an important influence on its strength and presence in individuals. Despite the knowledge gained from these studies, a significantly smaller portion of the cognitive research on mental toughness has been directed toward understanding whether these positive attitudes, beliefs, and mindsets inherent in mental toughness are realistic or rational and how they are upheld despite negative or stressful circumstances.

Active thinking processes refer to engaging in a sufficient amount of cognitive effort in situations where information processing is necessary (Kendall, 1992). Trying to solve a problem or reach a goal, which are fundamental for success in sports, are both

examples of active thinking processes. Cognitive processing distortions, which can be functional or dysfunctional, are also characterized as active thinking processes (Kendall, 1992). Cognitive processing distortions refer to active thinking processes that are misguided, governed by faulty reasoning processes, and divided into those that serve as functional distortions and others that serve as dysfunctional distortions (Kendall, 1992). Cognitive distortions have typically been conceptualized in the literature as negative (e.g., Beck, 1967). Much of the literature has linked cognitive distortions with various mental health disorders and emotional and behavioral difficulties (e.g., Beck, 1967; Burns, 1980; Rosenfield, 2004; Yurica, 2002). Cognitive processing distortions, such as selective attention, minimization, rationalization, all-or-nothing thinking, overgeneralization, emotional reasoning, should statements, fortune-telling, and arbitrary inferences, are common distortions that reinforce or produce the negative mood-related symptoms found within those suffering from mental illness (e.g., Beck, 1967; Burns, 1980). Research is still needed to shed light on how these distorted cognitive processes might function in a positive way for mentally tough individuals, even if relating something commonly characterized as negative to a positive psychological construct seems counterintuitive.

Much of the research on the cognitive components of mental toughness has also focused on information processing; however, this research has yet to address the possibility that information is being processed in a distorted manner in athletes who see only the positive, despite being surrounded by pressure and negativity. For example, the performance of mentally tough participants on a cognitive planning task was unaffected by negative feedback, whereas the performance of the less mentally tough was impaired

(Clough et al., 2002). Mentally tough individuals also have an enhanced ability to prevent unwanted information from interfering with current tasks or goals (Dewhurst, Anderson, Cotter, Crust, & Clough, 2012). Even though both of these findings represent important aspects of the specific cognitive processes that enable mentally tough individuals to perform well on tasks, research on the potential inaccuracies or distortions of these aforementioned filtering processes may be a crucial missing ingredient to the understanding of mental toughness. Therefore, the presence of cognitive processing distortions should be assessed in order to have a more complete cognitive understanding of this construct.

Despite the numerous findings on the negative consequences of cognitive distortions, healthy thinking can involve cognitive information- processing distortions as well (Geer, Davison, & Gatchel, 1970). Studies supporting the notion that distortions can potentially be adaptive and beneficial to one's well-being have been commonly overlooked. A review of the literature has shown that indeed some functional processing distortions can be beneficial in maintaining positive mental health (Kendall, 1992). Furthermore, many persons who qualify as extremely successful possess, to varying degrees, seemingly irrational convictions and a substantial number of should statements (Kendall, 1992). Overly positive self-evaluations, exaggerated perceptions of control and mastery, and unrealistic optimism also appear to promote mental health (Taylor & Brown, 1988). Mentally tough athletes who see only winning and losing (i.e., all-or-nothing thinking) or who overestimate or magnify their abilities and skills could ultimately be facilitating their success in sports through these cognitive processes. Distortions, in the form of positive illusions, may also be especially useful when an

individual receives negative feedback or is threatened, and may even serve as an adaptive function under these stressful circumstances (Taylor & Brown, 1988, 1994). The ability to get back on the field and perform well after a loss or after receiving negative feedback from a coach following a poor performance is a key characteristic of a mentally tough athlete. Having a sense of control, even if somewhat beyond reality, and possessing a positive view of the future, even if slightly grand, are more characteristic of healthy rather than of unhealthy thinking (Geer et al., 1970). If this point is true, athletes who selectively attend to or magnify the positive circumstances of an upcoming competition will probably be more confident going into the performance than athletes who look at their odds in a more realistic way. This might be the case when underdog athletes or teams win against the clear favorites in sports. These positive illusions and distortions in thinking may serve a protective function and play an important role for athletes who need to consistently perform in high-pressure situations and succeed in the face of adversity. Furthermore, engaging in self-enhancing cognitions, which may not necessarily be true or rational, can have not only positive psychological benefits but also biological, stress-buffering effects (Taylor, Lerner, Sherman, Sage, & McDowell, 2003).

Athletes in a variety of sports are confronted with highly stressful situations and intense scrutiny on a continual basis. How, then, do certain athletes thrive under these circumstances while others succumb to the pressure? There is a possibility that the continual positive perceptions, attitudes, and beliefs that mentally tough individuals have about their abilities and about their past and future performances, regardless of adverse circumstances or negative outcomes, may not be completely realistic and/or rational.

Therefore, a study examining the possibility that mental toughness is facilitated by cognitive processing distortions is warranted.

Purpose of the Study

The present study examined the possibility that mental toughness is related to the presence of specific cognitive distortions. In order to examine the possibility that engagement in cognitive distortions is predictive of mental toughness, the study was designed to discern which, if any, specific distortions (e.g., minimization, magnification, all-or-nothing thinking, comparisons to others, emotional reasoning and decision making, should statements, and perfectionism) were more common among athletes with higher levels of mental toughness. The hope was that this study would add to the understanding of the cognitive processes that underlie mental toughness in order to gain a better representation of the mental toughness construct.

Chapter 2: Literature Review

Even though research over the past several decades has vastly improved an understanding of mental toughness, more is needed as interest in this subject continues to grow. Mental toughness is one of the most commonly applied concepts in sports and also one of the least understood terms used by individuals in the athletic community (Jones et al., 2002). The field seems split regarding the application of a general and/or specific approach to the study of mental toughness. Viewing the key components of mental toughness as broadly applicable in all sports and contexts is a global perspective, while viewing particular components of mental toughness as more or less appropriate in a given sport or given context is a sport-specific perspective (Crust, 2008). Those who advocate that mental toughness is a trait-like construct (Clough et al., 2002) or at least partly genetically determined (Golby & Sheard, 2004) are likely to advocate for the need to conduct research that will help in understanding the broad influence of mental toughness.

Research on global mental toughness has found that mental toughness is significantly related to athletes' age, gender, and total years of playing experience in a particular sport (Nicholls, Polman, Levy, & Backhouse, 2009). Male athletes score significantly higher than female athletes on total mental toughness, while increasing age and years of experience are also shown to predict higher scores in total mental toughness, as well as within the challenge, commitment, and life control subscales of mental toughness (Nicholls et al., 2009; Sheard, Golby, & van Wersch, 2009). Bull et al. (2005) suggests that there are different forms of mental toughness, which can be differentiated between pressure mental toughness, endurance mental toughness, and mental toughness in extreme circumstances. For example, "the mental toughness required of a snooker

player is not likely to be congruent to that of a rower, or a mountaineer” (Crust, 2008, p. 578). Even though some theorists advocate sport-specific research, furthering the research on both global and sport-specific mental toughness is important because the study of mental toughness is still evolving (Crust, 2008). Furthermore, Crust (2008) believed that viewing mental toughness in a general sense does not necessarily depreciate the value of evaluating how key features of mental toughness become more or less important in specific sports. Similarly, Nicholls et al. (2009) found no significant differences in the level of mental toughness among athletes who participated in team or individual sports and athletes who participated in contact and noncontact sports. These findings support the rationale for examining mental toughness in a global sense for the present study.

Conceptualizations of Mental Toughness

Personality research laid the foundation for the discovery of mental toughness as a primary personality trait, but recent developments have produced refined definitions and conceptualizations of mental toughness (Clough et al., 2002; Jones et al., 2002, 2007) more specifically as it applies to athletes. These developments would not have been possible without investigations into the characteristics and behaviors of mentally tough athletes decades ago.

Mental toughness, originally considered as one of Cattell’s 16 primary personality traits, described such individuals as independent, self-reliant, realistic, responsible, and not emotionally sensitive (Cattell, 1957). The construct became of more interest to the entire sports community after researchers suggested that some of these positive

characteristics could be crucial in determining athletic success. For example, Loehr (1982, 1995) emphasized that athletes and coaches believed that at least 50% of success resulted from psychological factors that reflect mental toughness. Mental toughness was originally described as the ability for athletes to use energy positively during times of crises and as the possession of positive attitudes toward challenging and demanding situations (Loehr, 1982). Mental toughness was also originally conceptualized as the ability to consistently perform toward the upper range of one's talent and skill, regardless of competitive circumstances (Loehr, 1995). According to Loehr (1986), mentally tough performers are disciplined thinkers who respond to pressure in ways that enable them to remain relaxed and energized because of their abilities to increase their flow of positive energy in crisis and adversity. Mentally tough performers also have the right attitudes regarding problems, pressure, mistakes, and competition. These attitudes are believed to arise from having self-confidence, motivation, and positive energy, as well as from the ability to control attention and negative energy through the use of visualization and imagery (Loehr, 1986).

Fourie and Potgieter (2001) were also some of the first researchers to identify some of the psychological attributes related to the concept of mental toughness in sport. The written responses of 160 elite athletes and 131 expert coaches from 31 individual and team sports were gathered, and the data from these written responses were content analyzed. Twelve main components of mental toughness were identified: team unity, preparation skills, competitiveness, motivation level, coping skills, confidence maintenance, cognitive skill, discipline and goal directedness, possession of physical and mental requirements, psychological hardiness, ethics, and religious convictions (Fourie &

Potgieter, 2001). Despite these initial investigations describing the link between mental toughness and sports performance, researchers continued their investigations in order to advance and refine the working definition of mental toughness.

The work of Jones et al. (2002, 2007) also made a significant contribution to the current understanding of mental toughness in sport by providing a multi-dimensional conceptualization of mental toughness. They used qualitative methods to find out what sports psychologists, elite to super elite performers, and coaches from a variety of sports considered to be the qualities of the ideal mentally tough performer. Based on interviews conducted with elite and super elite athletic performers, Jones et al. (2007) proposed a refined definition of the construct. They defined mental toughness 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, p. 247). As a result of their qualitative studies, Jones et al. (2007) also identified 30 attributes of mental toughness, which were presented within four separate dimensions. These four dimensions consisted of (a) attitude/mindset (belief, focus); (b) training (using long-term goals as the source of motivation, controlling the environment, pushing oneself to the limit); (c) competition (handling pressure, belief, regulating performance, staying focused, awareness and control of thoughts and feelings, controlling the environment); and (d) post competition (handling failure, handling success).

In order to develop a psychometric measure to assess mental toughness, Clough et al. (2002) conceptualized mental toughness as a personality trait. Their initial quantitative research on mental toughness was grounded in the previous research on the similar but distinct construct of hardiness. Kobasa (1979) conceptualized hardiness as a combination of three components (i.e., commitment, control, and challenge) that provides an individual with the ability to appraise stressful situations optimistically and as opportunities for growth, thereby allowing them to remain healthy when faced with higher levels of stress (Kobasa, Maddi, & Khan, 1982). The three components that made up hardiness closely resembled, but did not fully encapsulate, the construct of mental toughness as it related to sports. A six-factor model evolved from Clough et al.'s (2002) research and suggested that a fourth dimension, confidence, be added to account for the recurrent qualitative theme found in the data exhibited by athletes, coaches, and sport psychologists. Confidence in one's abilities and interpersonal confidence were considered to distinguish mental toughness as a distinct construct from hardiness, and thus the 4Cs model of mental toughness was established (Clough et al., 2002). According to the 4Cs (challenge, control, commitment, and confidence) model of mental toughness (Clough et al., 2002), mentally tough individuals (a) view negative experiences (e.g., stress and anxiety) as a challenge that they can overcome, but also a natural and essential catalyst for growth and development; (b) believe that they are influential in dealing with and controlling negative life experiences; (c) are deeply involved in what they are doing and committed to achieving their goals; and (d) are confident in their ability to deal with and overcome negative life experiences. In essence, mental toughness is considered to act as a stress buffer that is influential in pressurized and adverse situations (Clough et al., 2002).

The knowledge gained from various qualitative and quantitative studies has highlighted the beliefs and attitudinal styles that make up mental toughness in sport. The current study hopes to progress the cognitive research one step further by identifying certain cognitions, which have yet to be assessed, that play a central role in mental toughness.

Development of Mental Toughness

Whether mental toughness is more of a stable, trait-like construct or a set of context-specific cognitive skills that can be developed through training is still the topic of much debate. The suggestion that mental toughness may be developed through the implementation of cognitive skills appears to have some merit within the mental-toughness literature. Retrospective interviews of elite, mentally tough athletes revealed that psychological strategies, such as goal setting, self-talk, and imagery, were important in helping athletes to cope with competitive anxiety and to prepare for competition (Connaughton et al., 2010). Furthermore, a 7-week mental-skills training program that included goal setting, visualization, relaxation, concentration, and thought-stopping skills, led to significant increases in both the performance and self-rated mental toughness of high-performing adolescent swimmers (Sheard & Golby, 2006).

Influences from various individuals (e.g., parents, coaches, siblings, senior athletes, sports psychologists;) Connaughton et al., 2010), in addition to being exposed to difficult environments and having opportunities to survive early setbacks in the early part of a junior athletic career, are pivotal to developing mental toughness (Bull et al., 2005). Since elite and professional sports are far more oriented toward outcomes and winning than amateur sports, one might reasonably assume that a harsher, performance-based

climate that more accurately mimics the true environment of competitive sports is more relevant to the development of mental toughness for aspiring professional athletes as opposed to athletes competing strictly on an amateur level (Crust, 2008). While debate still continues regarding the type of athletic environment required to develop mental toughness, the integration of mental skills, such as self-talk, visualization, goal setting, and relaxation, into the appropriate environment, rather than in isolation, can increase self-reports of mental toughness (Sheard & Golby, 2006) and play an important role in the development of mental toughness (Connaughton et al., 2010). Similarly, research on cognition asserts that the manner in which persons process content or incoming information will also have an important influence on their emotional and behavioral responses and their overall level of adjustment (Kendall, 1992). Therefore, certain cognitions and mental skills apparently play a key role in the development of core features of mental toughness (e.g., control). Exploring and understanding these processes might yield more fruitful information about how an athlete's overall mental toughness is developed and how it translates into successful and consistent performance.

Mental Toughness and Performance

In addition to the many physiological attributes requisite to outstanding sport performance, a psychological profile that includes high levels of mental toughness appears to distinguish elite-level players (Golby & Sheard, 2004). Differences in physical ability among elite athletes are minimal (Moran, 2004), and psychological attributes are suggested to play a key role, regardless of the sport, in linking athletes with success (Williams & Krane, 2001). Clough et al. (2002) also reported that mental toughness explains as much as 25% of the variation in performance under pressure. Furthermore,

one of the most important attributes of mentally tough athletes appears to be the avoidance of performance decrement resulting from damaging negative emotions and subsequent loss of focus through the use of psychological strategies in adverse circumstances or pressure situations (Bull et al., 2005; Clough et al., 2002; Jones et al., 2002). Even though previous research has already established a strong, positive relationship between mental toughness and athletic performance (Bull et al., 2005; Clough et al., 2002; Crust et al., 2014; Gucciardi, Gordon, & Dimmock, 2008; Jones et al., 2002, 2007), more research is needed to increase the understanding of the influence of the cognitive mechanisms that underlie mental toughness on performance in competitive and pressurized situations (Dewhurst et al., 2012). Researching specific cognitive mechanisms could shed some light on the strong relationship found between mental toughness and outcome performance measures in sport and other competitive situations. The present study hopes to accomplish this goal.

Emotional Control in Mental Toughness and Performance

Although little is known about the specific cognitive processes inherent in mental toughness and how these processes influence performance, the ability to control emotions is a key feature of mental toughness (Clough et al., 2002). Similarly, it has also been well established that cognitions influence and control emotions and behavior (Beck, 1967), so identifying the thought processes of mentally tough athletes is a key feature of the present study because it could provide insight on how these athletes are able to control emotions in intense performance situations. Furthermore, significant and positive correlations have been found between mental toughness and the use of emotional control (Crust, 2009), and this relationship could explain why the performance of mentally tough participants on a

cognitive planning task was unaffected by negative feedback, whereas the performance of the less mentally tough was impaired (Clough, Earle, & Sewell, 2002). Despite a clear understanding of the cognitive differences that exist between individuals with high and low levels of mental toughness, individuals with high levels of mental toughness apparently do not experience emotions more or less intensely than those with low levels of mental toughness (Crust, 2009). Furthermore, this finding does not suggest that individuals who are more mentally tough do not experience negative affect as a result of negative feedback. At present, no evidence suggests that the ability of mentally tough athletes to retain emotional control in adverse or pressurized situations is the result of these athletes having less intense emotional experiences. Therefore, in order to further understand how the performance of mentally tough athletes remains relatively unaffected by competition and adversity, Crust (2009) suggested that future researchers test for differences in cognitive processing between individuals with high and low levels of mental toughness. The relationship between cognitions and emotions has been well documented, so identifying specific cognitions that influence mentally tough athletes' abilities to control their emotions could provide fruitful information on how mentally tough athletes are able to perform successfully despite experiencing negative emotions.

Cognitive Processes

Thinking, otherwise known as cognition, is one of the most complex processes. Kendall (1992) categorized cognition into four features: (a) cognitive content, (b) cognitive process, (c) cognitive structures, and (d) cognitive products. For the purposes of this study, a specific focus on the understanding of cognitive processes through Kendall's cognitive taxonomy model is most relevant. Cognitive processes refer to acquiring,

processing, and using knowledge and information that give rise to thoughts and behavior (Kendall, 1992). However, variations in cognitive processes are common, and some of those variations can result in processing deficiencies and/or processing distortions. The distinction between processing deficiencies and processing distortions highlights the unwanted effects of a failure to think versus an active pattern of thinking in a distorted manner (Kendall, 1992). Cognitive processing distortions refer to active thinking processes that are misguided and governed by faulty reasoning processes (Kendall, 1992). Active thinking processes refer to engaging in a sufficient amount of cognitive effort in situations where information processing is necessary (Kendall, 1992). Trying to solve a problem or reach a goal, which are fundamental for success in sports, are both examples of active thinking processes. Since mentally tough athletes are commonly characterized in the mental-toughness literature as successful at these active thinking processes, considering the potential for those thinking patterns to occur in a distorted manner, rather than not occurring at all, would be prudent. Thus, investigating processing distortions rather than processing deficiencies would be important in an examination of the cognitive mechanisms underlying mental toughness.

Cognitive distortions are described as processing patterns that are systematic and erroneous (Beck, 1967) and can be divided into those that serve as functional distortions and others that serve as dysfunctional distortions (Kendall, 1992). Beck (1967) originally posited six varieties of cognitive distortions: (a) dichotomous thinking, (b) overgeneralization, (c) personalization, (d) magnification/minimization, (e) selective abstraction, and (f) arbitrary inference. Burns (1980, 1989) later proposed a list of 10 cognitive distortions in an effort to simplify and elaborate on Beck's list: (a)

labeling/mislabeled, (b) disqualifying the positives, (c) all-or-nothing thinking, (d) mental filter, (e) jumping to conclusions, (f) overgeneralization, (g) personalization, (h) should statements, (i) emotional reasoning, and (j) magnification/minimization.

Additional cognitive distortions, such as comparison to others, externalization of self-worth, and perfectionism (Freeman & DeWolf, 1990; 1992; Freeman & Oster, 1999) were later identified and highlighted the interpersonal and subjective dimensions of distorted thinking (Rosenfield, 2004; Yurica & DiTomasso, 2002).

Cognitive distortions have typically been conceptualized as negative within the literature (e.g., Beck, 1967), and much of the literature has linked cognitive distortions with various mental-health disorders and emotional and behavioral difficulties (e.g., Beck, 1967; Burns, 1989; Rosenfield, 2004; Yurica, 2002). Cognitive processing distortions are known to reinforce or produce the negative, mood-related symptoms found in those experiencing mental illness (Beck, 1967; Burns, 1989). However, despite the numerous findings on the negative consequences of cognitive distortions, healthy thinking can involve cognitive information-processing distortions as well (Geer et al., 1970). A review of the literature indicates that certain cognitive distortions may be functional and even beneficial in maintaining positive mental health.

Taylor and Brown (1988), for example, concluded that normal individuals possess unrealistically positive views of themselves, exaggerated perceptions of control and mastery over their environment, and a view that their future will be far better than that of the average person. In addition, depressed individuals were actually more accurate in their perceptions and judgments when compared to nondepressed individuals (Alloy & Abramson, 1979, 1988), and in another study, depressed individuals, or those who were

low in self-esteem, consistently displayed an absence of these self-enhancing illusions (Taylor & Brown, 1988). Based on these findings, apparently having an unrealistically positive view of the self, of the future, and of one's ability to control one's environment, can potentially have a positive effect on one's mood and mental health. Furthermore, Geer et al. (1970) posited that possessing a positive view of the future, even if slightly grand, is more characteristic of healthy than of unhealthy thinking.

Positive illusions and distortions in thinking may play an important facilitative role for mentally tough athletes who need to consistently perform in high-pressure situations and succeed in the face of adversity. Distortions, in the form of positive illusions, can be especially useful when an individual receives negative feedback or is threatened, and may even serve as an adaptive function under these stressful circumstances (Taylor & Brown, 1988, 1994). For example, having the ability to get back on the field and perform well after a loss or after receiving negative feedback from a coach following a poor performance is a key feature of being a mentally tough athlete. Additionally, having the illusion of control, even if somewhat beyond reality, can be a self-esteem-enhancing mechanism that prevents people from the negative consequences of perceiving the uncontrollability of important events (Yarritu, Matute, & Vardillo, 2014) and consequently prevents them from acting helpless. Merely having the perception of control over a situation also allows for enhanced performance, inspired confidence, and higher self-esteem (Tafarodi, Milne, & Smith, 1999). Having the belief that one is influential in dealing with and controlling negative life experiences (Clough et al., 2002) has also consistently been established as a core feature found in mentally tough athletes.

Evolutionary theorists also support the idea that cognitive distortions can play an adaptive and functional role for humans. Gilbert (1998) viewed cognitive distortions as an evolutionarily adaptive response to the perception of threat rather than as mere maladaptive thinking. Some empirical support exists for the adaptive function of certain cognitive distortions from an evolutionary standpoint, especially when dealing with threatening situations that require quick decisions. Decision making is much more rapid when the number of possible choices is reduced, for instance, either threat or no threat (Epstein, Lipson, Holstein, & Huh, 1992). This way of thinking makes coming to a decision on a course of action and then taking that action much quicker. One could reasonably assume that being successful in sports requires the ability to make rapid decisions constantly and, therefore, that using cognitive distortions to increase the speed and accuracy of decision making can be useful and applicable in this sense as well.

Stress, Coping, Optimism, and Mental Toughness

A wide range of negative emotions, such as frustration, anger, anxiety, fear, apprehension, and irritability, can be associated with stress (Zimbardo, Laberge, & Butler, 1993). Mental toughness can be viewed as a moderator or buffer of stress by helping an individual to manage the demands of stressors that training, competition, or life can put upon them (Clough et al., 2002; Fletcher et al., 2005). Fletcher et al. (2005) suggested that the mental-toughness level of the athlete can influence how that athlete responds behaviorally, emotionally, and cognitively to that stressor. In comparison to athletes who are not mentally tough, mentally tough athletes rate stress as less intense and are more in control of the stress they experience (Kaiseler, Polman, & Nicholls, 2009). The reason that mentally tough individuals are less affected by stress compared to individuals who

are not mentally tough, could be that the effect of environmental stressors is mediated by both the individual's cognitive appraisal of the stressors and of the individual's coping ability (Fletcher et al., 2005). Coping self-efficacy refers to the belief in one's ability to cope effectively with stress during competition (Feltz, Short, & Sullivan, 2008). The positive relationship found between mental toughness and coping self-efficacy indicates that athletes with high mental toughness have more confidence that their coping strategies will be able to manage stress effectively (Nicholls et al., 2009). Having the belief in one's ability to control anything that comes one's way ultimately influences the way that mentally tough athletes appraise stressors.

However, one should note that perceptions of self-efficacy might not always accurately reflect an individual's actual abilities, but this does not necessarily mean that engaging in this erroneous way of thinking is not functional or helpful to the individual. On the contrary, misperceptions about one's ability to overcome stressful experiences might still be helpful if they motivate one to act and produce adaptive behavior. Optimism is thought to be a major factor in determining two types of behavior: perseverance and resignation (Gaudreau & Blondin, 2004). Total mental toughness is also positively correlated with optimism (Clough et al., 2002) and refers to the hopefulness and confidence that a person has regarding any uncertain outcomes (Gaudreau & Blondin, 2004). Mentally tough individuals are optimistic in that they view negative experiences that evoke stress and/or anxiety as a necessary challenge that they can overcome in order to grow and develop (Clough et al., 2002). More optimistic individuals are also more likely to exhibit increased effort in attaining goals, whereas more pessimistic people are more likely to withdraw and disengage from attempts to

attain a goal (Gaudreau & Blondin, 2004). Research has also found that more optimistic skiers perform much better than their less optimistic counterparts (Norlander, Bood, & Archer, 2002). Therefore, increasing athletes' levels of optimism may be the key to increasing their mental toughness and, ultimately, their athletic performance (Nicholls et al., 2009).

One should also consider that in some plausible circumstances, unrealistic optimism and/or distorted or inaccurate appraisals of a competitive situation or of one's ability to handle an adverse situation may be beneficial to athletes. They could be beneficial if this way of thinking increases athletes' confidence in their abilities and allows them to stay motivated, focused, and committed to achieving their goals. Identifying the cognitions that increase, reinforce, or maintain athletes' optimism could be a missing piece that explains why these athletes are potentially the most successful at controlling their emotions and in attaining their goals. Athletes' appraisals of their own self-efficacy, which is an integral piece of mental toughness, might be unrealistic or distorted in some way and examining this possibility empirically might uncover an overlooked cognitive mechanism that could more thoroughly explain mental toughness.

Information Processing and Mental Toughness

Mentally tough athletes not only have the ability to prevent negative emotions from impacting their performance, but they also have an enhanced ability to prevent unwanted information from interfering with their current task performance and goals (Dewhurst et al., 2012). Having the ability to prevent negative emotions and unwanted information from interfering with their task performance might ultimately enable their performances to be more successful because mentally tough athletes do not allow

anything to stand in the way of their commitment to goal achievement, which is one of the main characteristics of mental toughness. These findings suggest mentally tough individuals are able to interpret or filter incoming information differently based on their level of mental toughness (Crust, 2009). It has also been suggested that functional cognitive distortions and positive illusions work positively for an individual because the cognitive processing mechanisms that underlie them impose filters on incoming information that distort it in the opposite direction and isolate negative information so that it may be represented in a more unthreatening manner (Taylor & Brown, 1988). While the mental-toughness research on information processing highlights the potential for mentally tough individuals to filter information differently from other individuals in an effort to prevent it from affecting their performance, one could hypothesize that the cognitive mechanisms that underlie functional cognitive distortions and positive illusions could potentially be the same cognitive processes underlying mental toughness. Therefore, research that identifies the potential inaccuracies or distortions of these aforementioned filtering processes may be a crucial missing ingredient to an understanding of the cognitive operations of mentally tough athletes.

Specific Distortions and Mental Toughness

The following section includes definitions of specific cognitive distortions that might be implicated in mental toughness. Examples of how these specific distortions might work in a functional capacity for mentally tough athletes were derived from connecting the research on mental toughness with the literature on functional cognitive distortions. These examples have yet to be empirically examined but could help to clarify an understanding of the cognitive mechanisms inherent in mental toughness.

1. All-or-nothing thinking refers to seeing situations in black or white categories (Beck et al., 1979) and is a cognitive distortion that is an example of rapid categorical thinking, which can be useful in situations where quick decisions need to be made. According to Gilbert (1998), once the brain perceives a threat, it will resort to more categorical processing to reduce response time and risk, resulting in action that may reduce the threat. Competitive sports require rapid decision making, and if mentally tough athletes think in terms of black or white (e.g., pass or shoot, win or lose), especially when playing against opponents, they might be able to make quicker decisions. If sport competitions can be considered as another circumstance that requires fast decision making in response to stressful situations in order to succeed, then engaging in these distorted ways of thinking would be advantageous for an athlete and could account for why mentally tough athletes are so talented and consistent while performing under pressure.

2. Social comparisons (Festinger, 1954) involve comparing oneself to others in order to learn how to define oneself. From an evolutionary perspective, comparing oneself socially with others is a useful way to identify one's superior or inferior in order to determine the most beneficial way to interact with that person (Gilbert, 1998). Another reason people compare themselves to others is to learn more about their abilities and, in doing so, to improve them (Buunk & Gibbons, 2000). Situations that foster competition are likely to promote interest in social comparison for most people, while performance-based situations will also promote social comparison for some (Ruble & Frey, 1991). Furthermore, social comparison can be functional in the sense that it can enhance one's self-esteem, boost confidence, reduce stress, and encourage perseverance on difficult

tasks (Gibbons & Gerrard, 1991; Gilbert, 1998). The desire or need for self-enhancement can affect the amount and direction of the comparison (upward vs. downward), as well as its impact (Wills, 1991). Heightened self-esteem or well-being is a basic reaction after engaging in a downward social comparison, and this self-enhancing reaction may be critical to sustaining one's motivation or sense of efficacy (Gibbons & Gerrard, 1991). Therefore, engaging in a downward self-comparison (i.e., comparing oneself favorably) to an opponent before or during a competition, even if this comparison is not entirely accurate, could be an example of how mentally tough athletes think in order to boost confidence in their abilities and ultimately perform successfully.

3. Emotional reasoning and decision making refers to the assumption that the emotions being experienced necessarily reflect the way situations really are, in other words, "I feel it; therefore it must be true" (Burns, 1980). Gilbert (1998) viewed emotional reasoning as another example of a fast-track thinking process that has helped animals and humans for millions of years to make decisions regarding survival in the face of threatening situations. As mentally tough athletes consistently feel confident and optimistic about their upcoming performances and their abilities and more optimistic individuals are more likely to exhibit increased effort in attaining goals (Gaudreau & Boldin, 2004), one could reasonably predict that believing in those positive feelings of confidence enables mentally tough athletes to make quick decisions during competition. This example of reasoning based on an unshakeable belief in one's abilities could ultimately enable mentally tough athletes to expend the effort necessary to produce successful performances.

4/5. Magnification and minimization are types of cognitive distortions that refer to either exaggerating the importance of events or inappropriately shrinking the importance of events (Burns, 1980). Athletes who selectively attend to or magnify positive circumstances while minimizing the negatives of an upcoming competition will probably be more confident and motivated going into a performance than if they were to look at their odds in a more realistic way; this might be the case when underdog athletes or teams win against the clear favorites in sports.

6. Should statements typically refer to one's expectations regarding how oneself or other people "should," "must," or "ought" to behave. People typically use should statements to motivate themselves, but the emotional consequences of these statements are usually guilt and sometimes frustration, anger, or resentment when they are directed toward others (Burns, 1980). However, many persons who qualify as extremely successful exhibit, to varying degrees, seemingly irrational convictions and a substantial number of should statements (Kendall, 1992). Therefore, the thoughts, "I must work harder than everyone else in order to be the best I can be" or "I must not fail or lose," might be examples of how engaging in should statements and perfectionism can serve a positive, functional purpose for a mentally tough athlete. Thinking in shoulds, musts, and oughts and wanting to strive for perfection might explain how mentally tough athletes find the motivation to navigate the intense demands of training, competition, and their lifestyle in order to be successful.

7. Perfectionism refers to a constant striving to live up to some internal or external representation of perfection without examining the evidence for the reasonableness of these perfect standards, often to avoid the subjective experience of failure (Freeman &

DeWolf, 1990; Freeman & DeWolf, 1992; Freeman & Oster, 1999). However, perfectionism is considered an important personality characteristic in sports and the performing arts because extraordinary dedication at the highest levels is essential, and near-perfect performances are often necessary to be successful in these domains (Hill, Witcher, Gotwals, & Leyland, 2015). Perfectionism is also considered especially common in sports, with coaches and instructors often identifying the characteristic in the high-level athletes they work with (Gould & Maynard, 2009). Individuals who possess perfectionistic traits generally have excessively high expectations and define their self-worth in terms of the achievement of goals or outcomes of events (Burns, 1980), but a perfectionist trait can be positive if it pushes the individual to attain higher levels of achievement (Stirling & Kerr, 2006). Perfectionism has also been found to predict a range of outcomes among athletes (Gotwals, Stoeber, Dunn, & Stoll, 2012) and can contribute to the success of athletes, as well as to other important factors implicated in achievement, such as motivation, regulation, and achievement goals (Stoeber & Eismann, 2007; Stoeber, Uphill, & Hotham, 2009). High goal orientation and more successful athletic performance have also been linked to perfectionism (Bradham, 2000), and because mental toughness is positively correlated with successful performance, one could reasonably predict that mentally tough athletes engage in high levels of perfectionistic thinking. Furthermore, numerous anecdotal reports from athletes and performing artists describe how being a perfectionist has helped their careers (Hall, Hill, & Appleton, 2012). As mental toughness is positively correlated with successful performance and is characterized by a deep commitment to achieving goals, one could also reasonably predict that mentally tough athletes engage in a significant amount of perfectionistic

thinking, especially when setting goals and attempting to achieve them. Striving for perfection could explain why mentally tough athletes are committed to achieving their goals regardless of setbacks and could motivate them to practice and train relentlessly in order to achieve their performance goals.

In conclusion, athletes who engage in all-or-nothing thinking, such as seeing only winning and losing; overestimate or magnify their abilities and skills; selectively attend to only the positive aspects of a stressful competition; act and make decisions on their positive emotions; take responsibility for negative outcomes; and strive to be perfect might be more mentally tough when compared to other athletes and ultimately facilitate their success in sports through the use of these distorted cognitive processes. Research is still needed to explain how these distorted cognitive processes might function in a positive way for mentally tough individuals, even if relating something commonly characterized as negative to a positive psychological construct seems counterintuitive. Doing so would possibly further the understanding of the cognitive mechanisms that underlie mental toughness. The aim of the present study is to accomplish this goal.

Research Hypotheses

Specific distortions might work in a functional capacity for mentally tough athletes. Competitive sports require rapid decision making, and if mentally tough athletes think in terms of black or white (e.g., pass or shoot; win or lose), especially when playing against opponents, they might be able to make quicker decisions. Downward social comparisons can be functional in the sense that they can enhance one's self-esteem, boost confidence, reduce stress, and encourage perseverance on difficult tasks (Gibbons & Gerrard, 1989; 1991; Gilbert, 1998). Since mentally tough athletes consistently feel

confident and optimistic about their upcoming performances and their abilities and more optimistic individuals are more likely than less optimistic individuals to exhibit increased effort in attaining goals (Gaudreau & Boldin, 2004), one could reasonably predict that believing in those positive feelings of confidence enables mentally tough athletes to make quick decisions during competition. People typically use should statements to motivate themselves (Burns, 1980), so having the thought, “I must work harder than everyone else in order to be the best I can be” or “I must not fail or lose,” might be examples of how engaging in should statements can serve a positive, functional purpose for a mentally tough athlete. Striving for perfection could also explain why mentally tough athletes are committed to achieving their goals regardless of setbacks because doing so enables them to practice and train relentlessly in order to achieve their performance goals. Lastly, athletes who selectively attend to or magnify positive circumstances while minimizing the negatives of an upcoming competition will probably be more confident and motivated going into a performance than if they were to look at their odds in a more realistic way.

Hypothesis 1: Engaging in all-or-nothing thinking, minimization, magnification, perfectionism, emotional reasoning and decision making, downward comparisons to others, and should statements, as measured by the Inventory of Cognitive Distortions, will predict higher levels of mental toughness on the Sports Mental Toughness Questionnaire.

Even though previous research has already established a strong, positive relationship between mental toughness and athletic performance (Bull et al., 2005; Clough et al., 2002; Crust & Clough, 2005; Gucciardi et al., 2008), the second purpose of

the study will be to examine if mental toughness does translate into better performance for this particular sample.

Hypothesis 2: Athletes with higher levels of mental toughness, as indicated by the Sports Mental Toughness Questionnaire, will have better performance ratings as measured by the coaches' ratings.

Perfectionism is considered an important personality characteristic in sports and the performing arts because extraordinary dedication is essential at the highest levels, and near-perfect performances are often necessary to be successful in these domains (Hill et al., 2015). Perfectionism is also considered especially common in sports, with coaches and instructors often identifying the characteristic in the high-level athletes with whom they work (Gould & Maynard, 2009). Individuals who possess perfectionistic traits generally have excessively high expectations and define their self-worth in regard to the achievement of goals or outcomes of events (Burns, 1980), but a perfectionist trait can be positive if it pushes the individual to attain higher levels of achievement (Stirling & Kerr, 2006). High goal orientation and more successful athletic performance have been linked to perfectionism (Bradham, 2000), and furthermore, numerous anecdotal reports from athletes and performing artists describe how being a perfectionist has helped their careers (Hall et al., 2012). Perfectionism has also been found to predict a range of positive outcomes among athletes (Gotwals et al., 2012) and can contribute to the success of athletes, as well as to other important factors implicated in achievement, such as motivation regulation and achievement goals (Stoeber & Eismann, 2007; Stoeber et al., 2009). As mental toughness is positively correlated with successful performance and

characterized by a deep commitment to achieving goals, one could reasonably predict that mentally tough athletes engage in high levels of perfectionistic thinking, especially when setting goals and attempting to achieve them. As a result of these findings, the third purpose of this study will consist of examining the frequency with which mentally tough athletes engage in perfectionistic thinking, in comparison to the aforementioned cognitive distortions being examined in the present study.

Hypothesis 3: Athletes with higher levels of mental toughness, as indicated by the Sports Mental Toughness Questionnaire, will engage in more perfectionism when compared to other cognitive distortions, as measured by the Inventory of Cognitive Distortions.

Chapter 3: Method

Research Design

The current study employed a correlational research design to examine if specific cognitive distortions predict overall mental toughness while controlling for age, gender, and years of experience in sport. Data were collected with the use of administered self-report questionnaires, in addition to archival statistics posted online. As the relationship between mental toughness and athletic performance had been established in the literature, the current study also aimed to identify whether participants' athletic performances differed based on their level of mental toughness in order to build on the understanding of this relationship. Lastly, since the prevalence of perfectionism in sports has been well documented, the current study also aimed to identify whether athletes higher in mental toughness engage in this type of thinking more frequently in comparison to other types of cognitive distortions.

Participants

The participants consisted of student athletes, head coaches, and assistant coaches recruited from 10 of the 16 total intercollegiate athletic teams within a medium-sized, Division III liberal arts college in New Jersey. The 10 teams were chosen based on the availability of statistics gathered from the collegiate website that were compatible with computing a uniform measurement of participation. The male and female athletes were recruited from all of the team sports within the college that provided statistics on the collegiate website about their previous season of competition. Individual statistics were collected from the college's website in order to identify eligible participants who played in at least 50% of the games from the previous 2016-2017 season. The male athletes were

sampled from the men's soccer, basketball, baseball, and lacrosse teams while the female athletes were sampled from the women's soccer, basketball, softball, lacrosse, field hockey, and volleyball teams.

Inclusion/Exclusion

Eligible participants ranged in age from 18 to 25 years old and were student-athletes competing in an intercollegiate team sport for the college. Eligible participants were required to be on the team roster for the previous season of competition in their respective sport. Eligible participants must have competed in at least 50% of games over the course of the previous 2016-2017 season. Eligible participants needed to be in good academic standing and were also required to be fluent in reading and writing in English in order to participate in the study. Participants also needed to complete all of the questionnaires during the same day and time in order to be included in the study. Redshirt athletes (i.e., athletes who could not compete in the previous season because of medical reasons) were excluded from the study.

Measures

Sports Mental Toughness Questionnaire

Mental toughness was assessed with the Sports Mental Toughness Questionnaire (SMTQ; Sheard et al., 2009). The SMTQ is a self-report instrument for the assessment of mental toughness in sports. The SMTQ consists of 14 items, with responses rated on a 4-point Likert scale (1 = *not at all true* to 4 = *very true*). The SMTQ also contains three subscales: Confidence (e.g., "I have an unshakeable confidence in my ability"); Constancy (e.g., "I am committed to completing the tasks I have to do"); and Control (e.g., "I get anxious by events I did not expect or cannot control"). Total possible SMTQ

scores range from 14 to 56. A total score for each dimension, as well as a total mental-toughness score, is represented by the mean of the respective items. Higher scores (e.g., 35 and above) represent greater levels of overall, or key dimensions of, mental toughness. Two studies were used in the development of the SMTQ. Across two samples of male and female athletes from beginner to elite competitive levels, Sheard et al. (2009) reported Cronbach's alphas that ranged from .79 to .80 (Confidence), .74 to .76 (Constancy), .71 to .72 (Control), and .75 (Total). Acceptable divergent validity was demonstrated through correlations between the SMTQ and the conceptually related but theoretically distinct scales of hardiness ($r_s = .14 - .33$; Maddi & Koshaba, 2001) and optimism ($r_s = .23 - .38$; Scheier, Carver, & Bridges, 1994).

Inventory of Cognitive Distortions

The Inventory of Cognitive Distortions (ICD; Yurica & DiTomasso, 2002), a 69-item self-report inventory, is composed of short sentences reflecting 11 factor-analyzed cognitive distortions. Although the ICD was designed for and validated with an adult clinical population with symptoms of anxiety and/or depression (Yurica & DiTomasso, 2002), the ICD was recently validated in a nonclinical sample as well (Roberts, 2015).

Participants rate how often they tend to think or feel a certain way based on a particular statement (e.g., "I minimize the importance of even serious situations"; "I make decisions on the basis of my feelings"; "I motivate myself according to how I should be"; "I compare myself to others all the time"). Items are scored on a 5-point Likert scale (1 = *Never* to 5 = *Always*). Total possible ICD scores range from 69 to 345, with lower scores reflecting lower frequency of cognitive distortions and higher scores indicating higher frequency of cognitive distortions. The initial validation study found a

test-retest reliability coefficient for total ICD scores of .998 ($n = 28$, $p < .001$). Cronbach's alpha for each of the subscales are as follows: Externalization of Self-Worth (.94); Fortune-Telling (.93); Magnification (.91); Labeling (.78); Perfectionism (.85); Comparison to Others (.82); Emotional Reasoning (.75); Jumping to Conclusions (.76); Emotional Reasoning and Decision-Making (.69); Minimization (.69); and Mind Reading (.56). The ICD demonstrated high internal consistency among items, an overall homogenous scale in content, and as a valid measure of the construct of both individual cognitive distortions and as an overall measure of total distortion (Yurica & DiTomasso, 2002).

Coaches' Measure of Performance

The head coach and the assistant coaches of each team were asked to rate each player's overall performance in competition from the previous season. The coaches were asked to grade the players on a scale from 1 to 10 (1 = *poor performance* to 10 = *excellent performance*). Having the coaches evaluate the participant's overall performance is a more objective measure of performance rather than solely asking the participant to rank his or her own performance. A similar method was used in a study on mental toughness conducted by Guiccardi et al. (2012) in which parent evaluations were used in addition to self-report measures in order to obtain multiple sources of objective measurement and to reduce the potential for socially desirable responding.

Demographics Survey

Demographics for each participant were obtained through the completion of a survey, which was distributed along with other measures to each participant. Participants were asked to identify their age, gender, ethnicity, sport(s) they participate in, years of

experience in their respective sport, grade point average, and year in college before completing the rest of the measures included in the study.

Procedure

Before administering the measures, the investigator obtained permission to conduct the study from the assistant athletic director of the college. The investigator then contacted via e-mail all of the head coaches, assistant coaches, and student-athletes who participated in 50% of the games during the previous year from the eligible team sports at Stockton University. The e-mail asked for their participation in a study about mental toughness and athletic performance and provided them with a brief description of the study and a copy of the informed consent form. The head coaches, assistant coaches, and student-athletes from each sport had 2 weeks to respond to the investigator, via e-mail, regarding whether they were interested in participating in the study.

Once all of the prospective eligible student-athletes and coaches who had been contacted by the investigator had responded, interested student-athletes and coaches were asked to meet at a specific date and time in the athletic building that was assigned for their respective team in order to sign the informed consent for participation in the study and to complete the measures to be used for data collection. The packet of questionnaires, consisting of the demographics survey, the ICD, and the SMTQ, were then distributed, in person, to every student-athlete during his or her team's designated meeting time at the athletic building on campus. A counterbalanced order was used in an effort to control for order effects. Each packet of questionnaires was given a code number that corresponded only to that particular student-athlete who was filling out the questionnaires for his or her specific sports team. A master list for each sports team consisted of code numbers and the

corresponding names of the student-athletes next to each code number. The name of each student-athlete was also written on the performance rating sheets that were given to the head and assistant coaches so that the investigator could add those rating sheets to each participant's packet of questionnaires by code number once they were completed by the coaches.

During that time period, head and assistant coaches from each team also were asked to score each of their athletes participating in the study on his or her overall performance from the previous season of competition on a scale of 1 to 10. All of the participants were asked to complete the questionnaires in one sitting, lasting no longer than 45 minutes. Participants and coaches handed all completed materials to the investigator separately and were asked to wait quietly until everyone had finished. Student-athletes and coaches were informed during the informed consent process that they would not have access to each other's responses. The investigator then used the names on the specific players' performance ratings from the coaches in order to directly add those forms into the packet of questionnaires completed by that particular student-athlete, using the corresponding code number from the master list. Once the coaches' ratings were included in each of the player's packets, only the code number remained on the packet of questionnaires without any identifying information. The investigator then thanked the team and coaching staff for their participation in the study and allowed both the student-athletes and coaches to ask any questions they had about their participation in the study. The investigator then securely destroyed all master lists by a locked paper shredder after the data collection had been completed and entered into SPSS for each specific team. The name and phone number of the primary investigator was given to the

student-athletes, coaches, and assistant athletic director should they have any further questions or concerns about the study. This exact procedure was replicated for each of the 10 teams participating in the study. All data were entered into an SPSS database at the Philadelphia College of Osteopathic Medicine.

Chapter 4: Results

Statistical analyses were computed to determine whether the engagement in all-or-nothing thinking, minimization, magnification, perfectionism, emotional reasoning and decision making, comparison to others, and should statements were predictive of mental toughness, while age, gender, and total years of playing experience were taken into account. Additionally, the present study aimed to determine whether higher levels of mental toughness would in fact translate into better athletic performance.

Lastly, the engagement in perfectionism was also predicted to be higher among athletes with higher levels of mental toughness versus athletes with lower mental toughness.

Statistical Analyses

The variables of interest were analyzed through the use of SPSS 22.0. The power analysis was set for a hierarchical multiple regression with 10 predictors. In this analysis, the effect size was set at 0.15, which is considered a medium effect size for multiple regression (Cohen, 1988, 1992), the significance level was set at 0.05, and the power level was set at 0.80, as per conventional standards (Cohen, 1988, 1992). This analysis determined that 106 participants were needed in order to perform the following multiple regression analysis.

Demographic Analyses

In order to investigate whether engaging in specific cognitive distortions was predictive of higher levels of mental toughness in athletes and to determine whether high levels of mental toughness translated into better athletic performance, a nonclinical group

of head coaches, assistant coaches, and student-athletes who participated in 50% of the games from the 2016-2017 year, were sampled from the eligible team sports at Stockton University. Overall, a total of 93 student-athletes, nine head coaches, and eight assistant coaches participated in the study and completed all of the necessary measures. Ten, 45-minute sessions over the span of 12 weeks were required to collect the data from all participants.

An analysis of the demographic characteristics of all student-athletes who completed the entire data collection packets (i.e., the demographics survey, the Inventory of Cognitive Distortions [ICD], and the Sports Mental Toughness Questionnaire [SMTQ]), was performed. Tables 1 through 5 show the group statistics.

Of the 93 total student-athletes who participated in the study, 93 completed all of the questionnaires. Of the 93 student-athletes who participated in the study, 56 were female (60.2%) and 37 were male (39.8%).

Table 1

Gender

Gender	<i>n</i>	%
Female	56	60.2
Male	37	39.8

In regard to ethnicity, 11 participants indicated that they were African American (11.8%), 77 indicated Caucasian (82.8%), three indicated Latino/a or Hispanic (3.2%), one indicated Asian (1.1%), and one identified as Bi/Multi-Racial (1.1%).

Table 2

Ethnicity

Ethnicity	<i>n</i>	%
African American	11	11.8
Caucasian	77	82.8
Hispanic or Latino/a	3	3.2
Asian/Pacific Islander	1	1.1
Bi/Multiracial	1	1.1

In regard to age, all participants fell within the 18- to 25-year age range, which was designated as a prerequisite for inclusion in the study. Two participants indicated that they were 18 years old (2.2%), 16 participants indicated that they were 19 years old (17.2%), 33 indicated that they were 20 years old (35.5%), 37 indicated that they were 21 years old (39.8%), three indicated that they were 22 years old (3.2%), and two indicated that they were 23 years old (2.2%).

Table 3

Age

Age in years	<i>n</i>	%
18	2	2.2
19	16	17.2
20	33	35.5
21	37	39.8
22	3	3.2
23	2	2.2

In regard to the type of sport that the student-athletes competed in at an intercollegiate level, the sample yielded 22 participants who competed in lacrosse (23.7%), 26 who competed in soccer (28.0%), four who competed in baseball (4.3%), 13 who competed in basketball (14.0%), seven who competed in softball (7.5%), seven who competed in volleyball (7.5%), and 14 who competed in field hockey (15.1%).

Table 4

Sport

Sport	<i>n</i>	%
Lacrosse	22	23.7
Soccer	26	28.0
Baseball	4	4.3
Basketball	13	14.0
Softball	7	7.5
Volleyball	7	7.5
Field hockey	14	15.1

In regard to the participants' total years of playing experience in their respective sport, the sample yielded seven participants who had played for 1 to 5 years (7.5%), 31 participants who had played for 6 to 10 years (33.4%), 41 participants who had played for 10 to 15 years (44.0%), and 14 participants who had played for 15 to 20 years (15.1%).

Table 5

Total Years Playing Experience in Respective Sport

Total Years	<i>n</i>	%
1-5	7	7.5
5-10	31	33.4
10-15	41	44.0
15-20	14	15.1

Hypothesis 1

The goal of the first hypothesis was to determine whether the engagement in specific cognitive distortions was predictive of mental toughness. It was predicted that engaging in all-or-nothing thinking, minimization, magnification, perfectionism, emotional reasoning and decision making, comparison to others, and should statements, as measured by the ICD, would predict higher levels of mental toughness on the SMTQ.

The first hypothesis was tested using a hierarchical multiple regression analysis. Prior to conducting a hierarchical multiple regression, the assumptions of this statistical analysis were tested and met. A normal P-P plot revealed that the assumptions of random errors, linearity, and homoscedasticity were met. As shown in Table 7, the relationships between the predictors and the criterion variables were linear, and the multicollinearity diagnostics, including tolerance and variance inflation factor (VIF), were acceptable. The VIF values should all be close to 1, and the tolerance statistics should all be well above 0.2 (Fields, 2009). These values ranged from 1.002 to 1.465 and .594 to .998, respectively, suggesting that the assumption of multicollinearity was met for this model. Lastly, Field (2009) suggested that obtaining Durbin-Watson statistic values between 1 and 3 are optimal when testing the assumption of independent errors. This statistic tests the assumption that residuals are not serially correlated, indicating that the value of the residual for one case does not have an impact on the residual value of the next case (Field, 2009). The Durbin-Watson statistic (2.016) was also acceptable for this analysis, revealing that the assumption of independent errors was met and that error variances were unrelated.

Table 6

Means and Standard Deviations for Sports Mental Toughness, Age, Gender, Total Years Playing Experience, Magnification, Perfectionism, Dichotomous Thinking, Minimization, Comparison to Others, Should Statements, and Emotional Reasoning

	<i>M</i>	<i>SD</i>
SMT	42.69	4.89
Age (years)	20.19	1.66
Gender	.40	.49
Total Yrs	11.69	3.91
MAG	16.39	4.59
PERFECT	14.08	5.29
DICHOT	9.50	3.06
MINIM	6.63	2.33
COMPAR	9.15	2.90
SHOULD	9.08	2.39
EMOR	6.76	1.73

Table 7

Correlations for Sports Mental Toughness, Age, Gender, Total Years Playing Experience, Magnification, Perfectionism, Dichotomous Thinking, Minimization, Comparison to Others, Should Statements, and Emotional Reasoning.

	SMT	Age	Gender	TotYrs	MAG	PERF	DICHO	MINIM	COMPA	SHOUL	EMO
SMT	---	.056	.302*	.051	-.400**	-.072	-.273*	-.306*	-.557**	-.297*	.037
Age		—	.037	.014	-.161	-.084	.034	-.060	-.142	-.021	.131
Gender			---	.041	-.060	.024	.069	.102	-.120	-.132	-.079
TotYrs				---	-.024	.244*	.001	.049	.004	.026	.007
MAG					---	.339*	.402*	.424*	.479*	.414*	.278*
PERF						---	.300*	.222*	.307*	.422*	.285*
DICHO							---	.316*	.499*	.369*	.105
MINIM								---	.407*	.243*	.084
COMPA									---	.576*	.127
SHOUL										---	.233*
EMO											---

* $p < .05$. ** $p < .001$.

The predictor variables were entered into the regression in two steps. The first step of the regression was conducted using gender, age, and total years of playing experience as predictor variables. The overall sports mental toughness total score was used as the outcome variable to show what proportion of the variance in the outcome variable (mental toughness) was accounted for by this model. The second step of the hierarchical regression included adding the seven specific cognitive distortions (i.e., all-or-nothing thinking, minimization, magnification, perfectionism, emotional reasoning and decision making, comparison to others, and should statements), as measured by the ICD, as the predictor variables. This process was done in order to show what proportion of the outcome variable of mental toughness was accounted for by this new model, while controlling for the variance of gender, age, and total years of playing experience.

As shown in the Model 1 summary (see Table 8), the first block of predictors accounted for approximately 9.5% of the variability on the criterion variable with a multiple correlation coefficient of .308. Overall, approximately 9.5% of the variability in mental toughness was attributable to the linear combination of gender, age, and total years of playing experience in this sample. Model 1 caused R^2 to change from 0 to .095. This change in the amount of variance explained yielded an F change of 3.074 and was significant at a probability of less than .05 ($p = .032$). The adjusted R^2 value of .064 revealed how well the regression model in this instance generalized to the population, indicating that shrinkage was minimal ($.095 - .064 = .031$).

As shown in the Model 2 summary (see Table 8), the second block of predictors accounted for approximately 44.2% of the variability on the criterion with a multiple correlation coefficient of .665. Overall, about 44.2% of the variability in mental

toughness was attributable to the linear combination of dichotomous thinking, emotional reasoning and decision making, minimization, magnification, should statements, perfectionism, magnification, and social comparison after controlling for gender, age, and total years of playing experience. Model 2 caused R^2 to increase by .347, making the R^2 of the new model .442. This increase in the amount of variance explained yielded an F change of 7.203 and was highly significant, $p < .001$. The adjusted R^2 value of .373 revealed how well the regression model in this instance generalized to the population, indicating that shrinkage was small ($.442 - .373 = .069$).

Table 8

Models 1 and 2 Summary

Model	R	R^2	Adjusted R^2	Std. error of the estimate	R^2 change	F change	$df1$	$df2$	Sig. F change
1	.308	.095	.064	4.72604	.095	3.074	3	88	.032
2	.665	.442	.373	3.86730	.347	7.203	7	81	.000

- a. Predictors: Total Years Playing Experience, Age, Gender to the dependent variable (sports mental toughness).
- b. Predictors: Total Years Playing Experience, Age, Gender, Dichotomous, Emotional Reasoning and Decision Making, Minimization, Should, Perfectionism, Magnification, Comparison to Others to the dependent variable (sports mental toughness).

As shown in the ANOVA summary table (see Table 9), Models 1 and 2 were significantly better at predicting total sport mental scores than was using the mean as a best guess. According to Field (2009), this F ratio demonstrates the ratio of improvement

in prediction that results from fitting the model that is the regression relative to the residual that represents the inaccuracy that exists. If the improvement resulting from fitting the regression model is much greater than the inaccuracy within the model, the value of F will be greater than 1. In this instance, Model 1 yielded an F ratio of 3.074, $p < .05$. Model 2 yielded an F ratio of 6.419, $p < .001$. The improvement from fitting the regression model for Models 1 and 2 far exceeded the inaccuracy in the model, meaning that both models significantly improved the ability to predict mental toughness. However, the second regression model appeared to be the best when predicting total sports mental toughness scores overall and significantly improved the ability predict total sports mental toughness scores on the SMTQ.

Table 9

Overall Regression Analysis

	Model	Sum of squares	<i>df</i>	Mean square	<i>F</i>	Sig.
1	Regression	205.961	3	68.654	3.074	.032 ^a
	Residual	1965.518	88	30.655		
	Total	2171.478	91			
2	Regression	960.039	10	96.004	6.419	.000 ^b
	Residual	1211.440	81	14.956		
	Total	2171.478	91			

- a. Predictors: Total Years Playing Experience, Age, Gender to the dependent variable (sports mental toughness).
- b. Predictors: Total Years Playing Experience, Age, Gender, Dichotomous, Emotional Reasoning and Decision Making, Minimization, Should, Perfectionism, Magnification, Comparison to Others to the dependent variable (sports mental toughness).

Table 10 contains the unstandardized and standardized beta coefficients and results of the *t* test for each variable. In Model 1, Gender, $t(81) = 3.02$, $p = .003$, was found to be a significant predictor of mental toughness. Model 2 revealed that after controlling for gender, age, and total years of playing experience, two of the predictors, Magnification and Comparison to Others, made a significant contribution to the prediction of total sports mental toughness. In Model 2, Magnification, $t(81) = -2.17$, $p = .033$, and Comparison to others, $t(81) = -3.94$, $p < .001$, were found to be significant predictors of mental toughness in sports.

As also shown in Table 10, Model 2 revealed that after controlling for gender, age, and total years of playing experience, two of the seven predictors (i.e., Magnification

and Comparison to others) made a significant contribution to the prediction of total sports mental toughness, whereas Perfectionism was not found to be a significant predictor of mental toughness in sports, $t(81) = 1.050$, $p = .297$, as was originally hypothesized see Hypothesis 3.

Table 10

Coefficients of Predictor Variables to the Dependent Variable from Model 1 and Model 2

Model	Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	Sig.
	B	Std. Error	Beta		
1(Constant)	38.321	6.187		6.194	.000
Age	.130	.298	.044	.438	.663
Gender	2.964	1.006	.299	2.945	.004
TotalYears	.047	.127	.038	.372	.710
2(Constant)	54.260	5.754		9.431	.000
Age	-.273	.257	-.093	-1.063	.291
Gender	2.582	.856	.261	3.015	.003
TotalYears	.018	.108	.014	.167	.868
MAG	-.248	.114	-.234	-2.169	.033
PERFECTION	.097	.093	.106	1.050	.297
DICHOTOMOUS	.009	.161	.005	.053	.958
MINIMIZATION	-.207	.203	-.099	-1.023	.309
COMPARISON	-.781	.198	-.465	-3.940	.000
SHOULD	.081	.223	.040	.365	.716
EMOREASON	.457	.255	.162	1.791	.077

Note. Dependent variable is sports mental toughness.

Hypothesis 2

To examine whether athletes with higher levels of mental toughness, as indicated by the SMTQ, had better performance ratings, as measured by the average of the coaches' ratings, compared to athletes with lower levels of mental toughness, an independent-samples *t* test was computed. Before the *t* test was computed, a median split of the data was completed and categorized participants who received an overall score of 42.5 and/or above on the SMTQ as having high levels of mental toughness and participants who received an overall score of 42.4 and/or below on the SMTQ as having low levels of mental toughness. Owing to an insignificant Levene's test, equal variances between groups were assumed ($p = .498$). As shown in Table 13, a statistically significant difference was not found between the groups of athletes with high mental toughness and athletes with low mental toughness in terms of their overall athletic performance ratings, $t(91) = -.763, p = .447$. On average, athletes with high total scores of mental toughness on the SMTQ were rated slightly higher by their coaches ($M = 7.04, SD = 1.76$) than athletes with low total scores of mental toughness on the SMTQ ($M = 6.78, SD = 1.56$) in terms of their overall athletic performance. However, this difference in the overall athletic performance rating between the two groups was not great enough to be considered a significant difference. In this sample, athletes with high levels of mental toughness versus athletes with low levels of mental toughness did not differ in terms of their overall athletic performance ratings. Median split, means, and standard deviations are presented in Tables 11 and 12.

Table 11

Sports Mental Toughness Total Median Split

SMT total median split	<i>n</i>	%
Low (.00)	45	48.4
High (1.00)	48	51.6

Table 12

Group Statistics: Coaches Performance Rating

SMTtotal median split	<i>N</i>	Mean	Std. Deviation	Std. error mean
Low	45	3.2708	.66938	.07889
High	48	2.8845	.74468	.05490

Table 13

Independent Samples Test

Coach perform rating	Levene's test for equality of variances		<i>t</i>	<i>df</i>	Sig. (two- tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
	<i>F</i>	Sig.						Lower	Upper
Equal variance assumed	.462	.498	-.736	91	.447	-.26389	.34577	-.95073	.42295
Equal variances not assumed			-.766	90.698	.446	-.26389	.34439	-.94802	.42024

Hypothesis 3

To examine whether athletes with higher levels of mental toughness, as indicated by the SMTQ, engaged in more perfectionism, as measured by the ICD, a one-way multivariate analysis (MANOVA) was conducted.

The two levels of the independent variable, mental toughness, were categorized as high versus low. A median split of the data was completed and categorized participants who received an overall score of 42.5 or above on the SMTQ as having high levels of mental toughness and participants who received an overall score of 42.4 or below on the SMTQ as having low levels of mental toughness. The dependent variables were the seven cognitive distortions on the ICD: magnification, perfectionism, minimization, dichotomous thinking, should statements, comparison to others, and emotional reasoning and decision making, with a particular interest on perfectionism.

First, the assumptions of the MANOVA were tested. Results of Box's test of the equality of covariance matrices were significant, Box's $M = 53.56$, $F(28, 28110.54) = 1.754$, $p = .008$, indicating that the observed covariance matrices of the dependent variables were not equal across groups, therefore violating this assumption. MANOVA assumes that the variances are roughly equal for each dependent variable and that the correlation between any two dependent variables is the same in all groups (Fields, 2009). Box's test should be nonsignificant if the matrices are similar, which was not the case for this sample. Levene's test of equality of variances for each of the dependent variables should also be nonsignificant for all dependent variables if the assumption of homogeneity of variances has been met (Fields, 2009). Results of the Levene's test of equality of error variances between the groups were not significant for any of the

dependent variables: Magnification $F(1, 90) = 1.159, p = .29$; Perfectionism, $F(1, 90) = .175, p = .68$; Dichotomous thinking, $F(1, 90) = .200, p = .66$; Minimization, $F(1, 90) = .062, p = .80$; Comparison, $F(1, 90) = .763, p = .39$; Should statements, $F(1, 90) = .000, p = .99$; and Emotional reasoning and decision making, $F(1, 90) = 12.662, p = .11$. These results indicate that the assumption of homogeneity of variances has been met. For the test of multivariate effect, Wilks's lambda was significant, Wilks's $\lambda = .759, F(7, 84) = 3.818, p = .001$. These results support a significant difference between athletes with low mental toughness and athletes with high mental toughness across a combination of the dependent variables.

In order to determine whether athletes with high versus low mental toughness differed in terms of engagement in perfectionism, a test of between-subjects effects using a one-way MANOVA was completed, as shown in Table 14. This result did not reveal a significant difference between athletes categorized as high on mental toughness and athletes categorized as low on mental toughness on perfectionism scores, $F(1, 90) = .351, p = .555$. These results suggest that athletes categorized as more mentally tough did not differ in terms of their engagement in perfectionistic thinking when compared to less mentally tough athletes and when compared to the six other cognitive distortions tested. As a result, Hypothesis 3 was not supported. (See Table 15 for means and standard deviations of high and low mentally tough groups on perfectionism).

A post hoc, exploratory test of between-subjects effects using a one-way MANOVA did, however, reveal a significant difference between athletes categorized as having high mental toughness versus athletes categorized as having low mental toughness on both Magnification, $F(1, 90) = 12.48, p = .001$, and Comparison to others, $F(1, 90) =$

16.34, $p < .001$ scores. These results suggest that athletes higher in mental toughness engaged in fewer magnifications and comparisons to others when compared to the athletes who were categorized as low in mental toughness. On the dependent variable of Magnification, partial eta squared = .122, indicating that 12.2% of the variance of magnification can be explained by the differences between high and low mental toughness. On the dependent variable of Comparison to others, partial eta squared = .154, indicating that 15.4% of the variance of comparison to others can be explained by the differences between high and low mental toughness.

Table 14

Tests of Between-Subjects Effects

	Dependent variable	Type III sum of squares	<i>df</i>	Mean square	<i>F</i>	Sig.
SMTMedianSplit	MAG	234.297	1	234.297	12.480	.001
	PERFECTION	9.901	1	9.901	.351	.555
	DICHOTOMOUS	51.774	1	51.774	5.787	.018
	MINIMIZATION	15.098	1	15.098	2.829	.096
	COMPARISON	118.310	1	118.310	16.342	.000
	SHOULD	6.355	1	6.355	1.106	.296
	EMOREASON	.782	1	.782	.259	.612

- a. R Squared = .122 (Adjusted R Squared = .112)
- b. R Squared = .004 (Adjusted R Squared = -.007)
- c. R Squared = .060 (Adjusted R Squared = .050)
- d. R Squared = .030 (Adjusted R Squared = .020)
- e. R Squared = .154 (Adjusted R Squared = .144)
- f. R Squared = .012 (Adjusted R Squared = .001)
- g. R Squared = .003 (Adjusted R Squared = -.008)

Table 15

Means and Standard Deviations Between Mental Toughness Groups for Perfectionism

Group	Perfectionism		N
	M	SD	
<hr/>			
SMTTOTAL			
Low	14.4222	6.41195	45
High	13.7660	3.98482	47
Total	14.0870	5.29286	92
<hr/>			

Chapter 5: Discussion

This study examined the relationship between specific cognitive distortions and mental toughness in sports, after accounting for age, gender, and total years of playing experience. Previous research on mental toughness has focused on operationalizing and better understanding the cognitive components of mental toughness. These studies have yielded important information regarding the attitudinal styles and beliefs of mentally tough athletes (Clough et al., 2002; Jones et al., 2007). Previous studies on mental toughness have also found a significant relationship between age, gender, and total years of playing experience as they relate to mental toughness in sports (Nicholls et al., 2009). Despite the knowledge gained from these studies, a significantly smaller portion of the cognitive research on mental toughness has been directed toward understanding whether the positive attitudes, beliefs, and mindsets inherent in mental toughness are realistic or rational and how they are upheld despite negative or stressful circumstances. In other words, previous studies have not looked at cognitive distortions as a potential mechanism underlying mental toughness in sports. As such, the main goal of this study was to determine whether the engagement in specific types of cognitive distortions, particularly perfectionism, would be predictive of higher mental toughness in athletes, after controlling for factors that are already known to influence the prevalence of mental toughness. Additionally, even though previous research has already established a strong, positive relationship between mental toughness and athletic performance (Clough et al., 2002; Crust & Clough, 2005; Bull et al., 2005; Gucciardi et al., 2008), the second purpose of this study aimed to validate whether mental toughness translated into better athletic performance in order to replicate previous findings from the literature.

Findings and Clinical Implications

Specific Cognitive Distortions and Mental Toughness

The current study found that sports mental toughness was highly negatively correlated with two of the seven predicted cognitive distortions. Comparisons to others and magnification were found to have strong, negative correlations with mental toughness, whereas the other five distortions (i.e., minimization, should statements, perfectionism, emotional reasoning and decision making, and dichotomous thinking) did not appear to be significantly related. Findings suggest that engaging in these two types of cognitive distortions less frequently is associated with higher mental toughness. In other words, athletes who do not frequently engage in amplifying events out of proportion to reality (magnification) or in comparing themselves unfavorably to others (comparison to others) tend to be more mentally tough. Although this finding was different from original predictions of the study, it corroborates findings in the mental-toughness literature that suggest that mentally tough athletes are confident in their abilities, in handling whatever comes their way, and in viewing negative experiences as a challenge that they can overcome (Clough et al., 2002).

Mental Toughness and Comparison to Others

In general, people typically seem unable to be confident in their abilities if they are consistently comparing themselves unfavorably to others. Research shows that engaging in consistent upward comparisons (i.e., comparing oneself to others who are better off) can lead to negative affect, sadness, and dissatisfaction (Kleinke, & Miller, 1998; Lyubomirsky, Tucker, & Kasari, 2001). The items on the Inventory of Cognitive Distortions (ICD) that assessed the engagement of comparison to others specifically

looked at upward social comparisons (e.g., “I do few things as well as others”; “When I compare myself to others, I come up short”). Engaging in upward comparisons (i.e., comparing oneself unfavorably) to an opponent before or during a competition might negatively impact athletes’ confidence in their abilities and ultimately their performance.

Therefore, mentally tough athletes should avoid engaging in ways of thinking that would jeopardize their self-confidence.

Mental Toughness and Magnification

Fear or anxiety can be caused by engaging in magnifications or by being far more negative than others by viewing and exaggerating a bad experience out of proportion to the reality of the situation (Beck & Emery, 1985, 2005). Consistently magnifying negative situations, problems, or fears is also commonly associated with the precipitation, maintenance, and exacerbation of anxiety disorders (Beck & Emery, 1985, 2005). Furthermore, when levels of arousal or anxiety become too high, performance decreases (Yerkes & Dodson, 1908). As such, magnifications could be considered as performance-interfering cognitions as a result of the anxiety that they can produce. Therefore, mentally tough athletes would not want to engage in ways of thinking like magnification, as doing so would increase their anxiety levels and interfere with their athletic performance or attainment of their goals. This finding could potentially help sport psychologists develop and incorporate interventions, such as cognitive-behavioral therapy (CBT), into their mental-skills training programs as a way to help athletes decrease the frequency with which they engage in these two types of distortions and ultimately help them to increase their mental toughness.

Age, Gender, Total Years of Playing Experience, and Mental Toughness

In this study, approximately 9.5% of the variability in mental toughness was attributable to the linear combination of gender, age, and total years of playing experience. The combination of age, gender, and total years of playing experience caused a change in the variance of sports mental toughness (i.e., from 0 to .095), which was significant at a probability of less than .05. The combination of variables exceeded the inaccuracy in the model, meaning that it significantly improved the ability to predict mental toughness. This finding is significant because it corroborates the previous literature, which suggests that age, gender, and total years of playing experience are significantly related to sports mental toughness (Nicholls et al., 2009).

Furthermore, the current study also found that sports mental toughness was indeed significantly correlated with gender and that gender made a significant contribution to the prediction of sports mental toughness. The results were consistent with findings previously demonstrated in the mental-toughness literature regarding the significant correlation between gender and mental toughness (Nicholls et al., 2009). These findings further support the decision to use age, gender, and total years of playing experience as the control variables in this study in order to gain a clearer understanding of the relationship between cognitive distortions and mental toughness in sports.

Athletic Performance and Mental Toughness

In this study, a significant difference was not found in terms of overall athletic performance between the student-athletes characterized as having high and low mental toughness. In other words, the athletes who scored higher in mental toughness did not

necessarily perform better athletically when compared to the athletes who were less mentally tough. The results in this study did not replicate the findings in the previous literature, which suggested that mental toughness is strongly, positively related to athletic performance and that it can account for approximately 25% of athletic performance (Clough et al., 2002; Crust & Clough, 2005; Bull et al., 2005; Gucciardi et al., 2008). The lack of significance in the current study could be attributable to the fact that the head and assistant coaches' performance ratings did not vary enough across players. Further examination of the data revealed that a majority of the head and assistant coaches' ratings fell within the intermediate range (5-8) on the 10-point Likert scale used as the performance measure in this study. The lack of variation or the propensity for the coaches' rating scores to hover in the average or "neutral" range could be caused by socially desirable responding factors that could have impacted the reliability of the results (Krosnick et al., 2002).

Perfectionism and Mental Toughness

This study also examined whether a significant difference existed between athletes with high versus low mental toughness in terms of perfectionism. The results did not reveal a significant difference on perfectionism scores between athletes categorized as high on mental toughness and athletes categorized as low on mental toughness, as originally predicted. Findings suggest that athletes categorized as more mentally tough do not differ in terms of their engagement in perfectionistic thinking when compared to less mentally tough athletes. The current study also did not find a significant relationship between engagement in perfectionistic thinking and mental toughness in sports. Although perfectionism has been positively linked with athletic performance (Bradham, 2000;

Gotwals et al., 2012), not much research has been conducted regarding the relationship between perfectionism and mental toughness. However, Mohebi and Zarei (2016) previously found that having high personal standards with less attention to mistakes, which is considered as “positive” perfectionism, was positively correlated with mental toughness, whereas concern over mistakes and perception of coach and parental pressure (i.e., “negative” perfectionism) were negatively correlated with mental toughness in sports by using a sports-specific measure of perfectionism (i.e., Sports Multi-dimensional Perfectionism Scale). A possible explanation for the lack of significance in the current study could be that perfectionism was assessed in terms of striving for perfection in all areas of life as opposed to sport-specific perfectionism. Perhaps if perfectionistic thinking were assessed strictly in terms of how athletes think in the sports domain, rather than in every area or domain of their lives, more fruitful information could be provided in terms of the potential, adaptive role that perfectionism could play regarding mental toughness in sports. Furthermore, the ICD possibly did not account for or assess the more positive aspects of perfectionism, such as setting high personal standards and paying less attention to mistakes, that could be more directly related to mental toughness in sports.

Limitations

One potential limitation of the current study is the use of a sample of convenience in obtaining the data. Using a sample of convenience could impact the generalizability of the results obtained if the size and diversity of the sample were not large enough to accurately reflect a greater population. Furthermore, the sample consisted of predominantly Caucasian participants attending a medium-sized liberal-arts university, thus suggesting that the findings might not be generalizable to minority populations or

people who are underprivileged in terms of their access to higher education and socioeconomic status.

An additional limitation of the study could be the validation of the ICD for use on an anxious and depressed population (Yurica & DiTomasso, 2002). Despite the recent validation of the ICD on a nonclinical sample (Roberts, 2015), replication of this validation finding would be important in future studies in order to confidently generalize the results from the ICD to nonclinical participants and, particularly, to athletes.

While the use of self-report measures in order to gather data has many advantages, such as the opportunity to gather unique information about the target of assessment, to directly tap into a person's self-perceived level of mental toughness, and for ease of administration (Paulhus, 1991), the disadvantages of self-reports should also be taken into account (Paulhus & Vazire, 2007). When using self-reports, socially desirable responding may occur. Socially desirable responding can be described as the tendency to answer questions in a manner that will be viewed favorably by others, such as overreporting "good behavior" or underreporting "bad behavior" (Paulhus, 1991). The effects of socially desirable responding can be mitigated by obtaining corroborating information with alternative assessment methods and making attempts to use well-validated measures (Paulhus & Vazire, 2007). Owing to the use of self-report measures in this study in order to obtain data on mental toughness, participants' responses or behaviors could be different when faced with real versus hypothetical scenarios of mental toughness. Even though the Sports Mental Toughness Questionnaire (SMTQ) is a validated method of assessment for measuring mental toughness in sports (Sheard et al.,

2009), mental toughness was evaluated using only one measure in the current study and could be considered an additional limitation.

Another potential limitation could be the use of a single retrospective measure in order to measure the participant's overall level of performance. This limitation could have contributed to the absence of a significant relationship found between mental toughness and overall athletic performance in this sample, as this current finding does not align with previous research that suggests a strong, positive relationship between mental toughness and athletic performance (Clough et al., 2002; Crust & Clough, 2005; Bull et al., 2005; Gucciardi et al., 2008). The lack of significance in the current study could be attributable to the lack of variance between the head and assistant coaches' performance ratings across players. Further examination of the data revealed that a majority of the head and assistant coaches' ratings fell within the intermediate range (5-8) on the 10-point Likert scale of performance used in this study. Studies have shown that although neutral options were designed to reduce false responses (i.e., choosing a response that does not reflect true beliefs) on surveys/ self-reports, providing neutral options also can significantly increase the number of people who choose neutral responses despite actually having a positive or negative opinion (Johns, 2005; Krosnick et al., 2002). Weijters, Cabooter, and Schillewaert (2010) also found that the more options one has, the less extreme one's responses. The lack of variation or the propensity for the coaches' rating scores to hover in the average or "neutral" range could have been a result of having more options to choose from on the performance measure and could have contributed to the nonsignificant relationship between athletic performance and mental toughness.

Perhaps another limitation could include the fact that a measure designed to specifically assess perfectionistic thinking as it relates to sports mental toughness was not used. Mohebi and Zarei (2016) previously found that having high personal standards with less attention to mistakes, which is considered “positive” perfectionism, was positively correlated with mental toughness, whereas concern over mistakes and perception of coach and parental pressure (i.e., “negative” perfectionism) was negatively correlated with mental toughness in sports. Their study was conducted by using a sports-specific measure of perfectionism (i.e., Sports Multi-dimensional Perfectionism Scale). Not using a sports-specific measure of perfectionism, as well as using a measure (i.e., ICD) that does not specifically look at varying aspects of perfectionism, could have also contributed to the fact that no significant relationship was found between perfectionistic thinking and sports mental toughness.

Future Directions

The findings of this study produced important information regarding the relationship between certain cognitive distortions and mental toughness. The negative correlation found between comparisons to others and mental toughness was assessed using the ICD; however, the items on the ICD apparently were designed to assess mainly the frequency of engagement in unfavorable social comparisons. A significant number of individual factors seem to moderate and influence the direction of social comparisons (i.e., upward versus downward) and the varying effects that can result from engaging in each type. However, research on social comparison theory does suggest that in certain instances downward comparisons can result in elevated self-regard (Suls, Martin, & Wheeler, 2002). As a result, future studies could specifically evaluate the relationship

between mental toughness in sports and the engagement in downward social comparisons (i.e., comparing oneself favorably to those who are worse off) in an effort to determine if that relationship could be significant, but in the positive direction as well.

Research on the development of mental toughness suggests that being exposed to tough environments and having opportunities to survive early setbacks in the early part of a junior athletic career is pivotal to developing mental toughness (Bull et al., 2005). Since elite and professional sports are far more oriented toward outcomes and winning than at the amateur level, one might reasonably assume that exposure to a harsher, performance-based environment, which more accurately mimics the true environment of competitive sports, is more relevant to the development of mental toughness for aspiring professional and elite athletes (Crust, 2008). The integration of mental skills, such as self-talk, visualization, goal setting, and relaxation, into the appropriate environment, rather than in isolation, can also increase self-reports of mental toughness (Sheard & Golby, 2006) and play an important role in the development of mental toughness (Connaughton et al., 2010). Retrospective interviews of elite mentally tough athletes revealed that psychological strategies, such as goal setting, self-talk, and imagery, were important in helping athletes to cope with competitive anxiety and to prepare for competition (Connaughton et al., 2010). Furthermore, a 7-week mental-skills training program, which included goal setting, visualization, relaxation, concentration, and thought-stopping skills, also led to significant increases in both the performance and self-rated mental toughness of high-performing adolescent athletes (Sheard & Golby, 2006).

These results could suggest that in order to become a mentally tough professional or elite athlete, individuals might have to change or develop the way they think in order

to adapt as the competitive levels and demands increase. For example, athletes aspiring to become professionals might do well to compare themselves unfavorably to better athletes (i.e., upward social comparisons) in order to gain a more accurate estimate of their abilities so that they can continue to improve and compete on the professional and/or elite level of sports. On the other hand, competitive athletes not at the professional or elite levels, such as the collegiate athletes sampled in this study, might benefit from not engaging in these types of upward social comparisons. Therefore, future studies could explore the idea of mental toughness in terms of engagement in specific ways of thinking that vary over the course of a developmental trajectory in an athlete's career. Examining whether the relationship between sports mental toughness and other cognitive distortions found in this study holds up or changes as the level of athletes' abilities approach the professional or elite end of the athletic spectrum might be prudent.

Future studies could also continue to use the variables of age, gender, and total years of playing experience as controls to help disentangle the relationships between other potential variables of interest and mental toughness. Owing to the current ambiguity surrounding specific gender differences in the mental toughness literature (Fawcett, 2013; Gao, Mack, Ragan, & Ragan, 2012; Madrigal, Gill, & Willse, 2017; Nicholls et al., 2009), future research should also be conducted to further examine these differences. Furthermore, Fawcett (2013) also concluded that future studies should continue to focus on individual differences (e.g., gender, sporting level, and cultural background) in order to better understand the construct of mental toughness in sports.

Since the basis of using CBT is targeted at improving the awareness and the reduction of engagement in cognitive distortions to improve functioning (Beck, 1967),

incorporating components of CBT (e.g., dysfunctional thought records) into mental-toughness skills training in order to help reduce the frequency of specific cognitive distortions could be beneficial for sports psychologists to use in order to improve athletes' overall mental toughness. Since the findings in previous literature also suggest that student-athletes with higher levels of mental toughness perform better than their less mentally tough counterparts, implementing programs aimed at improving mental toughness, specifically with the use of CBT, within collegiate and professional athletic departments might help improve the overall success of these athletic teams and programs. Future research could examine the combined effect of using cognitive-behavioral strategies to reduce the frequency of cognitive distortions (e.g., magnifications and comparisons to others) in conjunction with mental-toughness skills-training programs in order to determine if overall athletic performance improves.

In terms of the relationship between perfectionism and mental toughness, future studies should assess perfectionistic thinking strictly in terms of how athletes apply this thinking in the sports domain in order to provide more fruitful information regarding the potential adaptive role that perfectionism could play regarding mental toughness in sports. Future studies could also focus on the adaptive cognitive components inherent in various dimensions of perfectionism (e.g., positive versus negative perfectionism) as they relate to mental toughness. Future studies could look at whether engaging in certain perfectionistic ways of thinking and behaving (e.g., setting high personal standards, or "positive perfectionism") and paying less attention to mistakes and external pressures ("negative perfectionism") can actually facilitate mental toughness and ultimately improve athletic performance as a result.

In terms of viewing mental toughness as a personality trait, studies have looked at the relationship between global mental toughness and the Big-Five personality factors (Costa & McCrae, 1992). Horsburgh, Schermer, Veselka, and Vernon (2009) previously found a significant, negative, and moderately strong correlation between neuroticism and mental toughness. This finding is as expected because mentally tough individuals are typically characterized as experiencing low anxiety, having a high sense of self-belief, being calm under pressure, and having the confidence to overcome stressors and deal with negative events (Clough et al., 2002; Jones et al., 2007). In contrast, those who score high in neuroticism are found to respond more reactively to stressors, to interpret ordinary situations as threatening, to be more likely to view minor frustrations as hopelessly difficult, and subsequently to tend to suffer from anxiety (Costa & McCrae, 1992; Ormel et al., 2013). Mentally tough individuals, specifically athletes, are characterized by their ability to be more consistent and better than opponents in remaining determined, focused, and confident under pressure while performing (Jones et al., 2007). The characteristics of mentally tough athletes appear to be in direct opposition to those of individuals characterized as high in neuroticism. Furthermore, individuals high in neuroticism also exhibit more variability in terms of their trial-to-trial reaction time performances (Robinson & Tamir, 2006). As such, further research could examine the relationship between the personality trait of neuroticism and mental toughness in sports by using the SMTQ (Sheard et al., 2009) and NEO-PI- R (Costa & McCrae, 1992), in order to possibly examine whether the results found in the previous literature translate to the domain of sports mental toughness as well.

Summary and Conclusions

The study examined the relationship between specific cognitive distortions and mental toughness in sports, after accounting for age, gender, and total years of playing experience. It also aimed to validate whether mental toughness translated into better performance for this particular sample of athletes. Results demonstrated that after accounting for age, gender, and total years of playing experience, two specific distortions, magnification and comparison to others, made a significant contribution to the prediction of mental toughness. Results suggest that athletes who do not amplify situations and events out of proportion and do not compare themselves unfavorably to others are more mentally tough. Results did not demonstrate a significant difference in athletic performance between athletes characterized as having higher levels of mental toughness when compared to athletes characterized as having lower levels of mental toughness. This finding is inconsistent with previous literature regarding the positive relationship between mental toughness and athletic performance. Furthermore, results also did not demonstrate a significant relationship between perfectionism and mental toughness and did not suggest that mentally tough athletes engage in more perfectionism compared to their less mentally tough counterparts. Future research could continue to use age, gender, and total years of playing experience as control variables to aid in the exploration of mental toughness and its relationship to other variables of interest. Future studies should continue to evaluate the effects of gender differences, as well as of “positive perfectionism,” as they relate to mental toughness in sports. Clinical implications suggest that the integration of cognitive-behavioral interventions into mental-toughness skills programs to decrease the engagement of magnifications and upward comparisons to

others could prove useful for athletes in their pursuit of improved mental toughness and ultimately athletic success.

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