UNIVERSITY OF KWAZULU-NATAL

MENTAL TOUGHNESS AMONG COMPETITIVE SOUTH AFRICAN TENNIS PLAYERS: THE ROLE OF RESILIENCE, SELF-AWARENESS, AND STRESS

By

Richard Gregory Cowden

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DECLARATION

I Richard Gregory Cowden declare that:

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ABSTRACT

The purpose of the present study was to explore the role, relevance, and interrelatedness of selected psychological constructs, self-awareness, resilience, and stress, to mental toughness (MT) in competitive tennis. The constructs were examined using the Self-Reflection and Insight Scale, the Resilience Scale for Adults, the Recovery-Stress Questionnaire for Athletes, and the Sports Mental Toughness Questionnaire, respectively. A total of 365 South African competitive tennis players from diverse gender, ethnic, geographical, and competitive standard backgrounds completed the self-administered questionnaires. The results indicated strong positive relationships between self-awareness, resilience and MT and a strong negative association between stress and MT. The findings indicated a negative relationship between resilience and stress and resilience (as well as resilience subscales) did not significantly moderate the MT-total stress relationship. In addition, the path analysis results revealed a substantial degree of interrelatedness between resilience and MT.

The findings suggest that self-awareness components are associated with high mentally tough competitive tennis players, possibly denoting self-awareness as a component of MT. As anticipated, mentally tough tennis players are likely to report lower stress levels and higher resilience levels, with significations that resilience and MT share some common components and may overlap in several areas despite being distinct psychological constructs. Based on the results, prospective intervention efforts and directions for developing MT are described. The implications for understanding the composition and process of MT, the potential capacity to develop MT through intervention efforts, and the distinctions between MT and other closely associated

psychological constructs are outlined, with potential areas for further research posited, including additional sport-specific investigations, MT training and intervention studies, and MT instrument development and validation efforts.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction to the Study

Mental toughness (MT) originated and has been applied considerably in sporting contexts, garnering increased research interest in recent years (e.g., Clough, Earle, & Sewell, 2002; Fourie & Potgieter, 2001; Jones, Hanton, & Connaughton, 2002). The immense MT attention has derived from research indicating the propensity for MT to promote successful athletic performance (Crust, 2007; Jones, Hanton, & Connaughton, 2007). Specifically, MT assists athletes in maintaining performance levels during moments of competitive adversity, perceiving pressure as a challenge and a catalyst for prospering, possessing an invigorating belief that outcomes are controlled by the self, maintaining emotional, cognitive, and behavioural control despite adverse experiences, and rebounding rapidly following failures, setbacks, and negative incidents (Bull, Shambrook, James, & Brooks, 2005; Clough et al., 2002; Jones et al., 2002). The prospective benefits associated with MT to the dispositions of athletes and subsequent athletic performance denotes the relevance and importance of the construct to athletes of varied competitive standards.

Despite the apparent advantages of MT and the research endeavours that have sought to elucidate the construct and the particular subcomponents, a collectively accepted definition and framework for conceptualising the construct is absent. Various researchers have suggested that there is ambiguity and misunderstandings of MT (e.g., Crust, 2008). In fact, Jones et al. (2002) suggest that conceptualisations and definitions of MT have generally been unspecific and inconsistent as “virtually any desirable positive psychological characteristic associated with sporting success has been labelled as mental toughness at one time or another” (p. 206).

Considering the positive implications associated with MT in athletics, it is critical to obtain clarity and a thorough understanding of the construct.

1.2 Background and Rationale for the Study

In addition to conceptual and definitional issues, researchers contend that MT requires sport-specific conceptualisation and investigation (e.g., Crust, 2008). In fact, Bull et al. (2005) suggest that MT is dependent on the type of sport and the competitive situation requiring MT (e.g., serving while facing a break point as opposed to serving for a set during tennis competition). Different sports may emphasise MT at different stages of participation (e.g., prior to competition, during competition or specific stages of competition, post-competition) and varied sports may accentuate diverse types of MT (Bull et al., 2005). Thus, the kind of MT required by rugby athletes may diverge immensely from that required by swimmers. Based on the ostensible variances in MT that different sports may require and the potential discrepancies in temporal accentuation of MT across the competitive circumstances of different sports, researchers have initiated the investigation of MT within specific sports. Precisely, MT has been exclusively examined in groups of athletes participating in rugby (Golby, Sheard, & Lavallee, 2003; Golby & Sheard, 2004; Sheard, 2009), soccer (Coulter, Mallett, & Gucciardi, 2010; Thelwell, Weston, & Greenlees, 2005), Australian Rules football (e.g., Gucciardi, 2009; Gucciardi, Gordon, & Dimmock, 2009b; Gucciardi, 2010), and wrestling (Gould, Eklund, & Jackson, 1993). Additionally, researchers have constructed psychometrically validated instruments to assess MT in Australian Rules football (i.e., Gucciardi et al., 2009b) and cricket (i.e., Gucciardi & Gordon, 2009).

The efforts to examine MT within specific sporting domains and assess the MT of athletes involved in particular sports signifies the necessity to investigate MT within the context of precisely delineated sport types. Evidently, the areas of emphasis, the scenarios, dynamics, and conditions inherent to tennis may accentuate a type of MT or require specific forms of MT that diverges immensely from other sports. Perhaps, tennis emphasises different degrees of MT during various phases of competition, such as pre-competition (in order to enter competition thoroughly prepared), during competition (to maintain or sustain performance following negative and positive incidents), and post-competition (to recover swiftly from losses in order to prepare appropriately for forthcoming competition). The potential for MT to differ in form, constellation, and contextual emphasis across various kinds of sports warrants isolated examination of MT in tennis. Such endeavours may promote further understanding of MT as a psychological construct, the applicability of MT in specific sporting settings, and delineate the components of MT relevant to tennis.

In identifying and conceptualising MT, researchers have examined the characteristics inherent to or associated with MT. Such efforts have focused on ascertaining the facets or constituents of MT and the consequences associated with possessing the disposition of MT. Specifically, mentally tough individuals cope more effectively and employ more effective coping strategies, such as problem-focused coping (Nicholls, Polman, Levy, & Blackhouse, 2008), possess a persistent and resolute sense of self-belief (Gucciardi & Gordon, 2009; Jones et al., 2002), have heightened levels of intrinsic motivation (Gucciardi, 2010), exhibit a greater propensity to utilise performance-approach and mastery-approach achievement goals (Bull et al., 2005; Gucciardi, 2010), demonstrate superior control over their attention (Golby & Sheard, 2004; Gucciardi, Gordon, & Dimmock, 2009a) and negative emotions (Golby & Sheard, 2004), are more optimistic (Gould, Dieffenbach, & Moffett, 2002), are attitudinally tough (i.e., determined, persevering, tenacious; Bull et al., 2005; Thelwell et al., 2005), and may utilise specific types of mental imagery (e.g., motivational general mastery imagery; Matti & Munroe-Chandler, 2012). Although MT may encompass or be associated with the aforementioned psychological characteristics, investigations involving other concepts that may have implications for MT and subsequent athletic performance appear to have been neglected. Specifically, qualitative research examining MT has suggested that self-awareness may be an important contributor to MT (Gucciardi, Gordon, & Dimmock, 2008; Gucciardi, Gordon, Dimmock, & Mallett, 2009) and that *thinking clearly* (which includes awareness of the self) is a vital constituent of MT (Bull et al., 2005). Despite the posited relevance of self-awareness to MT, the absence of quantitative studies investigating the connection between the two concepts necessitates identification of whether self-awareness relates to or promotes MT. It is feasible to conceive that, perhaps, self-awareness may improve the emotional and cognitive control of mentally tough individuals, which may assist them to remain unaffected by adversity or distress. Objectively establishing whether self-awareness and MT relate may afford further appreciation of MT, how it operates, and ways to enhance MT through the improvement of related psychological characteristics (such as self-awareness).

Originating and primarily focused and researched in the context of sport, MT has similarities with other constructs such as hardiness, learned resourcefulness (LR), and resilience. For example, each is comprised of a set of components that assist, enable, or contribute to positive outcomes in various settings or when exposed to certain circumstances (Clough et al., 2002; Kobasa, 1979; Masten, 1994; Serap & Joseph, 2003). Possibly due to initial inceptions and applications in sport psychology, MT has, until more recently (e.g., Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al., 2012; Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al., 2012; Gerber et al., 2013), rarely been applied in non-sporting domains. With a potentially more globalised application than simply in sport that has begun to garner support, it appears that MT and constructs such as resilience possess similarities that supports placing MT with the ambit of the positive psychology literature, which is, in part, the theoretical foundation of the resilience construct. According to Seligman, Steen, Park, and Peterson (2005), positive psychology includes "positive emotions, positive character traits, and enabling institutions" (p. 410). With positive psychology focused on what makes people thrive, excel, or flourish (Seligman & Csikszentmihalyi, 2000), it is evident that MT coincides with Seligman et al.'s (2005) designation of positive psychology facets.

Considering the increased application and evidence of the relevance of MT in non-sporting populations as well as the similarities between MT and other positive psychology constructs (e.g., resilience), it is important that research investigates whether MT is distinct from other positive psychology constructs such as resilience, the manner in which it is distinct, and, perhaps, the role and relationship of MT with other positive psychology constructs.

Contemporary conceptualisations of MT denote that the construct, in part, has been appropriated from other psychological constructs. For instance, Kobasa's (1979) model of hardiness has been included in Clough et al.'s (2002) framework for conceptualising MT; the addition of *confidence* as a subcomponent of MT distinguishes the two constructs. Other psychological constructs, such as resilience, appear to possess similar characteristics to MT, indicating a degree of overlap between MT and resilience. Although resilience has received scant attention in sport and relative to MT in sport, both MT and resilience defend against adversity, stress, or pressure by sustaining performance levels (functioning) through the maintenance or use of cognitions, emotions, and behaviours. According to Sheard (2013), the discernment between MT and resilience relates to the applicability of MT during positive and negative circumstances, whereas resilience is solely relevant during negative circumstances involving adversity, stress, and risk. In qualitative studies, resilience has been associated with assisting mentally tough athletes in avoiding slumps in performance (Goldberg, 1998) and the quick recovery or retention of focus or concentration despite setbacks and adverse experiences (Clough et al., 2002). These findings suggest that MT and resilience co-exist or co-occur, and that MT may, to some extent, depend on resilience. However, the MT literature is unable to quantitatively indicate whether resilience relates to MT, is a characteristic or subcomponent of MT, and the divergences between the two constructs. Considering the apparent similarity and correspondence between resilience and MT, examining the interrelatedness and distinguishing aspects of both constructs may provide a profounder appreciation of MT and the features unique to the construct.

Preliminary research findings insinuate that resilience reduces, defends, or annuls the influence of stress among individuals high in MT (e.g., Gould et al., 2002), indicating the resilience may be an integral asset to mentally tough individuals or contribute to the MT of athletes. In fact, Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al. (2012) denote that, based on their findings, mentally tough individuals may be more resilient against stress. Although the authors did not explicitly evaluate resilience, the supposition suggests that resilience may be important for alleviating the influence of stress relative to MT. As little knowledge exists regarding the significance of MT and resilience relative to one another, evaluating whether resilience diminishes or protects against stress relative to MT may provide necessary detail explicating whether resilience functions separately or in conjunction with MT and, possibly, a more detailed understanding of the manner in which mentally tough individuals are more resistant to stress or adversity may be identified.

1.3 Significance of the Study

Despite attempts to clarify, appropriately define, provide conceptual precision, and ascertain MT characteristics, a number of issues associated with MT remain:

(1) Varied definitions of MT posited by authorships (e.g., Clough et al., 2002; Gucciardi et al., 2009a; Jones et al., 2002) elucidate ambivalence concerning the definition of MT within competitive sport. Consequently, there is an absence of a universally accepted definition of MT.

(2) There is disagreement on the conceptualisation of the construct (e.g., Clough et al., 2002; Gucciardi et al., 2009a; Jones et al., 2002; Middleton, Marsh, Martin, Richards, & Perry, 2004a) as researchers debate whether MT should be conceptualised within or across sports, whether the construct represents a trait or a state, and the constituents comprising MT. Inconsistent definitions of MT attribute to these issues, and endeavours have ensued to delineate and operationalise the construct without a conceptual frame of reference or using empirical evidence (e.g., Loehr, 1986).

(3) A number of MT inventories have been developed to measure the construct. However, the components included in inventories to assess MT differ across instruments (e.g., Clough et al., 2002; Loehr, 1986; Middleton et al., 2004a; Sheard et al., 2009), indicating there is disagreement surrounding the characteristics exemplifying MT. The increasingly intense debate about the validity of various MT measurements is concerning, signalling the need for comprehensive verification and use of such instruments to evaluate the appropriateness of the MT instruments that have been constructed.

(4) Certain characteristics contended as components of MT have acquired extensive research attention (e.g., self-belief, control, coping strategies). However, other stipulated constituents of MT have obtained scant attention. In particular, self-awareness has been qualitatively identified

and postulated as a characteristic of MT (e.g., Bull et al., 2005; Gucciardi et al., 2009; Loehr, 1995), but researchers have yet to quantitatively evaluate the relationship between self-awareness and MT in sport.

(5) There is an apparent scarcity of empirical MT investigations in specific sports. Recently, researchers have proceeded into certain sporting domains such as ice-hockey (e.g., Davis IV & Zaichowsky, 1998), rugby (e.g., Golby & Sheard, 2004), Australian football (e.g., Gucciardi, 2010; Gucciardi et al., 2008), and cricket (e.g., Bull et al., 2005; Gucciardi & Gordon, 2009). However, identifying and constituting MT in other sports (e.g., tennis) is required in order to conceptualise, ascertain, define, and measure MT sport-specifically.

(6) MT appears closely connected to a number of other psychological constructs, and, at times, has been confused or mistakenly referred as representing alternative constructs or combined with other constructs. Although the components of MT and other constructs may overlap, further research and understanding of these distinct yet related constructs is needed to fully comprehend how MT relates to other constructs. In particular, researchers contend that resilience is a construct associated with or contributor to MT (e.g., Clough et al., 2002; Gould et al., 2002; Loehr, 1995). Additionally, it has been suggested that mentally tough individuals are more resilient against stress (e.g., Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al., 2012), but the specific aspects of resilience responsible for buffering stress amid MT have yet to be examined and delineated.

(7) Although there is contention about whether MT is state or trait in quality, there is an indication that MT can be developed and may, in part, be influenced by factors in the environment. Researchers have found that MT is improved as a function of interventions and

training programs in competitive sport. However, further efforts are required to establish a reputable, MT specific intervention or training program to develop or improve MT.

There are distinct areas within the MT literature necessitating more extensive research. The ostensible ambiguity surrounding MT has endorsed further examinations in order to address the aforementioned issues. The surge for research within specific sports has been recent, and advancing the MT literature demands such investigations. However, research attention has not been illuminated towards competitive or elite tennis athletes. Considering the potential impact of MT on successful athletic performance, it is critical to quantitatively assess the nature of MT in competitive tennis.

Additionally, the postulation that mentally tough individuals have a heightened sense of self-awareness (e.g., Gucciardi et al., 2009) has not received quantitative examination in general sport or tennis. Even though researchers suggest that mentally tough athletes employ techniques or utilise psychological characteristics to intercede the effects of stress, pressure, or adversity (e.g., Kaiseler, Polman, & Nicholls, 2009), the relationship between stress and MT in tennis is unknown. Further, the influential effects of resilience on stress in athletic samples, particularly tennis, have received little quantitative investigation. Despite stipulations and assertions that resilience and MT are connected or interrelated (e.g., Gucciardi & Gordon, 2009; Gucciardi et al., 2008), it remains unclear as to what the distinguishing features of the two concepts are and the reciprocal influence the constructs have on one another, particularly in sport (generally and sport-specifically). In addition, there is a necessity to delineate how resilience defends against stress and what factors of resilience reduce the influence of stress among mentally tough athletes, especially in tennis. If mentally tough individuals are more resilient against stress (Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al., 2012), determining the specific resilience factors responsible for protecting against stress amid MT is important for determining the operational relationship between MT and resilience.

1.4 Objectives of the Study

Therefore, cogitating the areas of MT necessitating further inquiry, this study aims to address selected limitations to promote further comprehension of MT as a construct that is distinct from other constructs, is a concept that relates to other psychological characteristics to enhance athletic performance, and is a psychological construct that may be appropriately and adequately assessed using psychometrically validated assessment instruments. Succeeding the broader emphasis and focus of the study, the specific research objectives include:

(1) Assessing the factor structure and psychometric properties of an MT (the SMTQ), self-awareness (the SRIS), resilience (the RSA), and stress (RESTQ-Sport) instrument in a sport-specific domain (i.e., tennis) amid South African athletes.

(2) Exploring group differences in MT based on age, years of tennis participation, gender, and type of competitive tennis participation.

(3) Examining the relationship between self-awareness characteristics and MT in competitive tennis.

(4) Evaluating the association between:

(a) MT and resilience in competitive tennis.

(b) MT and stress in competitive tennis.

(c) Resilience and stress in competitive tennis.

(5) Providing an understanding of:

(a) The resilience sub-factors that relate to specific subcomponents of MT in competitive tennis.

(b) Whether resilience moderates stress in relation to MT in competitive tennis.

(c) Whether resilience subcomponents moderate the association between stress and MT in competitive tennis.

Collectively, this information will contribute to identifying additional characteristics associated with MT, provide further understanding of the relationship between MT and other closely associated constructs, and determining whether resilience defends against stress relative to MT, which may increase the depth of MT knowledge and provide clarity about differences between MT and other constructs (i.e., resilience), particularly in competitive tennis.

1.5 Format of the Thesis

The broad elements, foundation, and purpose for conducting the study are delineated in chapter 1. In chapter 2, the details of the relevant literature integral for understanding critical concepts and the extant research findings relevant to these concepts in constructing a framework for the present investigation are discussed. Chapter 3 provides methodological and procedural information for the inclusion of particular participants, the selected instruments, and the statistical approaches for quantitatively examining the objectives. Chapter 4 details the data analyses that produced the particular results pertaining to the objectives in this study. Included in the chapter is a comprehensive description of the analysis process and analyses utilised. In chapter 5, an in-depth discussion of the results is explicated, including important literature and practical implications for researchers, sport psychology professionals, and athletes. It also includes a discussion of the selected limitations of the study. Chapter 6 provides a comprehensive summary and conclusions based on the results obtained and subsequent discussion. The final chapter (chapter 7), details the major implications and prospective interventions that may be designed and implemented to develop MT amongst tennis players and other athletes, and outlines selected areas that researchers are encouraged to pursue in the future.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The framework, basis, and rationale for conducting the current study has developed from several underexplored areas in the sport psychology and positive psychology literature, yet are important areas to create further understanding of MT in sport. This chapter details the relevant literature as well as identifies the areas in which the MT literature is underdeveloped and requires further attention. In particular, conceptualisation developments of the MT construct are discussed, including the various definitions that have been posited. The debate surrounding the trait or state quality of MT is also described, which indicates the manner in which conceptualisations of MT have changed as research interest in the MT area has increased. The available MT assessment instruments are described in detail, including more recent sport-specific inventories. Related psychological constructs, relative to MT, are discussed, along with an indication of the characteristics of mentally tough athletes. In addition, research examining the amenability of MT is presented, coupled with approaches that have been developed and tested as part of MT interventions.

The conceptual underpinning and different perspectives of the resilience construct are explored, including resilience conceptual models that have been developed from the general and sport psychology areas. From a process perspective, resilience research is discussed and emphasis is placed on the characteristics that are associated with positive adaption. The assessment of resilience is also examined, which provides detail pertaining to the available resilience instruments. An exploration of similar or related constructs is also detailed, including MT, which, relative to resilience, has received insufficient attention.

The concept of stress is also detailed, particularly in the context of sport, which provides a conceptual basis for understanding the nature of stress in competitive tennis. The available stress instruments are also described, which, when considered from a particular conceptual perspective, affords an indication of the most relevant and appropriate instruments for use in the present study.

2.2 Mental Toughness: Definitional and Conceptual Considerations

The psychological construct, MT, has recently begun to receive increased emphasis and substantial research attention. However, in contrast to more extensively established psychological constructs, there is under development in delineating the characteristics comprising MT. Conceptual and definitional issues involving MT remain controversial, unclear, and require clarification to discern MT (Crust, 2008). Researchers agree, however, that MT is a critical factor for achieving athletic performance success (Clough et al., 2002; Crust, 2007; Jones et al., 2007; Loehr, 1986). However, various athletically involved personnel (e.g., researchers, sport psychology professionals, athletes, coaches) need to acquire an increased understanding of MT in order to more comprehensively ascertain and appreciate the relevant role of MT in sport.

One area of the sport psychology literature suggests that MT enables athletes to maintain performance by coping effectively during competitive situations encompassing high stress, is associated with self and social competitiveness, tenacity and persistence, and embracing stress or prospering under pressure or adversity. Additionally, MT involves possessing an engrained conviction that the person has control over incidents in life and outcomes, is associated with optimism, having immense determination to recuperate quickly and succeed following failures, setbacks, and negative events, is related to a willingness to take risks, and controlling emotions and cognitions during adverse circumstances and situations of pressure (Bull et al., 2005; Clough et al., 2002; Crust & Keegan, 2010; Jones et al., 2002).

There are a number of important MT components identified in the literature. These factors are related to possessing superior mental abilities (Golby et al., 2003; Loehr, 1995), hardiness, insensitivity, and resiliency (Bull et al., 2005; Clough et al., 2002). Individuals high in MT engage in more effective problem-focused coping strategies compared to avoidance coping strategies (Nicholls et al., 2008) and, when confronted with stress, self-report higher levels of self-control and lower degrees of stress (Kaiseler et al., 2009). MT characteristics and associated factors are important for athletes during varied junctures of competition.

When engaged in high-pressure competitive environments, MT assists athletes in controlling emotions to diminish or reduce the impact of stress and pressure, to perceive control over the competitive situation and performance outcomes, to relish challenging and pressured competitive circumstances, and to be averse to experiencing disappointment, failure, and defeat. MT enables athletes to maintain focus during competition and training. Additionally, during training, competition, and post-competition ensuing loss, MT assists athletes to cognitively and emotionally recover rapidly after negative events (e.g., Loehr, 1995).

Currently, researchers continue to disagree on the conceptualisation and a universally accepted definition of MT. It is generally agreed, however, that MT consists of a range of characteristics necessary for promoting positive outcomes in athletic performance during all phases of athletic involvement (i.e., training, pre-competition, competition, and post-competition stages).

Contemporary researchers have criticised early theoretical perspectives for inaccuracy in comprehensively defining MT. Previously, perceptions of the construct were based on the developments of the identification of MT, but the concepts were devoid of scientific methods and empirical evidence. Jones et al. (2002) contend that initial MT conceptualisations were vague as “virtually any desirable positive psychological characteristic associated with sporting success has been labelled as mental toughness at one time or another” (p. 206). Loehr (1982) provides an example of a general, non-operational definition. He suggests that MT is related to one’s capacity to utilise energy in a positive manner when exposed to adverse situations, with individuals high in MT confronting difficult scenarios with a positive attitude.

Various researchers have endeavoured to resolve the current MT definitional limitations using established scientific methods and empirical evidence. Fourie and Potgieter (2001), for instance, identified the constituents of MT and subsequently defined the construct by analysing the written opinions of 160 elite athletes and 131 coaches involved in various sports. The participants were asked to describe their perceptions of the characteristics of MT. The authors identified 12 components of MT: (1) preparation skills, (2) team unity, (3) ethics, (4) discipline and goal-directedness, (5) confidence maintenance, (6) religious convictions, (7) psychological hardiness, (8) coping skills, (9) cognitive skill, (10) motivation level, (11) competitiveness, and (12) possession of prerequisite physical and mental requirements. However, the authors concluded that, due to the conceptual vagueness associated with MT at the time, decisive validation of the identified components could not be accomplished.

Succeeding Fourie and Potgieter’s (2001) research efforts, Jones et al. (2002, 2007) concisely operationalised and defined MT, describing the encompassing qualities of a mentally tough performer. International athletes (n = 10) participated in either a focus group or interview. Using a qualitative research design, the authors delineated 12 attributes judged as requirements for optimum MT. These attributes were assigned a ranking based on participants’ perceptions of the importance of the characteristics. In order of ranked importance, the demarcated attributes include:

(1) Having an unshakable self-belief in your ability to achieve your competition goals,

(2) Bouncing back from performance setbacks as a result of increased determination to succeed,

(3) Having an unshakable self-belief that you possess unique qualities and abilities that make you better than your opponents,

(4) Having an insatiable desire and internalised motives to succeed,

(5) Remaining fully focused on the task at hand in the face of competition-specific distractions,

(6) Regaining psychological control following unexpected, uncontrollable events,

(7) Pushing back the boundaries of physical and emotional pain, while still maintaining technique and effort under distress in training and competition,

(8) Accepting that competition anxiety is inevitable and knowing that you can cope with it,

(9) Not being adversely affected by others' good and bad performances.

(10) Thriving on the pressure of competition,

(11) Remaining fully-focused in the face of personal life distractions, and

(12) Switching a sport focus on and off as required.

Extending prior findings, Jones et al. (2007) conducted a second study and identified 30 attributes categorised into four MT dimensions. The qualities were clustered into one general category termed attitude/mindset (e.g., self-belief and focus) and three time-specific categories: training (e.g., maximizing one's efforts during training, acquiring motivation from long-term goals), competition (e.g., self-belief, emotional and cognitive control, sustaining concentration or focus, embracing and successfully dealing with pressure), and post-competition (e.g., dealing with successes and failures). Classified according to the athletic context, the categories comprise the 30 qualitatively identified attributes of mentally tough athletes. This framework delineates and acknowledges the fundamental elements of MT, and each attribute is stratified according to the particular roles of specific MT aspects relative to the athletic performance context.

Emanating from the 30 qualitatively identified properties of mentally tough athletes, Jones et al. (2002) defined MT 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. Specifically, [mentally tough athletes are] more consistent and better than [their] opponents in remaining determined, focused, confident, and in control under pressure". (p. 209)

Jones et al.'s (2002) definition of MT does possess several limitations and shortcomings. Crust (2008), for example, denoted that Jones et al.'s MT definition edicts the achievements stemming from MT rather than a description and representation of MT. In addition, Crust (2007) contends that using a single focus group to engender subsequent evidence in a follow-up study is limiting and may inaccurately suggest that the embodiment of MT is represented amid elite athletes. Although Crust (2007, 2008) outlines and describes the apparent limitations of Jones et al.'s work (2002, 2007), the authors have generated a qualitative framework for further efforts towards precise identification of MT attributes and an operational definition of MT.

Thelwell et al. (2005) sought to corroborate Jones et al.'s (2002, 2007) findings in a group of six male professional soccer players. The athletes self-reported the most important attribute of MT in soccer as extremely similar to the top ranked attribute of “having an unshakable self-belief in your ability to achieve your competition goals” in the Jones et al. (2002) study. However, participants differed in their perceptions about what characteristics best describe MT. For example, Thelwell et al. (2005) advocated that “having a presence that affects opponents” (p. 331) is an integral component of MT. Jones et al. (2002), however, did not identify or include this characteristic in their conceptual framework of MT.

Clough et al. (2002) adopted an alternative approach towards evaluating and defining MT. Based on Kobasa’s (1979) three C model of hardiness as a structure for conceptualising MT, the construct is divided into four components, which are designated as the 4 C’s of MT: control, commitment, challenge, and confidence (Clough et al., 2002). Kobasa’s (1979) research focused on hardiness and reiterated that control, commitment, and challenge are the essential components of hardiness. Clough et al. (2002) acknowledged control, commitment, and challenge as necessary components of MT. As a result, the concept of hardiness was appropriated into a conceptual model of MT in sport. However, control, commitment, and challenge were considered conceptually insufficient to completely account for MT, and Clough et al. gathered evidence to determine the difference between hardiness and MT in sport. Based on the perceived importance of confidence in the context of athletic performance, it was agreed that the component distinguishing MT from hardiness is confidence (Clough et al., 2002). Resultantly, Clough et al. (2002) defined mentally tough individuals as:

> “Individuals [who] tend to be sociable and outgoing as they are able to remain calm and relaxed, they are competitive in many situations and have lower anxiety levels than others. With a high sense of self-belief and an unshakeable faith that they control their own destiny, these individuals can remain relatively unaffected by

competition or adversity". (p. 38)

Clough et al. (2002) and Jones et al.'s (2002, 2007) authorships have stimulated developments of MT towards a universally accepted definition of MT originating from scientific research. Both authorships, however, divergently conceptualised MT. As a consequence, there is not complete correspondence between the resultant definitions of MT. These definitions have a basic framework approach and modified the structure according to qualitative findings and MT relevancy. However, the MT research by Jones et al. and Clough et al. is devoid of a theoretical basis. Due to the absence of a theoretical framework, researchers have been encouraged to study MT within a particular theoretical framework of personality development (e.g., Crust, 2008).

Gucciardi et al. (2008, 2009a) recently and indirectly attended to Crust's (2008) recommendation. Though reference to personal construct theory (PCT) by sport psychology professionals is infrequent, Gucciardi et al.'s (2008, 2009a) application of PCT to MT signifies the first attempts to qualitatively apply an established psychological theory to explain MT. Integrating MT literature, applying PCT to MT aims to offer a potential framework for guiding future MT research. Taken from Kelly's (1955) conceptualisation of personality, Gucciardi et al. (2009a) defined the central theme of PCT as, "A person's processes, which include experiences, cognitions, affect, and behaviours, are determined by his or her efforts to make sense out of and anticipate his or her world of events, people, or themselves" (p. 62). Relating PCT to MT, MT is impacted by an interaction between (1) the individual's attitude, evaluation, and reaction to certain situations and (2) the MT characteristics already possessed by the individual. Gucciardi et al. (2009a) composed a definition of MT, suggesting that:

> "Mental toughness is a collection of experientially developed and inherent sport-general and sport-specific values, attitudes, cognitions, and emotions

that influence the way in which an individual approaches, responds to, and appraises both negatively and positively construed pressures, challenges, and adversities to consistently achieve his or her goals". (p. 69)

In addition to defining MT, Gucciardi et al. (2009a) noted that the PCT framework for conceptualising MT has three components. Firstly, the component operating as the base of the model and accentuates the characteristics associated with MT, which broadly includes values, cognitions, attitudes, and emotions. Certain characteristics display stability across sporting contexts, while others may be sport-specific. MT characteristics, in turn, impact an individual's appraisal and response to specific situations or incidents demanding MT. Thus, the second component of the PCT model of MT recognises the impact that scenarios, events, situations, and circumstances have on the application, growth, and modification of cognitions, emotions, values, and attitudes. Essentially, the first two components address the interaction between an individual's MT characteristics and environmental factors. In contrast, the third component emphasises the influence of social factors or other individuals on evaluating and determining the consequences and processes associated with situations needing MT. Gucciardi et al.'s (2009a) contention of the third component suggests that other individuals' (trainers, other players, or coaches) perceptions of certain events involving the athlete provide an alternative orientation of assessment, which contribute to an athlete's prediction of events and promotes growth of psychological qualities associated with MT.

2.3 Mental Toughness: The Trait-State Debate

Supplementary to the inconsistencies in conceptual models and definitions of MT, there is also debate surrounding whether MT represents a personality trait (Kroll, 1967; Werner & Gottheil, 1966) or a state of mind that can be developed, learned, and altered (Gibson, 1998;

Loehr, 1982, 1986, 1995). Cattell (1957) proposed 16 personality traits, including *tough-mindedness*. He considered a *tough-minded* individual as conscientious, sturdy, realistic, and reasonably independent. It is probable that *tough-mindedness* provided the preliminary foundation for stipulating MT as a personality trait. Kroll and Peterson (1965), Werner and Gottheil (1966), and Kroll (1967) used Cattell's 16PF inventory to investigate differences between athletes and non-athletes on a number of personality traits, including *tough-mindedness*. Specifically, Kroll (1967) used the 16PF measure to discriminate between 94 collegiate and amateur wrestlers of diverse achievement levels. Wrestlers, who had demonstrated higher achievement levels, scored considerably higher on the subscale of *tough-mindedness*. Even though Cattell's 16PF has not been utilised as a measure of MT in sport (Crust, 2007), the use of the inventory in sport generated the association between *tough-mindedness* as a personality trait and athletic performance. Providing further support for perceiving MT as a personality trait, Tutko and Richards (1971) proposed the Motivation Rating Scale (MRS) as a trait measurement of MT. The authors, however, did not offer a definition of MT. In addition, they neither reported the psychometrics of the measure nor offered a description of how a motivation scale measures MT. The inability to determine or adequately demonstrate validity and reliability of an MT measurement scale forms a common limitation in the existing literature on quantitative MT assessment.

Although selected research supports MT as a personality trait (e.g., Horsburgh, Schermer, Veselka, & Vernon, 2009), other authors question the validity of MT as a personality trait, and, instead, argue that MT is a state of mind (Dennis, 1978; Gibson, 1998). In his description of MT components, Loehr (1995) proposed that MT is partially a state of mind. However, he also denotes physical fitness as an essential aspect of MT. He asserts that the physical fitness of an athlete relates directly to the athlete's ability to cope with situations requiring mental vigour. Additionally, he postulates that an athlete's physical fitness is directly related to an athlete's self-belief, confidence, and capacity to manage adversity and pressure, and the ability to devote greater energy towards fighting emotionally and mentally. According to Loehr's perspective, MT is a malleable construct. An athlete's MT may augment through exercises and training aimed at developing the construct. The training exercises are intended to modify an athlete's cognitive processes through positive thinking, energetically thinking about pressure and adversity, and combating negative emotions through humorous thinking. Additionally, Loehr advocates exercises and cognitions to increase MT, such as improving the ability to focus on the present moment throughout competition, perceiving adversity as advantageous, visualisation training, and learning to enjoy the facets of the competitive environment. It is imperative to note, however, that Loehr's suppositions emanate from his speculations and experiences, as opposed to statistical methods involving construct validation.

The state and trait perspectives of MT continue to be debated by theorists and researchers. MT remains an underdeveloped psychological domain and requires additional research. Recently, however, MT research developments reflect the interaction between biological (trait) and environmental factors (state) in the development of MT. Clough, Earle, Perry, and Crust (2012) contend that MT is influenced by genetic and environmental facets, denoting the construct as comparable to other personality traits. The authors, however, indicated that this remains a highly debatable area advocating further examination and to attain consensus. In another study, Horsburgh et al. (2009) found support to suggest that individual differences in MT development result from a combination of hereditary influences and non-shared environmental experiences. The study found that specific components of MT (e.g., confidence, control, challenge, and commitment) were associated with low genetic influence, as compared to a more generalised framework of MT. The reduced role of heritability indicates that certain components of MT may be more susceptible to intervention and improvement, as compared to overall MT. Horsburgh et al.'s (2009) results indicate that MT resembles other personality traits, and, a combination of environmental (i.e., state measures of experiencing challenges, appraisal of stressors, and MT training) and biological factors (i.e., MT trait) may influence MT.

In contrast, Bull et al.'s (2005) perception of MT connotes the construct as contextually specific, suggesting MT manifestation depends on the category of MT required by particular sports. In other words, different sports may necessitate particular "types" or forms of MT. For example, MT in golf may be predominantly required through moments before and during each shot, whereas endurance athletes who reach mental and physical limits may need sustained MT for extensive periods during performance (Bull et al., 2005). Additionally, Bull et al. assert that different sports may accentuate MT at distinctive temporal periods. Specifically, certain sports may principally necessitate MT *prior to* engaging in competition. Others, however, may emphasise MT requirements *during* competition. A similar distinction can be made within tennis. The factors, conditions, and situations concomitant with MT in tennis appear to contrast other sports. Tennis, for instance, may require MT prior to competing in order to prepare fully for competition. Considering the relationship between MT and performance, MT in tennis is essential during competition to sustain performance when experiencing negative and positive scenarios during competition. Finally, MT is important following competition, as it may assist athletes to recover effectively from defeat, which may result in greater preparation for approaching competition. Crust (2008) acknowledged the necessity to examine the central factors associated with MT in the context of specific sports.

Recently, investigations have followed Crust's (2008) suggestion to evaluate MT in various sporting contexts. Gucciardi and Gordon (2009), for example, computed psychometric data validating a cricket specific MT inventory. Other authors have researched MT in an assortment of sports, including rugby (e.g., Golby et al., 2003; Golby & Sheard, 2004; Sheard, 2009), soccer (e.g., Coulter et al., 2010; Thelwell et al., 2005), and Australian Rules football (e.g., Gucciardi, 2009; Gucciardi, 2010; Gucciardi et al., 2009b). These recent surges towards conceptualising MT within distinctive sporting domains support the popularity, relevance, and appropriateness of sport-specific research involving MT. Apparently, researchers have overlooked MT in tennis. Considering the mental, physical, and emotional demands of tennis and the scarcity of MT research in tennis, studying the role and function of MT in tennis is warranted.

2.4 Assessing Mental Toughness

Loehr (1986) developed an early measure of MT, the Psychological Performance Inventory (PPI). According to Loehr, the PPI measures the seven integral factors associated with MT. These qualities include: (1) attention control, (2) negative energy, (3) self-confidence, (4) imagery and visual control, (5) attitude control, (6) motivation, and (7) positive energy. Each subscale includes six Likert-type items anchored at 1 (*almost always*) and 5 (*almost never*). Though Loehr produced the items from his professional and practical experiences, the inventory lacked validation, as psychometric data supporting the inventory was not provided. However, studies have assessed the psychometric properties of the PPI. In one study, Middleton et al. (2004) administered the questionnaire to 263 high school athletes to establish the PPI's psychometrics. Even though the researchers intuitively supported the PPI's conceptual and face validity, confirmatory factor analysis (CFA) indicated an inadequate model fit, and did not psychometrically validate the inventory. The researchers concluded an absence of empirical evidence in the development of Loehr's (1986) PPI.

In a more recent study, Golby, Sheard, and van Wersch (2007) examined the construct validity of the PPI with a group of 408 competitive athletes across eight sports. Principal component analysis (PCA) failed to support the PPI's original factor structure, a finding consistent with subsequent studies (e.g., Gucciardi, 2012). The inadequate PPI reliability and validity properties, the lack of rationale provided to substantiate item development, and the absence of normative data indicates that using the PPI for research should be avoided.

Golby et al. (2007), however, continued further with the PPI data and revealed support for a 14-item measure of MT that comprised the following four factors: (1) self-belief (four items), (2) visualisation (three items), (3) positive control (four items), and (4) determination (three items). Subjecting the items to subsequent CFA, the identified factor structure was reinforced and the model fit was significant. Thus, the modified inventory was renamed the Psychological Performance Inventory-Alternative (PPI-A).

The PPI-A's psychometric properties have been investigated recently in a sample of 333 adolescent Australian football players (Gucciardi, 2012). Specifically, the author found that, except for one goodness of fit index (Tucker Lewis Index), factorial validity support for the factor structure of the PPI-A was demonstrated. However, Gucciardi outlines that internal consistency for each of the sub-factors was below adequate ($\alpha < .70$), cautioning interpretations of the factor structure findings. The global measure of MT (all 14 items) was supported, and a strong internal reliability for total MT ($\alpha = .91$) was found. Although the findings are encouraging for the PPI-A, Gucciardi (2012) suggests that the reliability estimates of the subscales indicate issues with the items associated with measuring those particular factors. He does denote, however, that due to the recent development of the PPI-A, it is premature to conclusively ascertain the appropriateness or inappropriateness of the inventory as a valid measure of MT. Perhaps, future efforts should be afforded towards revising the items or generating novel items for inclusion in the instrument to improve the PPI-A's psychometrics (Gucciardi, 2012).

There have been other attempts to validate alternative measures of MT. In developing the Mental Toughness Inventory (MTI), Middleton et al. (2004a) employed a grounded theory method to permit the emergence of themes from the qualitative data collected from interviews (semi-structured). The participants included eight coaches, sports scientists, managers, and sports psychologists as well as 25 elite athletes (15 World Champions or Gold Medallists). The authors categorised the participant responses into global MT and a 12-subcomponent framework of MT. The 12 sub-factors include (1) positive comparisons, (2) value, (3) potential, (4) personal bests, (5) task focus, (6) mental self-concept, (7) perseverance, (8) self-efficacy, (9) positivity, (10) stress minimization, (11) goal commitment, and (12) task familiarity. Based on this conceptual model and definitions of MT from prior research endeavours (i.e., Middleton et al., 2004a), the authors generated 108 items subjectively adjudicated to assess the 12 delineated sub-factors of MT and global MT (Middleton, Marsh, Martin, Richards, & Perry, 2004b). Using 479 elite high school athlete responses, the authors, in a subsequent study, removed items (31) that did not load highly on the factors the items were created to measure. Succeeding the analyses, strong relationships between the global MT and each of the subscales were established. In addition, the construct validity of the MTI coincided with the originally established subscales and overall global measure of MT. The resulting inventory contained 67 items (five items assess each of the 12 subscales and seven items address global MT).

Middleton et al. (2004b) recognised the limitation of only utilising elite athletes in the initial validation of the MTI. Thus, Middleton, Marsh, Martin, Richards and Perry (2005) pursued assessment of the psychometric properties of the MTI amid a range of athletes competing in sub-elite to elite standards of participation. The MTI was administered to 292 elite athletes (age range = 11 to 38 years) and a group of 438 youth athletes with elite sporting aspirations (age range = 12 to 18 years). CFA specified a strong model fit, resulting in the preservation of 36 items across the 12 sub-factors (3 items for each subscale). Sample items include "Overall I am mentally tough" (global MT), "To have done my best is the most important thing to me" (personal bests), and "No matter what the pressure, I still believe in myself" (self-efficacy). Additionally, the results indicated a similar factor arrangement across aspiring elite and elite athletes. According to Middleton et al. (2005), the psychometric properties of the revised MTI are adequate and the internal consistency of the subscales ranges from .82 to .91. Though preliminary research indicates the MTI is an appropriate inventory for assessing MT, Crust (2007) suggests that additional use of the MTI is necessary to further ascertain the reliability and validity of the MTI as a measure of MT.

In contrast to Middleton et al.'s (2004a, 2004b, 2005) development of the MTI, Clough et al. (2002) established the Mental Toughness 48 Inventory (MT48) using their four C framework of MT. The inventory contains 48 Likert-type items anchored at 1 (*strongly agree*) and 5 (*strongly disagree*) across four sub-factors: challenge, commitment, control, and confidence. The internal consistency of the respective subscales was .71, .71, .73, and .80, and the test-retest reliability of total MT was .90. Criterion validity of the questionnaire was established by discriminating between those with low and high score on the MT48 and self-reported level of effort expended during an aerobic exercise task. Providing construct validity support of the

MT48, Crust and Clough (2005) demonstrated a positive correlation between the participants' ability to endure pain in a weight holding task and MT48 scores. In other studies, researchers have found positive and significant relationships between scores on the MT48 and optimism (Clough et al., 2002; Nicholls et al., 2008), coping skills (Nicholls et al., 2008; Nicholls, Levy, Polman, & Crust, 2011), satisfaction with life, self-image, and self-efficacy (Clough et al., 2002). During the process of validating the MT48, Clough et al. (2002) also constructed the Mental Toughness Questionnaire (MT18), an abridged version of the MT48. Although specific subscale information cannot be obtained, the MT18 measures global MT. The correlation between the MT18 and MT48 is strong (r = .87), indicating support for the abbreviated inventory as a measure of MT.

The construction and psychometric properties of the MT48 appear thorough, but Crust (2007) suggested that publishing additional research explaining the development of the MT48 and authorships verifying the MT48, as a valuable measure of MT, are necessary. Recently, Gucciardi, Hanton and Mallett (2012) examined the factor structure of the MT48 using CFA and exploratory structural-equation modelling (ESEM) in a group of 686 students who participate in individual (e.g., triathlon) or team sports (e.g., hockey) that varied in years of participation (M = 9.11 years). ESEM and CFA did not support the four-factor model of the MT48 purported to assess the framework of MT used to construct the inventory. The authors reported that a substantial number of items did not load significantly on the factor on which they were initially included, suggesting that this may be a product of inadequate item content clarity. Except for the control subscale, the internal consistency estimates were adequate for the sub-factors. Evaluating the combination of findings, Gucciardi et al. (2012) recommend that, pending thorough conceptual structure re-examination and demonstrated factorial validity of the instrument as a MT measurement, practitioners and researchers should utilise the current version of the MT48 cautiously.

In direct response to Gucciardi et al.'s (2012) study and findings, Clough et al. (2012) criticise the bases of the results outlined. Specifically, Clough et al. (2012) suggest that insufficient review of the MT literature (e.g., prior studies providing support for the MT48) generates concern about the foundations for conducting the study and denoted inaccuracies in Gucciardi et al.'s (2012) report of information about the MT48. Clough et al. (2012) also contend that exclusive use of CFA and applying stringent cut-offs and regulations to establish the validity of an inventory is inaccurate, but rather, other psychometrics must be considered too (e.g., criterion validity). In addition, the use of students who participate in sport is questioned, as the sample may not be generalisable to all athletes, particularly professional and elite athletes. Clough et al. (2012) do accept that continued efforts are required to improve the MT48 and that the instrument is not without flaws, but the authors suggest that Gucciardi et al.'s (2012) study is inadequate for adjudicating finality about the validity of the MT48.

Recently, Sheard et al. (2009) generated the Sports Mental Toughness Questionnaire (SMTQ) as a multidimensional measure of MT. Incorporating data comprising quotes and themes from a number of other qualitative investigations, 10 coaches and 10 athletes were asked to provide their perceptions on the applicability of 53 items relative to MT. Analysing the responses of the participants, 18 of the original 53 items were retained. The remaining items were administered to 407 male and 226 female competitive athletes. Using principal axis factor analysis (PAF) to ascertain correlations among sub-factors, three subscales comprised of 14 items emerged: control, confidence, and constancy. The items are combined for a measure of global MT. In order to assess the psychometrics of the SMTQ, the 14-item questionnaire was administered to an alternative group of 351 males and 158 females. CFA corroborated the sub-factor and higher-order factor structure, indicating a strong model fit. Discriminant validity of the SMTQ was demonstrated in the weak to moderate correlations between the inventory and optimism (r = .23 to .38), hardiness (r = .14 to .33), and positive and negative affect (r = .12 to .49). The discriminative power of the SMTQ was found by discerning between males and females, age, and athletes competing at varied levels. Sheard et al. (2009) suggested the internal reliability (α > .72) of the SMTQ is adequate. Therefore, the outlined psychometric properties indicate positive preliminary suppositions of the SMTQ as a measurement of MT.

In a recent study, Crust and Swann (2011) compared the SMTQ and the MT48. Strong internal consistency was found for both inventories, and the SMTQ's global factor correlated positively and significantly with overall scores on the MT48. The analyses indicated that 44% of the variance between the SMTQ and MT48 could not be explained. Interpreting this finding, Crust and Swann (2011) suggest that, "while the MT48 and SMTQ are significantly related, it would appear that they are measuring somewhat different components of MT" (p. 219). They also outlined several other concerns within particular subscales. Two of the SMTQ sub-factors (constancy and control) and two of the MT48 sub-factors (life control and emotional control) revealed inadequate internal consistency (α < .70; Crust & Swann, 2011). As a result, Crust and Swann (2011) advocate supplementary efforts to improve the psychometrics of the aforementioned subscales included in both inventories.

One plausible explanation for the subsequent results may be due to the smaller group of participants incorporated to psychometrically validate both inventories in the study (Crust & Swann, 2011). Although Crust and Swann (2011) indicate that the MT48 is a more appropriate measure of MT as it assesses a range of areas outside of athletics, recent findings by Gucciardi et al. (2012) contradict this recommendation. Ostensibly, the divergent opinions about the use of the MT48 accentuate the current disagreements and debates about defining and conceptualising MT.

The absence of complete cohesion between the SMTQ and the MT48 raises various concerns. A prospective route for alleviating the inconsistencies between MT instruments is for researchers to design, develop, and validate inventories for specific sports, which may resolve selected issues surrounding the incoherence between inventories. Indeed, if the Bull et al.'s (2005) postulation is correct, different sports may require different degrees and distinctive types of MT. Considering this, a single multidimensional instrument omits adequate assessment of the MT elements related to specific sports.

2.4.1 Sport-Specific Mental Toughness Inventories

Several attempts have ensued to develop inventories aimed at assessing MT in specific sports. Gucciardi et al. (2009b) constructed the Australian football Mental Toughness Inventory (AfMTI). The instrument was developed from Australian Rules football coaches' with elite coaching and playing experience perceptions of the constituents of MT in Australian Rules football. These characteristics include: (1) sport intelligence, (2) work ethic, (3) self-belief, (4) self-motivated, (5) emotional resilience, (6) resilience, (7) tough attitude, (8) concentration and focus, (9) physical toughness, (10) personal values, and (11) handling pressure (Gucciardi et al., 2008). The inventory assesses four aspects of MT developed from the qualitative information obtained and characteristics identified: (1) desire success, (2) thrive through challenge, (3) tough attitude, and (4) sport awareness. Subsequently, Gucciardi et al. (2009b) assessed the scores of the AfMTI from parents, coaches, and players. The results denoted satisfactory discriminant validity, construct validity, and discriminative power. In addition, internal consistencies were moderate to strong (α = .73 to .89) across the four sub-factors. The resultant instrument is comprised of 24 items rated on a seven-point Likert-type scale ranging 1 (*false*) to 7 (*true*). Even though the initial outcomes support the validity and reliability of the AfMTI, the authors suggest further investigation of the inventory and associated psychometrics before extensively utilising the scale to assess MT in the context of Australian Rules football.

Similarly, Gucciardi and Gordon (2009) developed an inventory to evaluate MT in cricket (Cricket Mental Toughness Inventory; CMTI). Initially, the authors used semi-structured interviews to ascertain MT in five elite Australian and 11 elite Indian cricket players. Following the analyses, six domains of MT specific to cricket were delineated: (1) resilience, (2) cricket smarts, (3) self-belief, (4) affective intelligence, (5) desire to achieve, and (6) attentional control. Succeeding this, the authors developed 42 items pertaining to the six factors identified and administered the questionnaire to nine elite Australian cricketers.

Examining the initial administration findings, Gucciardi and Gordon (2009) made minor alterations to the original items (e.g., re-wording) and eight new items were added. The authors administered the collection of items to 433 Australian cricketers and 570 cricketers of different levels of ability from across the world. CFA supported a 15-item, five-factor inventory for measuring MT in cricket. Statistically discerning between the five factors provided discriminant validity support. Additionally, convergent validity of the measurement was supported in the modest correlations between the CMTI subscales and hardiness (r = .05 to .38), resilience (r = .35 to .54), flow (r = - .15 to .54), and burnout (r = - .15 to - .43). Adequate internal consistency of the inventory was also reported (α = .69 to .80). Gucciardi and Gordon (2009) recommend further studies replicating and verifying the psychometric properties established. Preliminary information, however, supports the factor structure, discriminant validity, internal consistency, and construct validity of the CMTI.

2.4.2 Observing Mental Toughness

Multiple instruments have been established to ascertain MT in a variety of general and specific sporting contexts (e.g., Clough et al., 2002; Gucciardi et al., 2009). Only rarely, however, have researchers attempted to employ direct observation techniques to examine MT in sport. In order to facilitate the alignment and continuity between theoretical and practical (e.g., intervention) aspects of MT, it is necessary to include behavioural observations to explicate the behavioural correlates of MT in sport-specific contexts (Crust, 2008). In one study attempting to facilitate this association in ice-hockey players, Davis IV and Zaichowsky (1998) asked several individuals involved with the players (e.g., coaches) to rate athletes according to five behaviourally oriented categories. The authors did not, however, delineate reasons for selecting the five domains. Additionally, standardised checklists were not developed, inhibiting analysis of the data generated. Although the necessity to integrate behavioural observations into the literature on MT is apparent, attempting to attribute behaviours to a psychological concept is challenging. Researchers are encouraged to conduct intra-sport studies to determine behavioural correlates associated with low and high MT, as there is an apparent dearth of research in this area.

At the current stage in the growth of MT conceptualisation, the most effective and widely utilised approach to assess MT is through self-report inventories and questionnaires. Although further validation and reliability endeavours are required to verify and improve MT inventories, the MT literature indicates self-report instruments are suitable for evaluating MT.

2.5 Mental Toughness and Related Psychological Constructs

Understanding the developmental foundations of MT as a construct, it is important to identify distinct but closely associated general psychological constructs. It is evident that there are at least three concepts relevant to appreciating MT as a construct. General psychological concepts afford a basic structure for MT in sport, which may assist in conceptualising and defining MT. Thus, understanding MT is promoted and extended by exploring important general constructs associated with MT.

2.5.1 Sense of Coherence

Antonosky's (1987) "sense of coherence" (SOC) is one psychological construct that has recently received attention in sporting contexts. SOC refers to a perceptual and cognitive orientation that has the propensity to influence appraisal of the situation, scenarios, and events individuals' experience (Antonovsky, 1987). In his SOC model, Antonovsky demarcated three factors encompassing a sense of coherence: (1) comprehensibility, (2) manageability, and (3) meaningfulness. *Comprehensibility* is the extent to which an individual rationalises information generated from internalizations and the external environment. *Manageability* refers to whether an individual perceives sufficient availability and adequacy of personal resources to effectively overcome distressing scenarios. The third component, *meaningfulness*, is the extent to which the individual self-perceives an influence on daily events and outcomes in life. Therefore, individuals with a strong SOC are able to intellectualise, make sense of, and interpret external and internal information, perceive stressors as manageable and controllable, perceive importance in life experiences, and possess a conviction that they are able to influence circumstantial outcomes. According to Antonovsky (1987), a high SOC is associated with a greater likelihood of perceiving stimuli as non-stressful. This is due to the belief that impending issues can be constructively resolved and the perception that the identified stressor is insignificant in comparison to other types of stimuli (Antonovsky, 1987).

In recent years, sport psychology researchers have examined the relevance of SOC in sport. Specifically, Fallby, Hassmen, Kentta, and Durand-Bush (2006) examined the connection between mental skills and personal control by administering the Locus of Control (LOC) Scale, the Ottawa Mental Skills Assessment Tool-3 (OMSAT-3), and the Sense of Coherence Scale to 198 elite athletes from Sweden. The results specified that athletes with higher SOC and internal LOC attained higher scores on the OMSAT-3 as compared to athletes with low scores on the SOC and LOC Scales. Hence, athletes with meaningful, controllable, and manageable perceptions of the world possess superior mental abilities. Considering the increasing prominence devoted towards ascertaining the role of mental skills in performing successfully in sport, Fallby et al.'s (2006) results reveal the role of SOC in fostering, maintaining, and improving mental skills important in athletics.

Although the sport psychology literature is devoid of investigations examining the association between MT and SOC, authors have insinuated that individuals high in MT self-perceive a conviction of control over scenarios, incidents, and adversity in athletics (e.g., Clough et al., 2002; Jones et al., 2002; Middleton et al., 2004). Therefore, further research appears necessary to thoroughly and more directly ascertain the relationship between SOC and MT, which may provide an indication of whether SOC may enhance or facilitate MT among athletes.

2.5.2 Learned Resourcefulness

MT and LR are characteristically comparable. LR denotes the attainment of abilities and behaviours through social interactions, facilitating successful completion and management of daily tasks without assistance from other individuals (Rosenbaum, 1983; Zauszniewski, 1995).

According to Zauszniewski (1995), physical and psychological well-being is endorsed by the capacity to independently overcome and manage everyday responsibilities. LR reflects an individual's aptitude to manage inner emotional and cognitive processes, enabling efficacious task completion. LR enables individuals to employ coping strategies that are more effective (Ronen & Rosenbaum, 2010). In particular, high LR is associated with more efficient coping when confronted with situational stressors (Rosenbaum, 1989). In one study, Serap and Joseph (2003) examined the relevance of LR in tempering the negative influence of academic pressure in 141 university students. The findings indicated that a high degree of academic stress did not affect the academic scores of individuals high in LR. Even though distinct from sport, LR appeared to moderate the influences of academic stress amid participants high in LR.

It appears as though LR and MT share several commonalities. In particular, athletes high in MT construe stressful situations or events as challenges or opportunities to thrive and prosper. The high emphasis on internally controlling cognitions, emotions, and successful coping under pressure or adversity, characteristics of LR, are also apparent in a number of outcomes and definitions of MT (e.g., Clough et al., 2002; Jones et al., 2002; Middleton et al., 2004). Recently, Cowden, Fuller, and Anshel (2014) found support for the strong relationship between MT and LR and the ability of LR to significantly predict approximately 62% of the variance of athlete reported MT. In fact, LR was the sole significant predictor of athletes' MT ratings when factors such as age, sex, and team rank were considered. Considering the commonalities between the constructs, these findings support some degree of interrelatedness or overlap between the constructs. In addition, the unexplained variance may signify the distinctions between the constructs, with certain components, such as achievement or self-motivation, not an apparent component of LR (Cowden, Fuller, et al., 2014). The authors noted that due to the low sample size and the cross-sectional design employed, a clear understanding of the relationship between the two constructs requires additional research attention. Despite modest reference having been made to the construct of LR in relation to the conceptualisation of MT and more recent empirical research endeavours, research in this area may provide meaningful information about the MT process and generate additional routes through which MT can be enhanced, either directly through MT interventions or indirectly through interventions aimed at other constructs (e.g., LR).

2.5.3 Cognitive Hardiness

Hardiness, as a construct, has been assimilated for use as a structural reference for developing a conceptual model of MT (e.g., Clough et al., 2002). The construct is a personality or cognitive style connected to sustained health and performing positively despite being exposed to stress (Kobasa, 1979). As a psychological characteristic, hardiness enables individuals to emerge unaffected during high pressured, stressful, and adverse circumstances (Crust, 2008). The term includes the quality of resilience, which assists individuals to persevere and successfully navigate challenging situations encountered. Kobasa (1979) delineated three components of hardiness: (1) control, (2) commitment, and (3) challenge. Hardiness has been investigated in an array of domains (e.g., the military). Skomorovsky and Sudom (2011a, 2011b) examined life satisfaction, training satisfaction, stress perception, hardiness, psychological health, and personality in candidate military officers undertaking basic training. It was found that hardiness positively impacted the psychological well-being of the participants. The authors concluded with the assertion that hardiness is a vital construct to consider relative to psychological well-being. In another study, Adler and Dolan (2006) examined stress associated with deployment, hardiness, and physical and psychological health outcomes in a sample of 629 soldiers in the U.S. Army. The outcome reflected that hardiness was positively related to psychological well-being before and after deployment. Specifically, the soldiers with lower levels of depression exhibited a higher degree of hardiness.

Evaluating the applicability of hardiness in sport emanates from evidence of the positive influence of hardiness on managing stress and associated superior psychological well-being. Maddi and Hess (1992), for example, correlated hardiness measured preceding and immediately following a season in a group 37 male basketball players with performance evaluations at the end of the season. The findings indicated a moderate correlation (r = .45) between post-season performance outcomes and hardiness. In another study, Sheard and Golby (2010) evaluated hardiness in a group of 1566 athletes participating in various sports and across diverse levels of competition (international, national, county, and club). The results suggested that athletes with higher levels of hardiness were playing at higher competitive levels. In particular, athletes competing at international levels, as compared to athletes competing at lower standards, evidenced greater degrees of hardiness.

Clough et al. (2002) used Kobasa's (1979) hardiness model as a sub-framework for MT conceptualisation. From Clough et al.'s (2002) perspective, there are commonalities between MT and hardiness. Specifically, research has found high levels of hardiness amid individuals with high MT (Sheard, 2009). For instance, Golby and Sheard (2004) sought to ascertain the associations between hardiness and MT in a sample of 115 rugby athletes playing in three standards of professional rugby: Division One, Super League, and International. A moderate positive correlation (r = .38) between the Personal Views Survey (PVS III-R) and the PPI was found, noting the inventories assess distinct yet similar characteristics. The PVS III-R and the PPI-A were administered to 49 elite male rugby athletes in order to ascertain the association between hardiness and MT relative to athletic performance (Sheard, 2009). The strong positive correlation found evidences correspondence and overlap between hardiness and MT.

While there is an undeniable relationship between hardiness and MT, there is an explicit need to conduct further research distinguishing the two constructs. In fact, some researchers have mistakenly confused the two constructs and combined the terms to represent the same construct (e.g., Jalili, Hosseini, Jalili, & Salehian, 2011). Such issues can only attribute to the current debates surrounding MT. Therefore, a thorough understanding and clarification of MT can only be afforded by discerning MT from other constructs.

2.6 Characteristics of Mental Toughness

The characteristics of MT have, in part, been appropriated by researchers investigating the psychological characteristics associated with other constructs. A significant quantity of MT research has been dedicated to ascertaining the psychological qualities related to the construct. Collectively, multiple elements comprise MT. The primary characteristics and most frequently referenced MT constituents include: (1) self-belief, (2) coping strategies, (3) achievement motivation, (4) achievement goals, (5) concentration, (6) physicality, (7) mental imagery, (8) control, (9) optimism, (10) attributional style, (11) flow, (12) attitude, and (13) self-awareness.

2.6.1 Self-Belief

The United States Olympic Committee (2008) and Vealey, Hayashi, Garner-Holman, and Giacobbi (1998) suggest that self-belief is the primary and central factor responsible for positive sport performance. Gucciardi and Gordon (2009) incorporated 16 elite male cricketers to evaluate self-belief in sport. Based on the findings, the authors defined self-belief in athletics as "an unshakable self-belief in your physical ability to perform in any circumstance" (p. 1297). According to the group of cricket players, cricketers high in MT possess self-belief that is persistent and resolute against opponents of any competitive standard and reputation. In another study involving 11 Australian football coaches, Gucciardi et al. (2008) utilised interviews to ascertain MT within the theoretical framework of PCT. The coaches classified self-belief as the single most important MT characteristic. Coulter et al. (2010) assessed the MT interview replies from parents, players, and coaches of male Australian soccer players. The results indicated self-belief is one of the decisive features of mentally tough football players. In conjunction with and supporting prior research (e.g., Jones et al., 2002), self-belief appears important in numerous sporting domains.

Despite assertions that self-belief plays a significant role in competitive sport (e.g., Coulter et al., 2010) the relationship between self-belief and MT requires further exploration. Considering the potential prominence of self-belief as a factor of MT, additional research in this area is needed.

2.6.2 Coping Strategies

Methods and coping approaches function as psychological characteristics that contribute substantially to the construct of MT. Coping is the "constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141). Lazarus and Folkman (1984) indicated that there are two types of coping strategies: problem-focused and emotion-focused coping. Problem-focused coping seeks to eradicate stressors completely, whereas emotion-focused coping intends to control and moderate emotions associated with experiencing stressors (Lazarus & Folkman, 1984).

In sport, coping strategies describe the techniques or approaches used by athletes to manage external demands to facilitate successful performance (Gould, Finch, & Jackson, 1993).

In their qualitative study, Gould, Finch, et al. (1993) assessed the strategies used to cope effectively in a sample of U.S. national figure skaters, categorising the strategies used into 13 dimensions. The results indicated that the athletes used specific coping strategies based on the kind of stressor experienced. In particular, when confronted with physical problems (e.g., injuries), the elite skaters reported frequent use of coping strategies such as implementing healthy eating patterns, thinking rationally and using self-talk, training smart and hard, and centring attention on preparing mentally before competing and anxiety management. When experiencing psychological struggles (e.g., self-doubt), the regular coping strategies employed included focusing positively, training smart and hard, preparing mentally before competing and anxiety management. In contrast, environmental difficulties (e.g., resource deficits) were reportedly dealt with by employing prioritisation and time management, isolation, and deflection. When pressure to perform was high, the coping strategies used by the figure skaters included thinking rationally and using self-talk, social support, hard and smart training, positive focus and orientation, and using mental preparation before competing and managing anxiety. Therefore, Gould, Finch, et al.'s (1993) qualitative findings indicate that figure skaters, and, perhaps, other athletes (e.g., tennis) may employ a specific coping strategy or collection of coping strategies depending on the kind of stressor confronting them.

Several researchers have supported athletes utilising a particular coping strategy or group of strategies in sport (Anshel & Sutarso, 2007; Anshel, Williams, & Hodge, 1997; Rawstorne, Anshel, & Caputi, 2000). Specifically, Anshel and Si (2008) investigated the application of a precise strategy for coping with types of stressor in 391 elite female and male Chinese athletes. The results indicated support for the use of an approach or avoidance style of coping depending on the kind of encountered stressor. Avoidance coping is the retraction (physical or psychological) of an individual in response to a stressful scenario, whereas approach coping represents an individual's endeavour to control or resolve a stressor (Krohne, 1993, 1996).

The application of avoidance or coping strategies on performance outcomes has been examined in various studies of sport. Wang, Marchant, and Morris (2004), for instance, investigated coping and performance amid 88 recreational and elite basketball players. A significant association between an *approach* coping style and a decline in performance under pressure (choking) was found. Specifically, performance was poorer on a basketball free throw exercise amid players who employed an approach style compared to athletes who employed an avoidance coping style. However Anshel and Anderson's (2002) study contrasted these findings in a group of 36 competitive Australian male table tennis athletes. They established a strong association between the use of an *avoidance* style of coping and higher distress and a decrement in performance accuracy in the players. Krohne and Hindel (1988) suggested that using avoidance coping strategies positively influenced table tennis athletes. Additionally, Wang et al.'s (2004) results suggest that an avoidance coping style is not related to a decrease in performance. The disparate results denote uncertainty in delineating the benefits and consequences of employing avoidance or approach coping styles. It is clear, however, that the use of coping strategies are integral to assisting an athlete to overcome adversity, and may substantially influence an athlete's capacity to demonstrate MT.

Gould, Eklund, et al. (1993) suggested coping strategies are related to MT and emotional control. Researchers have attempted to identify the kinds of coping strategies commissioned by elite athletes and athletes high in MT. Studying Olympic wrestlers, Gould, Eklund, et al. (1993) found that the athletes employed a variety of coping strategies in different ways depending on the context and scenario. In another study, Nicholls et al. (2008) administered the Coping

Inventory for Competitive Sport and the MT48 to 677 athletes ranging from 18 and 58 years in age. The analyses revealed the two constructs were positively related, which denoted the relevancy of coping to MT. Particularly, individuals high in MT engaged in more efficient problem-focused coping strategies compared to an avoidance style of coping.

The overlap between certain characteristics of MT and coping strategies (Clough et al., 2002; Crust, 2009; Loehr, 1995) has increased the interest in the strategies employed by mentally tough athletes to cope effectively with stressors. Indeed, Jones et al. (2002) pronounced a range of psychological qualities affiliated with MT, and the function of MT appears exceptionally close to coping strategies. However, a comprehensive understanding of MT is warranted to distinguish coping strategies from MT. Further researchers need to identify the aspects differentiating coping strategies from MT and elucidate the responsibility of coping strategies in relation to MT and successful sport performance.

2.6.3 Achievement Motivation

The ability to maintain a strong sense of motivation towards achieving goals is critical to the success of athletes. Covey (2003) suggests that intrinsic self-determination is indispensable for sustaining motivation. In addition, Connaughton and Hanton (2009) describe motivation as among the principal components of MT. The supposed importance of motivation emanates from the positive effects of motivation that epitomise MT and MT outcomes. The range of positive consequences associated with high self-determined motivation include consistent and sustained focus and concentration, applying superior effort towards the sporting activity or activities, using effective coping strategies during stress, and superior performance (Vallerand, 2007). Connaughton, Wadey, Hanton, and Jones (2008) examined elite international athletes from various sports, finding several factors that were important in an athlete's early childhood years for cultivating a persistent motivation to succeed. Such influences include the determination of the athlete, enjoying training and associated experiences, receiving a personally appropriate and preferred amount of encouragement towards achieving future success, a suitable amount of parent, coach, and grandparent involvement, the coach's motivational ability, and mastering sporting skills.

In another study endeavouring to address the association between achievement motivation and MT in athletics, Gucciardi (2010) used the Sport Motivation Scale – 6 (Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007) to examine the relationship between the two qualities in male adolescent Australian football players. The authors found that the sample of athletes considered intrinsic motivation and external regulation as the strongest forms of motivation. Additionally, Gucciardi (2010) clustered the athletes in moderate and high MT groups, found participants delineated into the high MT group reported higher levels of identified regulation, external regulation, and intrinsic motivation that differed significantly from participants in the moderate MT group.

Though Gucciardi's (2010) predication that intrinsic motivation would be important among athletes high in MT was supported, the significance of external motivation in football players high in MT is inconsistent with prior research (e.g., Bull et al., 2005). Gucciardi (2010) contends that discrepancies between findings are a function of the type of sport, suggesting that the environment surrounding Australian football differs from other sports, as there is immense competitiveness and a strong desire to achieve. Gucciardi (2010), however, acknowledged that the findings could not be contrasted with other studies involving adolescents, as it was the first time the Sport Motivation Scale-6 and Achievement Goals Questionnaire for Sport were used with adolescents. Even though the outcomes could not be compared to findings from other studies with adolescents, Gucciardi's (2010) results distinctly reveal the relevance of motivation in relation to MT. However, limited literature is available to corroborate Gucciardi's findings in Australian football, other specific sports, and general sporting settings. In other words, examinations substantially confirming the perception that motivation is fundamental to MT remain to be conducted.

2.6.4 Achievement Goals

Achievement goals, as a stipulated MT quality, depend highly on an individual's motivation to accomplish and achieve. Two distinct types of achievement goals have been identified, which are contingent on the materialisation of competency: mastery (increasing mastery or developing competency of the activity) and performance goals (demonstrating competency relative to others; Elliot, 1999). Additionally, achievement goals depend on the methodological approach used to engage in an activity. That is, one may either approach positive consequences or evade negative consequences.

Elliot and McGregor (2001) conceptualised these factors into a 2 x 2 achievement goals structure. In particular, there are four ways an achievement goal can transpire: performance-approach (achieving the degree of competence expected), performance-avoidance (avoidance of pursuing the competence expected), and mastery-approach (achieving competency in activities), and mastery-avoidance (avoiding competency in activities). Outside of MT, the sport psychology literature supports the postulation that high self-perceived competence is associated with engagement in approach goals. Individuals with low self-perceived competence, on the other hand, typically employ the use of avoidance goals (Morris & Kavussanu, 2007; Nien & Duda, 2008). Jointly, the achievement goal findings may have important implications for MT.

Recently, research has sought to ascertain the kinds of achievement goals employed by mentally tough athletes. Gucciardi (2010), for instance, investigated the achievement goals used by adolescent male Australian football athletes. The findings suggested that the athletes favoured mastery-approach goals more strongly as compared to other achievement goals, and the lowest rated achievement goals were performance-avoidance goals. When the sample was grouped according to moderate and high MT, athletes in the high MT group reported superior use of performance-approach and mastery-approach goals compared to the group with moderate MT. In particular, the high and moderate MT groups were best discriminated by mastery-approach goals. Amid adolescent Australian soccer athletes, using approach goals (specifically mastery-approach goals) is associated with MT and may be beneficial for MT development, and a combination of performance and mastery achievement goals is commissioned by male adolescent Australian football players high in MT.

Gucciardi's (2010) findings are, to some extent, consistent with Bull et al.'s (2005) study; elite cricket players with high MT were found to typically utilise performance-approach goals. This may be a function of Bull et al.'s qualitative approach or due to the sport-specific nature of the studies and evidence of precise demands in each sporting context. Even though the work of Gucciardi (2010) and Bull et al. (2005) comprise the few endeavours to investigate the role of performance goals relative to MT, the authorships' research contributions to further understanding MT cannot be discounted. Supplementary studies examining the achievement goals mentally tough athletes employ (sport-specifically and generally) will assist in comprehensively ascertaining the relationship between both attributes.

2.6.5 Concentration

Concentration is a cognitive ability associated with MT. The likelihood of performing successfully when experiencing adversity is greater among athletes with the ability to maintain focus and concentration (Perry, 2005). Vernacchia (2003) suggests that athletes high in MT are able to adapt to environmental demands and are mentally disciplined. Even though the focus of Vernacchia's research attention was on the link between focus and sport performance, the author delineated three athletic dimensions requiring concentration: pre-competition (decision-making), during performance or competition (performance), and post-competition (evaluation). Immediate, short-term, and long-term subsequent performance is, in part, dependent on the ability of athletes to sustain focus consistently throughout these periods of sport participation. Certainly, the capacity to maintain concentration or focus during adversarial adversity at various phases of competition appears important. However, concentration or focus, relative to MT in sport, has acquired scant consideration.

2.6.6 Physicality

Based on his experiences as a sport psychology practitioner, Loehr (1995) posited physical fitness as a requisite and a promoter of MT. According to the qualitative analysis of the interviews that were conducted with 10 elite intercollegiate coaches from a variety of sports, Weinberg, Butt, and Culp (2011) identified creating a difficult and challenging practice environment as a factor that enhances MT, supporting Loehr's (1995) position. Coulter et al. (2010) reported physical toughness as a fundamental component of MT in soccer, providing additional impetus for a physical component to MT.

Quantitative investigations have also assessed the appropriateness of this assertion. Crust and Clough (2005) reported a superior ability to withstand and endure pain during a weight holding test amid individuals with high MT as opposed to their low MT equivalents. Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al. (2012) found significant relationships between moderate and vigorous physical exercise regimes and MT in a group of 284 high school adolescents. Additionally, adolescents who met the recommended physical activity criteria scored significantly higher on certain MT48 subscales compared to adolescents that did not (e.g., control, challenge, commitment). The authors suggest that physical activity and sport involvement promotes MT procurement.

Using PCP as a framework for investigating MT in Australian Rules football, Gucciardi et al. (2008) denoted physical toughness as fundamental to characterising MT. In another study, Coulter et al. (2010) identified and included physical toughness – overcoming the pain threshold and enduring injury, fatigue, and pain to sustain focus and maintain high performance levels during sport competition – as one of the primary attributes of MT, which was regarded by athletes, coaches, and parents as the third most important component of MT in soccer. Though it is apparent that MT may be characterised, in part, by an athlete's actual or perceived physical ability, fitness, or strength, there is scant indication as to whether physical facets (i.e., building physical capabilities) improve MT or whether individuals high in MT are more inclined to train harder or more intensely. Additionally, due to the relative absence of this type of MT research, particularly across varying sporting contexts, the relevance of physical toughness or abilities to all sports remains speculative.

2.6.7 Mental Imagery

Mental imagery is an important contributor to successful athletic performance (Beauchamp, Bray, & Albinson, 2002). The cognitive concept is denoted as a mental training technique associated with using mental visualisations to enhance performance, as a motivation tool, to alleviate anxiety, and to maintain control (Strachan & Munroe-Chandler, 2006; Vadocz, Hall, & Moritz, 1997). Until recently, mental imagery has received little attention relative to MT. In a sample of 107 competitive athletes, Crust and Azadi (2010) evaluated the psychological strategies employed by mentally tough athletes during practice and competition. The use of imagery was not significantly related to MT, suggesting that MT may not be associated with greater use of mental imagery techniques. However, identifying the need to conduct further examination into the use of mental imagery by mentally tough competitive athletes, Matti and Munroe-Chandler (2012) evaluated the use of specific mental imagery techniques in a group of 151 university athletes. The results indicated that motivational general mastery (MG-M) imagery (i.e., images of mental fortitude, being in control, and confidence) was the strongest predictor of global and the specific subscales of MT as measured by the MT48. Additionally, motivation general-arousal (MG-A) imagery (i.e., images associated with competitive arousal and anxiety) emerged as a predictor of the confidence, challenge, and control subscales of the MT48, cognitive specific (CS) imagery (i.e., imagery involving ability to execute certain skills) was associated with the sub-factor of confidence, and the use of cognitive general (CG) imagery (i.e., imagery associated with repeatedly reviewing strategies or tactics) was related to commitment, control, and challenge. These results contrast prior findings (e.g., Crust & Azadi, 2010), but this may be due to the use of a comprehensive mental imagery instrument.

The conjunctive results suggest that mental imagery is related to MT and that mentally tough athletes do utilise mental imagery. It does appear, however, that MT is associated with the use of specific types of mental imagery (e.g., MG-A) and precise types of mental imagery according to the particular aspect of MT (e.g., CS imagery for confidence). Although recent results suggest mental imagery is important amid MT, evaluating the use of mental imagery among athletes competing in specific sports is required to determine how mental imagery use differs according to the type of athlete and sporting context.

2.6.8 Control

According to Loehr (1995), the ability to control one's attitude, attention, and emotions are characteristic of mentally tough athletes. Control has been included as a subdomain in a conceptual framework of MT (e.g., Clough et al., 2002). In particular, Clough et al. (2002) suggest that an athlete's reaction to or manner of dealing with performance fluctuations, personal mistakes, penalisations, prejudiced crowds, and unfair umpiring decisions is related to the amount of control exercised by the athlete.

Crust (2009) found evidence indicating that individuals high in MT experience similar intensities of adverse emotions compared to low mentally tough athletes. He concluded that athletes, regardless of MT levels, experience similar affect. However, during situational adversity, mentally tough athletes control their emotions more efficiently. Perhaps, the ability to control emotions is due to the ability of a mentally tough athlete to appraise stressors as low in severity (Kaiseler et al., 2009). Gucciardi et al. (2009a) suggest that another aspect of control, attentional control, is a characteristic of MT that is applicable, relatively stable, and relevant in a range of sports. Thus, it appears as though mentally tough athletes are more successful at controlling emotions in adversarial situations (Crust, 2009) and are able to sustain and control attention more efficiently.

Reiterating Crust's (2009) findings, Horsburgh et al. (2009) found that high mentally tough individuals perceive stressors as less severe compared to athletes low in MT. Consequently, mentally tough athletes self-perceive superior control over stressors. In a study investigating MT differences between athletes participating in different rugby league levels, Golby and Sheard (2004) established that higher-level rugby players are able to control attention and negative emotions better compared to lower-level rugby athletes. Perhaps, some features of control are critical for athletic success, which is among the primary reasons for accentuating the importance of MT in sport. Despite a range of conceptual models and definitions of MT that have incorporated some aspect of control as a characteristic of MT, the extent to which control assists athletes high in MT is underdeveloped (Crust, 2009). Though the relevance of control as a component of MT reducing perceptions of stressor or stress intensity has been evaluated, it is necessary to determine how various types of control or subtypes of control may positively influence multiple areas of athletic functioning and be positively influenced by MT.

2.6.9 Optimism

Developments in the field of positive psychology are partly responsible for the recent surge towards examining the relevance of optimism in athletics. Optimism is associated with: (1) promoting recovery from negative scenarios of events, (2) high quality sport performance, and (3) improving or maintaining athletic performance during adverse circumstances (Seligman, 2006). A number of studies (e.g., Gould et al., 2002; Nicholls et al., 2008) have found a positive relationship between optimism and MT, indicating optimism is a factor associated with MT. In another study, Norlander and Archer (2002) found that amongst cross-country skiers, ski-marksmen, but not swimmers, high optimism scores significantly predicted athletic performance. Interpreting the results, optimism may be fundamental to athletic performance in certain sporting contexts, but not others. Additionally, optimism is linked to lower pre-competition anxiety levels (Wilson, Raglin, & Pritchard, 2002). Perhaps, this implicates the role of effective coping in relation to MT. In other words, partial responsibility for the coping efficacy of athletes high in MT may be attributed to optimism.

Although initial research endeavours depict the function of optimism relative to MT, further study to determine the precise role of optimism in facilitating athletic performance outcomes is required. In addition, confirmation of whether optimism may be an integral component of MT needs to be attended to in a diverse range of sports.

2.6.10 Attributional Style

Examinations of optimism in sport often entail significant attention towards attributional styles. Attributional style is defined as the manner or approach through which one rationalises explanations for the occurrence of events (Buchanan & Seligman, 1995). Optimistic individuals attribute or perceive negative incidents as occurring due to unstable, external, and specific causes, whereas pessimistic persons attribute or characterise negative events to stable, internal, and global causes (Seligman, 1990). In a specific study examining the attributional styles of swimmers, Seligman, Nolen-Hoeksema, Thornton, and Thornton (1990) provided false negative feedback to participants following a swimming performance (i.e., the swimmers were told they had swum slower than they had in actuality). On the second swim, the times of those swimmers with optimistic attributional styles did not differ from their initial times, whereas the times of participants with pessimistic attributional styles were significantly slower on the second attempt in comparison to the initial swim. In addition, compared to optimistic attributional style swimmers, pessimistic attributional style swimmers recorded a significantly greater number of weak competitive performances.

In another study, Gordon (2008) evaluated the attributional styles of 20 male football players. It was found that, losing or winning aside, an attributional style of optimism was associated with greater performance consistency. During a loss, an attributional style of pessimism was related to poorer performance. Collectively, the findings from Seligman et al. (1990) and Gordon (2008) suggest that expecting, anticipating, and possibly accepting defeat may ensue inferior performance among pessimistic attributional styled individuals. Therefore, with respect to sport, attributional styles may have a strong influence on performance outcomes.

An optimistic attributional style is related to positive responses to stressors, adversity, and difficulty, and is associated with reduced stress susceptibility (Peterson & De Avila, 1995; Rettew & Reivich, 1995). Evidently, optimistic attributional styles and responding positively or defending against adversity or stress are positively related. This suggests that if attributional styles are malleable, can be developed or improved, and are impressionable, augmented MT may result from the promotion of optimistic attributions.

2.6.11 Flow

Developing initially from the positive psychology realm, with more recent applications to athletic domains, flow (state) refers to (1) an optimum level of experience resulting from complete engagement in a particular activity and (2) a state devoid of conscious efforts to facilitate or demonstrate performance excellence (Csikszentmihalyi, 2000). The intensity, duration, and frequency of flow experiences are dependent on various personality characteristics (dispositions) that promote or enhance the occurrence of state flow experiences (Csikszentmihalyi, 1990). In the positive psychology literature, nine aspects that contribute to and encompass the experience of flow have been identified: (a) loss of self-consciousness, (b) an autotelic experience, (c) clear goals, (d) balance between challenges and skills, (e) complete concentration on the present task, (f) unambiguous feedback, (g) the merging of action and awareness, (h) a sense of control, and (i) transcendence of time (Csikszentmihalyi, 2000). Importantly, Jackson and Eklund (2002) provided support for the appropriateness of these dimensions in sport. In addition, many of the flow constituents correspond or resonate with the primary facets of MT, including challenge (Clough et al., 2002), control (Clough et al., 2002; Sheard et al., 2009), and concentration or focus (Vernacchia, 2003). The assimilating aspects suggest that MT and flow possess areas of similarity. In a recent examination of MT and dispositional flow in a group of 135 club and university athletes, Crust and Swann (2013) found that total MT and each of the sub-factors included in the MT48 were positively and significantly related to overall flow frequency scores. In conjunction with Crust and Swann (2013) and their findings, MT may be an important factor for catalysing or promoting flow experiences, though this does not suggest that flow experiences are assured amid the mentally tough. Though the study contributes to extending the understanding of MT, particularly as it relates to other psychological characteristics, further research is necessary to determine whether athletes high in MT experience heightened levels of state flow experiences, particularly in specific sporting contexts such as competitive tennis.

2.6.12 Attitude

Attitude is strongly related to yet separate and distinct from the MT qualities of attributions and optimism. Gucciardi et al. (2008) denoted that mentally tough athletes possess a "tough attitude," defining attitude in relation to MT as "an unshakeable, tough attitude directed towards becoming a champion of the game" (p. 271). In other studies, Bull et al. (2005) and Thelwell et al. (2005) suggest a primary constituent of MT is an optimistic, positive, and tough attitude. Despite researchers' suggesting a "tough attitude" promotes athletic performance (e.g., Kuehl, Kuehl, & Tefertiller, 2005), there is a lack of sufficient effort towards defining and delineating what a "tough attitude" is in relation to MT in sport. It is feasible to assume that attitudinal toughness cultivates or fosters determination and perseverance. However, additional evidence is required to ascertain the role of attitudinal attributes in sport-specific MT.

2.6.13 Self-Awareness

Self-awareness is described as a state of self-directed attention allowing the self to assess and examine behaviours, emotions, and cognitions (Duval & Wicklund, 1972). Although one may perceive and cognitively process external information without actively knowing it (consciousness), self-awareness encompasses the ability to reflect on the perception and processing of stimuli (Morin, 2011). Morin (2006) suggests that terms including reflective or metacognition suggest that self-awareness is a continuum comprising varying states of self-awareness. In his book on MT, Loehr (1995) suggests that growth towards MT can only be achieved through self-awareness and self-understanding. From his perspective, self-insight into emotions and cognitions (e.g., insecurity) promotes resilience, strength, and MT. Loehr's (1995) postulation is not empirically driven and little prominence has been devoted towards experimentally investigating the relationship between self-awareness and MT.

In a study involving elite cricketers, Bull et al. (2005) qualitatively established *thinking clearly* (awareness, focus, and control of thoughts) as an essential component of MT. Gucciardi et al. (2008, 2009b) noted that adolescent Australian Rules footballers considered increased self-awareness as a promoter of MT. However, the authors did not specify what embodied self-awareness. Despite recent qualitative findings, relatively little is known about the emotional and cognitive self-awareness of mentally tough athletes. Supplementary MT research involving self-awareness may stimulate appreciation of how MT operates. For instance, self-awareness may foster cognitive and emotional control among those high in MT. Quantitative investigations are necessary to resolve the link between MT and self-awareness in multiple sporting (e.g., tennis) and non-sporting domains, and perhaps, may provide a foundation for establishing how self-awareness assists mentally tough individuals.

2.7 Individual Differences in Mental Toughness

2.7.1 Gender

Though gender-specific MT research endeavours are scant, there have been attempts to contrast the MT of males and females. In one study, Nicholls, Polman, Levy, and Blackhouse (2009) found significantly higher global MT and subscale MT scores on the MT48 amid male athletes as compared to their female counterparts. The findings may indicate that the characteristics comprising MT may be more appropriate to male as opposed to female athletes. On the other hand, perhaps MT attributes are more intensely fostered due to the experiences and sporting environments to which male athletes are exposed. Along these lines, Nicholls et al. (2009) suggest that differences in MT may be the result of socialisation processes. In a non-sporting study, Gerber et al. (2013) found MT differences between female and male youths, with males evidencing higher MT at baseline and at a 10-month follow-up. In another study, Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al. (2012) also reported higher MT scores among male adolescents compared to females. These findings support the general contention that males generally possess superior confidence, self-esteem, and self-efficacy (Nicholls et al., 2009; Nicholls et al., 2011; Patton, Bartrum, & Creed, 2004), characteristics comprising MT.

Other studies, however, have not found support for gender MT differences. Crust (2009), for instance, in a sample of 55 men and 57 women, reported similar male and female MT levels. In another study, Crust and Azadi (2010) found that female and male athletes did not differ on MT. These reports contrast other findings (e.g., Nicholls et al., 2009), which suggests that further research is necessary to ascertain gender differences in MT, possibly at a sport-specific level.

Contributing to the difficulty in decisively determining gender MT differences, there are indications that MT perceptions diverge according to gender. Specifically, although Cowden (2012) found significant differences between the MT of male and female elite tennis players, there were a number of discrepancies between male and female tennis athletes in the ratings of the importance and relevance of a number of MT items included in the SMTQ to elite tennis. This may indicate that misunderstanding and misconstruing MT remains prevalent, particularly among athletes. On the other hand, it may be that male and female athletes, at least in elite tennis, differ in what they consider constituents or facets of MT. Confirmations of this perspective may suggest that investigations are required to evaluate whether MT should be conceptualised gender-specifically, with the characteristics of MT differing according to whether an athlete is male or female. Indeed, if certain previously identified characteristics of MT are irrelevant to the MT of females, this may distort MT scores to reflect higher MT among males. Clearly, further examinations are required to evaluate the appropriateness or accuracy of this supposition, but there is a necessity to determine whether the conceptual composition of MT differs according to gender, and, possibly, the differences between each gender's sporting demands, pressures, and challenges.

2.7.2 Culture

In conjunction with inadequate gender-focused MT research, culture and associated factors, relative to MT, have largely been neglected. In fact, studies examining cultural differences in the MT of athletes and non-athletes have yet to be conducted. However, there are a number of studies that may be compared for cultural comparisons of MT. For example, Bull et al. (2005) examined MT constituents in elite English cricketers, whereas Gucciardi and Gordon (2009) assessed MT in elite Australian cricket players. Though the studies were both qualitative and were divergent in their purposes, the studies had a number of comparable findings including the characteristics of self-confidence/self-belief, achievement and desire for success, resilience, and control of cognitions and concentration. However, the studies differed in certain facets, particularly as Bull et al. (2005) identified a variety of additional constituents of MT (e.g., willingness to take risks, self-reflection, and belief in making a difference). Thus, the variances in the cricket culture and experiences of elite English and Australian cricketers may afford explanation for the discrepancies in the delineated characteristics of MT in each of the studies.

Thelwell et al. (2005) examined MT in the context of elite soccer amid English soccer athletes, whereas Coulter et al. (2010) investigated MT amid Australian soccer athletes. The studies corroborated on a number of aspects of MT, including self-belief, maintaining focus, exhibiting emotional control, and the ability to cope under pressure. However, the studies' contrasted one another in various aspects. In particular, Thelwell et al. (2005) identified "having a presence that affects opponents" and "wanting to be involved [in the game] at all times" (p. 329) as characterising MT, whereas Coulter et al. (2010) outlined facets including personal values and being a risk taker as integral to MT; both facets were unidentified in the opposing study. Perhaps, the overlap and divergence between the findings from the two studies suggest that soccer is associated with a core collection of MT attributes, but the type of soccer environments (i.e., experiences, training programs, and pressures) associated with Australia and England are culturally distinct, with elements of the *soccer culture* in each country having a strong influence on the development of particular MT attributes. However, absolutist interpretations of the findings are indeterminable, though there is a necessity to more objectively contrast possible cultural differences in MT.

Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al. (2012) indicated that two items included in the original MT48 detracted from the reliability of the instrument. The authors suggested that this may be because the items were less applicable to the group of participants (German and Swiss adolescents) compared to the MT48 validation sample, denoting possible cultural attribute differences in MT (Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al., 2012). Without conducting cross-cultural discrimination of MT characteristics and instrument items, however, cultural differences in MT remain speculative. Thus, further studies are required that adopt similar methodological approaches for assessing and determining MT in order to conduct cross-cultural comparisons, particularly cross-culturally oriented studies with participants from an array of countries and backgrounds. Considering the cultural diversity inherent to the context of South Africa, evaluating and comparing the conceptual dimensions and characterisation of MT and contrasting findings to other countries is critical for furthering the sport psychology's understanding and demarcation of MT, particularly in specific sporting domains.

2.8 Modifying, Developing, and Improving Mental Toughness

Although MT requires further clarification, researchers have recently attempted to identify the developmental capacity of MT. The ability to foster and develop MT would afford insight and frameworks for intervention strategies. Due to the anticipated and inferred athletic performance outcomes associated with MT improvement, studies have ensued to establish the way in which biological and environmental factors distinctly and interactively influence MT. Horsburgh et al. (2009), for instance, found that differences in MT among individuals are a result of a mixture of shared biological and unshared factors environmental factors. The notion that MT is at least partially impacted by particular environmental factors is becoming increasingly accepted.

Bull et al.'s (2005) findings support the developmental aptitude and malleability of MT. In the study, the sample of cricket players attested to the positive influence of environmental experiences in early childhood on MT development. Similarly, in a group of young adolescent cricketers (*M* age = 16.15 yrs.), Gucciardi (2011) evaluated the relevance of both positive and negative incidents and experiences on MT development. His findings demonstrated that negative peer experiences and initiative experiences influenced MT development the strongest. Gucciardi (2011) did find an assortment of other developmental elements associated with MT, but the findings indicate that environmental factors (e.g., initiative experiences and interpersonal relationships) can operate as MT developers. Jones and Parker (2013) recently evidenced supplementary support for the relationship between positive experiences (during youth) and MT in an older adolescent sample (*M* age = 19.48 yrs.) of 299 multisport participants, with initiative experiences evidencing the strongest association with MT. The authors indicated that 14% of the variance of MT was accounted for by youth experiences, leading them to assert that MT is comprised or influenced by a variety of factors inside and outside of sport.

Connaughton, Hanton, and Jones (2010) have also afforded subsequent support for the developmental capacity of MT. Elite athletes, coaches, and sport psychologists were interviewed to ascertain the critical positive or negative events associated with fostering certain aspects of MT during particular developmental phases. The authors found that developing MT involves a long-term dynamic process influenced by multiple factors such as motivation, relationships with significant others (inside and outside of sport settings), and experiences internal and external to athletic domains. The influence of these factors occurs through periods denoted as early, middle, and later years. A fourth phase, maintenance years, succeeds the later years stage and is explicitly related to factors implicated in MT maintenance, such as the support of personnel inside and outside sporting contexts, effectively using mental skills (e.g., controlled imagery, self-talk, and positive thinking), and a relentless desire to succeed.

In another study, Gucciardi (2009) examined the MT development in two participant groups of adolescent Australian Rules football athletes. One group of participants were exclusively invested in Australian Rules football, while the other group of athletes participated in Australian Rules football during winter seasons and another sport in summer seasons. The authors evidenced MT developmental differences between the two groups, finding that the athletes exclusively participating in Australian Rules football exhibited stable levels of MT across all four factors evaluated by the MTI (Gucciardi, 2009). The distinction between the two groups of adolescents indicates the impact of specific sporting contexts on the development of MT.

Drees and Mack (2012) evaluated whether MT improved over one season in a group of 54 high school wrestlers. Although older participants self-reported higher MT, mean MT score comparisons between collegiate freshmen compared to seniors increased by approximately seven points. Greater MT was evidenced among athletes with superior achievement levels, but the MT of the wrestlers did not improve significantly over the course of the season. The authors contend that, although MT can be enhanced, improved, and developed, this process occurs gradually over the course of numerous years.

Evidently, researchers have determined and outlined the capacity for MT to develop and the influence of environmental factors on MT. Even though the importance of the outlined findings cannot be discredited, a lack of MT clarification as a construct is recognisable. Comprehensively distinguishing MT from other psychological constructs is imperative for identifying the intervention techniques and strategies aimed specifically at developing or improving sub-factor and global MT.

2.9 Approaches to Improving Mental Toughness

Empirical support for developing and improving MT through intervention techniques and strategies aimed at specific characteristics or mental skills is inconclusive and understudied. Loehr (1995) delineated multiple strategies for enhancing MT, some of which are related to new sport skill acquisition, while other techniques pursue the modification of cognitions and behaviours. These strategies emanate from his practical intervention experiences suggesting that athletes can develop, maintain, and improve MT levels (Loehr, 1995).

In an empirical investigation with adolescent swimmers involved in a seven-week psychological skills development and intervention program, Sheard and Golby (2006) found significant post-intervention improvements in the psychological profiles of the athletes, including MT. The training program, however, improved hardiness, which may explain performance improvements. Gucciardi, Gordon, and Dimmock (2009c, 2009d) assessed the success of two psychological skills intervention programs amid two samples of adolescent Australian Rules football athletes. Reports by parents, coaches, and athlete self-reports indicated that MT increased post-intervention, suggesting the efficacy of each program was similar (Gucciardi et al., 2009c, 2009d). In another study, Martin and Toogood (1997) outlined a cognitive behavioural training program for improving psychological profiles of figure skaters. The authors comprehensively detailed the program and reported that the parents, coaches, and participants were satisfied with the program. However, little is known about whether the program improved participant MT, but the study does exemplify sport-specific research involving training and intervention programs to accommodate contextual variants of MT.

In contrast, other researchers have aimed at improving specific characteristics associated with MT, such as optimism and attributional styles. In particular, intervention approaches to alter the attributional styles of athletes have been designed. Orbach, Singer, and Price (1999) examined the influence of attribution training in a group of 35 college novice tennis athletes. In the group offered post-performance feedback instructing them that performance was associated with controllable and stable elements, the impact of attributional style training was positive. In relation to the tennis performance task, the attributions were improved and positively altered. In addition, the results indicated that the modified attributions were retained three-weeks post-intervention. Among the participants with improved attributional styles, higher levels of optimism and encouragement were reported, as well as higher prospective achievement expectations. In another study, Rascle, Le Foll, and Higgins (2008) endeavoured to modify the attributions in a group of 41 novice golfers. The athletes were grouped into three categories: (1) a non-attributional (NA) feedback condition, (2) an internal/controllable/unstable (ICU) feedback condition, and (3) an external/uncontrollable/stable (EUS) feedback condition. Although feedback was only given to participants once, the ICU feedback condition (e.g., emphasising individual effort, strategy used to complete the task, and concentration) and the EUS feedback condition (e.g., the difficulty of the task) differed significantly in the attributions offered to explain performance outcomes. Specifically, as compared to before the feedback intervention, the EUS group attributed performance outcomes to external, more stable, and less controllable causes, whereas in the ICU group, performance outcomes were attributed to internal causes. In the NA feedback group, no significant modification in participant attributions was found before and after intervention. Thus, the results concurred with Orbach et al.'s (1999) findings, as attributional training successfully altered attributions in athletes subsequent to receiving one instance of feedback. By successfully modifying the attributional styles of athletes, research has established support for cultivating optimism, an important aspect of MT.

Rascle et al. (2008) also revealed that athletes in the ICU feedback group reportedly spent supplementary time practicing the task (i.e., putting) after receiving attributional style feedback compared to the control condition. This finding is of particular importance as persistence and perseverance are associated with MT (Parkes & Mallett, 2011). Parkes and Mallett (2011) conducted an attributional style alteration study involving seven male rugby athletes. The researchers stated that the self-perceived confidence of athletes' sporting ability had increased, resilience during adversity, pressure, and stress had improved, and more optimistic attributions were used in response to negative events. Overall, the results indicate that attributional intervention programs positively impact or augment optimism. Thus, altering attributions and subsequent optimism may enhance athlete MT.

In a Gordon's (2012) manuscript, he outlines strengths-based approaches and details the efficacy in the practical implementation of these approaches to improving MT among elite cricketers. He contends that strengths-based coaching approaches (i.e., spotting and exploiting athlete' strengths) differ markedly from traditional training approaches (i.e., identifying a problem or weakness and resolving it). Gordon outlines the use of a strengths-based approach to augment MT within an elite cricket team. Initially, MT scores on the CMTI (Gucciardi & Gordon, 2009) were obtained. Linley, Nielsen, Wood, Gillett, and Biswas-Diener's (2010) CAPP Realise2 Model was then applied to evaluate various categories of each athlete's strengths and weaknesses. The players participated in a discussion session that focused on five methods for overcoming weaknesses through strengthening activities (e.g., reshaping their role in the team, compensating weaknesses with strengths, working closely with a teammate with strengths in one's areas of weakness), which, following implementation, the players indicated that the methods were beneficial for reducing the relevance of the weaknesses. In addition, the cricketers CMTI responses were assessed and discussed using an *appreciative coaching approach* that focused on four dimensions: discovery, dream, design, and destiny/delivery. To Gordon (2012), this is considered an integral aspect for determining an individual athlete's perceptions of MT and a necessary process for athletes to thoroughly understand MT concepts. Despite the apparent empirical limitations of his work, Gordon provides a preliminary practical approach for improving MT, which contrasts historical approaches. Experimental examinations of this approach may be important for assessing the differential efficacy of this MT intervention, as compared to other training programs (Gucciardi et al., 2009c, 2009d).

Recently, Bell, Hardy, and Beattie (2013) developed and implemented one of the first longitudinal MT intervention programs. In comparison to prior MT intervention endeavours and approaches to developing MT (e.g., Gordon, 2012), Bell et al. (2013) employed a multidisciplinary and multifaceted intervention for implementation with elite adolescent cricketers, including a novel aspect of punishment-conditioned stimuli. The intervention was delivered to 20 cricketers (intervention group) over a total of 46 non-consecutive days and included four primary domains: (1) delivering various types of punishment (i.e., negative consequences) to the athletes following inadequate performance outcomes, (2) including the various cricket involved personnel (e.g., coaches, psychologists, administrative staff, ex-professional cricket players) to facilitate a visionary and inspirational environment that promoted athletes' belief in future successes and cricket growth, (3) a four-day structured environment for training under adversity, which included (a) a day for developing psychological, technical, and physical skills without associated negative consequences, (b) a day to train under pressure, during which support was provided by various personnel following failure to meet minimum testing criteria (c) a testing day, during which support was not provided following failed attempts to meet the minimum testing criteria, and (d) a review and goal setting day for identifying areas of success and aspects warranting improvement in the subsequent four day phase, and (4) the provision of psychological support, principally through the assistance that the research psychologists provided to other individuals (e.g., coaches) to enhance players' coping skills and psychological strategies for combating pressure during the various phases of the intervention cycle. A control group (n = 21), consisting of a number of the remaining players from which the intervention group was originally selected, was also included for group cross-comparisons.

The results indicated that the intervention and control groups did not differ on coach-rated MT, competitive performance level, indoor batting assessment scores, and multistage fitness prior to the intervention, but post-intervention, the intervention group evidenced significantly greater MT, competitive performance levels, indoor batting assessment scores, and multistage fitness as compared to the control group. Additionally, though the control group did not differ in MT, competitive performance levels, indoor batting assessment scores, and multistage fitness scores between the pre and post-intervention period, the MT, competitive performance levels, indoor batting assessment scores, and multistage fitness of the intervention group did, evidencing support for the multidisciplinary and multifaceted MT intervention program in enhancing MT and the performance levels of the cricketers. Bell et al. (2013) evidenced a set of findings that are, in part, unique, and contribute substantially to the MT literature in a number of ways: (1) support for a MT intervention program, at least amid elite adolescent cricketers, (2) empirical and objective findings denoting that (a) MT is important for attaining successful performance outcomes and (b) that athletic performance can be improved through MT development. Perhaps, the latter is the most critical element of their findings, which is fundamental to the importance of MT as a sport psychological construct.

However, the study did not include an assessment of other related, yet distinct psychological constructs (e.g., resilience and hardiness), which produces a challenge in determining the effectiveness of the program in exclusively developing MT. In accordance with prior training programs that have indicated improvements in other constructs in addition to MT (e.g., hardiness; Sheard & Golby, 2006), Bell et al.'s (2013) intervention may have improved other psychological constructs, which may, instead of MT, explain the improvements in cricket performance outcomes of the adolescents post-intervention.

Even though intervention programs appear to impact and, perhaps, improve MT, the indication that other constructs (e.g., hardiness) are improved by such programs and psychological and mental skill training signifies a principal issue in the sport psychology literature. There is inconclusive and unconvincing support to suggest that interventions are specific and solely improve MT. The positive impact of interventions on psychological constructs associated with MT makes it challenging to ascertain the degree to which interventions are specific to tailoring MT or a combination of MT and additional closely associated constructs. Comprehensive study is necessary to distinguish MT from other constructs including hardiness, LR, SOC, and resilience, which will assist in formulating intervention programs designed to exclusively improve MT.

Researchers and writers have, in more recent years, endeavoured to improve and advance our knowledge and understanding of MT. However, a lucid, universally accepted conceptualisation and definition of MT remains to be delineated. More research is required to elucidate a framework for conceptualising MT and clearly demarcating the critical constituents of MT applicable in sport-specific contexts. In addition, constructing interventions to augment and develop MT are essential, particularly as a function of sport type, sport scenario, gender, achievement, and other personal attributes.

2.10 Resilience

Resilience, as a psychological construct, has evolved considerably in recent years. Succeeding the initial research endeavours aimed at explaining positive adjustment and development of individuals pre-identified as high-risk for maladaptive psychological or behavioural outcomes (e.g., Garmezy, 1987), attention recently devoted towards resilience constitutes the majority of the research associated with the construct (Friborg et al., 2005). The evolutionary process and the contemporary accentuation of resilience represent an aspiration to clarify the construct operationally and conceptually. This lucidity is required as resilience is considered a factor that defends against the negative consequences of adversity (Johnson & Howard, 2007; Masten, Best, & Garmezy, 1990) and is associated with the ability to rebound from distressing experiences (Tugade & Frederickson, 2004). Such facets are critical in multiple contexts, including athletics. Athletes are continuously threatened and exposed to various forms of adversity, and the ability to maintain performance levels or rebound following distressing circumstances is critical for successful athletic outcomes (Mummery, Schofield, & Perry, 2004). Despite the relevance and postulated importance of resilience in the context of sport, scant efforts have been devoted towards examining the role of the construct in athletic settings (Fletcher & Sarkar, 2012).

Defining, conceptualising, and measuring resilience appropriately will provide the opportunity to evaluate the construct in relation to MT in sport, the degree to which the constructs converge and diverge, and perhaps, outline the resilience constituents responsible for moderating stress relative to MT.

2.11 Defining Resilience: Outcome or Process?

To a reasonable extent, Block and Block's (1980) *ego-resilience* personality trait formed a rudimentary basis for contemporary understanding of resilience. However, Luthar, Cicchetti, and Becker (2000) assert that *ego-resilience* and the concept of a *resilient personality* are constructs removed from resilience. Specifically, resilience is not considered an intrinsic trait that is stable across situations and time and does not solely represent an attribute or collection of characteristics possessed by an entity (Luthar & Cicchetti, 2000; Masten, 1999; Rutter, 1999). Resilience is what is demonstrated in the midst of adversity (Kaplan, 1999; Rutter, 1990) or the active interaction between individual and external factors resulting in positive outcomes (Luthar & Cicchetti, 2000; Richardson, 2002). In fact, the construct does not represent an observable trait as it may fluctuate according to the type of risk and the exhibition of resilience varies with outcomes (Rutter, 2007) and may augment through successful navigation of past risk exposure (Goldstein, 2008; Rutter, 1999) or over time (Egeland, Carlson, & Sroufe, 1993). The psychological literature also cautions that characterising resilience as a personality trait may create detrimental labels and categorise those unable to overcome adversity as personally responsible for such conclusions (Teram & Ungar, 2009). Individual characteristics or personal qualities may operate as protective factors against risk (Collishaw, Pickles, & Messer, 2007; Friborg et al., 2005; Kaplan, 1999), but such factors fluctuate temporally (i.e., functioning at some moments and not others) and according to the type of risk factor (Herrman et al., 2011; Rutter, 2007). Therefore, the role of internal attributes is critical to the manifestation of resilience, but researchers generally disregard resilience as an invariable trait (Luthar & Cicchetti, 2000; Luthar et al., 2000; Rutter, 1999, 2007).

Various researchers (e.g., Mancini & Bonanno, 2009) contend that resilience is evidenced through outcomes (e.g., maintaining functionality) during or following exposure to risk. According to this approach, post-risk outcomes indicating resilience include "good mental health, functional capacity, and social competence" (Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003, p. 2). Detaching attention from the individual and personal characteristics, importance is placed on the outcome in response to stress. Personal attributes may assist in achieving resilience, but individual qualities are not archetypal of what resilience is. Using this approach, researchers have emphasised the tangible indicators (i.e., adaptive behaviour markers) or functional behaviour patterns denoted as representing positive adjustment (Olsson et al., 2003) and categorising the degree of resilience based on the functioning of individuals in a specified number of areas in particular domains (e.g., Cicchetti, Rogosh, Lynch, & Holt, 1993; Flores, Cicchetti, & Rogosch, 2005). Thus, evaluating outcomes in a variety of domains is important for establishing resilience if resilient outcomes are not demonstrated through psychological measures (Coleman & Hagell, 2007; Olsson et al., 2003). However, indicators of functionality (e.g., overt behaviours) may differ according to contexts and domains, making it challenging to ascertain the indicators of resilience in a variety of areas across a sundry age range (Kaplan, 1999).

In more recent years, resilience research has diverted attention away from outcomes demarcating resilience towards the mechanisms or processes that result in positive adaptation, denoting resilience as an active process of interaction between the person and environment to achieve positive adaptation despite adversity (Egeland et al., 1993; Luthar et al., 2000). In addition to the prominence given to the organic-inorganic collaboration, integral to the resilience process is the necessity for positive adaptation. In a similar process-oriented approach, Olsson et al. (2003) consider resilience as an active process involving the relationship between multidimensional protective elements and risk factors, defining the construct as a "dynamic process of adaptation to a risk setting that involves interaction between a range of risk and protective factors from the individual to the social" (Olsson et al., 2003, p. 2). Thus, the person-environment interaction is viewed as a more encompassing protective-risk factor association. Assessing the interaction between risk and protective factors (range from micro to macro levels and in severity), resilience may be exhibited in a time specific and contextually exclusive manner, with the predisposition to vary. Similar to the outcome approach, process oriented professionals disregard resilience as a stable, invariable characteristic. In fact, the construct has the capacity to develop and change over time (Egeland et al., 1993). It is from this conceptual structure that enables the possession and demonstration aspects of resilience to co-exist. As a process, resilience can develop from the protective-risk factor interaction and be exhibited through positive adaptation as a result of this interaction in the context of adversity.

Although the process and outcome oriented approaches generate confusion when used interchangeably to describe different resilience attitudes (Olsson et al., 2003), perhaps, resilience is a combination of both approaches (Liebenberg & Ungar, 2009). Acknowledging the requisite of positive adaptation (Luthar & Cicchetti, 2000) and the influence of factors integral to mediating the effects of risk or adversity (Hjemdal, Friborg, Stiles, Rosenvinge, & Martinussen 2006; Luthar, 1991), the intricacy of resilience necessitates a comprehensive identification of the construct. Pursuing a multi-disciplinary operational definition of resilience by incorporating a systematic review of resilience literature, Windle (2011) provides an inclusive definition highlighting the salient aspects of resilience, demonstrating the applicability of unifying outcome and process perspectives:

"Resilience is the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma. Assets and resources within the individual, their life and environment facilitate this capacity for adaptation and 'bouncing back' in the face of adversity. Across the life course, the experience of resilience will vary" (p. 163).

Essentially, the formerly identified requirements of resilience, risk, and positive adaptation (Luthar & Cicchetti, 2000) have been amended to appreciate the function of features that modify risk effects and influence positive adaptation.

2.12 Conceptualising and Constituting Resilience

2.12.1 Risk and Positive Adaptation

Resilience is identified as a "multi-dimensional characteristic that varies with context, time, age, gender and cultural origin, as well as within an individual subject to different life circumstances" (Connor & Davidson, 2003, p. 76). Amid the intricacy of this evidently dynamic construct are fundamental aspects characteristic of resilience. The basic foundation in defining resilience is the notion of positive adaptation during or following adversity of stress (Egeland et al., 1993; Luthar, 1993; Rutter, 1999). Thus, resilience manifestation, at the least, is contingent on the following two factors: (1) experiencing adversity or risk factors and (2) adapting positively (Luthar & Cicchetti, 2000). The operationalisation of each facet depends on the combination of researcher orientation, the population, and the context researched (Kaplan, 1999).

Broadly, risk or adversity refers to any event or scenario resulting in disturbance, distress, or negative consequences in certain contexts (Luthar & Zelazo, 2003). Risk may be multiple distressing events over a period of time (Ryff & Singer, 2003), a single traumatic incident (Greene, 2002), or a predisposition (e.g., child of mother with schizophrenia; Garmezy, 1987). However, an ordinarily expected negative outcome given the risk is required for an event, situation, or factor to be considered a risk or adversity relative to resilience (Roisman, 2005). Positive adaptation indicates stability in or maintenance of functioning despite experiencing substantial adversity that increases risk for dysfunction or maladaptation (Bonanno, 2004; Masten et al., 1999; Kaplan, 1999) or an outcome superior to that expected given the severity of risk (Hjemdal, Friborg, Stiles, Rosenvinge, et al., 2006; Luthar & Cicchetti, 2000; Newman, 2004). Positive adaptation may be demonstrated by a combination of internal and external indicators (i.e., psychological and behavioural adaptation). It may be evidenced as a superior than expected outcome (Luthar & Zelazo, 2003), the attainment of additional protective mechanisms, growth, or coping skills following risk (Carver, 1989; Richardson, Nieger, Jensen, & Kumpfer, 1990), or the absence of expected psychopathology or maladaptive responses (Kaplan, 1999; Sroufe, 1997).

2.12.2 Protective and Vulnerability Factors

The interaction between risk and outcome is moderated by factors promoting positive adaptation (Hjemdal, Friborg, Stiles, Rosenvinge, et al., 2006) and effective coping once exposed to risk (Richardson et al., 1990). These *protective factors* positively modify the influence of risk or adversity on the outcome. There is debate about whether factors should be delineated as protective based on distinction between various levels of functioning during high-risk exposure (Werner & Smith, 1982) or from the demonstration of positive adaptation following varied levels of risk-factor exposure (Garmezy & Devine, 1984). Kumpfer (1999) and Luthar (1991) suggest that the level of adaptive functioning that transpires depends on the quantity of protective factors an individual possesses. Additionally, Garmezy, Masten, and Tellegen (1984) propose a compensatory process of resilience emphasising the additive compensatory effect of multiple protective factors.

Substantial efforts (e.g., Collishaw et al., 2007; Gizir, & Aydin, 2009; Hyman & Williams, 2001; Jain, Buka, Subramanian, & Molnar, 2012) have been afforded to demarcate protective factors that promote resilient outcomes in a substantial number of population groups (e.g., children, students) and settings (e.g., maltreatment, violent communities, academics). Generalising factors across situations and demographic variants is problematic (Luthar & Zelazo, 2003), indicating the importance of specificity in evaluating and designating such factors as protective. Thus, facets outlined as protective for a particular population in a specified context cannot be assumed to operate as protective in others (Rutter, 2000). Resultantly, protective factors have been categorised, allowing for divergent conceptualisation of each feature based on the context of resilience. Kumpfer (1999) outlined five protective factors that are strictly internal: (1) emotional stability and management, (2) behavioural/social competencies, (3) physical well-being competencies, (4) spiritual or motivational characteristics, and (5) cognitive competencies. Other authors have extended classification to encompass internal and external factors including: (1) individual, internal, personality features, (2) familial factors, and (3) social or community factors (Garmezy, 1993; Werner, 1996). Frameworks such as these allow identification of protective factors circumstantially and population specific (e.g., children, athletics).

While protective factors reduce the impact of risk on the outcome, vulnerability factors intensify the severity of risk factor effects and increase susceptibility for maladaptive outcomes or dysfunction when confronted with risk factors (Luthar, 1991). Vulnerability factors are also associated with the outcome specified (e.g., depression), suggesting that situational specificity is important. The multi-level relationship between protective and vulnerability factors (Cicchetti, 2010) has resulted in varied opinions about the interaction. Initially, vulnerability factors were considered polar opposites to protective factors (Luthar, Sawyer, & Brown, 2006). However, it has been denoted that vulnerability factors may occur without the existence of an opposing protective factor (Luthar & Sexton, 2007; Rutter, 2003). Therefore, factors may be unidirectional or bipolar relative to the protective-vulnerability factor affiliation.

The transferred attention from outcomes towards processes underlying resilience has stimulated research accentuating the dynamic relationship between protective forces (also denoted to as resources, strengths, or assets) and the ability to overcome risk, minimise the impact of endured adversity, and result in positive adaptation (Kitano & Lewis, 2005; Punamaki, Qouta, Montgomery, & El Sarraj, 2006; Werner, 1995; Werner & Smith, 1992). The delineated complex interplay between the influence of internal and external factors in the presence of risk with an outcome of positive adaptation represents the prominent conceptualisation of the construct. Identifying and operationalising each component requires precise clarification of the population, context, and domain investigated.

2.13 Resilience Model

In order to appreciate the process of interaction between the constituents of resilience, researchers have appropriated pre-established theoretical frameworks for conceptualising the resilience process (Cicchetti & Rogosch, 1997; Egeland et al., 1993), including organisational theory and developmental systems theory. Although the commonality among such theories is the emphasis on the long-term internal and external factor interactive processes that assist in successfully overcoming adversity throughout life, models derived outside of resilience may neglect important aspects of resilience and may not be appropriate in certain contexts (e.g., athletics). Specifically, little attention has been devoted towards investigating resilience in sport. Resilience research has largely focused on individuals that are compelled to exhibit resilience in the context of adversity. Though experiences of adversity, stress, pressure, and challenging scenarios exist in sport, athletes are not forced or required to engage in sport. Therefore, athletes are aware of the adversities associated with sport and, perhaps, participate in order to experience challenges in order to test abilities against others (Fletcher & Sarkar, 2012). Additionally, the athletic context also emphasises growth, learning, and strength that develop from adverse experiences (Shields & Bredemier, 1995), an aspect that is not addressed by appropriated models to explain resilience.

Recently, Richardson (2002) and Richardson et al. (1990) incorporated the exhaustive resilience research into an integrative and multidimensional resilience model, which applies to all domains, across all age ranges, life periods, and types of adversity. In addition to comprehensively outlining the interactive process among resilience components as a cyclical sequence occurring over time, the model includes the capacity to acquire and strengthen qualities of resilience that develop out of adversity, an important aspect in sport.

The metatheory represents a linear process of resilience and emphasises individual choice as influential to outcomes following distressing events or risk factors. At the core of the resilience process is the motivation to maintain biopsychospiritual homeostasis, a particular moment in time when an individual has adapted mentally, spiritually, and physically to current circumstances. Internal and external forces, changes, and circumstances continuously weather the balance between the three personal domains. Although threat to biopsychospiritual homeostasis may be internal or external, interpretation of the severity of events depends on personal qualities of resilience and prior resilient reintegration. Reintegration is the ability to grow, obtain knowledge, gain increased strength in resilience assets, and cope effectively with disruption.

Coping with risk factors develops resilient qualities, enabling individuals to function effectively in the environment. However, underdevelopment of qualities of resilience may result in chronic stressors and novel life prompts may generate disruption. Disruption occurs if protective factors are insufficient to counteract life prompts. Although individuals seek to maintain comfortableness in current circumstances, if disruption occurs, the individual's biopsychospiritual homeostasis is disturbed and positive or negative emotions and cognitions occur. In order to return to a physical, mental, and spiritual "comfort zone", reintegration occurs in one of four ways depending on the individual's ability to cope successfully: (1) a state of dysfunction (maladaptive functioning, such as self-injurious behaviour), (2) recovery with loss (lower degree of homeostasis), (3) return to pre-disruptive levels of homeostasis, or (4) resilient reintegration (growth and enhanced homeostasis). Thus, successful reintegration denotes superior personal qualities of resilience and additional protective mechanisms for future difficulties. The author notes that in some instances reintegrating to homeostatic levels higher than prior to the disruptions, may not be attainable, as the severity of some prompts (e.g., a professional athlete losing an extremity) may result in the loss of personal characteristics.,

2.13.1 Sport Resilience Model

Using Richardson et al.'s (1990) resilience model as a framework for investigating resilience in sport, Galli and Vealey (2008) utilised semi-structured interviews with a group of 10 university athletes (four males and six females) from a variety of sports (e.g., soccer, swimming) to determine the operational mechanism of resilience in sport. Using inductive analysis to analyse the data collected, the authors identified 94 broad categorical themes generated from the raw data. Subsequently, 20 higher-order categories were delineated, which were judged to encompass five resilience domains: (1) agitation, (2) sociocultural influences, (3) personal resources, (4) breadth and duration, and (5) positive outcomes.

Based on the identified dimensions of resilience, Galli and Vealey (2008) posit a process of resilience in sport. Specifically, the authors suggest that the initial phase in the process, adversity, was found to occur over lengthy periods of time (e.g., concussion) and influenced various aspects of athletes' lives directly and indirectly related to sport (e.g., inferior treatment post-injury compared to pre-injury). Following adversity, athletes' indicated that responses to adversity included an interactive process of unpleasant emotions, mental battles and questioning, and cognitive and behavioural coping strategies. A number of personal resources (e.g., enjoyment of the sport, motivation to achieve characteristics) were found to assist in alleviating the influence of or altering unpleasant emotions or the mental struggles athletes were experiencing. Additionally, sociocultural influences (e.g., cultural factors, social support) were also recognised as important for facilitating the process of resilience and producing positive outcomes. The authors also suggest that sociocultural factors may inhibit the resilience process (i.e., act as vulnerability factors), although a thorough explanation of how this occurs is not provided. A positive outcome is the final stage in the process, and the athletes suggested that despite the adversities experienced, a number of outcomes are indicative of achieving resilience, which include learning, attaining motivation to assist others, gaining perspective from the experience, improvements or becoming stronger, and realising the importance of support from others. The positive outcome indicators may function as personal resources to facilitate future resilience when exposed to adversity.

Evaluating the process of resilience outlined by Galli and Vealey (2008), the fundamental components of resilience in sport compare favourably with prior conceptualisations of resilience.

Specifically, the major components of adversity, positive adaptation, and protective or vulnerability factors are critical for resilience in sport. Considering the limitation of a single interview with each athlete and the small number of athletes included in the study, a diverse range of personal resources and sociocultural influences could not be generated. Further research efforts are required to determine internal and external protective and vulnerability factors influencing the resilience process in sport.

Galli and Vealey (2008) do insinuate that MT is a factor associated with promoting positive outcomes post-adversity, suggesting that MT is a subcomponent of resilience. However, MT was not identified as a personal resource, and other authors contend that resilience is a subcomponent of MT, as MT applies to a broader range of contexts outside of adversity alone (Loehr, 1995; Sheard, 2013). Although Galli and Vealey's (2008) resilience model in sport is a necessary and important contribution to the sport psychology literature, establishing the distinctions and similarities between MT and resilience is integral to determining how the two constructs relate to one another in sporting and non-sporting domains.

2.14 Researching Resilience

Evaluations endeavouring to uncover variance in post-risk outcomes of individuals have been delineated into two major categories: variable-focused and person-focused methods (Masten, 2001). Using multivariate statistical methods, variable-focused approaches examine relationships between measures of (1) risk, (2) internal or external qualities that may moderate risk, and (3) outcome.

Emanating from Project Competence, the term encompassing the extensive research aimed at identifying the features considered to differentiate children displaying competence (e.g., stress or socioeconomic status; SES) compared to children exhibiting dysfunction based on specific areas (e.g., academic competence) of inquiry (e.g., Garmezy, 1981; Garmezy & Strietman, 1974), the efforts pursuing the protective process associated with resilience guided Garmezy et al. (1984) to demarcate three models capturing risk factor-adaptation moderation: the protective factor (or immunity versus vulnerability model), the challenge, and the compensatory model. Protective factors interact explicitly with the risk factor diminishing or enhancing the effect of adversity on the outcome. The challenge model asserts that risk factors possess the potential to enhance positive adaptation. However, in excess it may be detrimental and contribute to maladaptive responding. According to this model, engaging and overcoming a risk factor can provide momentum for further success when exposed to future adversity, but failure to overcome risk factors may result in greater susceptibility to risk. Compensatory factors independently influence the effect of risk factors on adaptation without interacting with risk factors, and the direct influence of compensatory resources are evident during low and high-risk situations. Essentially, risk factors and positive attributes are additive, and the severity of risk factors can be compensated by the measure of positive attributes.

The authors' note that each model operates relative to another and each possesses the ability to influence one another and, together, assist in explaining contextual and internal variable relations. Using the engaging and disruptive aspects as indicators positive adaptation or maladaptation, Garmezy et al. (1984) evidenced support for assigning factors into the models based on the relationship between variables. For instance, the mitigation of stress by SES denotes SES as a compensatory factor, and the interaction between SES and IQ relative to academic achievement competence provides support for the protective model.

Luthar (1993) provides a detailed and comprehensive framework for operationalising interactive processes, delineating factors into main effect and interactive effect factors. A main effect factor, denoted as a *protective factor*, has enhancing effects at various levels of risk-factor intensity. Interactive effect factors signify a relationship between risk and functionality. These include, *protective-reactive* (although functioning is enhanced, superior functioning at low compared to high risk), *protective-stabilising* (maintaining functionality regardless of risk severity), and *protective-enhancing* (increased functionality with risk escalation). According to the classification system, factors can operate divergently depending on the internal-external relationship specific to each individual. For example, a *protective factor* for one individual may function as a *vulnerability factor* for another. Additionally, a factor serving as *protective-stabilising* in one context may operate as *protective-reactive* in others. Classifying particular factors and recognising the interchangeability of such factors based on unique individual and environmental features provides a structured model for discerning the operational mechanisms behind the protective-vulnerability factor affiliation with risk factors and outcomes. More importantly, this approach eliminates the confusion associated with the interchangeable use of main effects and interaction effects to describe vulnerability and protective forces (Luthar et al., 2000).

The person-focused method compares groups of individuals exposed to adversity across a multitude of measures at specified intervals to determine the features that distinguish resilience from non-resilience. Comparing individuals with adaptive outcomes to individuals with maladaptive outcomes, factors associated with resilience are identified, such as self-esteem (Dumont & Provost, 1999; Garmezy, 1991; Werner & Smith, 1992), intelligence (Fergusson & Lynskey, 1996; Masten et al., 1988; Masten et al., 1999; Werner & Smith, 1992), and temperament (Graham, Rutter, & George, 1973). The method has been used frequently in the resilience literature to determine the discerning factors between resilience and non-resilience among various demographic groups (e.g., children; Cowen et al., 1997; Wyman et al., 1999). Although initial studies have been critical to identifying factors associated with positive adaptation (Cowen, Lotyczewski, & Weissberg, 1984; Werner & Smith, 1982; Wyman et al., 1999), such efforts did not include low-risk groups to scrutinise differences between the profiles of resilience following varied adversity and profiles devoid of substantial risk. Subsequent studies introduced low-risk group comparisons. For instance, Masten et al. (1999) found similarities between the psychosocial resources, self-concepts (i.e., superior), intellectual functioning, competence (e.g., social, academic), and quality parenting (i.e., better or superior) in a group of resilient adolescents (high adversity exposure and positive adaptation) and low-risk competent adolescents. Additionally, both groups differed substantially on the same measures compared to non-resilient individuals. Other authors (e.g., Cowen et al., 1984) have grouped individuals based on resource measures (e.g., IQ), evidencing positive adaptation or maladaptive responses among children high or low in such resources, respectively.

Emanating from the extensive endeavours are the demarcations of the factors that differentiate positive adaptation from maladaptation among individuals exposed to risk. Research has been conducted with different population groups including adults (Greenfield & Marks, 2004), adolescents (Dumont & Provost, 1999; Luthar, 1991), and children (Rutter, 1987; Werner, 1990). In addition, protective factors have been examined among individuals exposed to varied circumstantial risk, such as medical or psychiatric illness (Steinhardt & Dolbier, 2007), maltreatment (Mrazek & Mrazek, 1987), poverty (Garmezy, 1993), and acts of terror (Bonanno, Galea, Bucciarelli, & Vlahov, 2007). Although identified factors are difficult to generalise to all populations and contexts, Werner (1996) organises these factors into three broad categories: (1) the individual (dispositions including education, cognitive processes, and a positive self-concept); (2) the family (possessing close bonds, having a competent and constant caregiver); and (3) the community (support from peers or other important community groups). In fact, this framework for classifying factors that endorse positive adaptation under adversity has been utilised by other authors (e.g., Garmazy, 1993; Garmezy, 1985; Rutter, 1990). The categorical approach used to organise protective factors has assisted in identifying the range of internal and external factors associated with resilience.

2.15 Researching Resilience in Sport

Though sports-related resilience research has been limited, in recent years, research endeavours have ensued to examine the role of resilience in sport. In a sample of 12 Olympic champions from a variety of sports, Fletcher and Sarkar (2012) conducted retrospective interviews to identify the factors that assisted in protecting the athletes from the negative effect of stressors on metacognitions and challenge appraisal. According to their perspective and approach, resilience involves a process whereby, when exposed to stress, psychological resources enable appropriate appraisal of challenges and cognitive processes that foster facilitative responses and subsequent optimal athletic performances. Based on qualitative analyses, the identified psychological facets critical to the process of resilience included (1) motivation, (2) perceived social support, (3) focus, (4) confidence, and (5) a positive personality. Fletcher and Sarkar's (2012) findings coincide with prior results (e.g., Galli & Vealey, 2008) indicating the elements of risk, positive outcomes, and protective resources are integral to resilience in sport. In contrast to Galli and Vealey's (2008) findings, however, Fletcher and Sarkar (2012) did not designate *sociocultural influences* as a component of the resilience process. However, the authors focused primarily on resilience in the immediate sporting environment, electing not to attend to developmental components and influences outside of the proximate sporting environment.

2.16 Protective Factors

2.16.1 Individual Qualities

Though protective factors differ across demographic variables and environmental contexts, a range of elements appear to be related to resilience. Factors implicated in protecting at-risk individuals from maladaptive outcomes include: (1) superior intelligence (Cederblad, Dahlin, Hagnell, & Hansson, 1995; Fergusson & Lynskey, 1996; Masten et al., 1988; Masten et al., 1999; Werner & Smith, 1992); (2) personal competence skills such as problem-focused coping strategies (Dumont & Provost, 1999), organisation and planning (Clausen, 1993); (3) high self-esteem (Garmezy, 1991; Werner & Smith; 1992) and self-efficacy (Baldwin et al., 1993; Conrad & Hammen, 1993); (4) an internal locus of control (Cederblad, Dahlin, Hagnell, & Hansson, 1993; Cowen et al., 1992); (5) social competence factors such as social expressiveness (Luthar, 1991); altruism (Mrazek & Mrazek, 1987; Werner, 1990), strong social skills (Olsson et al., 2003), social responsivity (Cowen et al., 1992; Masten, Morison, Pelligrini, & Tellegen, 1990), social perceptiveness skills and social maturity (Werner & Smith, 1992), good communication dexterities (Olsson et al., 2003); (6) possessing a conceptualisation of the self that is positive (Cederblad, 1996; Dahlin & Cederblad, 1993); (7) more advanced educational and employment pursuits (Werner & Smith, 1982, 1992); (8) an engaging temperament (Cederblad et al., 1995; Graham et al., 1973; Luthar, 1991; Smith & Prior, 1995); and (9) spiritual and religious factors (e.g., belief in a superior being; Masten, Morison, et al., 1990).

2.16.2 Familial Factors

External, yet closely involved in the resilience process are various family personnel. Factors promoting positive adaptation in this respect include: (1) parental factors, such as quality of parenting and parental competence (Cowen et al., 1997; Wyman et al., 1999), having a strong relationship with at least one parent (Cederblad et al., 1993; Rutter, 1971), authoritarian parental practices and involvement and interest in child's education achievement (Cederblad et al., 1993; Garmezy, 1983), and consistency in behavioural regulations and expectations (Bennett, Wolin, & Reiss, 1988), (2) a nurturing and consistent or protective and warm relationship with at least one family member (e.g., grandparents, sibling) in the absence of one or more parents or in difficult circumstances (e.g., discordant home environment; Jenkins & Smith, 1990; Werner, 1990), and (3) home environment factors such as organisation and structure (Pianta, Egeland, & Sroufe, 1990).

2.16.3 Social and Community Aspects

In addition to personal qualities and factors associated with immediate family dynamics, factors outside the family have the potential to protect against risk, comprising: (1) friends and peer factors such as the ability to disclose information to peers in certain contexts (e.g., street children; Felsman, 1989; Garmezy, 1991), possessing at least one strong relationship with a friend (Honey, Rees, & Griffey, 2011), and fewer deviant peer associations and antisocial behaviours involving peers (Dumont & Provost, 1999; Fergusson & Lynskey, 1996), (2) significant adults and supportive relationships with individuals outside of the family (e.g., teachers, community youth leaders; Benard, 1991; Herronkohl, Herronkohl, & Egolf, 1994), (3) school-related elements such as regular attendance (Honey et al., 2001), superior functioning schools (e.g., organised, cultivating environment; Rutter, 1990; Rutter et al., 1975), and supportive educational settings (Smith & Prior, 1995), (4) opportunities and availability of resources in the community (e.g., youth programs, foundational educational schools; Werner, 1990), and (5) neighbourhood and residential living area factors such as living in the countryside or small settlements (Lavik, 1977) and residing in areas with higher levels of cohesion and solidarity and lower conflict rates (Fonagy, Steele, Steele, & Higgett, 1994).

The factors within each domain represent the broad elements associated with protecting against risk. Outlying the extensive range of specific factors is counterproductive, as precise elements differ according to the characteristics of the individual examined, such as population group, the type of maladaptive outcome anticipated, and environmental aspects. Therefore, identification of particular protective factors requires clarification of individual-environmental aspects. In other words, certain protective factors may be applicable in some contexts and not others. Additionally, the delineated protective factors have developed largely from studies outside of athletics (e.g., maltreated children). Perhaps, the factors protecting against adversity in sport differ compared to other domains, reiterating the requirement for studying resilience in specific areas. Any distinguishing elements may be attributed to the voluntariness of sport, denoting that athletes actively seek adversity as a function of participation and competing, a feature in contrast to resilience in other domains (e.g., trauma victims).

Despite the necessity to evaluate resilience in sport, few investigative endeavours have attempted to delineate protective factors among athletes and compare the distribution of these factors to previously identified elements. In a qualitative study using grounded theory, Fletcher and Sarkar (2012) examined the psychological characteristics influencing meta-cognitions and challenge appraisal to mediate stress and produce facilitative responses (positive adaptation) in order to achieve optimal athletic performance among 12 Olympic champions. Interviewing the athletes, the psychological dispositions identified include confidence, focus, perceived social support, motivation, and a positive personality. Though prominence is assigned to psychological factors, interpersonal relations are associated with facilitating adaptive responses. Conceivably, athletics may accentuate the necessity to possess certain psychological characteristics to a greater degree than familial or other social factors that may be critical in other domains, indicating support for contextually specific conceptualisation (Luthar et al., 2000).

Notwithstanding the unique and valuable findings outlined in the inquiry, the qualitative information generated may neglect relevant factors that were unidentified. Specifically, the participants involved in the assessment of resilience may inaccurately suggest that the factors identified are protective against risk in sport simply because the athletes are elite Olympic champions. A broader examination of protective factors is required among athletes competing at various competitive standards to determine the applicability of types of protective factors across sporting levels and sport types. Furthermore, quantitative research exploring protective factors in sport (generally and in specific sports) is required to quantifiably ascertain the relevance of protective factors in mitigating risk-factor exposure in sport. Mummery et al. (2004) found that self-perceived ability to perform and cope with adversity, a strong self-perceived physical endurance capacity, and detachment from social support were associated with resilience in a group of 272 Australian swimmers and may be implicated as protective factors among swimmers. However, supplementary efforts are necessary to quantitatively examine protective factors in multiple sporting domains, including tennis.

2.17 Measuring Resilience in Adults

A number of resilience inventories have been developed to assess protective factors associated with resilience in various groups including children (e.g., California Healthy Kids

Survey – The Resilience Scale of the Student Survey; Sun & Stewart, 2007), adolescents (e.g., Resilience Scale for Adolescents; Hjemdal, Friborg, Stiles, Martinussen, & Rosenvinge, 2006), and adults (The Connor-Davidson Resilience Scale; Connor & Davidson, 2003). Additionally, a number of brief resilience scales have been devised (e.g., The Brief Resilience Scale; Smith et al., 2008). However, comprehensive measures developed to assess resilience in adults are rare, particularly in sporting scenarios. The following are extensive resilience inventories that have been developed for application with adults. The development, psychometric properties, and research involving these measures are examined.

2.17.1 Resilience Scale for Adults (RSA)

Using the broad triad of protective factors outlined by Werner (1996) and others (e.g., Rutter, 1990), Hjemdal, Friborg, Martinussen, and Rosenvinge (2001) developed the Resilience Scale for Adults (RSA) as a means of assessing internal and external protective resources. Items were generated from established resilience theory on protective factors based on identification of the factors associated with the three categories outlined above (i.e., individual, family, and social/community factors). After generating 295 positively worded items across 13 protective factors, 100 items were removed based on the independent analysis of the items by individuals ranging from clinical psychologists to individuals unaffiliated with psychology. The remaining items were administered to university students and subjected to exploratory principal component analysis, delineating a preliminary scale comprised of five areas using 45 items: (1) personal structure (four items), (2) personal competence (16 items), (3) family coherence (five items), (4) social competence (12 items), and (5) social support (nine items). Cronbach's alpha for total resilience was high (.93) and adequate across each of the five dimensions (ranging from .74 to .92).

Subsequently, Friborg, Hjemdal, Rosenvinge, and Martinussen (2003) verified the five-factor (RSA) in a nonclinical sample of 276 participants. Exploratory principal component analysis (EPCA) revealed 13 factors responsible for a large proportion of the variance, but due to two or three items loading on dimensions 6 to 13 (the authors pre-established a minimum of five per factor for inclusion), the scree-plot was examined and indicated a sharp curve at factor five. Examination of the items on the first five domains supported the five dimensions outlined in the preliminary study (i.e., Hjemdal et al., 2001). However, in the process, eight items were removed. Thus 37 items were retained, some of which appear on multiple dimensions. The correlation between personal structure and social support was not statistically significant, and low to moderate (r = .22 to .46) significant correlations were found between the other dimensions. Generally, this indicates the dimensions are distinct yet assess the same construct. Cronbach's alpha (ranging from .67 to .90) and test-retest correlations (ranging from .69 to .84) for the subscales were adequate. Females and males differed on the personal competence and social support factors, and personal structure increased with age. The dimensions of the RSA demonstrated adequate convergent and discriminant validity with the Sense of Coherence Scale and The Hopkins Symptoms Checklist-25, respectively. Comparing the subscales of the RSA to variables judged to be associated with resilience provided supplementary construct validity. Positive correlations between years of employment and the subscales of family coherence and personal structure and positive correlations between employment status and the factors of social competence, family coherence, and personal competence were found. However, relationships were not established between education (years) and RSA subscales. Importantly, the RSA differentiated the clinical group from the nonclinical group across all subscales, corroborating higher resilience among the nonclinical sample.

Friborg et al. (2005) aimed to further improve the psychometric properties of the RSA in a sample of 482 prospective military students. Implementing cross-validation of the 37-items in the current version of the inventory, the model was improved by removing four items and a significant absolute fit for the 33-item model across six factors. The analyses revealed two subcomponents to the personal strength factor: (1) perception of future and (2) perception of self. In order to improve the reflection of item content, the authors altered the descriptive term of a number of the factors. The remaining four factors include: (1) social competence, (2) structured style, (3) family cohesion, and (4) social resources. Internal consistency for the six factors and total RSA score were lower compared to the previous version, but the authors denoted internal consistency across the updated version as acceptable. Moderate, statistically significant correlations between the factors were found, suggesting the factors are distinct but measure the same construct. Jowkar, Firborg, and Hjemdal (2010) evidenced convergent validity of the RSA, contributing to prior convergent and discriminant validity findings (e.g., Friborg et al., 2005).

Using the RSA, higher scores on the measure were found to be associated with lower levels of self-reported stress and pain (Friborg et al., 2006). Nettelbladt, Hanssan, Stefansson, Borgquist, and Nordstrom (1993) established that when exposed to similar levels of risk or adversity, individuals with high RSA scores evidenced lower levels of anxiety and depressive symptomology compared to individuals with a low RSA score. The RSA has also demonstrated cross-cultural applicability by differentiating Iranian non-runaway girls from runaway girls (Jowkar et al., 2010). Additionally, Jowkar et al. (2010) evidenced differences between male and female children on the social resource scales, confirming prior findings (e.g., Friborg et al., 2003). The RSA appears to possess the psychometric properties, the ability to ascertain the protective factors associated with positive adaptation across a variety of individuals exposed to risk, and the capacity to distinguish various groups along the factors included in the inventory. However, research demonstrating the reliability and validity of the scale in sporting domains is necessary, as there is an apparent absence of such attempts.

2.17.2 Connor-Davidson Resilience Scale (CD-RISC)

Connor and Davidson (2003) appropriated components from prior research to develop a measure of resilience. Specifically, characteristics identified in projects completed by Kobasa (1979), Lyons (1991), and Rutter (1985) were selected to include as constituents of the resilience scale, and features interpreted as critical resilience factors in the survival of Edward Shakleton during his expedition in the Antarctic encompassed 17 overarching characteristics utilised in item development. However, the researchers omitted explanation for including factors associated with other psychological constructs (i.e., control, commitment, and challenge aspects of hardiness), the reasons for authorship selections and precise constituents to be included in the measure, and apparently neglected other relevant resilience research in deciding upon the characteristics of the measurement.

From the underlying resilience qualities identified, 25 five-point Likert-type items (0 = *rarely true*, 4 = *true nearly all the time*) were generated for the original inventory. Factor analysis was performed, indicating support for five factors indicative of resilience: (1) spiritual influences (2 items), (2) control (3 items), (3) security in relationships and accepting change (5 items), (4) accepting negative emotions, trusting personal instinct, post-stressor strengthening effects (7 items), and (5) persistence, personal competence (8 items). In a group of 577 nonclinical participants, item-total correlations between .30 and .70 were found, and internal consistency was .89. Test-retest reliability, using an intra-class correlation analysis, was .87, denoting strong test-rest reliability. The correlations between the general anxiety group's score on the CD-RISC and the Arizona Sexual Experience Scale at two points (at baseline and study conclusion) were not significant, demonstrating discriminant validity of the CD-RISC. Additionally, positive correlations between the CD-RISC, hardiness, and the Sheehan Social Support Scale were found, and negative correlations between the CD-RISC, the Sheehan Disability Scale, Perceived Stress Scale, and the Sheehan Stress Vulnerability Scale support the convergent and discriminant validity of the scale. The CD-RISC adequately differentiated between a nonclinical group, a general anxiety group, a post-traumatic stress disorder group, a psychiatric outpatient group, and a primary care group, evidencing support for increased resilience among individuals absent of psychological or physical illness. The authors also found support for the temporal improvement in CD-RISC scores among PTSD participants with improved clinical condition, supporting the fluctuation of resilience and the malleability of the construct. Additionally, the CD-RISC correlated positively with positive affect and negatively associated with negative affect, denoting validity of the scale (convergent and discriminant).

Subsequent to Connor and Davidson's (2003) study, Burns and Anstey (2010) used confirmatory factor analysis in a group of 1775 participants to verify the five-factor structure of the CD-RISC, suggesting that the factors correlated strongly with one another and invalidated the original factor structure that was posited. In fact, the researchers concluded that a one-factor model was more suitable in accounting for the variance, denoting the CD-RISC as a unidimensional resilience instrument. Additionally, the highest item loadings on the single factor differed from past findings (e.g., Campbell-Sills & Stein, 2007) on a number of items. As a result, a 22-item revised single dimension inventory of resilience was posited.

At a similar period, Sexton, Byrd and von Kluge (2010) thoroughly examined the CD-RISC in a group of 40 women experiencing fertility issues. In their confirmatory factor analysis

(CFA) of the inventory, although five-factors were identified, the item-loadings differed from the original findings presented by Connor and Davidson (2003). Thus, factor themes contrasted the initial model. However, Sexton et al. (2010) note the use of a female sample currently experiencing adversity may partially account for the disparate findings and may indicate the alternative presentations of resilience depending on the type of stress or stressor severity. Additionally, correlations between the CD-RISC and stress circumscribed to infertility were negative, and coping skills were positively related to the CD-RISC, which support the discriminant and convergent validity of the inventory.

Yu and Zhang (2007) did not find support for the five-factor CD-RISC inventory in a group of Chinese participants. Exploratory factor analysis (EFA) signified support for a three-factor model delineated as optimism, strength, and tenacity. The resultant Chinese version of the CD-RISC displayed strong internal consistency (α = .91) and convergent validity, indicating cultural differences between Western and Eastern conceptualisations of resilience.

Campbell-Sills and Stein (2007) aimed to psychometrically validate the CD-RISC using two samples (*n* sample 1 = 511, *n* sample 2 = 512). Following EFA in both groups, the authors noted that a precise delineation of the five-factors could not be determined with the original 25 items due to reasons including too few items loading on certain factors and factors that contained multiple themes. Based on these and other issues associated with the original inventory of items and factors, items with irrelevant or unpredictable factor loadings were removed. The remaining items were subjected to EFA with two groups (*n* group 1 = 532, *n* group 2 = 539). However, the high correspondence between the two revealed factors (persistence and hardiness) required CFA in a third group to determine whether the loading of the items on two factors was the result of variance error. Compared to the two-factor model, the analyses revealed stronger support for a single factor comprised of 10-items, which was further supported when combining the three groups. The reported Cronbach's alpha (α = .85) for the adapted measure indicated adequate reliability. Additionally, individuals with higher CD-RISC scores exposed to childhood maltreatment exhibited fewer psychiatric symptoms compared to children with low scores on the measure.

Recognising the requisite to evaluate resilience inventories in sport and provide comparisons to prior studies involving other populations, Gucciardi, Jackson, Coulter, and Mallett (2011) examined the 25-item CD-RISC and the abbreviated 10-item version in a group of Australian cricketers. CFA did not support the original five-factor model in both an adolescent and adult sample. However, the abbreviated 10-item version (Campbell-Sills & Stein, 2007) was supported in both groups, with strong internal consistency evidenced in both samples. As expected, the measure correlated positively with hardiness. The adapted scale was negatively related to the Athlete Burnout Questionnaire (Raedeke & Smith, 2001), denoting discriminant and convergent validity of the 10-item measure. Although support for the applicability of the abbreviated CD-RISC was obtained, Gucciardi et al. (2011) denote the importance of generating sport-specific measurements of resilience that assess the contextually specific factors associated with athletics.

Although the abbreviated CD-RISC may be a beneficial unidimensional measure in a number of domains, a concern is that important facets of resilience are omitted from being measured following the attempt to psychometrically validate the questionnaire. In addition, using Kobasa's (1979) hardiness model to derive items and characteristics utilised in measuring resilience is questionable, particularly without reasoning for such inclusions. The concern is that the CD-RISC is evaluating hardiness as opposed to solely assessing qualities of resilience.

Furthermore, the challenges researchers have demonstrated in validating the factor structure may suggest instability and construct validity issues. Without a thorough explanation for conceptualising and including items in the inventory and identification of the areas of resilience assessed by the CD-RISC, the measure may be eluding resilience altogether. Therefore, further examination of the scale is required in multiple contexts in order to rigorously identify the psychometric properties of the CD-RISC and additional improvements are necessary.

2.17.3 The Resilience Scale (RS)

In developing the Resilience Scale (RS), Wagnild and Young (1993) combined prior literature review of resilience and the findings from a qualitative study (Wagnild & Young, 1990) of resilience in a group of 24 older females who demonstrated positive adaptation following a substantial life trauma. A priori content validity approach was selected, and a total of 25 items were generated from the direct statements of the women involved in the qualitative study reflecting the following 5 factors identified as integral components of resilience: (1) self-dependence, (2) equanimity, (3) perseverance, (4) meaning in life or purpose, and (5) existential aloneness. Wagnild and Young (1993) examined the psychometrics of the RS in a group of 1500 older adults. The authors employed principal component analysis (PCA) to determine the factor structure of the RS, with the analyses indicating support for a two-factor model compared to the historical five factors used to include items in the scale. The two factors were labelled *personal competence* (17 items) and *acceptance of self and life* (8 items). Internal consistency was reportedly high ($\alpha = .91$), and validity was demonstrated resulting from the significant positive correlations between resilience, morale, and life satisfaction and the negative correlation between resilience and depression. The items are rated on a seven-point Likert-type scale (1 = *disagree*, 7 = *agree*) for a combined total ranging from 25 to 175. Wagnild (2009) denotes cumulative scores of 120, between 125 and 145, and above 145 represent low, moderate, and high resilience, respectively.

Wagnild (2009) reviewed subsequent studies using the RS, denoting Cronbach's alpha were moderate to high in various groups of adolescents (Black & Forbe-Gilboe, 2004; Hunter & Chandler, 1999; Rew, Taylor-Seehafer, Thomas, & Yockey, 2001) and strong in a range of groups of women young to middle-aged (Humphreys, 2003; Monteith & Ford-Gilboe, 2002; Schachman, Lee, & Lederman, 2004) and adults of middle and older ages (Leppert, Gunzelman, Schumacher, Strauss, & Brahler, 2005; Nygren, Alex, et al., 2005). The RS distinguished homeless adolescents on a number of factors (e.g., hopelessness; Rew et al., 2001), is positively associated with mothers' practices of health promotion and a health promoting family in adolescents' (Black & Forbe-Gilboe, 2004), is positively related to family health work in mothers' (Montieth & Ford-Gilboe, 2002), psychological well-being (Christopher, 2000), self-perceived mental and physical transcendence, life purpose, and possessing a personal sense of coherence in older adults (Nygren, Alex, et al., 2005), and negatively correlated with complaints of physical ailments in older adults (Leppert et al., 2005), loneliness, and feelings of hopelessness in adolescents (Rew et al., 2001), evidencing support for the validity of the scale.

The scale has also been examined and, in some instances, adapted for use in a variety of alternative populations, including Nigerian, Swedish, Russian, and Spanish participants (Aroian, Schappler-Morris, Neary, Spitzer, & Tran, 1997; Heilemann, Lee, & Kury, 2003; Nygren, Bjorkman-Randstrom, Lejonklou, & Lundman, 2005; Tajudeen & Owiodoho, 2011), with adequate internal consistency established across the diverse versions (Lundman, Strandberg, Eisemann, Gustafson, & Brulin, 2007). The factor structure of the RS differed in some cross-language versions of the measure compared to original version (e.g., the 25 item two-factor structure of the original version compared unfavourably in the Russian version, although an alternative 12 item version received support; Aroian et al., 1997). However, the validity of the scale has also been demonstrated with negative correlations between the RS and measures of depression and anxiety in a group of 70 Nigerian individuals (Tajudeen & Owiodoho, 2011) and positive and negative correlations between the Spanish version of the RS and life satisfaction and depression, respectively (Heilemann et al., 2003). Additionally, the Swedish version of the RS correlated positively with a sense of coherence and self-esteem (Nygren, Bjorkman-Randstrom, et al., 2005), which collectively demonstrate adequate generalisability of the RS to other language and cultural groups.

Although the RS has obtained empirical support for use among individuals varying demographically, the construction of the scale based exclusively on the statements matching pre-established facets of resilience from an isolated group of older women may have resulted in the exclusion of important components of resilience that are important in other contexts. Even though the scale may be measuring resilience, the constituents of resilience the inventory omits assessment requires examination. In addition, there is a paucity of research investigating the applicability of the RS in sporting contexts. Further research efforts are warranted to extrapolate the extent to which the questionnaire evaluates all aspects of resilience and the applicability of the scale in athletics.

2.18 Resilience and Relevant Psychological Constructs

The development in the understanding of resilience and frameworks for conceptualising the construct may, in part, be attributed to the appropriation of components or characteristics of other psychological constructs. Additionally, identification and evaluation of constructs closely related to resilience is integral to determining the distinguishing features between resilience and other constructs.

2.18.1 Hardiness

Reflected in resilience are elements of hardiness. Specifically, the two constructs are associated with controlling or resisting the effects of stress and adversity to protect the individual and associated functioning. In fact, Bonanno (2004) suggests that hardiness is a means of obtaining an outcome of resilience. Maddi (2002) denotes that hardiness increases the accuracy of stressor appraisal, resulting in more effective responses for overcoming adversity (i.e., hardiness operates as a protective factor). Lee, Sudom, and McCreary (2011) found support for a higher-order hardiness model of resilience, suggesting that hardiness is a strong predictor of resilience. Additionally, Kobasa's (1979) hardiness model has been incorporated into the development of the CD-RISC, supporting interconnectivity between the constructs and hardiness as a constituent of resilience. Perhaps, hardiness is a subcomponent of resilience or represents a personal characteristic that may protect against adversity and distress. Although preliminary evidence indicates associations between resilience and hardiness, the inadequate quantity of studies examining the relationship between the two constructs necessitates further examination. Specifically, such investigations have apparently been neglected in athletic populations, particularly tennis.

2.18.2 Sense of Coherence

Sense of coherence (SOC) evidences interrelation with resilience. Specifically, SOC, in part, refers to the extent to which one perceives the resources available are substantial to overcome adverse circumstances (Antonovsky, 1984). Although a variety of protective factors may be critical for the manifestation of resilience following risk, an individual's appraisal of such resources may be important for effective use of resources or factors. Nygren, Alex, et al. (2005) examined resilience and SOC in a group of 125 older participants, indicating a positive relationship between the two constructs; a finding corroborated in other studies (e.g., Friborg et al., 2003; Nygren, Bjorkman-Randstrom, et al., 2005). Wagnild and Young (1993) included meaningfulness, a subcomponent of SOC (Antonovsky, 1984), into a framework for generating items for inclusion in the RS. Additionally, Atonovsky's (1987) abbreviated SOC scale has been utilised as a measure of resilience (e.g., Almedom, Tesfamichael, Mohammed, Mascie-Taylor, & Alemu, 2005). Essentially, this asserts that resilience and SOC represent the same construct. It appears as though the relationship between resilience and SOC is unclear and requires further inspection. Predominating examination requirements is the emphasis on identifying the commonalities and distinguishing aspects of both constructs and the process through which SOC promotes resilience. Additionally, the connection between the two constructs has yet to be investigated in athletes, an area warranting attention.

2.19 Resilience in Relation to Mental Toughness

The relationship between MT and resilience is based on the understanding that both constructs are associated with athletic achievement (e.g., Clough et al., 2002; Hosseini & Besharat, 2010; Weissensteiner, Abernathy, & Farrow, 2009). MT and resilience share a number of commonalities, including the ability to deal effectively with adversity and pressure (Bull et al., 2005; Masten, 1994), rebounding following setbacks (Jones et al., 2002; Mummery et al., 2004), and perceived internal control over events or situations (Clough et al., 2002; Cowen et al., 1992). The two constructs, however, differ greatly in mechanistic operation. MT represents a set of qualities (emotional, cognitive, and attitudinal) that influence the way in which an individual appraises and approaches adversity, challenges, and goals (Gucciardi et al., 2009a). Resilience represents an interactive process between adversity, protective factors, and outcome. Perhaps, various components of MT operate as protective factors promoting positive adaptation during risk, indicating MT characteristics as subcomponents of resilience. In a recent study, Gerber et al. (2013) categorised adolescents into four distinct clusters based on baseline and 10-months post-baseline scores on stress, depression, and life satisfaction inventories. The findings indicated that there were significant differences in the MT of adolescents clustered into well-adjusted, maladjusted, deteriorated, and resilient groups, with the well-adjusted group evidencing greater MT. The students clustered into resilient and deteriorated groups initially did not differ on baseline levels of MT, but the resilient cluster indicated greater MT at the 10-month follow-up. The authors concluded with the suggestion that, at least amid adolescents, MT operates as a stress-resilience resource, purporting MT as a protective attribute that facilitates outcomes of resilience following exposure to risk. From this perspective, MT appears to function as a protective resource that moderates the stress-adaptation relationship.

Other researchers contend that resilience is an integral component of MT (e.g., Bull et al., 2005) and that the personal protective factors associated with resilience in sport are indicative of MT characteristics (Pickering, Hammermeister, Ohlson, Holliday, & Ulmer, 2010). In fact, Sheard (2013) suggests that resilience is one feature of mentally tough athletes, that MT encompasses many attributes in addition to resilience, and that athletes require a number of other attributes associated with MT outside the context of adversity and stress (i.e., during positive situations). Thus, to Sheard (2013), MT is important for both negative and positive scenarios and circumstances, enables or promotes successful navigation following distress, and is also connected to prospering or flourishing in situations of self-perceived positive stress. Loehr (1995) delineates "emotional resilience" as an aspect of MT, which enables an athlete to swiftly rebound from adversarial setbacks and maintain competitive standards. Recently, in their qualitative investigation to conceptualise MT using PCP, Gucciardi et al. (2008) reported resilience as an attribute contributing to the characteristic composition of MT. In another study, Gucciardi and Gordon (2009) identified and included resilience as a subcomponent of MT and the associated measurement instrument, the CMTI. Coulter et al. (2010) reported similar findings in a qualitative investigation of MT in soccer, suggesting resilience as one of 14 MT attributes of mentally tough soccer players. Thus, according to selected researcher' perspectives, resilience constitutes one of the fundamental components of MT. The primary differentiation between MT and resilience may be based on the distinguishing conceptualisation features of each construct. That is, MT is generally acknowledged as a collection of natural or developed characteristics, whereas resilience involves a process in which protective factors interact with some form of risk to produce positive adaptation or competence.

Resilience is advocated as enabling athletes high in MT to avoid performance slumps (Goldberg, 1998) and regain focus following discouraging events and retain concentration and attention on performance despite adversity (Clough et al., 2002; Gould et al., 2002). Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al. (2012) denoted that individuals high in MT may be more resilient against stress, deducing a direct relationship between the two psychological constructs. In another study, Pickering et al. (2010) examined the ability of mental skills (i.e., foundation skills, emotion management, and cognitive skills) to predict resilience in a group 27 military personnel. In three distinct resilience models (one each for foundation skills, emotion management, and cognitive skills), the authors found support for commitment, goal setting, imagery/mental practice, and planning as significant predictors of resilience. It is feasible to postulate these mental skills serve as protective factors when exposed to stress. Pickering et al. (2010) do contend that many of the mental qualities identified demonstrate congruence between MT and resilience. Indeed, researchers have asserted that commitment (e.g., Clough et al., 2002), achievement goals (e.g., Gucciardi, 2010), and the use of mental imagery (e.g., Mattie & Munroe-Chandler, 2012) are associated with or characteristics of MT. However, possibly due to the absence of a direct evaluation of MT in Pickering et al.'s (2010) study, the elements distinguishing MT and resilience could not be identified. Although congruence between resilience and MT is plausible, the ability to conclusively ascertain the relationship between the two constructs is important for delineating MT as a separate and distinct construct from others, including resilience.

It is evident that studies involving MT and resilience among athletes are limited, with many providing inferential qualitative findings associating the two constructs. Additionally, comparing the constructs based on prior evidence is challenging, as resilience has received a dearth of attention in sport, whereas MT was developed from sporting contexts and has received little attention in non-sporting settings. Furthermore, research has apparently neglected examining the components of resilience important for reducing the impact of stress relative to MT. Specifically, identifying the aspects of resilience responsible for buffering stress in mentally tough athletes will likely provide greater insight into the interaction between the two constructs. In order to more thoroughly understand the similarities and distinctions between resilience and MT in sport (generally and specifically), examining the two constructs meticulously amid athletes of all types is critical.

2.20 Stress

Researchers, sports psychology professionals, coaches, and athletes have become increasingly interested in the factors that enhance and debilitate athletic performance. Amid such factors is the emphasis on stress in sport, which may reduce the influence of certain qualities important for successful athletic performance (e.g., confidence; Meyers, 2001). Historically, stress has been perceived divergently as (1) stimuli that individuals encounter (e.g., Noblet & Gifford, 2002), or (2) responses to stimuli (e.g., Desborough, 2000). However, contemporary conceptualisations denote stress as a relationship between internal and external stimuli and responses. That is, stress is a dynamic process involving internal-external relationships and evaluation of environmental demands and strains (Fletcher, Hanton, & Mellalieu, 2006). In sport, athletes experience a variety of cognitions, emotions, and physiological responses, which may result from exposure to stressors and individual evaluation of the stressors (Hanton, Neil, & Mellalieu, 2008). Thus, athletes may be exposed to similar stressors, but individual athlete's appraisals of the stressors influence responses (e.g., anxiety). Feasibly, certain psychological constructs (e.g., MT, resilience) may enable or assist athletes to positively appraise stressors, which may reduce the likelihood of unfavourable responses to stressors or performance deficits.

Sport psychology researchers have conducted various studies investigating stress in sport. Gould and Weinberg (1985) identified sources of worry prior to competing (e.g., 'losing', 'performing to standards of ability', and 'concerns about coach thoughts or comments') among 37 intercollegiate wrestlers. Other researchers have focused on stress during athletic performance. For instance, Madden et al. (1995) quantitatively examined 84 male basketball players' responses to basketball-specific items referencing stress, suggesting that the primary sources of stress were personal performance slumps, holding up opposition play, general errors, and team loss. Additionally, participants who trained more frequently reported a greater stress amid negative team performance compared to athletes who trained less frequently.

Conceptualising stress in contexts broader than direct sporting settings, Gould, Jackson, and Finch (1993) emphasised the foundations of stress inside and outside the direct sporting environment. The authors examined the self-perceived causes of stress in 17 adult U.S. national figure skating champions, finding support for direct (e.g., expectations and pressure to perform) and indirect (e.g., concerns about life directions) stress associated with skating performance. Noblet and Gifford (2002) qualitatively studied a group of 32 Australian Rules football players with assorted levels of professional playing experience and identified six themes outlining sources of stress associated with injuries, team and coach relationships, performance pressures, communication structures, managing non-football and football obligations: (1) concerns about performance standards and expectations, (2) career development concerns, (3) demanding nature of work itself, (4) negative aspect of organisational systems and culture, (5) negative aspects of interpersonal relationships, and (6) problems associated with the work-non-work interface. These results stipulate the influence of stressors on athletes that are beyond pre-competition, during competition, and post-competition. Continuing with a broad examination of stressors in sport, Mellalieu, Neil, Hanton, and Fletcher (2009) qualitatively identified a factorial structure of stress in sport consisting of 23 categories (e.g., sport relationships and interpersonal demands) structured around *performance stressors* and *organisational stressors*. This finding extended prior findings implicating various performance stressors (performance issues) and organisational stressors (environmental issues) in sport (Hanton, Fletcher, & Coughlan, 2005).

Despite divergent frameworks for conceptualising and investigating stress in sport, the fundamental aim of efforts endeavouring to outline stress in sport is to determine what factors reduce the likelihood of such stressors having a negative impact on athletes. Hence, identifying stress has provided the foundation for examining the role of psychological constructs in alleviating stress-effects. Relative to resilience, stress operates as a risk factor with the propensity to influence adaptive functioning or the maintenance of functioning (i.e., athletic performance). In terms of MT, the ability to overcome, deal effectively, and control cognitions and emotions during pressure, adversity, and stress are common features in various conceptualisations of the construct (e.g., Clough et al., 2002; Jones et al., 2002; Kaiseler et al., 2009). In a recent study involving 92 collegiate American Rules football athletes, Petrie, Deiters, and Harmison (2013) found that when low MT and high positive stress was reported, the athletes displayed a greater number of days absent due to injury. The authors contend that athletes low in MT and heightened reports of positive life stress are more injury prone, which results from their threatened perceptions of stressful circumstances. Indeed, this supposition is supported by prior studies that have indicated lower perceptions of stressor severity and intensity among athletes high in MT (e.g., Horsburgh et al., 2009; Kaiseler et al., 2009). Hence, MT may be an important construct for avoiding unnecessary absentia from sport participation (i.e., practice or training). In another study involving adolescents, Gerber et al. (2013) found negative statistically significant correlations between MT and stress, both measured on two separate occasions. This suggests that mentally tough adolescents report or experience lower levels of stress, which may be critical to maintaining performance levels and functioning. In the same study, which extended 10-months in duration, Gerber et al. (2013) examined the relationship between MT and stress in 865 adolescents from two schools (i.e., school A and B). Based on cluster analyses using baseline (T1) and 10-month follow-up (T2) depression, life satisfaction, and stress scores, the authors categorized the adolescents from each school into four groups: (1) well-adjusted, (2) maladjusted, (3) deteriorated, and (4) resilient. Clustering the adolescents from school A into these groups, MT scores were compared at T1 and T2. At both measurement intervals, the lowest MT was found within the maladjusted group and the well-adjusted group evidenced the highest MT. Although the resilient and deteriorated groups demonstrated similar levels of MT at T1, the resilient group was significantly higher in MT at T2. The authors reported replication of the findings in school B. The study also found that greater MT scores at T1 were significantly predictive of higher T2 life satisfaction and lower levels of T2 depressive symptomology. Thus, Gerber et al. (2013) contend that superior MT is associated with more successful emotional adaptation, provisionally providing support for MT as a protective factor.

Examining the stress-related research involving resilience and MT, it appears as though both constructs may impact or reduce the degree to which stress influences athletes sport performance and non-athletes psychological functioning. Considering the postulation that mentally tough individuals are more resilient against stress (Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al., 2012), examining the manner in which resilience reduces the influence of stress in athletes may provide valuable information about the association between resilience and MT in sport. Although researchers have examined the relationship between MT and stress in sport (e.g., Kaiseler et al., 2009), further stress studies, particularly in association with resilience and MT in competitive tennis, are necessary.

2.21 Measuring Stress in Sport

Though researchers have identified stress among athletes in specific (e.g., competition) and broader (e.g., organisational stressors) contexts of athlete involvement, there are a limited number of sport-specific instruments evaluating athlete exposure to and degree of self-perceived stress experienced.

2.21.1 Athlete Stress Inventory (ASI)

Seggar, Pedersen, Hawkes, and McGown (1997) contend that the stressors experienced by athletes in their lives (e.g., obtaining adequate rest and finding time to relax) generate stress and, consequently, may encumber athletic performance. Exposure to stressors and response to stressors differ temporally and across individuals. From the authors' perspective, all stressors possess the capacity to produce stress and individual appraisal is integral to the effect of stressors. Using this structure, the Athletic Stress Inventory (ASI) was developed to ascertain life stressors experienced by athletes and to examine the relationship between the questionnaire and athletic performance. Based on athletic and coaching experiences, the researchers generated 49 items rated on an 11 point Likert-type scale. The questionnaires were administered to 148 female U.S. Division I intercollegiate athletes participating in varied sports (e.g., tennis). Using PCA, four factors were identified: (1) negative mood, (2) team compatibility, (3) physical well-being, and (4) academic efficiency.

Seggar et al. (1997) reported predictive validity of the ASI by correlating scores on the measure with the athletic performance of female athletes participating in gymnastics and tennis. Specifically, ASI scores were negatively associated with performance. Internal consistency and test-retest reliability were considered acceptable. However, the ASI has been used sparingly to examine stress in sport. As a result, reliability and validity information is incomplete, and thoroughly determining whether the ASI is an appropriate instrument to assess stress is necessary.

Although the inventory may be appropriate for use with intercollegiate athletes, the questionnaire may not be suitable for use with other groups of athletes. For instance, academic efficiency may not apply to athletes not enrolled in educational institutions. Additionally, analysis of the inventory did not include male athletes. Perhaps, the stress factors influencing male athletes differ from females. Conceptualising athlete stress based solely on life events is limiting, as athletes experience a variety of other stressors during competition (e.g., opposition deceit) that may influence performance outcomes. The questionnaire has received inadequate attention and use, particularly in specific sporting domains (e.g., tennis).

2.21.2 The Recovery-Stress Questionnaire for Athletes (RESTQ-Sport)

The RESTQ-Sport (Kellmann & Kallus, 2001) was developed to assess multiple domains of stress and recovery in athletes. The inventory assesses general and sport specific stress and recovery and is comprised of 76 Likert-type items (0 = *never*, 6 = *always*) across 19 subscales (four items each). In establishing the questionnaire, Kellmann and Kallus (2001) included the 12 subscales from the Recovery-Stress Questionnaire (Kallus, 1995), which assesses physical and psychological stress and an individual's present recovery capacity. The stress-oriented subscales include general stress, emotional stress, social stress, conflicts/pressure, fatigue, lack of energy, and physical complaints. The subscales assessing recovery encompass success, social recovery, general well-being, physical recovery, and sleep quality. However, Kellmann and Kallus (2001) recognised the necessity to include subscales assessing stress and recovery specific to athletes. Of the seven sport-specific scales, three assess stress (disturbed breaks, emotional exhaustion, and injury) and the remaining four address recovery aspects (being in shape, personal accomplishment, self-efficacy, and self-regulation).

The RESTQ-Sport is based on the linear relationship between the stress and recovery process. That is, greater degrees of stress require longer periods of time for recovery. Recovery from stress requires an individual to use available resources to facilitate recovery. Lower than expected recovery resulting from inadequate resources for facilitating recovery may influence physical and psychological states and be detrimental to performance (Kellmann, 2002). Although the pre-established General Recovery-Stress Scale was developed from research focusing on biological and psychological processes of stress, the sport-specific items were generated from observations of recovery and stress states in athletes (Kellmann & Kallus, 2001). Thus, the items and scales were developed from a priori approach. The authors conducted PCA separately on the seven Sport subscales and 12 General subscales, delineating two overarching factors within each domain: (1) stress and (2) recovery. This factor structure has been supported in adapted forms of the RESTQ-Sport in Spanish (Gonzalez-Boto, Salguero, Tuero, & Marquez, 2008), German (Kellmann & Kallus, 2000), and Dutch versions (Nederhof, Brink, & Lemmink, 2008). Internal consistency values in a group of Canadian participants for each of the 19 subscales ranged from .72 to .93 (Kellmann & Kallus, 2001), a finding supported in other studies (e.g., Gonzalez-Boto et al., 2008; Nederhof et al., 2008). The 24-hour test-retest reliability was reportedly adequate for each of the subscales (Kellmann & Kallus, 2001). The construct validity of the RESTQ-Sport has been examined using the Profile of Mood States (POMS; McNair, Lorr, & Droppelman, 1971). Except for the vigour subscale (which was positively related to recovery), the tension, depression, anger, fatigue, and confusion subscales of the POMS correlated negatively with recovery. The stress scales were correlated conversely with the aforementioned scales of the POMS compared to the recovery scales (Kellmann & Kallus, 2001).

Davis IV, Orzeck, and Keelan (2007) used maximum likelihood factor analysis to empirically examine the factor structure of the individual items included in the RESTQ-Sport. The authors denote that the seven subscales included in the General Stress domain significantly loaded on that factor; the Sleep Quality subscale did not load on the General Recovery factor.

The Sport scales did load significantly onto previously delineated factors. Therefore, the factor structure of the General Stress scale, the Sport Stress, and the Sport Recovery domains were supported. However, the results assert that further efforts are required to thoroughly validate the factor structure of the General Recovery domain. In the study, Cronbach's alpha for the General and the Sport dimensions were .76 and .83, respectively. Although the factor structure was generally confirmed across the General and Sport stress and recovery scales, Davis IV et al. (2007) suggest that item-loadings on the factors do not support the original structure. For instance, two items ('I slept restlessly' and 'My sleep was interrupted easily') originally included in the General Recovery scale loaded significantly on the General Stress scale. Although the authors denoted that the RESTQ-Sport is a valid instrument, further validation is required to confirm the item-loadings on subscales included in the inventory. However, the inventory does assess a broad range of areas that may be responsible for generating stress directly and indirectly associated with the athletic environment.

Using the RESTQ-Sport to assess performance in a group of 10 athletes (sprinters and jumpers) involved in an indoor championship and a different group of 11 athletes (sprinters and jumpers) participating in an outdoor championship, Kalda, Jurimae, and Jurimae (2004) found significant negative correlations between participants' performance in the outdoor championship and scores on the emotional stress and fatigue subscales. Additionally, athlete performance in the outdoor championship correlated negatively with the physical complaints subscale. The authors suggested further investigation of the RESTQ-Sport to provide further validation, but the findings indicate the ability of the RESTQ-Sport to predict performance outcomes. Maestu, Jurimae, Kreegipuu, and Juimae (2006) reported an increase in scores on stress scales when male rowers were subjected to heavy training schedules and a decrease in stress-scale scores during the recovery period following the intense training period. In another study involving 6 elite male rowers participating in different categories over three world cup championships (double and quadruple skulls), Purge, Jurimae, and Jurimae (2005) found that the RESTQ-Index score (obtained by subtracting the stress score from the recovery score – higher scores indicating better recovery) for double skull rowers decreased due to reductions in recovery scores, whereas RESTQ-Index scores for quadruple skull rowers declined as a result of increases in stress scores. Additionally, the authors reported deterioration in the performance of the athletes from tournament one to tournament three. Thus, the stress-recovery relationship may be specific to the individual, and, at least for the quadruple skull rowers, higher stress scores are associated with performance deficits.

Studies examining the RESTQ-Sport suggest the inventory is an adequate stress and recovery assessment instrument, is related to performance, and examines multiple areas of athlete stress sources and experiences. The measure does require further validation however, and additional research is required to more extensively examine the applicability of the RESTQ-Sport in athletic populations such as tennis players. Furthermore, the measure has received scant attention relative to other important psychological constructs in sport (e.g., MT and resilience), and conducting such evaluations may provide supplementary psychometrics of the RESTQ-Sport.

2.22 Conclusion

The various facets of the MT literature, related constructs, and psychological concepts discussed, in conjunction with the limitations associated with the current MT literature, provide a foundation and framework for the present study. The current study seeks to address selected limitations and advance existing knowledge of MT within a sport-specific context, tennis. The findings may enable more comprehensive identification of MT in tennis, denote convergent and discriminating aspects of MT and other psychological constructs, and explicate the interrelation between MT and other constructs, dispositions, and characteristics.

CHAPTER THREE

METHOD

3.1 Introduction

The following chapter provides methodological details that pertain to the selection of the broad research approach and design, the designated target population (along with inclusion criteria), the research instruments and associated psychometric properties, and the data collection process, which includes the sampling procedure and techniques as well as the recruitment and participation process. In addition, the data analyses that were computed in order to achieve the aim and particular objectives of the study are outlined and the analysis process described.

3.2 Research Design

The apparent ambiguities associated with MT necessitate more objective evaluations of the construct. In particular, the delineated objectives have, in part, been formulated to address the qualitative shortcomings of prior research endeavours and to provide clarity of MT in a specific sporting context; a limitation of previous research. Specifically, evaluating the direct and indirect relationship and effects of the designated psychological constructs, characteristics, and states emphasises the necessity to utilise quantitative methods to evaluate the complex interrelatedness between specified variables. Thus, given the selected limitations and considering the objectives of the present study, a quantitative cross-sectional methodological approach will be employed. A cross-sectional design is useful and appropriate when examining relationships between variables and attempting to obtain a clearer understanding of constructs of interest amid a particular population at a given point in time (Levin, 2006). This was a primary objective in this study, with the specific focus on competitive tennis players in South Africa.

Considering the current investigation included a unique set of objectives that have received scant attention, particularly amongst tennis players, a cross-sectional design that corresponds with more descriptive and exploratory purposes is suitable for providing novel insight into underexplored phenomena of interest within a selected target group. The inherent drawback to a cross-sectional design approach is the inability to ascertain causal relationships and the manner in which constructs of interest influence or affect one another. Although this study has been conducted in an exploratory framework, there are limitations to the interpretability of the findings. There is also the issue of generalisability that is associated with cross-sectional designs, as the results may not be applicable to other types of population groups other than the population of interest (Creswell, 2003). However, with the recent MT literature advocating sport-specific MT investigations (e.g., Bull et al., 2005), a tennis specific MT study is warranted in order to examine MT within the context of a sport that has received inadequate MT attention.

3.3 Participants

A total of 365 competitive tennis athletes participated in the study. All participants were required to have engaged in some form of tennis competition within the last two weeks (or during the time of their participation) and must have engaged in tennis participation for a minimum of five years prior to their participation in the study. These two criteria were considered necessary in order to operationally define the term *competitive*, which would more likely enable the evaluation of a specific sub-group of tennis participants and maintain congruence among all participants. Additionally, the criteria were considered important for reducing the potential for confounds to influence the results and subsequent interpretation of the findings. For instance, if the requirement to include athletes currently competing was omitted, the degree to which participant scores on the various measures were influenced by the act of engaging in competition or absence of competitive engagement could not be determined.

Having delineated the requirements for participation and participant inclusion criteria, the sampling of participants was required. There are a number of sampling approaches that may be employed, which fall into two categories: (1) probability and (2) non-probability sampling (Onwuegbuzie & Leech, 2007). Probability sampling techniques utilise varying degrees of random selection to select and include participants in a study. However, these techniques require knowledge of each individual in the target population in order to apply techniques to randomly select participants. On the other hand, non-probability sampling techniques are less stringent in the application of random selection of participants, but generate issues surrounding respresentivity and subsequent generalisability of the results to the broader target population. For this reason, probability sampling techniques are typically preferred.

The designated population group that was outlined, coupled with participation requirements (current engagement in competition), created a major challenge in identifying and quantifying each individual in the target population. In fact, the emphasis on current engagement in competition meant that the number of currently competitive tennis participants would fluctuate on a frequent basis. In addition, this specification also meant that one of the most feasible means for obtaining participants was to approach competitive tennis events to obtain actively competing tennis players. It was based on these considerations that probability sampling could not be feasibly employed in this study, and, instead, a number of non-probability techniques were used. In particular, a combination of snowball and convenience sampling techniques were used. Snowball sampling involves attaining additional participants' information, contact details, or participation through those that have already participated (Onwuegbuzie & Collins, 2007), which, in this study, involved referring other competitive tennis players to the principal investigator or the internet-based questionnaire to participate. Convenience sampling, on the other hand, involves obtaining participation from relevant individuals that are conveniently available and willing to participate (Onwuegbuzie & Collins, 2007), which, in the current study, included those participants who were currently competing at particular tennis events and were approached by the principal investigator due to the ease of access and availability. Although non-probability techniques may not be preferred for data collection purposes, the inherent challenges associated with the current study necessitated the use of alternative techniques to obtain the required data.

Participants were recruited through local and national tennis organisations, universities, high schools, professional coaches, tournaments, and county clubs. University ethical approval from the Institutional Review Board was obtained prior to participation. All participants were provided and completed an informed consent document prior to participation in the study.

3.4 Research Instruments

3.4.1 Mental Toughness

The Sports Mental Toughness Questionnaire (SMTQ; Sheard et al., 2009) was used to assess the MT of the participants. The SMTQ is a multidimensional measurement of MT that is based on the qualitative constituents of MT consistently identified in the MT literature (Sheard, 2013). The primary reason for selecting the SMTQ was based on the demonstrated construct validity of the inventory resulting from CFA support following EFA, adequate internal reliability, divergent validity, and discriminative ability findings. In fact, Sheard (2013) asserts that the SMTQ is only one of two MT instruments (the other being the PPI-A) that have been extensively evaluated using EFA and CFA and acquired support from the analyses. The lower quantity of items on the SMTQ is also advantageous, as, although the instrument is comprehensive, the participants were required to complete other inventories as part of their participation in the study. Therefore, restricting the number of items administered for MT decreased the total quantity of items administered across all inventories.

The SMTQ is comprised of three subscales (confidence, constancy, and control) that combine for a general measure of MT. Sheard et al. (2009), in their CFA, evidenced strong support for the hierarchical three-factor model, with a goodness-of-fit index (GFI) of .95, suggesting a good model fit. The coefficients between the higher-order factor of total MT and second-order factors of confidence (r = .72), constancy (r = .71), and control (r = .66) were considered acceptable. Correlations between confidence and control, confidence and constancy, and constancy and control were reportedly .28, .31, and .31, respectively, all of which were statistically significant (Sheard et al., 2009). Internal consistency for global MT on the SMTQ was strong (α = .81). Additionally, internal consistency for the sub-factors was considered moderate to strong (confidence = .79, constancy = .76, control = .72).

Providing evidence for the divergent validity of the measure, correlations between the SMTQ and the subscales on the Life Orientation Test, Personal View Survey III-R, and the Positive and Negative Affect Schedule were moderate and ranged from .23 - .38, .14 - .33, and .12 -.49, respectively (Sheard et al., 2009). The researchers also reported the discriminative power of the SMTQ resulting from statistically meaningful differences between athletes of dissimilar competitive levels, age, and gender with higher scores for more advanced competitive levels, for older athletes, and males.

The SMTQ contains 14-items rated on a Likert-type scale, anchored between 1 (*not at all true*) and 4 (*very true*). Sample items on the three sub-factors include "I interpret potential threats as positive opportunities" (confidence), "I give up in difficult situations" (constancy), and "I am overcome by self-doubt" (control).

3.4.2 Resilience

The Resilience Scale for Adults (RSA; Friborg et al., 2005) is appropriate for measuring resilience in adults. The 33-item inventory is rated on a five-point Likert-type scale with opposing attributes at each end of scale for each item. The questionnaire encompasses 6 domains of resilience: social competence (e.g., "When I am with others: I easily laugh – I seldom laugh"), social resources (e.g., "I get support from: friends/family members – No one"), family cohesion (e.g., "In difficult periods my family: Keeps a positive outlook on the future – Views the future as gloomy"), structured style (e.g., "I am good at: Organising my time – Wasting my time"), and personal strength/perception of self (e.g., "My abilities: I strongly believe in – I am uncertain about") and personal strength/perception of future (e.g., "My future goals: I know how to accomplish – I am unsure how to accomplish"). Seventeen of the items are reverse scored, and the items are summated for individual subscale calculation and the total resiliency score, with high scores on the subscales and total score indicating greater resiliency. The internal consistency values for personal strength/perception of self, personal strength/perception of future, social competence, family cohesion, social resources, and structured style were .70, .66, .76, .78, .69, and .69, respectively. The authors also indicated support for discriminant and convergent validity of the RSA (Friborg et al., 2005).

The decision to utilise the RSA in the present study was based on evidence of strong psychometric properties and the comprehensive assessment of resilience. Specifically, the RSA possesses six sub-factor categories that permit investigation of individual factors that defend against stress relative to MT. Additionally, the RSA has not been utilised in competitive tennis, and use amid sporting groups may provide evidence of the applicability of the measure in athletic contexts.

3.4.3 Self-Awareness

The Self-Reflection and Insight Scale (SRIS; Grant et al., 2002) was used to assess private self-consciousness (PSC), a term analogous to self-awareness and frequently referred to as self-awareness (e.g., Morin, 2011; Wiekens & Stapel, 2010). Although there is scant prior research to identify the particular components of self-awareness that may be associated with MT, the inventory was selected based on the focus of personal insight and reflection, aspects that may be of prominence in individual sport (i.e., tennis). Reflection involves repeated scrutiny and negative rumination or assessment of one's own cognitions, emotions, and behaviour, whereas insight refers to acknowledgement and general understanding or awareness of one's own cognitions, behaviour, and emotions (Grant et al., 2002; Harrington & Loffredo, 2010).

The SRIS is comprised of 20 items rated on a six-point Likert-type scale ranging from 1 (*disagree strongly*) to 6 (*agree strongly*) across two subscales: (1) self-reflection (SRIS-SR – a combination of 'engagement in self-reflection' and 'need for self-reflection'; 12 items) and (2) insight (SRIS-IN; eight items). Following the construction of 30 items adjudicated to assess self-reflection (10 items), engagement in self-reflection (10 items), and insight (10 items) by doctoral psychologists, 260 university students completed the inventory. Using PCA, Grant et al. (2002) found support for a five-factor model. However, the insufficient loadings of certain items on the identified factors resulted in the removal of those items. The remaining items were re-analysed using PCA and found support for the two-factor, separately structured 20-item model. In a subsequent study, PCA provided additional support for the previously delineated model in a group of 121 university students (Grant et al., 2002). Cronbach's alpha's for the SRIS-SR (α =

.91) and SRIS-IN (α = .87) scales were reportedly strong. Test-retest correlations in 28 university students for the SRIS-SR and SRIS-IN were statistically significant, providing further reliability of the measure.

In the study involving 121 collegiate students, Grant et al. (2002) demonstrated convergent validity of the SRIS-IN based on negative correlations between the scale and depression, alexithymia, stress, and anxiety. Lyke (2009) also evidenced positive relationships between the SRIS-IN and subjective well-being, whereas no relationship was found between subjective well-being and the SRIS-SR. The SRIS-SR correlated positively with stress and anxiety but not alexithymia and depression, providing mixed support for prior evidence suggesting that heightened self-regulation may be negatively associated with psychological well-being indicators as in other studies (e.g., Creed & Funder, 1998; Watson, Morris, Ramsey, Hickman, & Waddell, 1996). Additionally, participants who engaged in diary writings scored higher on the SRIS-SR and lower on the SRIS-IN scale. Males and females did not differ significantly on either scale. The correlations between the scales across the studies conducted were mixed, with one non-significant and one significant negative correlation found; findings that were supported in past studies examining the relationship between insight and self-reflection (e.g., Kingree & Ruback, 1996). In addition to indicating the independency of the measures in cohesion with Grant et al.'s (2002) theoretical postulation, the findings suggest that the SRIS scales assess different aspects of self-awareness. The SRIS-IN is associated with positive insight and awareness into thoughts, emotions, and behaviours, whereas the SRIS-SR assesses a dysfunctional self-reflective orientation.

The SRIS-SR is comprised of 12 items (e.g., "I frequently examine my feelings"), and the SRIS-IN contains eight items (e.g., "I am usually aware of my thoughts"). Nine of the items are reverse scored before the items are summated within each scale for self-reflection and insight scale and subscale scores.

3.4.4 Stress

A modified version of the Recovery-Stress Questionnaire for Athletes (RESTQ; Kellmann & Kallus, 2001) was used to examine stress. Specifically, the items developed to measure recovery were omitted and only the remaining stress-related items were administered. Therefore, from the original 76 items, 40 were retained for use in the current study. The items comprise 10 dimensions of stress (four items for each factor), which permits the assessment of the stress experienced by athletes in a broad range of aspects inside and outside of sport. The stress subscales include general stress (e.g., "I was fed up with everything"), emotional stress (e.g., "I felt anxious or inhibited"), social stress (e.g., "I was annoyed by others"), conflicts/pressure (e.g., "I couldn't switch my mind off"), fatigue (e.g., "I did not get enough sleep"), lack of energy (e.g., "I was unable to concentrate well"), somatic complaints (e.g., "I felt physically bad"), disturbed breaks (e.g., "I could not get rest during the breaks"), burnout/exhaustion (e.g., "I felt burned out by my sport"), and fitness/injury (e.g., "I felt vulnerable to injuries"). The items are rated on a seven-point Likert-type scale anchored at 0 (*never*) and 6 (*always*) and address the degree to which the participants experienced the item in the past three days/nights; higher scores reflect greater levels of stress.

The inventory has been validated using PCA (Kellmann & Kallus, 2001), a finding that has been cross-culturally verified (e.g., Gonzalez-Boto et al., 2008; Nederhof et al., 2008). Maximum likelihood factor analysis revealed support for the factor structure of the general and sport stress subscales (Davis IV et al., 2007). Kellmann and Kallus (2001) reported adequate to strong internal consistency of the subscales, which has been consistent with subsequent studies (e.g., Gonzalez-Boto et al., 2008; Nederhof et al., 2008). Kellmann and Kallus (2001) also demonstrated sufficient test-retest reliability of the subscales. The construct validity of the stress subscales has been supported (Kellmann & Kallus, 2001).

The RESTQ-Sport was selected to assess stress for a number of reasons. In particular, the stress dimension is a comprehensive measure of the stress experienced by athletes in general and sporting settings and across a range of factors. Additionally, the inventory has been used and validated on multiple occasions and demonstrated strong psychometric properties for use with athletes. Thus, the inclusive and multidimensionality of the measure, the established psychometrics, and the application of the inventory in sport renders the stress domain of RESTQ-Sport appropriate for use in the current study.

3.5 Data Collection

Local county clubs, national universities, local tournament organisers, national tournament organisers, and national tennis affiliations were initially contacted to identify potential participants. Permission letters were obtained from various organisations (see Appendices B and C) to attain permission to access the database of tennis athletes or the contact information of the athletes affiliated with such organisations. Following the attainment of the permission letters, the informed consent document along with the questionnaire were placed into an online survey format with the ability to electronically mail the survey link to prospective participants. Relevant local, provincial, and national organisations were provided the survey link and requested to forward the link the appropriate competitive tennis players attached to such organisations.

The online survey link initially delineated informed consent elements and requested the participants' agreement to the informed consent elements prior to proceeding with the questionnaire items. This specification included the broad scope of the study as well as the nature and purpose of the study. The prospective benefits to both the participants, sport, and general society were also outlined, along with a clear indication of the voluntariness of participation and the ability to withdraw at any stage without negative consequences. The risks and potential harm were also detailed, though few issues were anticipated due to the non-sensitive and non-invasive nature of the participation. Participants were also ensured that their participation in the study was completely anonymous and that their responses would remain confidential. The principal investigator's, the University of Kwazulu-Natal Ethics Committee's, and the academic supervisor's contact details were provided as part of the informed consent document, which enabled the participants to raise any potential issues or questions as they proceeded with their participation. Once informed consent agreement was attained, the participants proceeded through the questionnaire items that mirrored the hard copy completion process.

The internet-based survey did not obtain the participation levels that were anticipated, with slow response rates and limited referrals (snowball sampling) from the participants. The principal investigator then examined the competitive tennis calendar of events for appropriate tournaments to personally visit. This approach was limited by time constraints, and with many of the tournaments occurring in provinces located at vast distances from the principal investigator, travel and accessibility arrangements were challenging. In addition, many of the relevant tournaments that were identified had insufficient numbers of participants (less than 30 entries), making it unfeasible to attend. However, there were several large tournaments that were identified as appropriate and attained a large enough entry database to attend. Initially, the directors and coordinators of these identified tournaments were approached to determine whether the principal investigator would be permitted to attend the tournaments to engage the tennis participants and obtain the required data. When such tournaments were attended, the questionnaires were administered to the players in groups of convenient sizes based on their availability (approximately 5 to 10 players at a time). It was at these tournaments that convenient sampling was applied.

Initially, informed consent elements including the purpose and objectives of the study, anonymity and confidentiality, voluntariness of participation, withdrawal from participation without negative consequences, risks and benefits, as well as the contact details of the principal investigator, University of Kwazulu-Natal Ethics Committee, and academic supervisor were outlined and discussed with the participants, followed by the formal request for informed consent in the form of signed documentation and agreement to informed consent from each of the participants. Questions, concerns, and issues were addressed as required and the informed consent documentation was collected from each participant. The self-administered questionnaire was then distributed to the participants, which required approximately 15 to 20 minutes to complete. The participants were able to ask questions and raise issues during any stage in the questionnaire completion phase.

3.6 Data Analysis

3.6.1 Data Capturing, Missing Item Replacement, and Item Recoding

Participant responses were entered into Microsoft Excel, following which the data were exported to various statistical analysis programs including the Statistical Package for Social Sciences (SPSS 22) and an SPSS extension program AMOS 20. Initially, the frequency of responses across each of the individual variables was assessed to determine the quantity of missing responses. Except for annual income (which yielded a large number of non-responses), there were low frequencies of missing responses along variables that contained missing responses. Considering annual income was included as a demographic variable as well as the large number of non-responses, the variable did not undergo missing value replacement.

Table 3.1 outlines the variables missing responses along with descriptive statistics for such variables. The remaining variables contained a small number of missing values (less than 1%), which were considered to be missing completely at random. That is, the missing values along items were not related to or dependent on any of the other items or variables in the dataset (Osborne, 2013), due, in part, to the low number of missing items. There are several techniques available to overcome missing values in a particular dataset, including case deletion or removal, mean imputation, and multiple imputation techniques such as Maximum Likelihood estimation or Monte Carlo simulation (Acuna & Rodriguez, 2004; Osborne, 2013). There are suggestions that mean substitution should be avoided when missing data is occurs approximately 20% of the time on a particular variable as well as variance overestimation issues that are likely to occur when there are a number of missing values along variables (Osborne, 2013), but low quantities of missing data (less than 1%) are considered negligible (Acuna & Rodriguez, 2004).

Due to the low number of missing responses across the items included in this study (two or less, which was less than 1%), the missing values were replaced by the rounded mean value (nearest whole number) calculated for each particular variable. This method is considered appropriate and acceptable when there are very low quantities of missing responses along variables (Downey & King, 1998). Interestingly, the missing responses that were replaced with rounded mean values did not alter the mean values and non-substantially altered the standard deviation values for the variables (see Table 3.1).

Table 3.1

Pre and Post Replacement Descriptive Statistics of Items Missing Responses

Instrument	Variable	*N*	Missing Responses	Pre-replacement		Post-replacement	
				M	*SD*	*M*	*SD*
	Annual Income	185	180	R416 910.27	359455.764	N/A	N/A
RSA	4	363	2	3.82	.961	3.82	.959
	5	364	1	3.86	.982	3.86	.980
	6	363	2	2.05	1.059	2.05	1.056
	8	363	2	2.03	1.048	2.03	1.045
	11	364	1	2.24	1.330	2.24	1.328
	12	364	1	3.67	1.245	3.67	1.243
	13	364	1	2.19	1.075	2.19	1.073
	15	364	1	2.31	1.204	2.31	1.202
	16	364	1	3.60	1.122	3.60	1.121
	17	364	1	2.21	1.173	2.21	1.171
	18	364	1	3.82	1.117	3.82	1.115
	19	363	2	1.71	.870	1.72	.868
	26	364	1	3.57	1.228	3.57	1.227
	28	364	1	1.59	.823	1.59	.822
	32	364	1	4.29	.919	4.28	.917
	33	364	1	1.64	.846	1.64	.845
SRIS	1	364	1	2.80	1.378	2.80	1.376
	15	364	1	4.67	.928	4.67	.927
	4	364	1	2.92	1.294	2.92	1.292
	12	364	1	4.16	1.236	4.16	1.235
RESTQ-Sport	22	364	1	2.36	1.208	2.36	1.207
	30	364	1	2.01	1.191	2.01	1.189
	26	364	1	2.55	1.281	2.55	1.280
	12	364	1	2.65	1.482	2.65	1.480
	32	364	1	3.26	1.733	3.26	1.731
	25	364	1	2.27	1.470	2.27	1.468
	4	364	1	2.37	1.293	2.37	1.292
	31	364	1	2.39	1.457	2.39	1.455
	40	364	1	2.22	1.262	2.22	1.261
	20	364	1	2.24	1.279	2.24	1.278
	54	364	1	2.08	1.317	2.08	1.315

Note. The variable numbers correspond with the items included on the original validation studies. *N* = Number of Participants; *M* = Mean; *SD* = Standard Deviation.

Following the replacement of selected variables' non-responses, the SMTQ, RSA, and SRIS questionnaire items that required reverse scoring were recoded to reflect the appropriate response direction for each scale. The reverse coded items (corresponding to the original validation study item numbers) from each of the questionnaires included:

1. SMTQ: Items 2, 4, 7, 8, 9, and 10.
2. RSA: Items 1, 3, 6, 8, 9, 11, 13, 15, 17, 19, 22, 24, 28, 30, 31, and 33.
3. SRIS: Items 1, 2, 4, 7, 14, 16, 17, 18, and 19.

3.6.2 SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale Factor Structure Analysis

Principal component analysis (PCA) was selected to evaluate the factor structure of each of the instruments. Although each of the instruments included in the study have undergone prior psychometric assessment and validation, some of the instruments have not been validated in sport-specific contexts (e.g., SMTQ), some have been used scantly in the South African sporting context (e.g., RSA), and many of the questionnaires have yet to be utilised in a sport-specific context within South Africa. For these reasons, it was considered important to examine the factor structure of these instruments as they applied to the context of competitive tennis players within South Africa using PCA.

Direct Oblimin rotation was chosen due to the high likelihood that the components would be correlated with one another, largely because the inventories have previously undergone validation assessment and are purported to measure a single underlying construct. Initially, scree plot analyses were conducted for each measure to determine an appropriate point at which identified components did not add substantially to the factor structure of the measures. The method was selected in conjunction with the commonly used eigenvalue of > 1 approach because the latter has a tendency to overestimate the number of factors (Hayton, Allen, & Scarpello, 2004). The scree plots were carefully scrutinised and evaluated for the point at which the plotted graph had a distinct break and began to flatten. Provided that the point at which the graph precipitously declined or dropped was above an eigenvalue of 1, these were the number of factors that were retained for subsequent PCA with each measure. PCA analysis was subsequently conducted with the specification of the number of factors to be extracted based on eigenvalue and scree plot analysis.

The pattern matrix was examined for each measure to determine items that did not possess clear or adequate loadings onto specific factors. One of the more common approaches used to assess the appropriateness of item-factor loadings is to apply loading cut-off criteria to the rotated factor solution results. That is, in order for an item to be retained in the factor structure, the highest item-factor loading should fall above the established criterion. According to Matsunaga (2010), a loading criterion of an absolute value of .4 is a liberal yet appropriate cut-off value, but was selected for application in this study across each of the instruments, primarily because the questionnaires have undergone prior psychometric assessment as part of the original studies that developed each questionnaire, some of which have undergone subsequent validation efforts (e.g., RESTQ-Sport; Davis IV et al., 2007). Items with strongest loadings onto a single factor of less than .4 were removed and PCA was re-run (with the same factor number specification that was used previously) for those scales that resulted in the removal of items. The pattern matrices were subsequently re-examined to ensure that the remaining items loaded adequately onto specific factors (at or above .4). Prior to further examination and interpretation of the results, the Barlett's Test of Sphericity estimate was examined for statistical significance and the Kaiser-Meyer-Olkin (KMO) values were examined to ensure that the data were suitable for proceeding further with PCA.

3.6.3 Revised SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale Reliability Estimates

Following PCA and factor structure assessment of each of the instruments, Cronbach's alpha, a measure of internal consistency and reliability, was computed for each of the measures as well as the subscales produced. In addition, because Cronbach's alpha is often considered sensitive to the number of items included in a scale, Briggs and Cheek (1986) suggest that reporting the mean inter-item correlation is important for assessing homogeneity, particularly for scales that contain lower quantities of items (e.g., 10 items or less). Therefore, mean inter-item correlation coefficients were also computed and reported alongside Cronbach's alpha estimates for scales and subscales with 10 or fewer items.

3.6.4 Revised SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale Item Summation

Once the factor structure of each measure had been evaluated, the items that corresponded with each particular scale and subscale were summated and each scale assigned an appropriate term based on the content of the items. The specific items, the number of items included in each scale, and the scale and subscale names, post-PCA, are displayed in Table 4.6. Each of the PCA-based sub-factors was assigned terms that appropriately described the factor assessed and fit conceptually with the included items as well as the primary construct. The terms associated with each of the scales and subscales were used in subsequent analyses and are presented in the results chapter.

3.6.5 Revised SMTQ, SRIS, RSA, RESTQ-Sport Stress Scale Outlier Removal

Initially, descriptive statistics were computed for each of the scales and subscales. Upon examination of the box-plots for the presence of outliers, outliers were evidenced within a number of the scales and subscales, which prompted the removal of the outliers prior to further analysis. This was completed using box-plots, which provided an individual variable indication of outlier presence. Following the removal of relevant outliers to improve the distribution of the data along each variable, normality assessment analysis was performed.

3.6.6 Revised SMTQ, SRIS, RSA, RESTQ-Sport Stress Scale Normality Assessment

Several approaches were selected to determine the adequacy of the data in meeting the normality assumption for parametric hypothesis testing. Although hypothesis tests exist for assessing the extent to which variables are normally distributed, Kim (2013) and Kline (2009) suggest that widely accepted tests such as the Shapiro-Wilk and Kolmogorov-Smirnov tests of normality are suitable for smaller and medium sized samples (e.g., $n < 300$), but may be less reliable with larger sample sizes. For this reason, it was considered appropriate to evaluate the normality of the variables using a combination of methods. Although there are no definitive indicators of normality adequacy (Kline, 2009), examining the absolute skewness and kurtosis indexes as well as the Q-Q plots for each variable are commonly used methods to evaluate whether the distribution of the data amid each variable is approximately normal. In particular, a more conservative absolute value cut-off criterion for skewness and kurtosis acceptability evaluation is between -1 and +1, with variables evidencing skewness and kurtosis values outside of this range considered to violate the normality assumption (Bowen & Guo, 2011; Walker, 1999). That is, skewness values between -1 and +1 are considered approximately symmetrical and kurtosis values between -1 and +1 are considered mesokurtic and denote the data are approximately normally distributed (Walker, 1999). The Q-Q plots that were produced for each of the variables were also examined for visual normality, with acceptable normality evidence if the data points display a tendency to fall along the plotted linear 45 degree line.

3.6.7 Revised SMTQ, SRIS, RSA, RESTQ-Sport Stress Scale Descriptive Statistics

Following outlier removal and normality assessment of the scales and subscales, descriptive statistics (means and standard deviations) were calculated and are reported for all scales and subscales. The descriptive statistics form the basis for the inferential statistics that were computed as part of the major objectives included in this study.

3.6.8 Mental Toughness Group Differences: Age, Years of Tennis Participation, Gender, and Type of Participation

Initially, the age and years of tennis participation variables were grouped (see subsequent section). Prior to proceeding with each of the analyses, the normality and homoscedasticity assumptions associated with the dependent variable were assessed amid each of the variable groupings. In each case, the assumptions were adequately satisfied, resulting in the computation of parametric analyses to examine group MT differences. Post-hoc Tukey *HSD* comparisons were only performed to evaluate significant MT differences between each of the groups included in the subsequent analyses when the omnibus test for the one-way ANOVAs was statistically significant.

3.6.8.1 Mental Toughness and Age

With age being an interval/ratio variable, it was considered important to categorise the age variable to determine whether there were MT differences between various age groupings. Prior to categorising the groups, it was necessary to designate the categories based on psychosocial human development. In determining appropriate grouping categories, Sacco (2013) recently proposed a revised eight stage model of development that is based on and corresponds with Erikson's (1982) theory of development. The primary difference, however, is that Sacco (2013) posits revised age groupings that more likely correspond to contemporary society. As a result, the age categories at each stage in the psychosocial development process were used to categorise the participants in this study. The present study included adult participants, and, therefore, the relevant developmental categories were young adulthood (18 to 29 years), middle adulthood (29 to 48 years), and older adulthood (48 to 78 and older). Due to the inherent overlap in Sacco's (2013) age groupings, the following groupings were used to categorise the participants in this study: young adulthood (18 to 29 years), middle adulthood (30 to 48 years), and older adulthood (49 and older). In computing the analysis, a one-way ANOVA was used to evaluate the presence of group differences.

3.6.8.2 Mental Toughness and Years of Tennis Participation

Considering the years of participation variable is measured on an interval/ratio scale, it was anticipated that greater information could be obtained through the computation of an analysis that examined the presence of MT differences between groups as opposed to a relational analysis. Therefore, the years of participation variable was categorised into groups, which were the following: (1) 5 to 15 years, (2) 16 to 25 years, (3) 26 to 35 years, and (4) 36 years or more. A one-way ANOVA was used to evaluate the presence of group differences.

3.6.8.3 Mental Toughness and Gender

An independent samples *t*-test was computed to determine whether males or females tended to possesses higher or lower levels of MT compared to each other.

3.6.8.4 Mental Toughness and Type of Participation

A one-way ANOVA was computed to determine whether one or more of the groups differed in MT levels.

3.6.9 Correlations Between Mental Toughness, Self-Reflection and Insight, Resilience, and Stress Scales

The hypothesis testing assumptions of normality and homoscedasticity were tested to evaluate whether the dependent variable(s) is normally distributed along each of the independent variables and whether the variance of the dependent variable(s) is equal along all points of the independent variables. These assumptions were appropriately satisfied, resulting in the computation of Pearson correlations to evaluate the linear relationships between the MT scales and revised SRIS, RSA, and RESTQ-Sport stress scales and subscales.

3.6.10 Simple Linear Regression: Total Self-Reflection and Insight, Resilience, and Stress as Predictors of Mental Toughness

Three simple linear regression analyses were performed to determine the extent to which the revised total SRIS, RSA, and RESTQ-Sport stress scales (separately) significantly predicted MT. Prior to proceeding, the normality and homoscedasticity assumptions were evaluated, indicating the appropriate use of parametric statistics.

3.6.11 Multiple Linear Regression: Subscale Self-Reflection and Insight, Resilience, and Stress as Predictors of Mental Toughness

Three multiple linear regression analyses were computed separately for each of the revised instrument subscales (i.e., revised SRIS, RSA, RESTQ-Sport stress scale) in order to predict MT and ascertain the conjunctive effects of each of the components included in each measure in predicting MT. Only those subscales that evidenced statistically significant correlations with MT were included in the multiple regression analyses.

In addition, a multiple regression analysis was performed using all of the subscales included on each of the revised SRIS, RSA, and RESTQ-Sport stress scales. Subscales that were not statistically and significantly correlated with MT were not included in the analysis. Before proceeding with parametric analyses, the hypothesis testing assumptions of normality and homoscedasticity were examined and satisfied.

3.6.12 Mental Toughness and Resilience Subcomponent Path Analysis

In order to determine the interrelatedness of MT and resilience sub-factors, path analysis using structural equation modelling was used. Specifically, path analysis was selected as all the variables in the study are directly measured and observed. Additionally, compared to regression analysis, path analysis provides more meaningful information as multiple equations can be examined simultaneously for an overall model fit. In doing so, path analysis provides insight into the manner in which MT and resilience components interrelate with one another.

The model to be examined using the SEM technique – path analysis – is presented below (Figure 3.1). In this model, the three resilience sub-factors (*interpersonal bonds and resources*, *personal resources*, and *social competence*) are denoted as the exogenous variables (i.e., the cause of the variable is external to the model and is included to explain other variables in the model) and the MT sub-factors (*confidence/self-efficacy*, *emotional/cognitive control*, and *positive perspective*) are the endogenous variables (i.e., predicted by one or more variables in the model; Lleras, 2005). Using $p = (q^2 + q)/2$ to identify all possible parameters, with q equalling the number of variables, a maximum of 21 parameters may be included in the model (Streiner, 2005). Following the application of Streiner's (2005) procedure for calculating the number of included parameters in a particular model (i.e., adding together the paths from exogenous variables to endogenous variables, the correlations between exogenous variables, the number of error terms from endogenous variables, and the number of exogenous variables), 18 parameters were included in the model. Subtracting the number of parameters included in the model from the total number of possible parameters (the method for calculating degrees of freedom), the model is considered over-identified, which allows for model fit examination.

Kline (2005) suggests that the x^2 and p-value, root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR), and comparative fit index (CFI) indices should be reported. In addition, Hoyle (2012) indicates that x^2/df is also an important index to report when examining model fit. The decision to utilise a number of fit indices is based on the understanding that a combination of indices provide a more reliable assessment of model fit (Hoyle, 2012). Additionally, certain fit indices, such as x^2, are extremely sensitive to large sample sizes (exhibiting a greater likelihood of rejecting the null hypothesis and adequacy of model fit; Hoyle, 2012), which, given the large sample in the current study, it would be considered inappropriate to evaluate single indices of this nature. An indication of the established and consensual cut-off values for each of the aforementioned fit indices is displayed in Table 3.2. According to Hoyle (2012), these values should be used as guidelines for assessing model fit and not used as finite measure of the adequacy of a particular model. That is, the aspects specific to any particular study (such as sample size) should be considered and factored into the evaluation of the indices evaluated. Following the examination of the full model standardised regression weight estimates, the non-statistically significant regression paths were removed and the model re-analysed. The model was revised twice at which point each of the standardised regression weights evidenced statistical significance, which prompted examination of the model fit indices. These were contrasted and evaluated against the fit indices cut-off criteria (Table 3.2) in order to determine the appropriateness of the model as an indicator of the interrelatedness of MT and resilience sub-factors.

Figure 3.1: Specified Mental Toughness and Resilience Sub-factor Model.

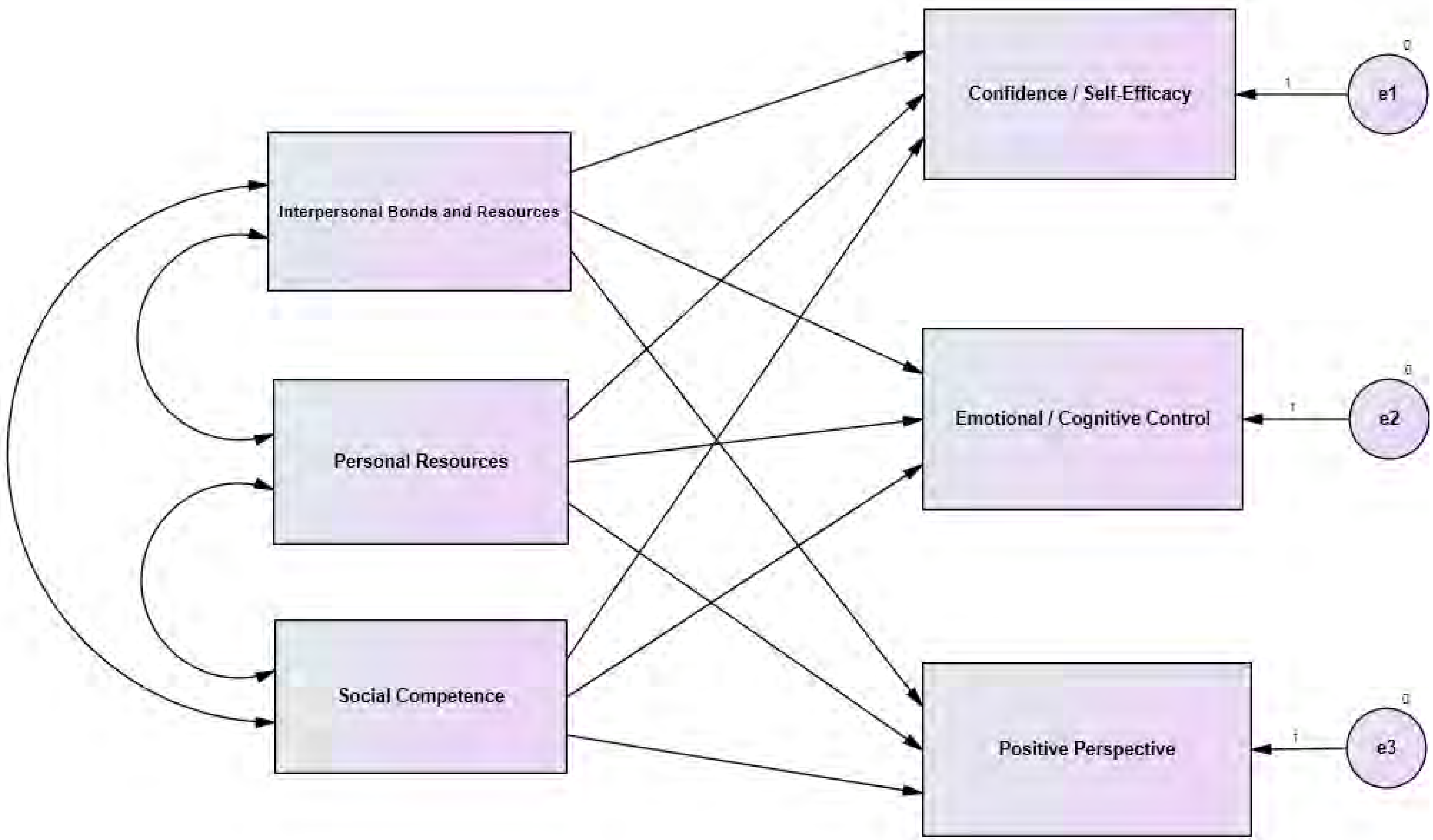


Table 3.2

Fit Indices Cut-off Criteria

Fit Index	Cut-off Value	Reference
x^2/df	< 5	Wheaton, Muthén, Alwin, and Summers (1977)
x^2 *p*-value	> .05	Hu and Bentler (1999); Jöreskog (1969)
RMSEA	< .08	Browne and Cudeck (1993); MacCallum, Browne and Sugawara (1996)
SRMR	< .08	Bentler (1995); Hu and Bentler (1999)
CFI	≥ .90	Hoe (2008)

3.6.13 Hierarchical Moderated Regression: Mental Toughness, Stress, and Resilience Sub-factors

A series of hierarchical moderated regression analyses were performed to determine (1) whether resilience moderates the relationship between MT and total stress and (2) whether specific resilience sub-factors moderate the association between MT and total stress. The hierarchical moderated regression approach entails two block entering phases for each analysis. Initially, the predictor (MT) and moderator variables (resilience and resilience sub-factors) were entered into block one, which was subsequently followed by block two that contained the predictor, moderator, and interaction between the two variables. Statistically significant interactions (included in block 2) between (1) MT and resilience and (2) MT and each of the resilience sub-factors indicated whether resilience and particular subdomains moderated the MT-total stress relationship. The comparison of the standardised regression weights enabled a determination of the most influential resilience components as moderators of the relationship between MT and total stress.

3.7 Conclusion

A detailed description and account of the research design choice and rationale, the participant selection criteria and process, as well as the sampling and recruitment process was provided in chapter three. In addition, the data analysis process and techniques that were used to compute the relevant statistical analyses and obtained the necessary results that align to the primary objectives in this study were also discussed, which included, where applicable, explanations for the selection of certain techniques and procedures over others.

CHAPTER FOUR

RESULTS

4.1 Introduction

The results obtained through the analyses pertaining to the primary objectives in this study are presented in the following chapter. In particular, the participant demographics, instrument factor structure and property assessment analyses, scale and subscale reliability estimates, descriptive statistics, correlation and the regression analysis results are reported. In addition, the hierarchical regression computations along with the path analysis model that was examined are discussed.

4.2 Participant Demographics

The participants included 365 (M_{age} = 28.80 years, *SD* = 13.68) adult competitive tennis athletes of varied ages, which were comprised of 191 males (M_{age} = 31.32 years, *SD* = 15.28) and 174 females (M_{age} = 26.03 years, *SD* = 11.08). The average number of years of tennis participation across all participants was 16.75 years (*SD* = 12.03), with males (*M* = 19.33, *SD* = 13.59) reporting a higher average number of years of participation than females (*M* = 13.91, *SD* = 9.29). The female group also exhibited a lower level of income compared to that of the male group.

Although the majority of the participants represented one ethnic group, a range of ethnic groups participated in the study, including Black (*n* = 80), Coloured (*n* = 18), Indian (*n* = 9), and White (*n* = 258) tennis players. The mean age for the White group of participants was highest (*M* = 30.85, *SD* = 15.24) and also reported a higher average number of years of participation (*M* = 19.52, *SD* = 13.01). In comparison to the other groups, the Black ethnic participant group reported a lower average income. Each of the provinces were represented in various quantities, including the Western Cape (*n* = 49), Eastern Cape (*n* = 57), Northern Cape (*n* = 4), Kwazulu-Natal (*n* = 72), Free State (*n* = 26), North West (*n* = 25), Gauteng (*n* = 113), Mpumalanga (*n* = 6), and Limpopo (*n* = 13). The Eastern Cape participants evidenced the highest mean age (*M* = 37.00, *SD* = 15.50) as well as years of participation (*M* = 23.56, *SD* = 14.31). A high number of the participants had completed Grade 12 (*n* = 152), obtained a 3-year Undergraduate degree/diploma (*n* = 132), Honours degree (*n* = 51), Master's Degree (*n* = 19), or a Doctorate (*n* = 2). Only two participants reported not completing Grade 12 and seven participants indicated specialised or unique qualifications that were not categorised on the questionnaire (e.g., 4-year diploma, agricultural short courses). As anticipated, the average age of the participants increased and the average number of years of participation increased as education levels increased. Except for the Doctorate level participations (which had a low number of participants), there was a tendency for average income levels to increase as education levels increased.

As indicated, almost half of the participants did not provide income responses, which may relate to the high number of participants currently engaged in formal studies and less likely to be employed. This may be reflected in the high number of University Team or League tennis players that participated in the current study. The athletes ranged in competitive standards and included County Club (*n* = 63), local County tournaments (*n* = 24), University Team or League (*n* = 160) National (*n* = 83), and International (*n* = 35) competitive tennis players. County Club players indicated a greater number of years of tennis participation (*M* = 24.37, *SD* = 14.07) and a higher mean age (*M* = 41.21, *SD* = 14.61) as compared to the other types of participation. There were higher average incomes reported in the National Tournament and International Tournament participation groups.

Table 4.1

Participant Demographics

Variable	Age			Years of Participation			Annual Income		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Gender	365	28.80	13.68	365	16.75	12.03	185	R416 910.27	359455.76
Male	191	31.32	15.28	191	19.33	13.59	114	R459 950.88	386369.01
Female	174	26.03	11.08	174	13.91	9.29	71	R347 802.82	301314.53
Ethnicity	365	-	-	365	-	-	185	-	-
Black	80	23.46	6.29	80	9.84	5.27	35	R176 782.86	145029.10
Coloured	18	25.28	8.18	18	10.56	3.29	10	R338 300.00	212899.59
Indian	9	24.44	7.52	9	11.11	2.67	4	R912 500.00	409013.04
White	258	30.85	15.24	258	19.52	13.01	136	R469 911.76	372230.38
Province	365	-	-	365	-	-	185	-	-
Western Cape	49	28.67	14.44	49	17.71	12.56	25	R528 600.00	596046.42
Eastern Cape	57	37.00	15.50	57	23.56	14.31	37	R355 254.05	197690.47
Northern Cape	4	20.75	1.50	4	11.75	1.26	2	R332 500.00	236880.77
Kwazulu-Natal	72	34.01	16.52	72	18.54	14.22	46	R446 608.70	360190.54
Free State	26	22.96	8.09	26	13.65	5.11	14	R450 714.29	308435.86
North West	25	21.36	2.61	25	11.92	3.76	11	R308 454.55	283784.20
Gauteng	113	26.03	10.80	113	15.02	10.66	45	R418 066.67	337863.70
Mpumalanga	6	21.50	1.38	6	10.33	5.05	2	R169 500.00	6363.96
Limpopo	13	20.38	1.39	13	8.31	2.36	3	R235 000.00	60621.78
Education	365	-	-	365	-	-	185	-	-
Below Grade 12	2	18.50	0.71	2	7.00	1.41	1	R190 000.00	-
Grade 12	152	24.72	11.49	152	13.86	9.00	58	R345 051.72	256890.48
3-Year Degree	132	28.37	12.61	132	15.98	11.78	65	R448 360.00	463227.81
Honours	51	35.51	14.49	51	21.16	13.60	40	R426 175.00	310154.38
Masters	19	36.21	14.34	19	24.00	14.24	13	R523 461.54	325092.45
Doctorate	2	47.00	28.28	2	33.50	30.41	1	R250 000.00	-
Other	7	54.14	13.57	7	40.29	9.96	7	R525 714.29	311654.57
Participation Type	365	-	-	365	-	-	185	-	-
County Club	63	41.21	14.61	63	24.37	14.07	52	R376 711.54	247793.82
Local County Tournaments	24	30.96	12.80	24	18.21	12.58	17	R354 705.88	264610.04
National Tournaments	83	32.58	15.70	83	20.04	13.68	45	R503 200.00	319037.66
International Tournaments	35	29.69	17.11	35	19.06	16.54	19	R568 684.21	349443.38
University Team / League	160	21.44	2.81	160	11.32	4.05	52	R347 315.38	478388.42

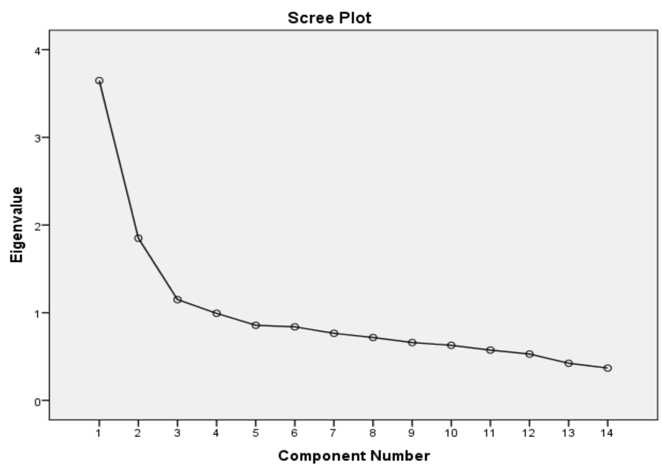
Note. n = Number of participants; *M* = Mean; *SD* = Standard Deviation.

4.3 SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale Factor Structure Analysis

4.3.1 Sport Mental Toughness Questionnaire Factor Structure Analysis

The scree plot (see Figure 4.1) indicated the presence of three components prior to the flattening of the line across the points. These three points also evidenced eigenvalues of greater than one. As a result, the number of factors that were specified for extraction in the subsequent factor structure analysis was fixed to three.

Figure 4.1: SMTQ Dimension Reduction Scree Plot.



PCA with a factor extraction limit of three (using a Direct Oblimin rotation) was conducted with the original 14 questionnaire items. The pattern matrix was examined to determine items that did not possess clear or adequate loadings onto specific factors. One of the more common approaches to assessing the appropriateness of item-factor loadings is to apply loading cut-off criteria to the rotated factor solution results. That is, in order for an item to be retained in the factor structure, the highest item-factor loading should fall above the established criterion. According to Matsunaga (2010), a loading criterion of an absolute value of .4 is a liberal yet appropriate cut-off value, which was selected for application in this study across each of the instruments, primarily because the questionnaires have undergone prior validation and is established instruments. The pattern matrix with item loadings is displayed in Table 4.2. Although a number of items evidenced factor loadings close to an absolute value of .4, the application of this cut-off criterion resulted in the retention of each item. The retention of all the SMTQ items was followed by further examination of the PCA results.

Table 4.2

PCA Pattern Matrix SMTQ Item Factor Loadings

Item	Factor 1	Factor 2	Factor 3
3	**.793**	.052	-.403
12	**.712**	.086	-.024
6	**.609**	-.050	.233
14	**.558**	-.121	.319
11	**.493**	-.022	.145
1	**.442**	-.112	.220
2	-.179	**- .712**	-.017
9	-.059	**- .691**	.100
4	.047	**- .657**	.200
7	-.073	**- .651**	.015
10	.181	**- .632**	-.201
8	.339	**- .554**	-.156
13	.032	.014	**.780**
5	.237	-.044	**.496**

Note. The variable numbers correspond with the items included on the original SMTQ validation study.

The Barlett's Test of Sphericity was statistically significant, $x^2_{(91)} = 1010.796$, $p < .001$. This rejection of the null hypothesis suggests the presence of correlations based on the items included in the analysis, and, as a result, denotes the appropriateness of the data for proceeding with PCA. In addition, the Kaiser-Meyer-Olkin (KMO) value was calculated to evaluate the sampling adequacy of the dataset. In this instance, KMO was

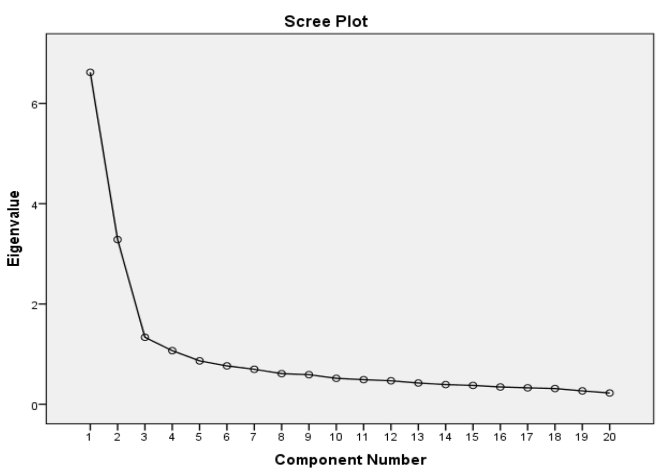
.796, which, according to the general rules outlined by Hutcheson and Sofroniou (1999) is within a moderate to strong and acceptable range for proceeding with PCA.

The total variance explained by Factor 1, Factor 2, and Factor 3 were 26.05%, 13.21%, and 8.21%, respectively, with a total variance of 47.48% explained by the three factors. Examining the pattern matrix that converged with 18 iterations, six items loaded on Factor 1, six items loaded onto Factor 2, and two items loaded onto Factor 3 (see Table 4.2).

4.3.2 Self-Reflection and Insight Factor Structure Analysis

The scree plot that was produced (see Figure 4.2) indicated a major break in the line graph between components three and four. As a result, the number of factors that were specified for extraction in the subsequent factor structure analysis was fixed to three.

Figure 4.2: SRIS Dimension Reduction Scree Plot.



PCA with a factor extraction limit set to three was analysed and the pattern matrix was examined to determine SRIS items that did not possess clear or adequate loadings onto specific factors. The pattern matrix with item loadings is displayed in Table 4.3. An item-factor loading criterion of an absolute value of .4 was used to evaluate the retention of items into the overall factor structure. Each of the items possessed strongest factor loadings above an absolute value of .4, resulting in the retention of all items.

Table 4.3

PCA Pattern Matrix SRIS Item Factor Loadings

Item	Factor 1	Factor 2	Factor 3
5	**.790**	-.082	.024
4	**.731**	.209	.213
7	**.713**	.173	.051
10	**.698**	-.193	-.222
6	**.678**	-.251	-.171
3	**.665**	-.197	-.241
2	**.664**	.287	.164
11	**.655**	-.225	-.169
12	**.629**	-.259	-.296
1	**.592**	.166	-.039
19	.006	**.758**	-.022
14	-.063	**.749**	-.086
17	-.074	**.712**	-.194
18	.236	**.676**	-.164
16	.063	**.660**	.017
15	-.041	.236	**-.804**
20	-.094	.333	**-.709**
9	.410	-.156	**-.535**
8	.409	-.065	**-.448**
13	.284	.080	**-.441**

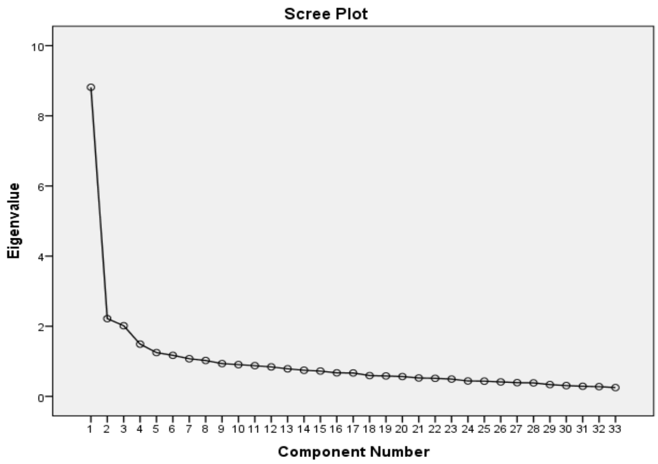
Note. The variable numbers correspond with the items included on the original SRIS validation study.

The Barlett's Test of Sphericity estimate was statistically significant, $x^2_{(190)}$ = 3342.497, p < .001. This rejection of the null hypothesis suggests the presence of correlations based on the items included in the analysis, and, as a result, denotes the appropriateness of the data for proceeding with PCA. The KMO was .898, which is considered strong to excellent (Hutcheson & Sofroniou, 1999). Based on the PCA computed, the full 20 SRIS items were retained across three factors. The total variance explained by Factor 1, Factor 2, and Factor 3 were 33.10%, 16.42%, and 6.80%, respectively, with a total variance of 56.20% explained by the three factors. Examining the pattern matrix that converged with 17 iterations, 10 items loaded on Factor 1, five items loaded onto Factor 2, and five items loaded onto Factor 3 (see Table 4.3).

4.3.3 Resilience Scale for Adults Factor Structure Analysis

The scree plot (see Figure 4.3) indicated a major break in the line graph between components three and four. Based on this, it was considered important to include three components into the initial analysis. As a result, the number of factors that were specified for extraction in the subsequent factor structure analysis was fixed to three.

Figure 4.3: RSA Dimension Reduction Scree Plot.



PCA with a factor extraction limit set to three was subsequently conducted and the pattern matrix was examined to determine RSA items that did not possess clear or adequate loadings onto specific factors. An item-factor loading criterion of an absolute value of .4 was used to evaluate the retention of items into the overall factor structure. Three items (4, 5, and 6) evidenced a strongest factor loading of less than +/- .4, resulting in the removal of the items in subsequent PCA analysis.

Prior to proceeding with an assessment of the results, the Barlett's Test of Sphericity was statistically significant, $x^2_{(435)} = 3837.737$, $p < .001$. This rejection of the null hypothesis suggests the presence of correlations based on the items included in the analysis, and, as a result, denotes the appropriateness of the data for proceeding with PCA. The KMO was .896, which is considered strong to excellent (Hutcheson & Sofroniou, 1999). Upon closer examination of the remaining items, it became apparent that item 14 did not conceptually fit with the items that were included on the factor it loaded highest on. As a result, it was considered important to remove the item and to re-conduct the PCA.

The final PCA analysis for the RSA revealed the Barlett's Test of Sphericity was statistically significant, $x^2_{(406)} = 3731.532$, $p < .001$. This rejection of the null hypothesis suggests the presence of correlations based on the items included in the analysis, and, as a result, denotes the appropriateness of the data for proceeding with PCA. The KMO was .898, which is considered strong to excellent (Hutcheson & Sofroniou, 1999). Thus, 29 items were retained from the original RSA and used in subsequent analysis. The total variance explained by Factor 1, Factor 2, and Factor 3 were 28.17%, 7.46%, and 6.70%, respectively, with a total variance of 42.33% explained by the three factors. Examining the pattern matrix that converged with 10 iterations, 13 items loaded on Factor 1, 10 items loaded onto Factor 2, and 6 items loaded onto Factor 3 (see Table 4.4).

Table 4.4

Final PCA Pattern Matrix RSA Item Factor Loadings

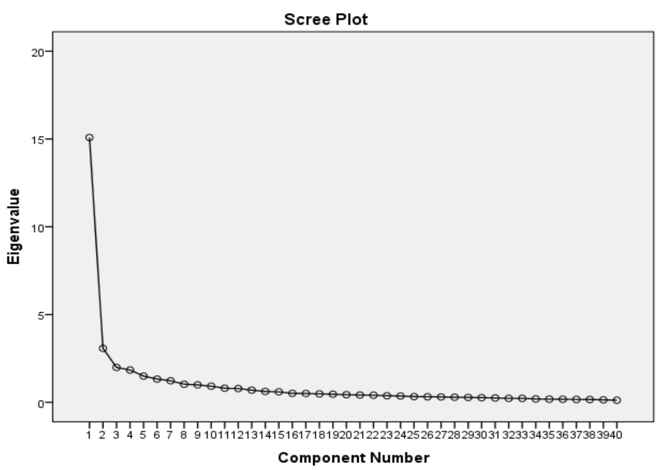
Item	Factor 1	Factor 2	Factor 3
31	**.744**	-.011	.023
33	**.740**	.098	-.085
23	**.715**	.160	-.063
32	**.705**	-.064	-.022
22	**.665**	.185	-.044
28	**.658**	-.091	.142
30	**.619**	.013	-.032
24	**.614**	.098	.063
26	**.604**	-.105	.064
25	**.579**	.191	.077
21	**.575**	.122	-.003
29	**.431**	-.151	.313
27	**.424**	-.020	.331
8	.044	**.605**	.129
9	.063	**.603**	.101
10	.130	**.585**	-.006
12	-.054	**.539**	-.121
1	.047	**.532**	.194
11	-.175	**.527**	.094
13	.141	**.460**	-.101
7	.195	**.459**	-.106
3	.095	**.452**	.253
2	.196	**.427**	-.003
17	-.033	.218	**.741**
18	.064	.167	**.710**
20	-.055	.186	**.702**
15	.014	-.144	**.658**
19	.135	.028	**.546**
16	.050	-.084	**.528**

Note. The variable numbers correspond with the items included on the original RSA validation study.

4.3.4 Recovery-Stress Questionnaire for Athletes Stress Scale Factor Structure Analysis

Initially, a scree plot analysis was conducted to determine an appropriate point at which identified components do not add substantially add to the factor structure. The scree plot (see Figure 4.4) indicated that the point at which the graph appears to decline distinctly is between components three and four, which was the basis for specifying three factors for extraction in the subsequent PCA computation for the RESTQ-Sport stress scale.

Figure 4.4: RESTQ-Sport Stress Dimension Reduction Scree Plot.



PCA with a factor extraction limit set to three was subsequently conducted and the pattern matrix was examined to determine RESTQ-Sport stress items that did not possess clear or adequate loadings onto specific factors. An item-factor loading criterion of an absolute value of .4 was used to evaluate the retention of items into the overall factor structure. Seven items (18, 32, 44, 31, 40, 15, and 63) evidenced strongest factor loadings of less than +/- .4, resulting in the removal of the items in subsequent PCA analysis.

Prior to proceeding with an assessment of the results, the Barlett's Test of Sphericity was statistically significant, $x^2_{(528)} = 7974.449$, $p < .001$. This rejection of the null hypothesis suggests the presence of correlations based on the items included in the analysis, and, as a result, denotes the appropriateness of the data for proceeding with PCA. The KMO was .925, which is considered excellent (Hutcheson & Sofroniou, 1999). Upon closer examination of the remaining items, it appeared that item 7 did not conceptually fit with the items that were included on the factor it loaded highest on. As a result, it was considered important to remove the item and to re-conduct the PCA.

Following the removal of item 7, the PCA results indicated the Barlett's Test of Sphericity was statistically significant, $x^2_{(496)} = 7681.034$, $p < .001$. This rejection of the null hypothesis suggests the presence of correlations based on the items included in the analysis, and, as a result, denotes the appropriateness of the data for proceeding with PCA. The KMO was .922, which is considered excellent (Hutcheson & Sofroniou, 1999). Therefore, 32 items were retained from the original RESTQ-Sport stress scale for use in the presented study. The total variance explained by Factor 1, Factor 2, and Factor 3 were 38.16%, 9.41%, and 6.13% respectively, with a total variance of 53.69% explained by the three factors. Examining the pattern matrix that converged with 6 iterations, 15 items loaded on Factor 1, seven items loaded onto Factor 2, and 10 items loaded onto Factor 3 (see Table 4.5).

Table 4.5

Final PCA Pattern Matrix RESTQ-Sport Stress Item Factor Loadings

Item	Factor 1	Factor 2	Factor 3
5	**.848**	-.086	.051
8	**.783**	-.037	.046
26	**.756**	.083	.051
38	**.749**	-.015	-.095
21	**.746**	.120	.171
37	**.746**	.091	.107
48	**.721**	-.031	.003
28	**.689**	-.083	-.077
30	**.658**	.025	-.155
45	**.655**	.015	-.134
24	**.640**	.051	-.082
22	**.584**	-.123	-.129
20	**.473**	.160	-.194
12	**.414**	.112	-.208
11	**.412**	.181	-.355
50	-.090	**.861**	-.013
64	-.112	**.860**	-.062
57	-.058	**.843**	-.035
73	-.012	**.781**	.057
76	.119	**.621**	.073
68	.157	**.498**	-.063
54	.097	**.425**	-.253
25	-.138	.016	**-.830**
35	-.085	.103	**-.793**
16	-.031	-.086	**-.784**
2	.019	-.028	**-.674**
58	.152	.031	**-.656**
51	.201	.049	**-.610**
66	.236	.050	**-.554**
42	.060	.250	**-.496**
4	.291	.116	**-.487**
72	.300	.039	**-.478**

Note. The variable numbers correspond with the items included on the original RESTQ-Sport validation study.

4.4 Revised SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale Item Summation

The PCA item-factor loadings for each scale and subscale were used to generate the revised measures. The individual items corresponding to each scale and subscale are outlined in Table 4.6 and an appropriate term to describe the underlying construct of the items was assigned to each of the sub-factors revealed through PCA.

Table 4.6

Scale and Subscale Items, Item Quantities, and Variable Names

Variable Name	Items	*N*
Mental Toughness	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	14
Confidence/Self-Efficacy (MT)	1, 3, 6, 11, 12, 14	6
Emotional/Cognitive Control (MT)	2, 4, 7, 8, 9, 10	6
Positive Perspective (MT)	5, 13	2
Self-Reflection and Insight	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	20
Engagement in Self-Reflection (SRIS)	1, 2, 3, 4, 5, 6, 7, 10, 11, 12	10
Emotional/Behavioural Clarity (SRIS)	14, 16, 17, 18, 19	5
Cognitive/Behavioural Analysis and Awareness (SRIS)	8, 9, 13, 15, 20	5
Resilience	1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33	29
Interpersonal Bonds and Resources (R)	21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33	13
Personal Resources (R)	1, 2, 3, 7, 8, 9, 10, 11, 12, 13	10
Social Competence (R)	15, 16, 17, 18, 19, 20	6
Total Stress	2, 4, 5, 8, 11, 12, 16, 20, 21, 22, 24, 25, 26, 28, 30, 35, 37, 38, 42, 45, 48, 50, 51, 54, 57, 58, 64, 66, 68, 72, 73, 76	32
Emotional/Cognitive Stress (TS)	5, 8, 11, 12, 20, 21, 22, 24, 26, 28, 30, 37, 38, 45, 48	15
Athletic Exhaustion (TS)	50, 54, 57, 64, 68, 73, 76	7
Fatigue/Insufficient Rest (TS)	2, 4, 16, 25, 35, 42, 51, 58, 66, 72	10

Note. N = number of items. The variable numbers correspond with the items included on the original validation studies.

4.5 Revised SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale Reliability Estimates

Cronbach's alpha reliability estimates as well as mean inter-item correlations for each of the revised scales and subscales are presented in Table 4.7.

Table 4.7

Cronbach's Alpha and Mean Inter-Item Correlation Coefficients for Scales and Subscales

Variables	Items	α	Mean Inter-item Correlation Coefficients
Mental Toughness	14	.771	-
Confidence/Self-Efficacy (MT)	6	.720	.299
Emotional/Cognitive Control (MT)	6	.739	.324
Positive Perspective (MT)	2	.420	.266
Self-Reflection and Insight	20	.874	-
Engagement in Self-Reflection (SRIS)	10	.890	-
Emotional/Behavioural Clarity (SRIS)	5	.797	.440
Cognitive/Behavioural Analysis and Awareness (SRIS)	5	.754	.385
Resilience	29	.894	-
Interpersonal Bonds and Resources (R)	13	.886	-
Personal Resources (R)	10	.750	-
Social Competence (R)	6	.776	.367
Total Stress	32	.944	-
Emotional/Cognitive Stress (TS)	15	.929	-
Athletic Exhaustion (TS)	7	.858	.457
Fatigue/Insufficient Rest (TS)	10	.897	-

Note. Mean inter-item correlation coefficients were not computed for scales and subscales with 10 or more items.

4.6 Descriptive Statistics

The descriptive statistics (number of cases, mean, standard deviation, skewness, and kurtosis) for all scales in subsequent analyses are reported in Table 4.8. The scales and subscales each evidenced absolute skewness and kurtosis values of less than 1, indicating that the data are approximately normally distributed within each of these variables (Bowen & Guo, 2011; Walker, 1999). The Q-Q plots for each of the scales and subscales were also examined. Although most of the scales and subscales demonstrated the plotting of data points that was consistent with the 45-degree line (denoting the normal distribution of the data), several scale and subscale variables evidenced minor data point deviations from the 45-degree line. However, considering the skewness and kurtosis estimates in Table 4.8, the variables were considered to display acceptable normality.

Table 4.8

Descriptive Statistics for all Variables

Variable	*n*	*M*	*SD*	*Skewness*	*SE*	*Kurtosis*	*SE*
Mental Toughness	357	41.23	4.67	.052	.129	-.364	.257
Confidence/Self-Efficacy (MT)	364	18.94	2.50	-.248	.128	.301	.255
Emotional/Cognitive Control (MT)	362	16.53	3.11	.114	.128	-.300	.256
Positive Perspective (MT)	335	5.67	0.85	-.337	.133	-.448	.266
Self-Reflection and Insight	364	83.92	13.22	.087	.128	-.120	.255
Engagement in Self-Reflection (SRIS)	362	41.30	8.90	-.121	.128	-.397	.256
Emotional/Behavioural Clarity (SRIS)	363	19.93	4.76	-.156	.128	-.573	.255
Cognitive/Behavioural Analysis and Awareness (SRIS)	353	23.20	3.26	-.172	.130	-.186	.259
Resilience	363	117.55	14.62	-.463	.128	-.452	.255
Interpersonal Bonds and Resources (R)	364	54.43	8.06	-.620	.128	-.526	.255
Personal Resources (R)	365	40.06	5.79	-.325	.128	-.390	.255
Social Competence (R)	361	23.06	4.33	-.309	.128	-.675	.256
Total Stress	347	72.13	21.03	.460	.131	.004	.261
Emotional/Cognitive Stress (TS)	351	32.40	10.92	.693	.130	.099	.260
Athletic Exhaustion (TS)	355	16.75	6.18	.608	.129	-.160	.258
Fatigue/Insufficient Rest (TS)	348	23.04	8.35	.491	.131	-.270	.261

Note. *M* =Mean; *SD* = Standard Deviation; *SE* = Standard Error.

4.7 Mental Toughness Group Differences: Age, Years of Participation, Gender, and Type of Participation

As indicated, the acceptable skewness and kurtosis values as well as similar variances of the dependent variable across each of the grouping variables warranted the use of parametric analyses for group comparisons.

4.7.1 Mental Toughness and Age

A one-way ANOVA was computed to determine whether there were significant differences between the MT of competitive tennis players at different age groups. The result evidenced a statistically significant omnibus test $F_{(2,\ 354)} = 6.627$, $p = .001$, suggesting the presence of one or more differences between the MT of competitive tennis players aged 18 to 29 years ($n = 259$, $M = 40.68$, $SD = 4.51$), 30 to 48 years ($n = 55$, $M = 42.84$, $SD = 5.28$), and 49 years and older ($n = 43$, $M = 42.42$, $SD = 4.15$).

Examining the Tukey *HSD* post hoc pairwise group comparisons, the 18 to 29 year old age group was significantly different from the 30 to 48 year old group ($p = .005$). Assessing the mean scores for each of the groups, the 30 to 48 year old group scored significantly higher than the 18 to 29 year old age category. The remaining post hoc comparisons were not statistically significant, suggesting similar MT levels between the 18 to 29 year old age group and the 49 and older age group as well as the 30 to 48 year old age group and 49 and older age group.

4.7.2 Mental Toughness and Years of Tennis Participation

A one-way ANOVA was computed to determine whether there were significant differences between the MT of competitive tennis players at different groupings based on years of tennis participation. The result evidenced a statistically significant omnibus test

$F_{(3, 353)} = 7.946$, $p < .001$, suggesting the presence of one or more differences between the MT of competitive tennis players participating between 5 to 15 years (n = 240, M = 40.45, SD = 4.47), 16 to 25 years (n = 50, M = 42.30, SD = 4.79), 26 to 35 years (n = 33, M = 43.91, SD = 5.20), and 36 or more years (n = 34, M = 42.47, SD = 3.89).

The Tukey *HSD* post hoc pairwise group comparisons indicated the mean MT score within the 5 to 15 year participation group was significantly different from the 16 to 25 year participation group (p = .046) and the 26 to 35 participation group ($p < .001$). Examining the mean scores for each of the groups, the 5 to 15 year participation group scored significantly lower than the 16 to 25 year and 26 to 35 participation year groups. The remaining post hoc comparisons were not statistically significant, suggesting similar MT levels among the 16 to 25 year participation, 26 to 35 year participation, and 36 or more year participation groups as well as the 5 to 15 year participation and 36 or more year participation groups.

4.7.3 Mental Toughness and Gender

An independent samples *t*-test was computed to compare the MT of males and females. The result indicated that there are no differences between the MT of males (n = 189, M = 41.58, SD = 5.05) and females (n = 168, M = 40.83, SD = 4.17), $t_{(355)} = 1.516$, p = .130.

4.7.4 Mental Toughness and Type of Participation

A one-way ANOVA was conducted to determine whether there were significant differences between the MT of tennis players competing at different standards. The result indicated that there are no differences between the MT of County Club (n = 62, M = 42.40, SD = 4.96), Local County Tournament (n = 24, M = 40.33, SD = 4.94), National

Tournament (n = 80, M = 41.50, SD = 4.79), International Tournament (n = 34, M = 41.53, SD = 4.08), or University Team or League players (n = 157, M = 40.69, SD = 4.51), $F_{(4,352)}$ = 1.848, p = .119. Therefore, the MT of tennis players appears to be similar regardless of the type of competition tennis athletes primarily participate in.

4.8 Correlations Between Mental Toughness, Self-Reflection and Insight, Resilience, and Stress Scales

The Pearson correlation results between all the variables are outlined in Table 4.9. In particular, MT exhibited moderate to strong positive and statistically significant correlations (r = .41 to .82) with each of the revised MT subscales. In addition, there were moderate positive and statistically correlations (r = .19 to .34) between each of the MT subscales. Moderate to strong positive relationships were found between SRIS and the revised SRIS subscales (r = .48 to .88). *Engagement in self-reflection* (SRIS) was not correlated with *emotional/behavioural clarity* (r = .09; SRIS) or *emotional/cognitive control* (r = .02; MT).

Small to large effect sizes were evidenced in the correlations between the MT and stress scales (r = .11 to .49), except for the relationships between *positive perspective* (MT) and *athletic exhaustion* (r = - .03; TS) and *positive perspective* (MT) and *fatigue/insufficient rest* (r = - .10; TS), which were not statistically significant. Except for the relationship between *positive perspective* (MT) and selected stress subscales, the findings generally indicated greater levels of MT are associated with lower levels of stress. The revised stress subscales demonstrated strong positive correlations with total stress (r = .64 to .85), and medium to large effect sizes were computed between the stress subscales (r = .37 to .59).

The correlations between the MT and resilience scales were all positive and statistically significant, indicating greater degrees of MT and subcomponents are associated with higher levels of resilience and subcomponents. In addition, strong statistically significant correlations were evidenced between the resilience sub-factors and resilience. Moderate to strong correlations were found between the resilience sub-factors, providing support for the interrelatedness of the sub-factors as measures of different forms of resilience.

Except for the relationship between *social competence* (R) and *athletic exhaustion* (r = - .08; TS), the correlations between the resilience and stress variables were negative and statistically significant (r = - .14 to - .38). These findings indicate that greater levels of resilience and subcomponents of resilience are associated with lower levels of stress and sub facets of stress.

Table 4.9

Pearson Correlations between all Scales and Subscales

Variable	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) **MT**	.72**	.82**	.41**	.31**	.11*	.47**	.27**	.55**	.44**	.50**	.36**	-.38**	-.41**	-.22**	-.32**
(2) C/SE (MT)		.34**	.26**	.35**	.23**	.29**	.37**	.52**	.44**	.44**	.37**	-.21**	-.26**	-.11*	-.17**
(3) E/CC (MT)			.19**	.23**	.02	.49**	.13*	.44**	.38**	.39**	.29**	-.49**	-.47**	-.31**	-.40**
(4) PP (MT)				.22**	.12*	.20**	.18**	.20**	.11*	.25**	.21**	-.13*	-.22**	-.03	-.10
(5) **SRIS**					.88**	.48**	.77**	.37**	.33**	.39**	.25**	-.11*	-.13*	-.12*	-.11*
(6) ESR (SRIS)						.09	.60**	.18**	.16**	.21**	.16**	.05	.04	-.00	.01
(7) E/BC (SRIS)							.22**	.42**	.38**	.35**	.25**	-.33**	-.35**	-.26**	-.24**
(8) C/BAA (SRIS)								.38**	.31**	.41**	.20**	-.06	-.06	-.10	.02
(9) **R**									.89**	.75**	.70**	-.28**	-.38**	-.18**	-.20**
(10) IBR (R)										.49**	.51**	-.27**	-.34**	-.17**	-.20**
(11) PR (R)											.36**	-.24**	-.27**	-.17**	-.19**
(12) SC (R)												-.21**	-.31**	-.08	-.14**
(13) **TS**													.85**	.64**	.84**
(14) E/CS (TS)														.37**	.59**
(15) AE (TS)															.45**
(16) F/IR (TS)															

Note. MT = Mental Toughness; C/SE = Confidence/Self-Efficacy; E/CC = Emotional/Cognitive Control; PP = Positive Perspective; SRIS = Self-Reflection and Insight; ESR = Engagement in Self-Reflection; E/BC = Emotional/Behavioural Clarity; C/BAA = Cognitive/Behavioural Analysis and Awareness; R = Resilience; IBR = Interpersonal Bonds and Resources; PR = Personal Resources; SC = Social Competence; TS = Stress; E/CS = Emotional/Cognitive Stress; AE = Athletic Exhaustion; F/IR = Fatigue/Insufficient Rest.
* *p* </= .05 (two-tailed); ***p* </= .001 (two-tailed).

4.9 Simple Linear Regression: Global Self-reflection and Insight, Resilience, and Stress Scales as Predictors of Mental Toughness

To determine the extent to which the total SRIS, the revised RSA, and revised RESTQ-Sport stress scale predicted MT, separate simple linear regression analyses were performed with each of the scales as independent variables.

4.9.1 Self-Reflection and Insight

The simple linear regression results indicated that SRIS significantly predicted MT (R^2 = .098, r = .314, p < .001, *CI* for r [.077, .149]). Therefore, the MT of the tennis athletes could be predicted by the SRIS self-reports of the athletes. Specifically, SRIS was found to account for approximately 9.8% of the variance of MT (see Table 4.10).

Table 4.10

Linear Regression Model (ENTER) for Predicting Mental Toughness using Self-Reflection and Insight

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	31.755		28.716	34.793
Self-Reflection and Insight	.113**	.314	.077	.149
R^2	.098			
F	38.605**			

Note. **p < .001 (two-tailed); CI = Confidence Interval.

4.9.2 Stress

The simple linear regression results (Table 4.11) indicated that total stress significantly predicted MT (R^2 = .142, r = - .377, p < .001, *CI* for r [- .108, - .063]). Therefore, the MT of the tennis athletes could be predicted by the total stress self-reports of the athletes. Specifically, total stress was found to account for approximately 14.2% of the variance of MT.

Table 4.11

Linear Regression Model (ENTER) for Predicting Mental Toughness using Total Stress

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	47.535		45.858	49.212
Total Stress	-.085**	-.377	-.108	-.063
R^2	.142			
F	55.847**			

Note. ***p* < .001 (two-tailed); CI = Confidence Interval.

4.9.3 Resilience

The simple linear regression results (Table 4.12) indicated that resilience significantly predicted MT (R^2 = .301, *r* = .549, *p* < .001, *CI* for *r* [.150, .207]). Therefore, the MT of the tennis athletes could be predicted by the resilience self-reports of the athletes. Specifically, resilience was found to account for approximately 30.1% of the variance of MT.

Table 4.12

Linear Regression Model (ENTER) for Predicting Mental Toughness using Resilience

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	20.198		16.832	23.565
Resilience	.179**	.549	.150	.207
R^2	.301			
F	153.107**			

Note. ***p* < .001 (two-tailed); CI = Confidence Interval.

4.10 Multiple Linear Regression: Self-Reflection and Insight, Resilience, and Stress Subscales as Predictors of Mental Toughness

Separate multiple linear regression (stepwise forward selection, alpha to enter = 0.05, alpha to exit = 0.10) were used to determine the degree to which the subscales associated with each of the inventories were significant predictors of MT. The decision to compute the multiple regression analyses was based on the potential for one of the sub-factors to more significantly predict MT than another.

A multiple regression analysis was also performed with all of the subscales to determine the extent to which each of the subscales significantly predicted MT. This afforded a global perspective of the predictiveness of each sub-factor in the presence of one another, regardless of the underlying construct. In each of the analyses, only those sub-factors that correlated significantly with MT were included in the multiple regression analyses.

4.10.1 Self-Reflection and Insight Subscales

The results indicated that *emotional/behavioural clarity* (SRIS) and *cognitive/behavioural analysis and awareness* (SRIS) were significant predictors of MT (R^2 = .244, p < .001), indicating that *engagement in self-reflection* (SRIS) did not substantially contribute to the prediction of MT beyond that of the other SRIS sub-factors. In particular, *emotional/behavioural clarity* (SRIS) and *cognitive/behavioural analysis and awareness* (SRIS) accounted for approximately 24.4% of the variance of MT, denoting the latter two sub-factors of the SRIS are most important for determining projected MT scores among tennis players (see Table 4.13).

Table 4.13

Linear Regression Model (Stepwise Selection) for Predicting Mental Toughness using Revised Self-Reflection and Insight Subscales

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	26.635		23.338	29.933
Engagement in Self-Reflection (SRIS)				
Emotional/Behavioural Clarity (SRIS)	.405**	.411	.311	.498
Cognitive/Behavioural Analysis and Awareness (SRIS)	.283**	.199	.149	.418
R^2	.244			
F	55.192**			

Note. ***p* < .001 (two-tailed); CI = Confidence Interval.

4.10.2 Stress Subscales

The results indicated that *emotional/cognitive stress* (TS) was the significant predictors of MT (R^2 = .167, *r* = - .408, *p* < .001, *CI* for *r* [- .231, - .141]), indicating that *athletic exhaustion* (TS) and *fatigue/insufficient rest* (TS) did not substantially to the prediction of MT beyond that of the initial variables (see Table 4.14). In particular, *emotional/cognitive stress* (TS) accounted for approximately 16.7% of the variance of MT, suggesting that *emotional/cognitive stress* (TS), relative to other stress components, is most important for predicting the MT of tennis athletes.

Table 4.14

Linear Regression Model (Stepwise Selection) for Predicting Mental Toughness using Stress Variables

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	47.328		45.825	48.831
Emotional/Cognitive Stress (TS)	-.186**	-.408	-.231	-.141
Athletic Exhaustion (TS)				
Fatigue/Insufficient Rest (TS)				
R^2	.167			
F	65.147**			

Note. $^{**}p < .001$ (two-tailed); CI = Confidence Interval.

4.10.3 Resilience Subscales

The results indicated that all resilience sub-factors were significant predictors of MT ($R^2 = .320$, $p < .001$). Although the strongest predictor of MT was *personal resources* (R), in the presence of one another, each factor contributes substantially to the prediction of MT (see Table 4.15). Collectively, the resilience sub-factors accounted for approximately 32% of the variance of MT, suggesting that these facets of resilience are all important for predicting the MT of tennis athletes.

Table 4.15

Linear Regression Model (Stepwise Selection) for Predicting Mental Toughness using Resilience Variables

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	19.250		15.843	22.657
Personal Resources (R)	.292**	.353	.210	.374
Interpersonal Bonds and Resources (R)	.122**	.207	.059	.185
Social Competence (R)	.155*	.143	.046	.264
R^2	.320			
F	54.692**			

Note. $*p = .005$; $**p < .001$ (two-tailed); CI = Confidence Interval.

4.10.4 Self-Reflection and Insight, Resilience, and Stress Subscales

The results indicated that *personal resources* (R), *emotional/cognitive stress* (TS), *emotional/behavioural clarity* (SRIS), and *social competence* (R) were significant predictors of MT (R^2 = .420, p < .001). Collectively, these sub-factors accounted for approximately 42% of the variance of MT, suggesting that these *personal resources* (R), *emotional/cognitive stress* (TS), *emotional/behavioural clarity* (SRIS), and *social competence* (R) are the most important self-reflection and insight, resilience, and stress sub facets for predicting the MT of tennis athletes (see Table 4.16).

Table 4.16

Linear Regression Model (Stepwise Selection) for Predicting Mental Toughness using Self-Reflection and Insight, Resilience, and Stress Subscales

Predictor	DV = MT			
	B	β	95% CI for B	
			Lower	Upper
(Constant)	23.331		19.300	27.361
Personal Resources (R)	.299**	.355	.222	.377
Emotional/Cognitive Stress (TS)	-.096**	-.211	-.137	-.055
Emotional/Behavioural Clarity (SRIS)	.234**	.231	.141	.326
Social Competence (R)	.184**	.171	.086	.283
Engagement in Self-Reflection (SRIS)				
Cognitive/Behavioural Analysis and Awareness (SRIS)				
Interpersonal Bonds and Resources (R)				
Athletic Exhaustion (TS)				
Fatigue/Insufficient Rest (TS)				
R^2	.420			
F	56.186**			

Note. $**p < .001$ (two-tailed); CI = Confidence Interval.

4.11 Mental Toughness and Resilience Subcomponent Path Analysis

To compute the specified Path Analysis (PA) model for examining the interrelatedness of resilience and MT (see Figure 3.1), the Maximum Likelihood (ML) approach was selected for computing the model fit estimations. An estimation of means and intercepts was specified because of the missing cases along the variables that occurred as a result of the removal of outliers. Due to the presence of missing values, model modification fit indices could not be computed and examined. The initial model is considered over-identified, which was determined by the degrees of freedom (in this instance 3) and the subsequent denotation that there are a greater number of individual variance and covariance components than parameters set for estimation (Kline, 2011). Thus, the model fit indices could be evaluated.

Following PA with the full model, the regression weights were examined to determine statistically significant regression paths and for determining which regression paths could be removed (occurrence of non-significant regression estimates). A summary of the regression weights for the original and subsequent models is provided in Table 4.17. Several regression estimates did not reach statistical significance, which resulted in the removal of the regression estimates with the highest *p*-values, one at a time. Following the removal of a regression path, the model was re-analysed. The revised model, with standardised regression weights, is presented in Figure 4.5, with each reaching statistically significance ($p < .05$).

Table 4.17

Standardised Regression Estimates and p-values for all the Full MT and Resilience Subcomponent Model

Regression Paths	Standardised Estimate	*p*-value
Original Full Model		
Confidence/Self-Efficacy (MT) and Interpersonal Bonds and Resources (R)	.228	< .001
Emotional/Cognitive Control (MT) and Interpersonal Bonds and Resources (R)	.218	< .001
Confidence/Self-Efficacy (MT) and Personal Resources (R)	.275	< .001
Emotional/Cognitive Control (MT) and Personal Resources (R)	.251	< .001
Positive Perspective (MT) and Personal Resources (R)	.241	< .001
Confidence/Self-Efficacy (MT) and Social Competence (R)	.166	.002
Positive Perspective (MT) and Social Competence (R)	.175	.005
Positive Perspective (MT) and Interpersonal Bonds and Resources (R)	-.088	.182*
Emotional/Cognitive Control (MT) and Social Competence (R)	.092	.095
First Modified Model		
Confidence/Self-Efficacy (MT) and Interpersonal Bonds and Resources (R)	.228	< .001
Emotional/Cognitive Control (MT) and Interpersonal Bonds and Resources (R)	.218	< .001
Confidence/Self-Efficacy (MT) and Personal Resources (R)	.274	< .001
Emotional/Cognitive Control (MT) and Personal Resources (R)	.251	< .001
Positive Perspective (MT) and Personal Resources (R)	.208	< .001
Confidence/Self-Efficacy (MT) and Social Competence (R)	.166	.002
Positive Perspective (MT) and Social Competence (R)	.142	.012
Emotional/Cognitive Control (MT) and Social Competence (R)	.092	.096*
Second Modified Model		
Confidence/Self-Efficacy (MT) and Interpersonal Bonds and Resources (R)	.229	< .001
Emotional/Cognitive Control (MT) and Interpersonal Bonds and Resources (R)	.259	< .001
Confidence/Self-Efficacy (MT) and Personal Resources (R)	.275	< .001
Emotional/Cognitive Control (MT) and Personal Resources (R)	.263	< .001
Positive Perspective (MT) and Personal Resources (R)	.208	< .001
Confidence/Self-Efficacy (MT) and Social Competence (R)	.165	.002
Positive Perspective (MT) and Social Competence (R)	.142	.012

Note. * The highest regression path *p*-value and was removed from subsequent model analysis.

Figure 4.5: Revised Mental Toughness and Resilience Subcomponent Path Analysis Model.

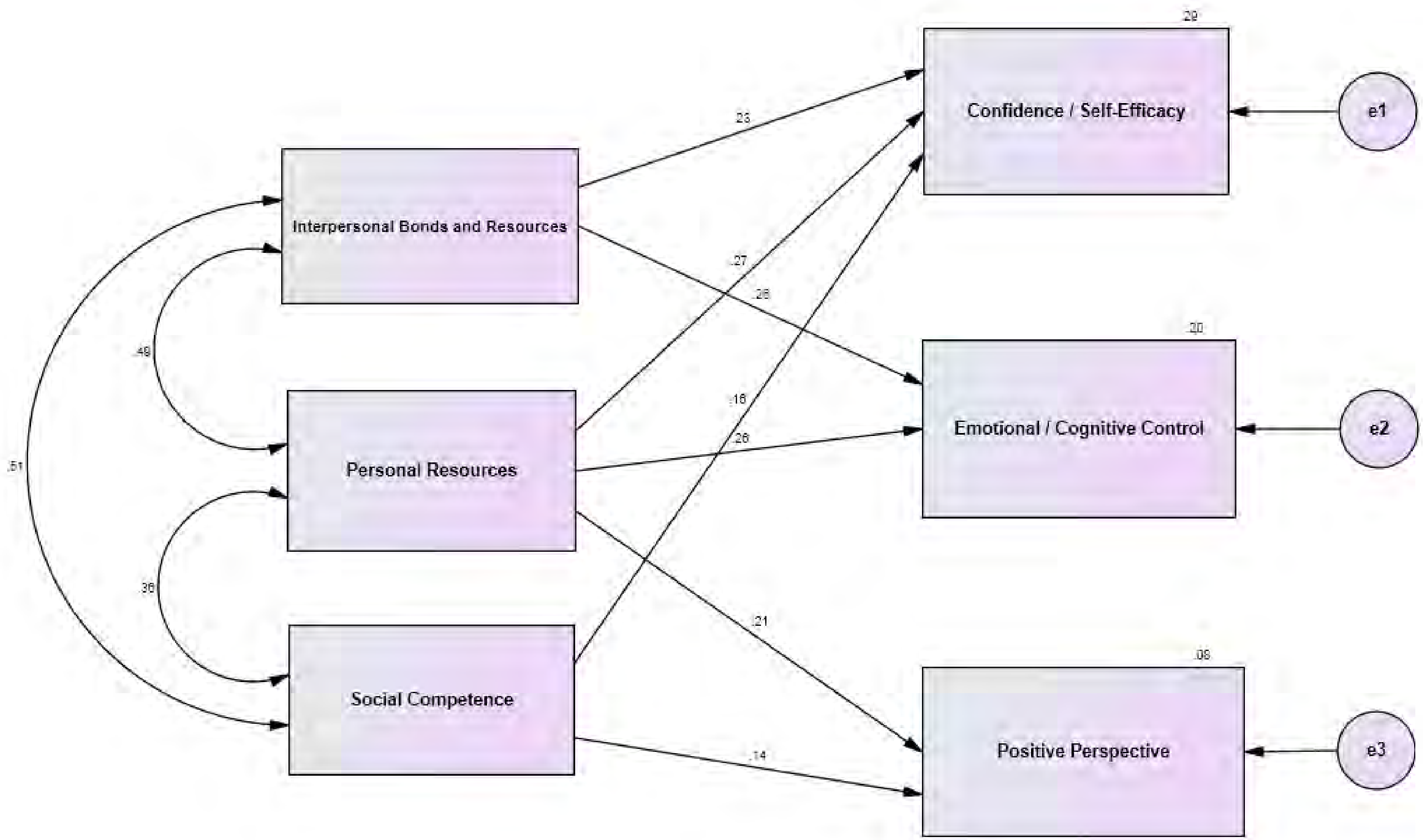


Table 4.18

Revised MT and Resilience Component Path Analysis Fit Indices

Fit Index	Cut-off Value	Value
x^2/df	< 5	4.466
x^2 *p*-value	> .05	< .001*
RMSEA	< .08	.098*
SRMR	< .08	N/A
CFI	≥ .90	.961

Note. * Value did not meet cut-off criterion.

With the second modified model evidencing statistically significant standardised regression estimates for each of the regression paths, $x^2_{(5)} = 22.328$, $p < .001$ was calculated for the model. The model fit indices for the revised model are reported in Table 4.18. Hoelter's "critical *N*" for significance for an alpha level of .05 was 181 for the ninth modified model, suggesting that the x^2 is likely to be statistically significant due to the influence of the large sample size and the model will likely demonstrate poor fit according to this statistic. The x^2/df was below the absolute cut-off criteria of 5 and the RMSEA estimate was slightly higher than the cut-off value. However, Kenny, Kaniskan, and McCoach (2014) denote that for models with low *df*, the RMSEA is likely to yield higher values. Thus, because the revised model included 5 *df*, the RMSEA value was considered acceptable for this model. The CFI was above the traditional .90 requirements for model acceptance and above more conservative cut-off criteria (e.g., .93; Byrne, 1994). The SRMR estimate could not be computed because of the missing values along selected variables and could not be used to evaluate model fit. Considering the statistical significance of each of the remaining regression paths in the revised model and the appropriate level of many of the fit indices, the second revised model was accepted as an estimation of the interrelatedness of MT and resilience subcomponents.

The revised model indicated statistically significant levels of interrelatedness between most of the MT and resilience subcomponents. The regression weights between *interpersonal bonds and resources* (R) and *positive perspective* (MT) as well as *social competence* (R) and *positive perspective* (MT) did not contribute significantly to the model and were removed, perhaps denoting some degree of divergence between MT and resilience.

4.12 Hierarchical Moderated Regression: Mental Toughness, Total Stress, and Resilience Factors

To examine the extent to which the MT-total stress relationship is dependent on the degree of resilience and resilience components, a series of hierarchical moderated regression analyses were computed. In particular, four separate analyses were computed, with resilience, *interpersonal bonds and resources*, *personal resources*, and *social competence* as individual moderators in each analysis. For each analysis, two regression blocks were specified. The first block contained the predictor (MT for each analysis) and the second block contained the moderator variable (resilience and resilience sub-factors). For each analysis, total stress was used as the dependent variable. This hierarchical method enabled the determination of whether the moderation (interaction) effect contributed significantly to the prediction of total stress beyond that of the predictor and moderator alone. Prior to the computation of the regression analyses, the predictor and moderator variables were mean centred, following which the interaction terms were computed. The hierarchical moderated regression results are outlined in Table 4.19. In particular, the analyses indicated that resilience (β = .027, p = .601), *interpersonal bonds and resources* (β = .043, p = .416), *personal resources* (β = .017, p = .743), and *social* *competence* (β = - .036, p = .481) were not significant moderators of the MT-total stress relationship. The absence of a significant interaction in each of the analyses denotes that the relationship between MT and total stress is not dependent on the degree to which a tennis athlete possesses resilience, *interpersonal bonds and resources*, *personal resources*, or *social competence*.

Table 4.19

Hierarchical Moderated Regression Analyses Predicting Total Stress

	DV = Total Stress		
	β	R^2	ΔR^2
Analysis 1			
Step 1		.144**	
Mental Toughness	-.352**		
Resilience	-.046		
Step 2		.144**	.001
Mental Toughness	-.356**		
Resilience	-.040		
Mental Toughness x Resilience	.027		
Analysis 2			
Step 1		.142**	
Mental Toughness	-.341**		
Interpersonal Bonds and Resources	-.070		
Step 2		.144**	.002
Mental Toughness	-.348**		
Interpersonal Bonds and Resources	-.057		
Mental Toughness x Interpersonal Bonds and Resources	.043		
Analysis 3			
Step 1		.142**	
Mental Toughness	-.380**		
Personal Resources	.005		
Step 2		.142**	.000
Mental Toughness	-.382**		
Personal Resources	.008		
Mental Toughness x Personal Resources	.017		
Analysis 4			
Step 1		.142**	
Mental Toughness	-.365**		
Social Competence	-.032		
Step 2		.144**	.001
Mental Toughness	-.359**		
Social Competence	-.034		
Mental Toughness x Social Competence	-.036		

Note. ** $p < .001$.

4.13 Conclusion

A detailed account of the statistical computational processes and the results obtained from the selected analyses was provided in the chapter. The inferential statistical analyses, in particular, generated important information that promotes further understanding of the construct of MT in competitive tennis players, with the implications of the results for the MT and related literature detailed in the chapter that follows.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The objectives in this study warranted a comprehensive set of statistical analyses that cumulatively provide a global perspective of the relevance of self-awareness dimensions, resilience, and stress to the construct of MT. A discussion of these findings is presented in this chapter, including important literature on MT, resilience, self-awareness, and stress considerations and implications for athletes, especially competitive tennis players. In particular, the chapter is delineated into an assessment of the psychometric properties of the instruments used, MT differences between groups based on age, years of tennis participation, gender, and type of tennis participation, and the various relational analyses between MT, self-awareness, resilience, and stress. Additionally, the limitations inherent to the study are also outlined, which details the shortcomings of this study.

5.2 Instrument Validation: Psychometric Property Assessment

Factor structure assessment of each measure was considered a vital preliminary phase in the analysis, particularly because MT has been under-researched amongst competitive tennis players, in general, and in the context of South Africa. In addition, some of the instruments incorporated into this study have not been used amongst athletes. For these reasons, it was essential that assessment of the factor structure of each instrument be conducted to determine the most appropriate factor structures of these measures in the context of competitive tennis players in South Africa. The table below details the factors identified for each of the inventories included in the study.

Table 5.1

Scale and Subscale Items, Item Quantities, and Variable Names

Variable Name	Items	*N*
Mental Toughness	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	14
Confidence/Self-Efficacy (MT)	1, 3, 6, 11, 12, 14	6
Emotional/Cognitive Control (MT)	2, 4, 7, 8, 9, 10	6
Positive Perspective (MT)	5, 13	2
Self-Reflection and Insight	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	20
Engagement in Self-Reflection (SRIS)	1, 2, 3, 4, 5, 6, 7, 10, 11, 12	10
Emotional/Behavioural Clarity (SRIS)	14, 16, 17, 18, 19	5
Cognitive/Behavioural Analysis and Awareness (SRIS)	8, 9, 13, 15, 20	5
Resilience	1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33	29
Interpersonal Bonds and Resources (R)	21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33	13
Personal Resources (R)	1, 2, 3, 7, 8, 9, 10, 11, 12, 13	10
Social Competence (R)	15, 16, 17, 18, 19, 20	6
Total Stress	2, 4, 5, 8, 11, 12, 16, 20, 21, 22, 24, 25, 26, 28, 30, 35, 37, 38, 42, 45, 48, 50, 51, 54, 57, 58, 64, 66, 68, 72, 73, 76	32
Emotional/Cognitive Stress (TS)	5, 8, 11, 12, 20, 21, 22, 24, 26, 28, 30, 37, 38, 45, 48	15
Athletic Exhaustion (TS)	50, 54, 57, 64, 68, 73, 76	7
Fatigue/Insufficient Rest (TS)	2, 4, 16, 25, 35, 42, 51, 58, 66, 72	10

Note. The variable numbers correspond with the items included on the original validation studies.

5.2.1 Mental Toughness Factor Structure

Although the SMTQ has been developed and validated previously (Sheard et al., 2009), recent studies involving the SMTQ have recommended further validation efforts towards the refinement of the instrument (e.g., Crust & Swann, 2011). In this study, the

SMTQ PCA analysis results confirmed the original three factor structure of the instrument (Sheard et al., 2009). However, the item-factor loadings in this study indicated that the items included in each of the sub-factors diverge to some extent from the original SMTQ. Specifically, the results revealed that 6 items loaded onto *confidence/self-efficacy*, 6 items loaded onto *emotional/cognitive control*, and 2 items onto *positive perspective*. This contrasts the original SMTQ item-factor loadings of six, four, and four items on the confidence, constancy, and control subscales, respectively.

Compared to the original SMTQ items included on each factor, the present results differ in several ways. Two of the items that previously loaded onto the confidence subscale ("I interpret potential threats as positive opportunities" and "I have an unshakeable confidence in my ability") loaded onto *positive perspective*, two of the items that previously loaded onto the constancy subscale ("I am committed to completing the tasks I have to do" and "I take responsibility for setting myself challenging targets") loaded onto *confidence/self-efficacy*, and two of the items that previously loaded onto the constancy subscale ("I give up in difficult situations" and "I get distracted easily and lose my concentration") loaded onto *emotional/cognitive control*.

The SMTQ was previously validated using samples of competitive athletes from a range of sports (26 different sports), whereas this study solely included competitive tennis players. The divergence between the present and past findings may also be influenced, in part, by the geographic and cultural context in this study, as the original factor structure investigation did not involve South African tennis players. Prior studies have evidenced discrepancies between athletes' perceptions of item relevance and importance in the context of their particular sport. For instance, elite tennis athletes reported "not giving up in difficult situations" as the most important MT facet (Cowden, 2012), whereas "a winning mentality and desire" was considered the most important component in soccer (Coulter et al., 2010). The context, participation factors, and demands associated with particular sports may emphasise certain MT components as opposed to others, which may explain perceptual differences and the item-factor loading differences in this study.

The multicultural, multiracial, and broad range of tennis players included in the current study may also provide some explanation for the results obtained. It is recognised that certain psychological constructs, such as intelligence, are conceptualised differently between African and Western societies (Serpell & Haynes, 2001). Perhaps these distinctions also apply to MT, with the possibility that certain aspects of MT, as it applies to South Africa, are not included on the SMTQ, and, as a result, were not examined in this study. Prior studies have suggested cultural differences in MT among athletes involved in the same sports, such as Bull et al.'s (2005) report of a number of components associated with MT in English cricketers (e.g., willingness to take risks) that were not outlined in Gucciardi and Gordon's (2009) study involving Australian cricketers. The findings in both studies did overlap to some extent, however (e.g., self-belief or confidence, cognitive control), providing support for distinct types of MT based on cultural influences (e.g., cricket culture, societal culture). Although MT studies in tennis are limited, it is conceivable to suggest that tennis culture factors, along with social influences, have an impact on the MT manifestation within South African tennis players.

Another reason may be based on the factor structure evaluation method that was selected. That is, Sheard et al. (2009) used CFA to evaluate the EFA identified factor structure of the SMTQ, whereas PCA was used in this study. In addition, Crust and Swann (2011) suggested that the some of the SMTQ subscale internal consistency scores denoted that certain subscales were assessing more than one construct of MT. With the potential influence of cultural perceptions and interpretations in the current sample, the apparent heterogeneity in the item content of selected SMTQ subscales may signify that, at least in the sample of tennis players in this study, some of the SMTQ items may more appropriately load onto the factors delineated.

Therefore, the differences between the original SMTQ item loadings and the present findings are conceivable, and, perhaps, appropriate. In addition, the discrepancy between the original and current findings may relate to the common underlying factor of MT, denoting that the items are all measuring a similar underlying construct. This is supported by the strong subscale-global factor (*confidence/self-efficacy* = .72, *emotional/cognitive control* = .82, and *positive perspective* = .41) and subscale (*confidence/self-efficacy* and *emotional/cognitive control* = .34, *confidence/self-efficacy* and *positive perspective* = .26, *emotional/cognitive control* and *positive perspective* = .19) correlations in the present study. These findings compare favourably with Sheard et al.'s (2009) report of strong subscale-global factor correlations (confidence = .72, constancy = .71, and control = .66) and subscale correlations (confidence and control = .28, confidence and constancy = .31, and constancy and control = .31).

Although certain items loaded differently in this study as compared to the original SMTQ subscales, a number of the items were retained on their original scales. Specifically, four items from the original confidence and control subscales, respectively, loaded significantly onto the same factors in this study, possibly denoting that particular aspects of MT are central to the construct, regardless of culture or sport type, and that certain aspects of MT may be more malleable or adaptable than others based on environmental factors (e.g., type of sport). Indeed, Gucciardi et al.'s (2009a) definition of MT connotes the relevance of inherent facets as well as the experientially developmental nature of MT, with a core MT component/s that is relatively stable throughout situations and sport involvement. Perhaps this core MT component/s extends cultures, genders, and sport type involvement, with non-core MT components more likely to fluctuate based on background, experiences, and sporting requirements. This perspective would coincide with Horsburgh et al.'s (2009) report that MT is dependent on both biological influences and environmental experiences, with the supposition that some aspects of MT may be more amenable to adaptation than others. Determining which aspects of MT are more heritable or adaptable than others, however, is an area that needs to be explored.

As denoted, the subscale terms exhibit conceptual overlap with the original SMTQ subscales, except for the subscale of constancy, which was not adjudicated as an appropriate label for either of the factors revealed in this study. In a prior study, Crust and Swann (2011) suggested that the constancy subscale items appear to assess more than one construct (e.g., personal responsibility and concentration), which was posited as a potential reason for the lower internal consistency estimate for the subscale that was found in their study. This may afford some explanation for some of the items included on the original constancy subscale demonstrating superior loadings with other factors. Although the third factor, *positive perspective*, has limited similarity with the original SMTQ subscales, it does possess some degree of congruence with Clough et al.'s (2002)

MT48 instrument, in which a subscale – challenge – is included as a component of MT. Based on the findings in this study, *positive perspective* may be likened to the MT48 challenge subscale because of common thread of possessing an optimistic outlook and interpretation of the self and events or situations. These similarities may suggest that, despite the findings of different SMTQ factor structure contents in this study, the constructs the SMTQ appears to be measuring overlap with other measures as well as the components of MT identified in the literature. Contextualising the *positive perspective* component amid the other MT components outlined in the study, it would appear that this optimistic and hopeful attitude has important implications for high self-efficacious thoughts and behaviours, such as self-perceived confidence, the ability to control thoughts, emotions, and behaviours, to overcome adversity, and to perceive difficulties as challenges as opposed to threats. Therefore, it would appear that possessing a positive perspective is an indispensable characteristic for being mentally tough. Providing support for this, Nicholls et al. (2008) evidenced greater levels of optimism and lower levels of pessimism at higher levels of athlete MT. Due to the capacity for optimism to be augmented (Seligman, 1990), regardless of whether optimism is a component of MT (or a component of *positive perspective*) or simply a characteristic mentally tough individuals are more likely to possess, interventions aimed at enhancing optimism amongst athletes may provide benefits for improving the MT of athletes (Nicholls et al., 2008).

The internal consistency for the total SMTQ scale computed in this study (α = .771) compares favourably with previous research (α = .700 to .810 - Crust & Swann, 2011; Sheard et al., 2009). The internal consistency the *confidence/self-efficacy*, *emotional/cognitive control*, and *positive perspective* subscales were .72, .74, and .42, respectively. Although *confidence/self-efficacy* and *emotional/cognitive control* exhibited acceptable internal consistency, Cronbach's alpha for *positive perspective* was low. With indications that, for scales with low item quantities, mean inter-item correlations be reported and fall between .2 and .4 for reliability to be considered acceptable (Briggs & Cheek, 1986), the *positive perspective* subscale mean inter-item correlation was .266, which resulted in the decision to retain the subscale and include it in subsequent analyses.

Despite this, the divergence between the present results and the original SMTQ findings reported by Sheard et al. (2009), coupled with the low internal consistency for the *positive perspective* subscale, further SMTQ validation investigations are encouraged and warranted to provide additional evidence of the factor structure, item loadings, and support for the use of the SMTQ amongst athletes in general and sport-specific domains. Perhaps, Bull et al.'s (2005) supposition that different sports require or emphasise different types of MT may have particular relevance to the distinctions between the original SMTQ factor loadings and the present study. Indeed, researchers have begun to examine and develop sport-specific MT instruments (e.g., Australian rules Football, Cricket - Gucciardi & Gordon, 2009; Gucciardi et al., 2009b), positing that MT may be best understood and measured within particular sporting domains as opposed to more general sporting contexts. The AfMTI assesses four components of MT, including tough attitude, desire success, sport awareness, and thrive through challenge. The CMTI, on the other hand, assesses affective intelligence, resilience, attentional control, desire to achieve, and self-belief. Though there is apparent distinction between the facets of MT examined through each of the sport-specific instruments, there are similarities between them, such as the need or desire for success. In addition, there are some commonalities between these instruments and more general measures of MT, such as the control (subscales on the MT48 and SMTQ) and self-belief (similar to confidence on the MT48 and SMTQ). The factor structure outlined in this study demonstrated analogies between the composition of MT in competitive tennis players and the sport-specific MT measures that have been developed. For instance, the *confidence/self-efficacy* and *emotional/cognitive control* subscales are similar to the attentional control and self-belief subscales included in the CMTI, whereas the *positive perspective* subscale may be likened to the thrive through challenge subscale included on the AfMTI. This may further support the notion of a core set of MT components across all spheres and subtle differences based on sport-specific requirements or experiences. As such, it may be important to determine and designate the applicability of the SMTQ as a measure of MT within specific or general athletic populations, or whether instruments should be developed for particular use with a single sporting group. This is one area of the MT literature that requires attention and clarification.

Regardless of the proposed direction for measuring MT, the current findings suggest that the SMTQ is an appropriate measure of MT, but that greater caution should be used when interpreting results based on the sub-factors as compared to global MT scores.

5.2.2 SRIS Factor Structure

The PCA results in this study revealed a three factor structure underlying the SRIS instrument. In particular, 10 items loaded onto *engagement in self-reflection*, five items loaded onto *emotional/behavioural clarity*, and five items loaded onto *cognitive/behavioural analysis and awareness*. In the original validation of the inventory, Grant et al. (2002) found support for a two factor structure, which were labelled (1) self-reflection and (2) insight. The authors denoted that the self-reflection subscale included items that measured two facets: engagement in self-reflection and need for self-reflection. In their factor structure evaluation of the SRIS, Roberts and Stark (2008) reported a three factor structure that comprised engagement in self-reflection, the need for self-reflection, and insight, although one item was removed from the insight scale due to poor model fit. Due to this, the three factor structure evidenced in this study was initially thought to have reflected a combination of insight and the original two components of self-reflection. However, upon closer inspection of the item-factor loadings, the findings diverged from this preliminary position.

The nature of the item-factor loadings suggested that engagement in self-reflection and need for self-reflection would not conceptually fit with the items included on the factors produced. Two items that had previously been included on the self-reflection subscale ("It is important for me to evaluate the things that I do" and "I am very interested in examining what I think about") loaded significantly onto *cognitive/behavioural analysis and awareness* and three items that were included on the insight subscale no longer loaded significantly onto the factor including the remaining items on the original insight subscale ("I am usually aware of my thoughts", "I usually have a clear idea about why I've behaved in a certain way", and "I usually know why I feel the way I do"), but, rather, loaded onto the *cognitive/behavioural analysis and awareness* subscale. The total variance explained by the three factors in this study

(56.20%) was similar to Grant et al.'s (2002) study 1 (56%), but higher than their findings in study 2 (51%), although a different rotation method was used in their second study (Varimax Rotation).

As indicated, the factor loadings and component associated with each loading differed to some extent from the original SRIS subscale constructs. These assigned labels were considered indicators of the content of the items and represented distinct components that collectively reflected the overarching construct. This was supported by the strong and statistically significant correlations between the three subscales and global self-reflection and insight (*engagement in self-reflection* = .88, *emotional/behavioural clarity* = .48, and *cognitive/behavioural analysis and awareness* = .77). *Engagement in self-reflection* attends to the extent to which individuals emphasise, value, and are interested in examining their thoughts and behaviours, *emotional/behavioural clarity* assesses whether individuals have a clear understanding or explanation for their thoughts and behaviours, and *cognitive/behavioural analysis and awareness* refers to the knowledge and awareness that an individual has about the thoughts and behaviours they experience as well as a necessity to examine and evaluate thoughts and behaviours that occur. *Cognitive/behavioural analysis and awareness* is an appropriate grouping of these items because concentrated thought and behavioural analysis requires the knowledge of the types of thoughts and behaviours that occur.

The original validation study, along with subsequent studies (e.g., Roberts & Stark, 2008), included non-South African university student participants that were not specified as athletes. The inclusion of a South African sport-specific sample of participants in this study may afford some explanation for the factor structure differences, as the role and function of self-awareness, self-reflection, and thought and behavioural analysis may differ between tennis and other sports. Additionally, the sample in this study included a diverse and expansive age range of participants (M_{age} = 28.80 years, *SD* = 13.68), which is not a feature of university student populations and samples.

In the present study, *engagement in self-reflection* was not significantly correlated with *emotional/behavioural clarity* (*r* = .09), both of which bear some similarities and overlap with the self-reflection and insight subscales in Grant et al.'s (2002) study (*r* = -.03) and the engagement in self-reflection and insight subscales reported in Roberts and Stark's (2008) results (*r* = .06). The third factor, *cognitive/behavioural analysis and awareness*, demonstrated moderate to strong effect size correlations with *engagement in self-reflection* (*r* = .60) and *emotional/behavioural clarity* (*r* = .22), which may be likened to Roberts and Stark's (2008) outlined correlation between the engagement in self-reflection and insight subscales (*r* = .22). The results denote some overlap and similarity particularly between *engagement in self-reflection* and *cognitive/behavioural analysis and awareness*. Engaging in self-reflection is quite possibly a precursor or initial phase of behavioural and thought analysis prior to delving into deeper forms of examination. The primary difference between the two subscales is the focus of the latter on deep thought and examination of one's thoughts, emotions, and behaviours to obtain a stronger sense of understanding, whereas the former denotes a general surface examination of the thoughts, emotions, and behaviours one experienced or is experiencing.

The use of the SRIS in this study is one of few attempts to utilise the instrument amid a sport-specific group of athletes. The divergences between the original validation study, subsequent validation efforts, and the current findings merit further investigations and efforts to determine the psychometric properties of the SRIS and future applicability of the scale in general and sport specific domains. It may be that item interpretations and factor loadings differ in sporting spheres, which may be one plausible reason for the present findings. This supposition is an area that necessitates further attention and future research is encouraged to examine the factor structure of the SRIS among athletes, both generally and sport-specifically. Due to the content and construct validity support garnered for the SRIS (Grant, 2001; Grant et al., 2002) along with the strong internal consistency of the overall SRIS measure and correlations between the global measure and each of the subscales identified in this study, the SRIS appears an appropriate instrument for measuring self-reflection and insight. The support for the factor structure in this study, along with the internal consistency estimates obtained for each subscale (*engagement in self-reflection* = .890, *emotional/behavioural clarity* = .797, and *cognitive/behavioural analysis and awareness* = .754), indicated that subscale use is appropriate in this study, and, as a result, each subscale was retained for subsequent analyses.

5.2.3 RSA Factor Structure

Although Friborg et al. (2005) reported a factor structure for the RSA that included six subscales, the present findings supported a three factor structure comprising *interpersonal bonds and resources*, *personal resources*, and *social competence*. Three item-factor loadings did not contribute substantially ("My judgments and decisions", "In difficult periods I have a tendency to", and "Events in my life that I cannot influence") to the factors on which they loaded the highest and were removed for an improved item-factor loading fit. Examining the grouping of items that loaded onto each of the three factors, one particular item ("Rules and regulations") did not conceptually fit with the items and the factor it loaded highest on. As a result, the item was removed to ensure that the factors were relatively homogenous and made conceptual sense. Thus, in this study, a 29-item RSA was supported as opposed the original 33 items proposed by Friborg et al. (2005). Despite the PCA results of three factors, there are similarities between the original and the current study's factor structure. The items that loaded onto *interpersonal bonds and resources* were from the original RSA family cohesion and social resources subscales. In addition, except for the items that were removed, the remaining items from the perception of self, perception of future, and structured style subscales loaded highest onto *personal resources*. The perception of self, perception of future (which theoretically comprise a higher order factor of Personal Strength; Grant et al., 2002) and structured style represent personal abilities, characteristics, and perceptions, which the resilience literature would suggest refer to individual or personal protective features (Kumpfer, 1999) or personal resources (Galli & Vealey, 2008). All of the items included on the original social competence subscale loaded highest onto *social competence* in this study and signifies the closest subscale overlap between the original RSA and the present factor structure findings. Cumulatively, the factor structure of the RSA may be considered more succinct, while still assessing the range of resilience facets that Friborg et al. (2005) originally purported.

The distinctions between Friborg et al.'s (2005) validated RSA factor structure and the current findings are possibly due to a number of reasons. Firstly, the RSA has received scant use in sporting contexts and populations, with the particular demands and circumstances that competitive athletes are exposed to likely to influence the types of resilience and resilience subcomponents that are required by them. The differences in the samples used may also be a factor influencing the factor structure evidenced in this study, as Friborg et al. (2005) included a sample of military college applicants to validate the instrument. In addition, to the non-specific sporting nature of such participants, military college applicants are likely to be less diverse in age (M_{age} = 24.00, SD = 5.20) than the current sample of competitive tennis players (M_{age} = 28.80 years, SD = 13.68). Thus, if the RSA is to be considered and used further in sporting domains, it is important that the instrument be evaluated for application in such population groups.

The correlations between global resilience and each of the subscales were strong and statistically significant (*interpersonal bonds and resources* = .89, *personal resources* = .75, *social competence* = .70), indicating that each of the subscales is measuring a similar global construct. The subscales were also significantly correlated with one another (*interpersonal bonds and resources* and *personal resources* = .49, *interpersonal bonds and resources* and *social competence* = .51, and *personal resources* and *social competence* = .36). Therefore, the subscales appear to be measuring a similar underlying concept, but are distinct in the particular component that they are assessing. The internal consistency for global resilience and each of the subscales were generally higher in this study (α = .750 to .894) compared to the original study subscales (α = .660 to .780), denoting improved internal consistency with the revised subscale structure, at least amongst the sample of participants included in this study. With the revised RSA in this study exhibiting strong psychometric properties as well as some continuity and synergy with the original RSA, the global scale and subscales were used in the remaining analyses. However, acknowledging this is the first instance the RSA has been used amongst competitive tennis players, it is critical that additional psychometric evaluations of the instrument be conducted to further examine the use and role of the RSA in sporting settings.

5.2.4 Sport Stress Scale Factor Structure

In contrast to Kellmann and Kallus's (2001) 10 stress-related subscales (seven assessing general stress and three assessing sport-related stress), the PCA results in this study supported a three factor structure of *emotional/cognitive stress*, *athletic exhaustion*, and *fatigue/insufficient rest*.

Evaluating the factor loadings in this study compared to the original RESTQ-Sport stress scales, the majority of the all the items from the original emotional stress and social stress subscales (a finding that reflects prior RESTQ-Sport validation efforts; Davis IV et al., 2007), one item from the lack of energy subscale, and one item from the somatic complaints subscale loaded onto *emotional/cognitive stress*. Arguably, the latter two items reflect cognitive and emotional experiences and the items included on the original social stress subscale, though related to social contexts and interactions, are emotionally and cognitively based. Except for the item that was removed from the burnout/emotional exhaustion subscale, all of the items from the original burnout/emotional exhaustion and fitness/injury subscales loaded onto *athletic exhaustion*. Each of these items was included in the sport-stress component of the RESTQ-Sport, so there is credence to the mutual loadings of these items. The items that were previously included on the fatigue and disturbed breaks subscales, as well as one item from lack of energy and somatic complaints, respectively, loaded onto *fatigue/insufficient rest*. The latter two items possess comparable qualities to the other items that loaded onto *fatigue/insufficient rest* from the fatigue and disturbed breaks subscales because, for example, "I felt physically exhausted" coincides with fatigue symptoms. The disturbed breaks items that failed to load onto the factor including the other sport-stress items may be explained by the absence of sport-specific reference to disturbances in breaks. That is, the items included on the original disturbed breaks subscale do not refer specifically to sporting breaks, which is one of the primary reasons the items may not have loaded with the other sport-stress items.

The overarching fatigue, burnout, lack of rest, physical tiredness, and injury themes that transcend the *athletic exhaustion* and *fatigue/insufficient rest* subscales in this study signify similarities between the two types of stress. However, *athletic exhaustion* assesses athletic and sports-related types of fatigue, injury, and burnout, whereas *fatigue/insufficient rest* refers to general types of psychical stress aspects that are not particular to sport (may be experienced by non-athletes too).

The three subscales identified in this study assess different types of stress and maintains assessment of sport-related stress that the original structure measured. The present finding of an alternative factor structure for the RESTQ-Sport stress component is not unique to the present study. Davis IV et al. (2007) reported a marginally different factor structure and item loadings in the sample they included in their study, although their sample of Canadian athletes differed from Kellmann and Kallus's (2001) validation samples, which included European and American athletes. Davis IV et al. (2007), however, attributed some of the differences in their study due to the inclusion of problematic items that did not appear to load significantly onto the originally purported

RESTQ-Sport scales. The sample included in this study may also explain the discrepant findings, as the RESTQ-Sport has yet to receive attention amongst South African competitive tennis players. In addition, the scant validation efforts have been devoted towards the inventory in African or South African contexts, and with the apparent cultural perception differences in psychological construct make-up (e.g., intelligence), it is likely that the types of stress that individuals in Africa or South Africa experience differs from other cultural groups. These differences may relate to issues pertaining to sport factors, such as level of competitiveness or desire to achieve, as well as non-sport factors, such as socioeconomic differences between developed and developing countries, which are likely to impact stress outcomes differently.

Due to the emphasis of the RESTQ-Sport on general types stress, the inventory may inadequately measure relevant types of stress that are likely to be experienced South African tennis players. For instance, there is much evidence denoting cultural differences in the attributions (e.g., Morris & Peng, 1994), cognitive appraisal (e.g., Aaker & Lee, 2001), and coping strategies (e.g., Yoshihama, 2002) that are exhibited or employed when confronted with stress, indicating that the influence of stress is somewhat dependent on cultural and social factors. This may also be characteristic of South African society, in which the type of attributional style, for example, may impact the type and degree of stress competitive tennis players' experience.

The correlations between total stress and each of the subscales were each strong and statistically significant (*emotional/cognitive stress* = .85, *athletic exhaustion* = .64, and *fatigue/insufficient rest* = .59). In addition, the correlations between *emotional/cognitive stress* and *athletic exhaustion*, *emotional/cognitive stress* and *fatigue/insufficient rest*, and *athletic exhaustion* and *fatigue/insufficient rest* were moderate to strong and statistically significant (.37, .59, and .45, respectively). Collectively, the relational analyses between total stress and each of the subscales support the measurement of different types of stress, but that each subscale has a homogenous commonality (i.e., total stress). Cronbach's alpha for total stress, *emotional/cognitive stress*, *athletic exhaustion*, and *fatigue/insufficient rest* were excellent (α = .944, .929, .858, and .897, respectively), which supports the retention of the total stress scale and subscales for use in this study. Although the present findings diverge from the original RESTQ-Sport Stress scale factor structure, the results, coupled with the unique sample included in this study, provide support for the applicable incorporation of the revised measure in this study. Importance is placed, however, on the need to examine the RESTQ-Sport within a South African context, particularly due to the geographic, cultural, and ethnic factors that have the potential to impact the relevance and importance of selected components of the original RESTQ-Sport in South Africa. Additional research is also required amid particular sports groups, as prior validation studies have been devoid of including tennis athletes in the validation sample (e.g., Davis IV et al., 2007).

5.3 Mental Toughness and Age

The results indicated a statistically significant difference between the MT of competitive tennis athletes aged between 18 and 29 years as compared to those aged 30 to 48 years. In particular, the older age group evidenced higher MT levels. These findings compare similarly with prior results suggesting MT increases with age (e.g., Marchant et al., 2009; Nicholls et al., 2009). Interestingly, MT levels did not differ between the younger age category (18 to 29 years) and the oldest age category (49 years and older) as well as the middle age category (30 to 48 years) and the oldest category (49 years and older). Conjunctively, perhaps these findings signify that MT develops throughout the lifespan, but begins to plateau and MT levels are more likely maintained as one enters later years. Indeed, this denotation would support Connaughton et al.'s (2010) suggestion that the development of MT occurs over phases categorised into early, middle, later, and maintenance years, with the latter associated with sustaining MT levels. The present findings lend credence to Connaughton et al.'s (2010) developmental pattern of MT, which appears to suggest that although MT may develop over time, the development is not uniform and there are periods during which MT is more likely to develop and be emphasised more strongly.

In accordance with Connaughton et al.'s (2010) assertion, perhaps different phases of development emphasise or require various forms of MT. In fact, in a selected sample of younger athletes, Crust and Keegan (2010) found significant relationships between age and selected MT components and not others. Considering Crust and Keegan's (2010) sample did not include a broad range of athletes, further endeavours are encouraged to determine whether there are meaningful differences in the emphasis that various age groups place on particular components of MT. Perhaps, the relationship between MT and age is dependent on the type of MT component, with some aspects of MT possibly enhanced or reduced through the aging process based on requirements and age-related circumstances. In addition, it may be that the development of MT components occurs differently at varying stages throughout the life course. The present results may further support the contention that MT develops over time (e.g., Bull et al., 2005), possibly through a series of developmental phases and based on the experiences and environmental circumstances athletes experience (Gucciardi, 2011). Some degree of caution is warranted in interpreting the nature of the present findings, however, as one of the age groups (i.e., 18 to 29 years) had a substantially larger number of participants than the others. Nonetheless, these findings suggest the potential for MT to change or improve, which has implications for interventions aimed at enhancing MT levels of athletes. Supplementary research endeavours may support variations in MT levels and MT emphasis across the course of human development, which may inform MT training and improvement programs and interventions, possibly focusing on relevant MT components, which are catered towards individuals based on, amongst other factors, their age.

5.4 Mental Toughness and Years of Tennis Participation

The findings suggested that those competitive tennis players that have been participating for between 5 and 15 years generally tend to possess lower levels of MT as compared to those who have been participating for between 16 and 25 years and 26 to 35 years. These results appear to coincide with prior findings that have indicated greater levels of MT being associated with increases in sport participation experience (e.g., Nicholls et al., 2009). Perhaps, sporting experience and length of participation may have a positive influence on the development of MT. This perspective is supported in prior studies that have reported the influence of sport-general and sport-specific experiences on the development of MT (Connaughton et al., 2010; Jones & Parker, 2013). Perhaps the manifestation of the development of MT in sport is dependent, in part, on the type of sport in which athletes participate. That is, different sports may accentuate different types of MT components, fostering greater or more extensive development in these areas as compared to other MT components (Gucciardi, 2009). Although Nicholls et al. (2009) found no differences between the MT reported by individual or team participating athletes or contact or non-contact participating athletes, particular sports were not examined and MT subcomponents were not examined.

The present findings indicated similar levels of MT between the groups of competitive tennis players that have been participating between 16 to 25 years, 26 to 35 years, and 36 or more years. This may denote that although MT develops over time, it begins to stabilise as one participates for an extensive number of years. Certainly, this may be influenced, in part, by aging, which may explain the similarities between the group comparisons across years of tennis participation and age.

Interestingly, the years of participation groups of 5 to 15 years and 36 or more years did not differ significantly, possibly signifying the development of MT through participating in tennis that begins to decline after an apparent length of participation that covers much of the lifespan. Again, this may be influenced by age as well as the emphasis of certain MT components at various levels of participation, because, in all likelihood, those athletes who have been participating for more than thirty years, largely due to age factors, are less likely to be engaged in more rigorous and highly competitive forms of competition compared to those who may have been participating for shorter periods. Assuming that many of the tennis players that have been participating for extensive numbers of years are likely to be categorised as middle aged or elderly, perhaps these findings provide some early evidence that MT may be less important or relevant at later stages of human development. With the apparent paucity of MT research in competitive tennis, the present findings and suppositions require further examination. In addition, similarly to the age results presented previously, a considerably larger number of participants were categorised in the 5 to 15 years of participation group, signifying the necessity to avoid over interpreting the connotations and implications of the results. The findings do, however, provide novel and preliminary insight into the differences in MT levels as well as developmental indications of MT based on the period of time athletes are engaged in tennis participation.

5.5 Mental Toughness and Gender

Contrary to previous studies that have reported differences between the MT of male and female athletes (Crust & Keegan, 2010; Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al., 2012; Geber et al., 2013; Nicholls et al., 2009), the current findings denoted similar MT levels across male and female tennis players. The results, however, are congruent with selected studies evidencing no distinction between the MT of male and female athletes (Crust, 2009; Crust & Azadi, 2010). Although prior research is mixed in the determination of gender differences in MT, the present results may be based, in part, on the sport-specific focus of this study (tennis), with prior studies focusing on a variety of sports or athletes involved in unspecified sports. A recent sport-specific study involving basketball players reported higher MT amid males as compared to females (Newland, Newton, Finch, Harbke, & Podlog, 2013), with the authors suggesting that MT skill development efforts should focus on female basketball players. There has been scant research examining MT gender differences in competitive tennis, providing a basis for further replication studies to examine the gender differences in MT, particularly in tennis. One tennis-specific study, however, evidenced similar MT levels amid male and female elite tennis players (Cowden, 2012), though the sample size was limited (< 20). The study also found selected differences between the male and female tennis players' perceptions of the importance of instrument items (SMTQ) in the context of tennis, suggesting that the MT requirements in elite female tennis differ from elite male tennis. Thus, although overall MT levels may be similar across genders in competitive tennis, there may be certain MT components that are emphasised more strongly in one gender group as opposed to the other. This is supported by Cowden's (2012) finding of a higher mean score for males on the SMTQ control subscale and slightly higher mean scores for females on the confidence and constancy subscales. As a result, gender MT differences in competitive tennis may appear at a subcomponent level as opposed to a global level, suggesting the need to examine particular MT components to more accurately assess MT levels amongst males and females as well as to design interventions that meet the MT demands of each gender.

5.6 Mental Toughness and Type of Participation

The finding that MT levels did not differ based on the level of competitive tennis participation is similar to prior findings indicating comparable levels of MT based on the level of achievement (e.g., Nicholls et al., 2009) and the presence of differences in selected MT components and not others (some degree of MT similarity at different achievement levels; Golby & Sheard, 2004). Therefore, it may be that level of athletic achievement is less influential or important when considering MT, with MT potentially impacted more strongly by other factors, such as other psychological characteristics (e.g., resilience, LR), and that level of achievement and participation may be more strongly affected by ability and skill or other psychological factors (Nicholls et al., 2009).

Perhaps MT is less important for enhancing achievement and participation levels, but is more influential in achieving athletic success or excellence once a particular level of participation is achieved. This supposition is partially supported by prior evidence denoting greater achievement/playing ability is associated with higher levels of MT among a homogenous group of elite tennis players (Cowden, Anshel, & Fuller, 2014). On the other hand, because the participants ranged in age and specified their current highest competitive tennis participation, many players, particularly within older age groups, may have previously participated at higher competitive levels at younger ages, with their current participation at lower competitive standards. Therefore, in many of the groups (such as Local County Tournament) the participants may have previously competed internationally. This consideration may also have implications for the direction of the results evidenced in the current study.

It must be noted that a number of the types of participation groups may have been underrepresented in the current study, with markedly fewer International athletes as compared to University Team or League athletes, a facet similar to Nicholls et al.'s (2009) study. Therefore, prudence is warranted in interpreting the present findings and replication research, particularly amid competitive tennis players, is required.

5.7 Mental Toughness and Self-Awareness

The findings revealed positive and statistically significant relationships between MT and the global self-reflection and insight scale as well as each of the three subscales, with each of the correlations considered small to large effect sizes. These findings support the relevance of various facets of thought, emotional, and behavioural awareness, reflection, and evaluation to MT. MT evidenced the strongest correlation between *emotional/behavioural clarity* (SRIS), suggesting that those with higher degrees of MT are more inclined to possess a clearer understanding and explanation for the occurrence of emotional and behavioural experiences. Perhaps, as Loehr (1995) suggests, tennis athletes that possess greater levels of awareness and understanding of emotions and cognitions are more likely to experience MT growth and development. On the other hand, it may be that the ability to attain awareness and understanding into thoughts, emotions, and behaviours may result from the superior control mentally tough athletes possess. In fact, the large and statistically significant positive correlation between *emotional/cognitive control* (MT) *emotional/behavioural clarity* (SRIS) may afford some explanation for the meaningful relationship between *emotional/behavioural clarity* (SRIS) and MT, as it may be that this clarity and insight contributes to the control and regulation of emotions and cognitions amid those tennis athletes high in MT.

According to the present findings, mentally tough tennis athletes have heightened levels of thought and behavioural awareness, with these comprehension levels possibly aiding their ability to maintain cognitive and emotional control. With prior evidence indicating that mentally tough athletes possess similar levels of adverse emotional intensity compared to their non-mentally tough counterparts (Crust, 2009), it is conceivable that through superior degrees of emotional, behavioural, and cognitive awareness, understanding, and general self-reflection, mentally tough athletes are able to control these experiences and avoid the detrimental effect of such experiences on performance outcomes. Although previous studies have indicated the superior levels of emotional, attentional, and behavioural control amongst mentally tough athletes (e.g., Golby & Sheard, 2004), with superior control, in part, attributed to the use of more effective coping methods (e.g., Gould, Eklund, et al., 1993), this is amongst the first studies with results that may provide a potential reason for the superior control exhibited by mentally tough athletes. That is, the ability of mentally tough tennis athletes to engage in self-reflection, to have insight and awareness into their experiences, as well as to critically analyse, internalise, and have a clear understanding of and reasoning for such experiences may aid the successful control of their thoughts, behaviours, and emotions to maintain performance excellence.

Perhaps the role of intelligence, particularly emotional intelligence, as a characteristic that assists in understanding and managing emotional experiences (Mayer, Salovey, Caruso, & Sitarenios, 2001) may contribute to mentally tough athletes' superior self-awareness abilities (especially in terms of emotions) and maintain superior control. Indeed, affective intelligence (comparable to emotional intelligence) has been posited as a component of MT (Gucciardi & Gordon, 2009), suggesting the superior ability of mentally tough athletes to monitor, understand, and deal effectively with emotional experiences. Another form of intelligence, sport intelligence, has also been identified as a counterpart of MT (Coulter et al., 2010; Gucciardi et al., 2008), which signifies an athlete's knowledge of the game, strategic and tactical understanding, abilities, choices, and requirements or demands in particular competitive moments or situations. Due to their superior sport intelligence, it may be that mentally tough tennis players also exhibit heightened levels of self-awareness facets because of their knowledge of the types of emotional and physiological experiences they are likely to experience throughout competition (e.g., break point down). That is, using their sport intelligence, mentally tough tennis athletes may be better able to connect their emotional, cognitive, and behavioural experiences to particular aspects of competition and sporting demands (e.g., the emotions they experience when serving for a set) to overcome or avoid the negative effects of these experiences. Perhaps the role and relevance of various types of intelligence need to be more extensively examined in order to provide a clearer understanding of the characteristics mentally tough athletes are likely to possess or the process through which they are able to sustain high performance levels.

The apparent relationship between MT and resilience may also offer an explanation for the current findings, because if MT functions as a protective personal resource (resilience component) at selected times, then the role of certain self-reflection and insight facets (the *emotional/behavioural clarity* [SRIS] and *cognitive/behavioural analysis and awareness* [SRIS] subscales in particular) as potential characteristics of MT may contribute to the personal resources of competitive tennis athletes and facilitate more resilient outcomes in and outside of sport settings. The statistically significant correlations between *cognitive/behavioural analysis and awareness* (SRIS), the global MT measure and each of the MT subscales appear to provide preliminary support for Bull et al.'s (2005) suggestion that thinking clearly (which includes awareness and thought control) is a component of MT. In addition, this quantitative endeavour has extended prior qualitative findings suggesting the role of self-awareness to MT (Gucciardi et al., 2008, 2009).

Emotional/cognitive control (MT) was, however, not significantly related to *engagement in self-reflection* (SRIS), which may suggest that a tennis player's control of emotions and cognitions requires more than a surface examination of such experiences, but necessitates thorough analysis into the origin and reasoning for such experiences in order to obtain clarity and understanding (aspects particular to the *emotional/behavioural clarity* [SRIS] and *cognitive/behavioural analysis and awareness* [SRIS] subscales). Perhaps the depth of thought, emotion, and behavioural analysis is also important, with mentally tough tennis players conceivably more thorough in their examination and assessment of how they think, what they feel, and how they behave. This deduction is an area that warrants additional attention, but it may be important to determine the depth of analysis and awareness of mentally tough tennis players, both during and outside of sport competition.

The self-reflection and insight scale significantly predicted MT, explaining approximately 9.8% of the variance of MT. This corroborates the linear relationship results, denoting self-reflection and insight is an important factor to consider, and, perhaps, a contributor to the MT of competitive tennis players. The multiple regression results indicated that *emotional/behavioural clarity* (SRIS) and *cognitive/behavioural analysis and awareness* (SRIS) were the significant subscale predictors of MT, explaining approximately 24.4% of the variance of MT. Collinearity between *engagement in self-reflection* (SRIS) and *cognitive/behavioural analysis and awareness* (SRIS), however, may afford some explanation for the non-significant contribution of *engagement in self-reflection* (SRIS) to the prediction of MT.

Comparing the variance in MT explained by global self-reflection and insight to the variance explained by the subscales, it appears that *engagement in self-reflection* (SRIS) is not as important for determining or contributing to the MT of tennis players, particularly when the other self-reflection and insight subscales are included. In fact, the subcomponent may be detracting from the overall predictability of MT, at least when the global self-reflection and insight scale is considered. Therefore, it appears as though *emotional/behavioural clarity* (SRIS) and *cognitive/behavioural analysis and awareness* (SRIS) are more important factors to consider in relation to MT, supporting the contention that critical scrutiny, awareness, and clarity of emotions, cognitions, and behaviours are the principal elements for predicting heightened levels of MT, with surface reflection of these experiences without extensive analysis and clear comprehension less important for determining the MT of tennis players. The unexplained variance of MT by the self-reflection and insight scale and subscales indicates that there are additional factors to consider when predicting MT. This further suggests that MT is a complex construct that is associated with a number of positive characteristics and outcomes, including coping, mental imagery, and motivation (Gould et al., 2002; Gould, Eklund, et al., 1993; Gucciardi, 2010; Matti & Munroe-Chandler, 2012). Although self-reflection and insight and associated subscales positively contribute to the prediction of MT, whether self-reflection and insight or selected aspects are a component/s of MT or whether mentally tough athletes are simply more inclined to possess superior levels of self-reflection and insight characteristics is an area that requires further enquiry.

5.8 Mental Toughness and Stress

MT demonstrated negative and statistically significant correlations with total stress and each of the subscales, which ranged from medium to large effect sizes. Thus, greater levels of MT are associated with lower levels of stress and different components of stress. These findings support prior research evidencing that MT is associated with lower levels of stress (Gerber et al., 2013). Except for the correlations between *positive* *perspective* (MT) and *athletic exhaustion* (TS) and *positive perspective* (MT) and *fatigue/insufficient rest* (TS), the correlations between each of the MT subscales and the stress scales were negative and statistically significant. The strongest relationships, however, were evidenced between the *emotional/cognitive control* (MT) subscale and the total stress and stress subscales, indicating that athletes with greater cognitive and emotional control experience lower levels of stress in several areas. This may support the ability of mentally tough athletes to control cognitions and emotions despite experiencing or the occurrence of stressful or adversarial events (Clough et al., 2002; Jones et al., 2002; Kaiseler et al., 2009). According to Middleton et al. (2004a), stress minimisation is among the 12 components of MT, which denotes that ability to reduce the influence of stress despite experiencing it. It may be that high mentally tough athletes' lower perceptions of stressor intensity and severity provide some explanation for the lower levels of stress they are more likely to experience (e.g., Horsburgh et al., 2009; Kaiseler et al., 2009). Perhaps, *emotional/cognitive control* (MT) is among the most important MT components that influences the extent to which stress is experienced and affects performance. Compared to the other stress scales, there was also a tendency for the *emotional/cognitive stress* (TS) component to correlate more strongly with MT and the MT subscales, suggesting that this type of stress is one of the more critical stress factors to consider relative to the detriment of athlete MT. The absence of statistically significant relationships between *positive perspective* (MT) and *athletic exhaustion* (TS) and *positive perspective* (MT) and *fatigue/insufficient rest* (TS) may be explained by the largely physical nature of these types of stress.

Regardless of the extent to which one is positive, optimistic, and interprets adversarial events as challenging as opposed to threatening, physical fatigue, exhaustion, injuries, and sleep or rest issues are unlikely to improve through the possession and maintenance of a positive perspective and outlook, as this is primarily a mental quality and is unlikely to influence the extent to which these physical forms of stress are experienced. Although this contrasts the findings that mentally tough individuals are more optimistic and less pessimistic (e.g., Nicholls et al., 2008), perhaps this reflects the insight and understanding mentally tough athletes have about their physical experiences, with the possibility that such athletes may be more likely to accurately appraise their physical stress experiences, with the knowledge that physical forms of stress require rest, breaks, and recovery periods. Athletes high in MT may, as a result, be more inclined to make more accurate assessments about their fitness, injury, and levels of fatigue, which may enable them to manage their injuries and rest periods better to return to participation sooner than their non-mentally tough counterparts (Petrie et al., 2013).

The small to medium effect sizes between *confidence/self-efficacy* (MT), *emotional/cognitive control* (MT) and *athletic exhaustion* (TS) and *fatigue/insufficient rest* (TS) suggest that these two MT components of MT have some indirect influence on the extent to which an athlete reports exhaustion and fatigue. That is, in accordance with prior evidence, mentally tough athletes may experience similar levels of stress or stressor intensity as compared to their low mentally tough counterparts (e.g., Horsburgh et al., 2009).

The negative correlations found between MT (and MT subscales) and *athletic exhaustion* (TS) and *fatigue/insufficient rest* (TS) may indicate that mentally tough athletes appraise these facets of stress as less severe, possibly due to the superior control they have over their emotions and cognitions about their exhaustion, fatigue, or injuries, or the confidence and belief they possess about maintaining performance despite the presence of these forms of stress. Petrie et al. (2013) reported that, in the presence of high stress, mentally tough athletes had fewer injury-related days absent from sport participation. This finding may support the current results, because even if tennis athletes are experiencing similar levels of athletic fatigue, injury, and general sleep and rest disturbances, mentally tough athletes may be more likely to consider these forms of stress as less severe, and, consequently, maintain athletic engagement when fatigued or return quicker from injury than non-mentally tough athletes. Although the repercussions of lower stress severity perceptions, particularly physically related, are challenging to determine, taking fewer days off when injured or continuing to participate (train or compete) despite experiencing immense fatigue may be likened to some form of risk-taking. Crust and Keegan (2010) found that higher MT is associated with greater attitudes towards physical risk-taking, so it is conceivable that lower perceptions of stress (particularly physical) have the capacity to negatively affect the rest and injury periods of athletes with high MT. Alongside Crust and Keegan's (2010) recommendation, the relationships and influence of these variables on one another is an area that needs further investigation.

There may also be another explanation for the negative relationship between these physically related forms of stress and MT as well as selected MT components. Crust and Clough (2005) found support for the superior physical strength of mentally tough individuals, with more recent endeavours indicating that higher levels of physical exercise intensity are associated with greater MT (Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al., 2012). In addition, Gucciardi et al. (2008) and Coulter et al. (2010) proceeded further to postulate physical toughness as a component of MT. In accordance with these results and perspectives, mentally tough athletes are perhaps less inclined to experience fatigue, exhaustion, and injury. Thus, mentally tough athletes may be less likely to experience physical forms of stress due to their superior physical ability, endurance, or toughness, or they may experience similar levels of physical stress but that their MT assists them to more positively appraise stress or employ MT and associated characteristics to mitigate the influence of these stressors on their participation and performance. Clearly, these are two divergent perspectives, and a thorough understanding of MT would require underpinning the manner in which stress and MT relate to one another.

The finding that total stress significantly predicts approximately 14.2% of the variance of MT amongst tennis athletes further supports the linear relationship results and suggests that lower levels of stress is an experience that high mentally tough tennis players are more inclined to report. The unexplained variances, once again, relate to the inability of total stress to explain, more comprehensively, the fluctuations in MT, and there are other factors that contribute to the prediction of MT. Research has evidenced a large number of positive characteristics of mentally tough athletes, but there is less research identifying the characteristics that mentally tough athletes are perhaps less likely to possess. This may be an important area to pursue, which may afford additional information as to how mentally tough athletes are less likely to experience performance detriments. Coupled with this, MT research involving stress, anxiety, and choking, may provide further indications of the relevance of other similar constructs (e.g., resilience, LR) to MT. In a recent LR and MT investigation, Cowden, Fuller, et al. (2014) found a significant portion of the variance of MT explained by LR (62%), suggesting that, based on the similarities between the characteristics of each construct (e.g., various forms of control), the constructs seemingly intersect in selected areas. However, the unexplained variance was considered to reflect the dissimilarities between the constructs, with MT facets, such as motivation, commitment, and the desire to achieve or succeed, not relevant to the LR construct.

In relation to resilience in the present study, if mentally tough athletes are inclined to experience lower levels of stress, anxiety, and choking, the relationship between resilience and MT may be a more prominent area of focus because of the protective factors that are common to many conceptualisations of resilience (Kumpfer, 1999; Luthar, 1991). Considering resilience involves positive adaptation to adversity or risk (Olsson et al., 2003), which is remarkably similar to the notion of mentally tough athletes' ability to bounce back following setbacks or difficult experiences (e.g., Fourie & Potgieter, 2001), there may be overlap or a specific relationship between MT and resilience that, in part, elucidates the manner in which those high in MT are able to overcome adversity to maintain performance levels. Although the present study explored the plausible construct interrelatedness, much additional work is required in this area, particularly because of the propensity to develop or improve both MT (Bell et al., 2013) and resilience (Egeland et al., 1993).

The multiple linear regression results indicated that one of the stress subscales, *emotional/cognitive stress* (TS), was the single significant predictor of MT. The factor accounted for 16.7% of the variance in MT, which was marginally higher than that explained by total stress. Although the stress subscales were correlated, indicating some degree of collinearity influencing the regression outcome, the findings suggest that *emotional/cognitive stress* (TS) is the most important type of stress to consider relative to the MT of tennis athletes. Thus, in determining potential aspects of stress that are more likely to be associated with lower MT, prominence should be devoted towards *emotional/cognitive stress* (TS). This may be due to the comparative psychological quality of *emotional/cognitive stress* (TS) and MT. That is, the other stress subscales included in this study were primarily associated with physical forms of stress. These physical stress factors are, conceivably, less malleable or susceptible to psychological interventions as opposed to more psychological forms of stress. There may be indirect methods, however, that may assist athletes to avoid or reduce the likelihood of experiencing fatigue, injury, and burnout, such as teaching athletes to identify fatigue or burnout symptoms. However, this is limited by the demands that are placed on athletes and whether they have the ability to rest, take breaks, or receive appropriate treatment when required. Perhaps, at least amongst competitive tennis players, athletic forms of stress are unavoidable due to the training, practice, and competitive strain and requirements tennis players are subjected to.

Whether the experience of lower levels of *emotional/cognitive stress* (TS) amongst tennis players higher in MT is due to MT itself or other related constructs (e.g., resilience, LR) is an aspect that should be identified, which has potential intervention implications. Catering *emotional/cognitive stress* (TS) reduction interventions around

MT may prove futile if MT is not one of the primary reasons for lower *emotional/cognitive stress* (TS) reports amongst mentally tough individuals.

5.9 Mental Toughness and Resilience

The medium to large effect sizes between MT and resilience (and subscales) reflect the strong positive association between the variables. In addition, medium to large effect sizes were found between the MT subscales and resilience (and subscales). *Positive perspective* (MT), however, evidenced small to medium effect sizes with resilience (and subscales), indicating relationships between *positive perspective* (MT) and resilience are lower in strength than the other variables. Collectively, these results coincide with prior denotations of the positive relationship between the two constructs, possibly because of the commonalities they possess. Both constructs are associated with athletic achievement (e.g., Clough et al., 2002; Hosseini & Besharat, 2010), possessing a sense of control over events or the outcome of events and situations (Clough et al., 2002; Cowen et al., 1992), bouncing back from setbacks and adversity (Fourie & Potgieter, 2001; Jones et al., 2002; Mummery et al., 2004), and successfully overcoming pressure and distressing circumstances (Bull et al., 2005; Masten, 1994). The subscales included in the RSA are considered protective factors that contribute to the successful adaptation following exposure to risk. Resilience and the subscales included in this study may be facilitating the MT components examined in this study. For example, possessing strong relationships with family and friends may promote confident and self-efficacious thoughts and behaviours, control of emotions and cognitions, and perceiving circumstances optimistically. On the other hand, the resilience components may assist athletes to maintain MT levels when experiencing adversity, stress, or risk exposure.

The ability of resilience to significantly predict approximately 30.1% of MT and each of the resilience subscales to significantly predict 32% of the variance of MT provides further evidence of the overlap, similarity, or convergence between the constructs, but there is a substantial portion of the variance of MT that is not explained by resilience. Perhaps this denotes and supports the departures between the constructs. Indeed, resilience is considered a process through which one experiences some form of risk that is combated, counteracted, or appeased through protective factors to achieve positive adaptation (Windle, 2011). MT, however, comprises a set of characteristics that impact the manner in which athletes appraise and approach positive (e.g., goals) and negative (e.g., adversity) experiences (Gucciardi et al., 2009a). The conceptual basis underlying resilience has prompted researchers to suggest that MT operates as a protective factor, a contention that has been posited and supported previously (e.g., Gerber et al., 2013). However, much MT research has begun to suggest that resilience is a component that comprises the MT spectrum, particularly because MT is associated with positive and negative attitudes, perceptions, and experiences and that resilience is one subcomponent of MT (Sheard, 2013).

In more recent MT conceptualisations, numerous researchers have asserted resilience as a component of MT (Coulter et al., 2010; Gucciardi & Gordon, 2009; Gucciardi et al., 2008), supporting Sheard's (2013) perspective. This deliberation was one of the reasons for the current investigation, with the objective of further identifying the interrelatedness, and, possibly, speculating the process through which MT and resilience interact with one another. The accepted modified PA model examining the interrelatedness between MT and resilience components (Figure 4.5) demonstrates small to moderate effect sizes (standardised regression weights) between many of the subscales. The model was improved by removing the regression paths between *interpersonal bonds and resources* (R) and *positive perspective* (MT) and *social competence* (R) and *positive perspective* (MT), indicating that in the presence of the other regression paths, these relationships did not add substantially to the model of resilience and MT interrelatedness.

Although the remaining regression paths were statistically significant and the model accepted, the findings may indicate that, though there is overlap between the two constructs, there are areas of distinction between the two. Therefore, although possessing resilience components may be associated with higher MT across each component and possibly contributes to MT components, examining the actual subscale content provides some insight into the distinctions between the two constructs. MT is primarily an internal and psychologically-based construct, with little emphasis on external factors, such as social or familial relationships (Fourie & Potgieter, 2001; Gucciardi et al., 2009a; Jones et al., 2002). This may be likened to the resilience subscale of *personal resources* (R), which has some degree of similarity with MT. However, *social competence* (R) and *interpersonal bonds and resources* (R) are facets that do not prominently feature in conceptualisations of MT.

Assessing Galli and Vealey's (2008) conceptualisation of resilience in sport, they attest to the role of social factors (e.g., social support) as moderators of risk to attain positive outcomes, but they also suggest the presence of personal resources (e.g., achievement motivation) as influential on outcomes following adversarial experiences. Fletcher and Sarkar (2012) found several factors that influence the resilience process, some of which overlap with (e.g., confidence) and differ (e.g., social support) from MT.

Therefore, cogitating complete overlap between the constructs would not be appropriate. Even though the two constructs, at a scalar and sub scalar level, may be highly related, this does not automatically denote construct similarities. Considering MT is relevant to positive experiences and events, a notion that diverges from resilience, the overt irrelevance of certain resilience components to MT are indicative of clear differences between the constructs. Rather than suggesting resilience as a subcomponent of MT or MT as a subcomponent of resilience, perhaps there are certain facets of resilience that contribute to MT and there are selected MT aspects that comprise resilience.

Thus, it is possible that MT and MT constituents act as protective factors when exposed to risk, but selected resilience components (in this particular study *personal resources* [R]) may contribute to the MT levels of tennis athletes. According to Kumpfer's (1999) identification of protective factors, internal factors, such as emotional stability and management and cognitive competences, are quite similar to the MT components in this study of *emotional/cognitive control* (MT) and *confidence/self-efficacy* (MT). With this in mind, it may be more appropriate to evaluate and determine the relationship between resilience and MT on a sub scalar level as opposed to a global level, which provides greater insight into the prospective differences between the two constructs. The apparent discrepancies between the two constructs also support the recognition of both constructs in the sport and positively psychology literature as unique constructs. This has been an area, particularly relative to MT, that has needed further evidence, as there has been a dearth of research differentiating MT from other similar constructs. This is a critical area considering other constructs have been used as a framework for conceptualising MT (e.g., hardiness; Clough et al., 2002). Recent efforts, however, have begun to differentiate MT from other similar constructs (e.g., LR; Cowden, Fuller, et al., 2014), and the present findings further these endeavours to justify MT as a unique psychological construct.

According to Bull et al.'s (2005) perspective that MT may differ based on sport type and the circumstances surrounding participation, and, considering the potential overlap between resilience and MT, there may be particular moments in which resilience components are less relevant to a tennis athlete. For example, *social competence* (R) is unlikely to play a considerable role during competitive situations, particularly during singles events, though *personal resources* (R) may be utilised more extensively. On the other hand, post-competition, following negative match results or losses, *interpersonal bonds and resources* (R) may be extremely important for helping an athlete to overcome disappointments and setbacks, particularly among tennis players because of the individualistic nature of the sport. With the assertion that MT is considered to be sport and situationally specific, based on the type of sporting requirements (Bull et al., 2005) and develops, in part, based on particular sporting experiences (Gucciardi, 2009), it may be that mentally tough athletes utilise or incorporate different forms of resilience based on the situations and events they encounter. This, however, is an area that requires research attention.

The proposed similarities between MT and resilience, coupled with the strong positive relationships between the scales and subscales in this study, may provide preliminary prospective intervention insight to improve the presence and strength of both constructs amid athletes. The early suggestions that MT can be altered, improved, and developed through experience, time, and interventions (Loehr, 1995) have garnered empirical support. In particular, evidence suggests MT is influenced by environmental factors (Gucciardi, 2011; Horsburgh et al., 2009), such as early childhood experiences (Bull et al., 2005) and initiative experiences (Jones & Parker, 2013). Intervention studies involving a strength-based approach (Gordon, 2012) and longitudinal multidisciplinary intervention (Bell et al., 2013) have reinforced the ability to enhance MT through practical interventions. Thus, it is becoming more apparent that MT not only develops over time, but that psychological interventions can contribute to the improvement of MT among athletes. Resilience, too, is considered to fluctuate depending on risk exposure (Rutter, 2007) and develop over time through positively adapting to and overcoming risks (Goldstein, 2008). In addition, there are several indications that the resilience process is influenced by the degree of protective factors that are relevant and present at moments of risk exposure (Herrman et al., 2011; Rutter, 2007). If MT (or parts of MT) acts as a protective factor, then developing MT may have positive implications for enhancing athletes' strength of protective resources, and, as a result, increase the likelihood of positive outcomes. Although resilience appears to develop gradually over time (Egeland et al., 1993), the components of resilience that are entirely distinct from MT (e.g., social, cultural, or familial factors) may provide some method for improving MT.

In the same way that MT can be enhanced, and, perhaps, act as a resilience protective factor, efforts to develop family and social relationships and social engagement skills, may contribute to the presence of protective factors, which, in turn, may facilitate positive risk exposure outcomes. With protective factor growth and the increased likelihood of positive adaption, such athletes may be more likely to rebound following setbacks and adversity than before. This improved resilience may have positive implications for increased MT levels, particularly in areas in which they are paralleled. The reciprocal augmentation of resilience and MT that has been outlined requires investigations to verify the extent to which this is likely to occur amongst athletes. That is, improving or developing one construct may enhance the other, but the converse may not occur. Nonetheless, the findings in this study provide a promising foundation for further evidence to explicate whether the strong relationship between MT and resilience is a basis for improving one or both constructs amongst athletes.

5.10 Mental Toughness, Resilience, and Stress

The MT and resilience relationship analyses conducted in the present study have provided an initial sense of the interrelatedness between the constructs. The hierarchical regression results indicated that resilience and each of the resilience subscales did not significantly moderate the total stress-MT relationship. The absence of significant moderation effects from resilience and the remaining resilience subscales may provide additional support for the similarities between MT and resilience. Clear distinctions between the constructs would likely have yielded significant moderation effects, but perhaps this finding should be anticipated considering the strong significant correlations and ability of resilience (and the subscales) to significantly predict MT. In conjunction with prior elucidations, there are apparent areas of correspondence between the two constructs, though these are not absolute. With the current study being amongst the first to quantitatively examine the resilience and MT relationship, a clear designation of the interrelatedness and discrepancies between the two are challenging to identify. Replication research as well as sophisticated research designs may provide supplementary information and more explicitly detail these areas the present study has explored.

5.11 Resilience and Stress

The linear relationships between resilience (and subscales) and total stress and *emotional/cognitive stress* (TS) were negative and statistically significant, ranging from medium to large in effect size. Except for the relationship between *social competence* (R) and *athletic exhaustion* (TS), which was not statistically significant, the correlations between resilience (and subscales) and *athletic exhaustion* (TS) and *fatigue/insufficient rest* (TS) were negatively and statistically significant, ranging from small to medium in effect size. The strength of the negative relationship between resilience and stress appears to differ based on the type of stress experienced, with stronger relationships between resilience and psychological types of stress as compared to more physiological forms of stress. This may be because, regardless of the degree of resilience and associated resources, they are unlikely to negate or abate physical forms of stress involving fatigue, exhaustion, and injury. This notion is further evidenced by the absence of a significant relationship between *social competence* (R) and *athletic exhaustion* (TS), which may denote the irrelevance of certain resilience components to selected forms of stress. It appears counterintuitive that these two components would be related and even less likely that *social competence* (R) to influence *athletic exhaustion* (TS). That is, possessing socially competent characteristics is unlikely to assist in avoiding or reducing athletically-related fatigue and burnout.

Perhaps, in a similar way to MT, resilience may have an effect on the appraisal of stress or reduce the length of time away from athletic participation due to injury or fatigue. Regardless of the manner in which resilience may relate to stress, the present findings expand on previous denotations that resilience is associated with lower levels of risk or successfully overcoming risk (stress being one form of risk; Luthar & Zelazo, 2003). Due to the relative absence of resilience-stress investigations in sporting domains, particularly in competitive tennis, these findings provide novel information about the potentially positive influence or role of resilience amongst athletes.

Even though resilience has primarily been applied in non-sporting contexts, the construct, or at least some of the protective factors, may be useful for athletes to possess. In addition, with the RSA measuring the extent to which an individual possesses selected protective factors (Friborg et al., 2005), support for the RSA as a predictor of positive adaptation following exposure to risk (in this case stress) is acquired through the present findings. Considering the potential similarities and overlap between MT and resilience outlined in this study, efforts or interventions to improve one or both constructs may have positive outcomes for stress experiences, possibly reducing the extent to which athletes experience stress.

5.12 Self-Reflection and Insight, Resilience, and Stress Subscales as Predictors of Mental Toughness

Placing each of the self-reflection and insight, resilience, and stress subscales as independent variables to predict MT, the findings indicated that *personal resources* (R), *emotional/cognitive stress* (TS), *emotional/behavioural clarity* (SRIS), and *social competence* (R) were the significant predictors of MT. Although the relationships between each of the subscales for each instrument (collinearity) may afford some explanation for the absence of significant predictions of MT through the remaining variables, these findings indicate that based on the variables included in this study, the four significant predictors are the most important variables to consider when attempting to predict or ascertain changes in MT among competitive tennis players. Collectively, these variables explain approximately 42% of the variance of MT.

These findings have similarities with the results obtained from analyses separately using each of the instrument subscales to predict MT. For instance, *engagement in self-reflection* (SRIS) was not a significant predictor of MT when the other self-reflection and insight subscales were included. Nonetheless, it would appear that selected components of each construct, as compared to others, may have a greater influence on the fluctuations or MT outcomes of competitive tennis athletes. Attempts to increase *personal resources* (R), *social competence* (R), and *emotional/behavioural clarity* (SRIS) and reduce *emotional/cognitive stress* (TS) may provide positive benefits for the MT of tennis players. Though not accounting for the potential influence of other factors that were not included in this study or the measurement model, particular attention should be devoted towards these components for evaluating and possibly influencing MT. Whether these factors have a direct influence on MT is an area that requires additional attention, although commonalities among some of the constructs included in the study (e.g., MT and resilience) may signify potential covariance and the effect such constructs may have on one another.

A substantial portion of the variance of MT was explicated by the four significant dependent variables, but the result indicates that other factors are likely to influence the variance of MT. This may further contribute to the multi-characteristic make-up of MT that has been posited (Gucciardi et al., 2009a) and the research denoting the association between MT and a range of positive qualities and outcomes (e.g., effective coping, goal types, optimism; Gould et al., 2002; Gucciardi, 2010; Nicholls et al., 2008; Nicholls et al., 2011). In addition, it extends denotations of the associations between more negative qualities, experiences, and outcomes (i.e., stress), areas that have been devoted insufficient attention in the MT literature.

5.13 Limitations of the Study

Although the present study has contributed to further developing an understanding of the MT construct, the relationship MT has with other constructs, and the types of characteristics associated with mentally tough individuals specifically in the context of competitive tennis, there are several limitations that must be noted:

(1) The cross sectional design that was used in the present study restricts the ability to generalise the findings to other types of athletes not involved in competitive tennis as well as other non-South African competitive tennis athletes. Despite the apparent confines to employing this kind of design, one of the primary goals of the study was to conduct a MT study that was tennis-specific, with this specification seemingly negating the need to generalise to non-tennis sporting groups. With indications that MT should be examined sport-specifically (e.g., Bull et al., 2005) and the recent development of sport-specific MT inventories (e.g., Gucciardi and Gordon, 2009; Gucciardi et al., 2009b), the cross-sectional approach used in the current study is warranted. Cross-sectional methodological approaches also limit the interpretability of the results because causal inferences cannot be made. Though this restricts the extent to which more concrete conclusions about the nature and direction of the relationships and interactions between the variables examined in this study, the unique and original objectives included in the

study sought to provide initial and preliminary information about the phenomena of interest in the context of competitive tennis and generate novel insight that should be explored further.

(2) Due to the use of non-probability sampling techniques in this study, the representivity of the sample to the target population may be interrogated, as the use of snowball and convenience sampling may have introduced some degree of sampling bias. As such, generalisability to the entire population of interest may be limited, with the possibility that certain segments of the target population may have been overrepresented. Indeed, this study had substantially larger numbers of younger, university team or league, and white participants. Due to the sampling techniques employed, whether these participant demographic discrepancies reflect the target population characteristics or not cannot be identified. One of the major restrictions that inhibited the use of probability sampling techniques was accessibility to the participants, with time and financial constraints making it challenging to employ a more preferred probability sampling technique. Contributing to the challenge of definitively identifying each member of the target population was the criterion of being engaged in current tennis competition (within the past two weeks prior to participation in the study), which meant that the target population quantities changed according to potential participants' involvement in tennis competitions at particular times.

(3) The selection criteria for inclusion in the study may also have imposed selected limitations on the study. In particular, requesting participants to indicate their current level of competitive tennis participation may have omitted the details of the highest level of participation the athletes may have engaged in throughout their lifespan. It is likely

that many of the participants, particularly in the older age range, have participated at higher competitive levels in the past. The exclusion of this information may caution extent to which selected results, such as MT in relation to the type of participation, should be interpreted.

(4) Another limitation may be associated with the selection and use of the instruments in the current study. Although each instrument was selected based on prior validation support and adjudicated appropriateness for use in the current study, many of the instruments have received little attention in sporting contexts (e.g., RSA, SRIS), especially competitive tennis. In addition, considering some of the factor analysis discrepancies between the current and past studies identified in this study and were associated with each questionnaire, it appears that each instrument requires refinement and further psychometric evaluation efforts to establish acceptable use in competitive tennis and other athletic populations. Despite apparent limitations, each inventory was psychometrically assessed and reasons provided for appropriate use in the current study, which was considered a critical phase prior to proceeding with subsequent analyses.

(5) The resilience instrument that was used in this study was developed and validated using non-athletic participants. With the recent resilience model for sport that has been posited (Galli & Vealey, 2008), it may be necessary to develop a sport resilience scale to applicable and particular use amongst athletes. The identified factor structure differences between the original RSA and the present study may support this contention, and, perhaps, without taking into account the sports-related facets of resilience, the interpretation of the current results may be limited.

(6) Linked to some extent to the inventories used is the collection and focus on self-report data in this study. Although psychological constructs are challenging if not impossible to observe or quantify from an external perspective, the potential occurrence and influence of self-report bias on the results and outcomes in this study cannot be overlooked.

5.14 Conclusion

Even though the study is not devoid of certain limitations, the information generated offers innovative and contemporary insight into the construct of MT as well as the potential role and relevance of characteristics and constructs in the context of competitive tennis players in South Africa. Based on the findings and discussion produced, the present study has provided unique information that may be used to progress the current understanding of MT in all types of athletes, especially tennis players.

CHAPTER SIX

CONCLUSIONS

6.1 Introduction

The results in this study revealed several important findings that are considerably beneficial to the MT and related literature. Based on these findings, primary considerations, contributions, and recommendations can be made about instruments used in the present study, the characteristics that relate or contribute to MT, and the interrelatedness between MT and other constructs.

6.2 SMTQ, SRIS, RSA, and RESTQ-Sport Stress Scale

6.2.1 Sports Mental Toughness Questionnaire

The original three factor structure reported by Sheard et al. (2009) was supported in this study, although the item-factor loadings in this study exhibited several differences from the original SMTQ. Crust and Swann's (2011) findings suggested that some of the original SMTQ subscales (e.g., constancy) assessed more than one construct and recommended further refinement of the instrument. Though the SMTQ has received psychometric support, the instrument has received limited use and requires supplementary validation support. The current study contributes to the determination of the appropriateness of the SMTQ as a measure of MT, especially in tennis. The differences between the present and original SMTQ may be due to the inclusion of participants from a single category of sport participation (i.e., competitive tennis players), which may suggest some sport-specific distinctions in the requirements and manifestations of MT between various sports (Bull et al., 2005). The correlations between the revised subscales and global MT in this study provide additional support that the subscales are measuring components of MT.

Considering the item development and face validity support process that proceeded in the development of the SMTQ, the present study's findings support the use of the SMTQ as a measure of MT. However, the most appropriate use, at this stage, may be the global MT scale, with further investigation required for ascertaining the subscale structure and items and whether the SMTQ should be used at sub scalar level. With the recent development of sport-specific MT instruments (e.g., Australian Rules football, Cricket - Gucciardi & Gordon, 2009; Gucciardi et al., 2009b), it may be essential to validate the SMTQ in sport-specific contexts. Indeed, there appear to be distinctions in athletes' perceptions of the relevance and importance of various components to MT across different sports (Cowden, Anshel, et al., 2014), which may suggest that MT inventories need to be catered towards particular sports.

The current study contributes to the further validation and refinement of the SMTQ as well as provides initial evidence of a SMTQ factor structure and an item-factor loading structure that may be unique to competitive tennis athletes. The findings support the use of the SMTQ as a global measure of MT, but it appears important to continue validation efforts to obtain additional evidence denoting the structure and content of the subscales. Thus, researchers are encouraged to engage in additional psychometric assessment of the SMTQ both in general and specific sports participants.

6.2.2 Self-Reflection and Insight Scale

The SRIS has yet to receive attention and use in sporting populations, particularly competitive tennis. It was, therefore, important to examine the factor structure of the instrument. Contrasting the original validation study two factor structure (Grant et al., 2002) but similarly to the three factor reported by Roberts and Stark (2008), a three factor structure was evidenced in this study. The constructs identified in this study possessed some overlap with prior studies, particularly *engagement in self-reflection* (Roberts & Stark, 2008). In addition, the absence of a significant relationship between *engagement in self-reflection* and *emotional/behavioural clarity* appears similar and may be likened to the negligible correlation between the self-reflection and insight subscales reported in Grant et al.'s (2002). The item-factor loadings in this study, however, were distinct in a number of ways that resulted in the refinement of the subscale construct labels that were assigned. As with the SMTQ, these distinctions may result from the unique participants included in this study, as past validation efforts have included non-sporting participants. Thus, the current study provides preliminary support for a factor structure that may be unique to competitive tennis. However, with the limited use of the SRIS in sporting domains, it is important to engage in further validation efforts in general and specific sporting contexts.

6.2.3 Resilience Scale for Adults

Contrary to the original development and six factor validation endeavour (Friborg et al., 2005), the current study revealed a refined three factor structure. The factor structure that was revealed, however, was conceptually relevant and maintained correspondence with the original six factors. For instance, the internal and personally associated subscales and items loaded onto one factor (labelled *personal resources*). The item-factor loadings and the factor structure also maintain conceptual overlap with the resilience literature. That is, the subscales identified in this study, for example *interpersonal bonds and resources*, is remarkably similar to the social factors identified in the resilience literature as a protective factor that aids or facilitates adaptive functioning (Galli & Vealey, 2008).

A number of items were removed from the original RSA, possibly signifying that certain aspects of resilience may be less relevant to competitive tennis athletes than other population groups. This study is among the few that have quantitatively investigated resilience in the context of sport, particularly competitive tennis, and it may be likely that resilience is dependent on the population of interest. Although a condensed factor structure was identified, the overlap and similarities between the original and current psychometric validation efforts provide initial support for the use of the revised RSA as a resilience assessment instrument in competitive tennis. However, considering the limited use of the inventory in sport and tennis, additional research is warranted in this area to provide additional information on the factor structure and relevance of the RSA content to various sports settings.

6.2.4 Recovery-Stress Questionnaire Sport Stress Scale

Although the original RESTQ-Sport stress component had 10 subscales (Kellmann & Kallus, 2001), the current study evidenced greater support for a three factor structure. Davis IV et al. (2007) reported some differences in the factor structure of the instrument as compared to the original measure, which may be due to sample demographic distinctions across the studies. Thus, the nature and manifestation of stress may differ based on demographic characteristics, which may explain the differences in this study. The findings in this study may also suggest further refinement of the RESTQ-Sport stress component is necessary, because, for example, the original disturbed breaks subscale items (which was purported to measure sport stress) loaded more strongly with some of the general stress items. In addition, several items included on the original scales were removed from this study, possibly signifying the irrelevance of previously designated stress components in the context of competitive tennis athletes based in South Africa.

The three factor structure, though reduced, does possess similarity with the original stress scales. That is, one of the factors measures sport stress facets, with the other two scales measuring non-sport specific types of stress. Therefore, the revised RESTQ-Sport stress scale in this study measures both general and sport stress. Although there are similarities between the original measure and the revised structure evidenced in this study, this remains one of the few studies that has utilised the RESTQ-Sport in competitive tennis, especially in South Africa. The divergent factor structure and item-factor loadings in this study may reflect the type of participants included in the study and the relevant components of stress in the context of competitive tennis. However, with the dearth of research using the RESTQ-Sport in competitive tennis, the revised factor structure reported in this study may need to be interpreted cautiously pending supplementary investigations evidencing psychometric support for the RESTQ-Sport stress component.

6.3 Mental Toughness, Age, Years of Tennis Participation, Gender, and Type of Participation

Extending prior studies examining MT and demographic characteristics, participation, and achievement levels, the current study contributes to the determination of these relationships and demographic MT differences among competitive tennis players. The results present a tennis-specific set of age-related MT considerations that are comparably, to some extent, with prior research. In this study, the youngest and oldest age group differed significantly from one another, which is similar to previous reports (e.g., Marchant et al., 2009). The absence of differences between the remaining comparisons may indicate that MT develops over time and begins to stabilise as athletes move into middle to later years. Thus, there is support for the developmental nature of MT amid competitive tennis players that transcends the human development stages (Connaughton et al., 2010). With the scarcity of competitive tennis studies involving MT, further work is required to designate the developmental trajectory of MT across the lifespan in order to validate whether MT displays a linear development trend or decelerates once competitive tennis athletes enter middle to later years.

The years of tennis participation results displayed similarities with the age results. That is, MT levels were greater amongst those athletes that had been participating for between 16 and 35 years as compared to those that have been participating for between 5 and 15 years. This is consistent with the developmental capacity of MT through sporting experiences (Connaughton et al., 2010; Jones & Parker, 2013) and as participation lengths increase. The absence of differences between the shortest and longest years of participation groups may provide additional information about the pattern of MT development through sporting experience and participation in tennis. That is, perhaps MT develops through sporting experiences, but once one reaches a particular length of participation, MT levels are sustained or possibly decline to some extent. Although the influence of age is likely, these findings provide new insight into the possible developmental process of MT through length of participation in sport, albeit in competitive tennis. There is a need to continue these types of investigations amid other sporting groups, which may provide greater indications and support for the developmental capacity of MT.

Prior studies have reported mixed results about gender MT differences, with some reporting MT differences (e.g., Crust & Keegan, 2010; Gerber et al., 2013) and others not (e.g., Crust, 2009; Crust & Azadi, 2010). The current findings indicated similar MT levels between males and females. With the present study being the first to examine gender MT differences in competitive tennis players, the results may indicate that, at least within competitive tennis, males and females possess similar MT levels. Considering the divergent results reported previously, it would be important to further such investigations amid all types of sporting groups and replicate these preliminary findings. Determining whether males and females are likely to possess similar or different levels of MT across various sports may have an influence on MT intervention and training programs.

Regardless of type of participation level, comparable levels of MT were evidenced between the tennis players. This coincides with prior evidence involving global MT (e.g., Nicholls et al., 2009), although there have been indications that athletes at different levels of participation may differ along some MT components and not others (e.g., Golby & Sheard, 2004). Previous studies have not included competitive tennis players, indicating that the current findings extend type of participation level indications of athlete MT into a sport group previously devoted scant attention. The current results may be based, in part, on the broad age range of the participants and the likelihood that older participants' current level of participation may differ from former participation levels, and it may be useful to examine MT differences among homogenous groups of athletes, as previous studies have indicated higher levels of MT among higher achieving elite tennis players (Cowden, 2012). This area of research is encouraged because it may have positive consequences for understanding whether MT assists athletes to improve in areas such as technical ability or skills or whether MT is restricted to enhancing positive performance outcomes and achievement only if an athlete already possesses the technical ability and skill to reach a certain level of participation. On the other hand, the similar levels of MT evidenced across the gender groups may be based, in part, on the individualistic nature of sport participation in tennis as well as the inability to interact with significant others (e.g., coaches) during performance. That is, the factors distinguishing tennis from other types of sports may necessitate the development and possession of similar and holistic MT facets, regardless of gender.

Considering the relative absence of age, years of participation, gender, and type of participation MT comparisons in general and specific sports, the current study provides important information for determining the role of MT in competitive tennis and the attention that should be devoted towards these areas when assessing and improving MT components.

6.4 Mental toughness and Self-Awareness

Although there have been previous denotations that MT is associated with heightened levels of self-awareness (Gucciardi et al., 2008, 2009) and related concepts, such as thinking clearly (Bull et al., 2005), the current study provides quantitative support for these early suppositions, at least in competitive tennis. Whether self-awareness and related aspects are components of MT or outcomes of possessing heightened levels of MT remains an area that require further attention. The results may, however, suggest that self-awareness characteristics, whether related to or a component of MT, contribute to the ability of mentally tough tennis players to control their emotions and cognitions more effectively. Despite this needing thorough investigation, the positive relationship between self-awareness characteristics and MT may have ostensible benefits for the development of MT amongst tennis athletes. That is, efforts devoted towards fostering or heightening self-awareness levels may have positive outcomes for the MT of tennis players. This postulation would require some form of intervention study to assess, but the preliminary findings in the current study afford several relevant and potentially important information in areas of the MT literature that have yet to receive sufficient attention and have the potential capacity to enhance, not only theoretical and conceptual understandings of MT, but contribute to the knowledge surrounding the capability to increase MT levels through one or more methods.

6.5 Mental Toughness and Stress

Comparable to prior research findings (cf. Gerber, Kalak, Lemola, Clough, Puhse, Elliot, et al., 2012), MT is associated with lower levels of stress components amid competitive tennis players. The absence of a statistically significant relationship between MT and stress subcomponents in selected instances (e.g., *positive perspective* [MT] and *athletic exhaustion* [TS]) may signify that MT and selected MT components are more important or influential relative to certain types of stress as opposed to others. This was supported by the generally stronger correlations between the *emotional/cognitive control* (MT) subscale and the stress scale and subscales. Although MT may be associated or partly characterised by the ability to minimize stress (Middleton et al., 2004a) or successfully overcoming adversity (Jones et al., 2002), there may be forms or types of stress that MT is less likely to assist athletes in avoiding or overcoming. Specifically, according to these findings, selected MT components may provide little assistance when more physical types of stress or adversity are experienced as opposed to more psychological types of stress. Whether MT has distinct relationships and divergent influences on various forms of stress (physical versus psychological) is an area that needs examining. The present findings, however, expand upon prior research efforts and provide a comprehensive perspective of the relationships between MT, stress, and associated subcomponents in a group of competitive tennis athletes in South Africa.

Although research supports the tendency for mentally tough athletes to experience lower stress, less is known about the manner in which these athletes are able to negate or avoid the influence on stress on performance outcomes. Perhaps, as Kaiseler et al. (2009) suggest, mentally tough athletes appraise stressors as less intense, resulting in a more optimistic outlook. It may be their superior ability to control their thoughts and emotions that assists with the appraisal of stressors or their ability to employ more effective coping strategies (Nicholls et al., 2008). It may also be plausible, based on the current findings, that the heightened levels of self-awareness, insight, and cognitive and behavioural analysis that mentally tough individuals are more likely to experience have positive consequences for the influence of stress or adversity. That is, their enhanced knowledge and understanding of the way they think and feel when experiencing stress may assist them to control (possibly through the use of coping) the extent to which stress impacts their performance levels.

The role of similar, yet distinct psychological constructs, such as LR and resilience, may also be integral to the sustenance of athletic performance when exposed to stress. Inherent to the resilience construct is an outcome of positive adaptation following risk or adversity, suggesting the potential importance of resilience in contributing to positive post-stress outcomes amid competitive tennis players. Indeed, the strong positive correlations between MT and resilience factors in this study may lend early credence to this presumption. However, it is clear that these are postulations that need further attention, but continued research involving MT and stress may offer a more thorough understanding of the process through which mentally tough athletes remain relatively unaffected by stress or adversity.

There was a general trend within the results that the more physical forms of stress (e.g., *fatigue/insufficient rest* [TS]) are less strongly associated with MT, particularly with some of the MT subcomponents (e.g., *positive perspective* [MT]). This may suggest that mentally tough athletes are more likely to experience similar physical types of stress as compared to their low mentally tough counterparts. With prior findings indicating mentally tough athletes have heightened attitudes towards physical forms of risk-taking (Crust & Keegan, 2010) and are likely to spend fewer days absent from sport participation due to injuries (Petrie et al., 2013), it is critical that fatigue, burnout, and injury-related consequences of MT be explored further. This may have meaningful implications for interventions aimed at improving MT or assisting those high in MT to manage their athletic health better. Importantly, the current results suggest that assessing MT relative to particular types of stress (physical and psychological) is an essential undertaking for ascertaining the MT-stress relationship and the manner in which coaches and sport psychology professionals promote MT amongst the athletes they engage with.

6.6 Mental Toughness, Resilience, and Stress

The results in the present study provide empirical support for prior contentions of the relatedness of MT and resilience (Gucciardi & Gordon, 2009). Although resilience has previously been examined and a model of resilience in sport posited (i.e., Galli & Vealey), scant quantitative attention has been devoted towards examining the two constructs simultaneously. Although the cross-sectional design precludes the determination of the causal sequences or relationships between the two constructs, it enables preliminary indications of the interrelatedness between the constructs. Specifically, the strong correlations between the scales and subscales, the strong ability of resilience and resilience subscales to significantly predict and explain a substantial portion of the variance of MT, and the non-statistically significant hierarchical moderated regression results signify there is some degree of convergence between the two constructs. Conceptually, both are associated with achievement or positive outcomes, perceived control over adversity and events that occur, and the ability to overcome adversity or to rebound swiftly following setbacks (Clough et al., 2002; Cowen et al., 1992; Jones et al., 2002; Mummery et al., 2004). Perhaps these similarities in conceptual make-up, in part, explain the relationships evidenced in this study.

The path analysis results, however, provide the groundwork for determining potential areas of divergence between the constructs. That is, the best fitting model did not include selected regression paths between the resilience and MT subscales. Potential reasons for this may be the differences in the component make-up of resilience and MT, with the social components, particularly relationships and bonds with others, not considered a component of MT (at least based on the MT instrument used in this study).

In addition, MT is an internally based construct whereas resilience includes both internal and external factors. Therefore, instead of suggesting that MT is a component of resilience (e.g., Gerber, Kalak, Lemola, Clough, Puhse, Holsboer-Trachsler, et al., 2012) or that resilience is a component of MT (e.g., Sheard, 2013), there may be a complex relationship between the two constructs with the relatedness between the two depending on the context and situation competitive tennis athletes find themselves in. That is, it may be that in more negative and adversarial situations MT may act as a personal resource that contributes to resilience protective factors. On the other hand, athletes high in MT may require, use, or emphasise certain resilience components during different stages of sport participation, such as pre competition, during competition, and post competition. Resilience and associated factors, however, may be irrelevant during more positive circumstances that do not involve adversity or distress (risk). Despite the requisite to further examine MT and resilience interrelations, overlap, and divergence, the current study contributes substantially by providing novel insight into these two constructs as they relate to competitive tennis players. It is anticipated that the current results will cultivate additional research efforts that seek to more definitively identify the similarities and differences between these constructs, which may promote the progress of MT growth and development programs for tennis and other athletes.

6.7 Resilience and Stress

The present findings support the conceptualisation of resilience as a process through which positive adaptation occurs through the moderation of risk resulting from the interaction of protective and vulnerability factors. Therefore, additional construct validity support has been attained for the RSA and that greater levels of resilience protective factors are associated with lower stress levels. This is important information to obtain, particularly since the resilience-stress relationship has yet to be examined in competitive tennis. Similarly to MT, however, selected resilience subscales were not related to more physical forms of stress, possibly denoting the positive adaptation limitations that resilience facets have in the presence of stress. Therefore, from a MT and resilience perspective, it may be that these psychological constructs have little influence on competitive tennis athletes' abilities to avoid or adapt positively following exposure to physical types of stress. Whether high mentally tough and high resilience individuals are more inclined to continue athletic participation despite experiencing physically distressing circumstances is an area that requires additional examination, which would afford some indication of whether MT and resilience are associated with a higher or lower propensity to continue participating longer or avoiding breaks despite experiencing fatigue, burnout, or injury.

6.8 Mental Toughness Predictors: Self-Reflection and Insight, Resilience, and Stress Subscales

Using each of the subscales to assess the best fitting predictive model of MT, the results denoted selected self-reflection and insight, resilience, and stress facets are stronger predictors of MT, albeit when all subscales are considered. The findings evidenced a mixture of self-reflection and insight, resilience, and stress components as significant predictors, with a large variance of MT explained by the factors included in the model. These results appear to provide further support for the assertion that MT is comprised of several components or the construct being associated with a number of positive outcomes (Gould et al., 2002; Gucciardi, 2010) that have implications for athletic performance, particularly in tennis. The unexplained variance would suggest that other factors that were not included in this study are important to consider relative to MT (e.g., LR, achievement motivation). The large amount of variance explained by the significant factors, however, do suggest that efforts devoted towards these particular aspects of self-reflection and insight, resilience, and stress may have positive implications for enhancing MT levels amid competitive tennis players. The current results remain the first amid competitive tennis players and provide potential routes for designing MT training and other interventions with the prospect of generating MT growth amongst tennis players and other athletes.

6.9 Conclusion

The instruments included in the present study demonstrated some degree of overlap as well as distinctions between the originally validated instruments, with such differences due, in all likelihood, to the sport-specific sample as well as cultural and demographic divergences of the present study sample of athletes. MT levels differed according to particular age and years of participation groups, providing additional support for the developmental nature of MT (Connaughton et al., 2010). Contrasting selected studies (e.g., Crust, 2009) however, there were similar MT levels among male and female tennis players, a finding that may be unique to tennis due to the singular sport participation emphasis and demands associated with participation. Strong relationships were evidenced between the global self-reflection and insight, resilience, stress scales and MT, with these findings largely mirrored among the instrument subscales. These findings expand current appreciations of the interrelatedness of MT and other previously underexplored psychological constructs and provide prospective routes for developing

MT amongst tennis players. The high degree of resilience and MT interrelatedness as well as the absence of significant MT-total stress interaction effects in the hierarchical moderation analyses may suggest some degree of overlap between MT and resilience, extending prior indications and understanding of the associations between the two constructs. Collectively, the present study has contributed substantially towards exploring MT and the manner in which it relates to or is influenced by characteristics or constructs, particularly in the context of competitive tennis. These findings may inform further research and intervention efforts, which are described in the succeeding chapter.

CHAPTER SEVEN

PRACTICAL IMPLICATIONS, INTERVENTIONS AND RECOMMENDATIONS

7.1 Introduction

The present findings expand the current MT literature in several areas, each of which combine to provide a basis for suggesting potential implications that may have practical significance as researchers proceed with subsequent MT research and sport psychology practitioners implement methods to develop MT amid the athletes with which they are involved. In particular, the chapter will focus on two aspects: (1) the assessment of MT and instrument development, and (2) prospective intervention routes to enhance athlete MT. Coupled with these explications, the chapter also includes areas that are recommended for further research.

7.2 Mental Toughness Instrument: Suggestions and Prospective Directions

The current general (non-sport specific) MT inventories appear to possess several commonalities in the components of MT they assess, including various aspects of control (Clough et al., 2002; Golby et al., 2007; Loehr, 1986; Sheard et al., 2009), confidence, self-belief, or self-efficacy (Clough et al., 2002; Golby et al., 2007; Loehr, 1986; Middleton et al., 2004a, 2004b, 2005; Sheard et al., 2009), commitment (Clough et al., 2002; Middleton et al., 2004a, 2004b, 2005), constancy or perseverance (Middleton et al., 2004a, 2004b, 2005; Sheard et al., 2009). Some of these mutual components appear in selected sport-specific MT inventories, such as control and self-belief (e.g., CMTI; Gucciardi & Gordon, 2009). The present findings, too, reflected some degree of similarity between the available MT instruments, albeit this study incorporated a previously validated instrument and did not aim to develop a novel inventory.

In accordance with Gucciardi et al.'s (2009a) definition and conceptualisation of MT, these shared commonalities across instruments may reflect the core and sport-general aspects of MT that may be required across a range of sports. The discrepancies and distinctions between the instruments, however, suggest that complete agreement and understanding of the construct has yet to be developed, possibly resulting in incomplete instruments. Perhaps, the description of the general and non-sport specific instruments should be revised to indicate the sole measurement of core MT components as opposed to total MT, with supplementary components incorporated based on the type of sport of interest.

With this consideration pertinent to the future direction of the assessment of MT, it appears important that the constructs that are closely associated with MT and the identified characteristics of MT be further examined. The present results identified self-awareness aspects including *engagement in self-reflection* (SRIS), *emotional/behavioural clarity* (SRIS), and *cognitive/behavioural analysis and awareness* (SRIS) as strongly related to MT. Such self-awareness facets may provide an underlying explanation for certain MT components and outcomes, such as superior control, as being able to control one's emotional and behavioural experiences would require one, at the very least, to be aware of these experiences. Therefore, it is plausible to suggest that the strong relationship between self-awareness aspects and the control component of MT may signify the relevance of constructs that have previously been devoted scant attention to the conceptual make-up of MT and provide additional explanation for the superior abilities of high mentally tough athletes, such as various forms of control. If this were the case, then it would appear that the current MT instruments might be overlooking a number of fundamental components of MT, which may also explain the current divergences between the various instruments.

In addition, the subscale *positive perspective* (MT) was identified in this study as a component of MT, which has similarities with the Clough et al.'s (2002) challenge subscale, Loehr's (1986) positive energy subscale, and Middleton et al.' s (2004a, 2004b, 2005) positivity subscale. Similar to self-awareness, perhaps the concept of optimism is critical to the composition of MT, and, despite studies that have examined the relationship between MT and optimism amongst athletes, the current MT inventories may not be emphasising the concept sufficiently as a key component to consider when measuring athlete MT. Optimism may also provide an underlying explanation for other aspects of MT that are commonly included in MT instruments, particularly self-confidence or self-belief.

Mental imagery is another aspect of MT that has been included in selected MT instruments (e.g., PPI; Loehr, 1986), and, though mentally tough athletes appear to engage in mental imagery and particular types of mental imagery techniques (Matti & Munroe-Chandler, 2012), MT instruments have apparently neglected the potential contribution of the concept as a component of MT. Mental imagery, too, may have important implications for self-confidence and control through the use of appropriate techniques to enhance or maintain self-concepts and control emotions or behaviours when experiencing adversity.

Clearly, there are a number of concepts and constructs that have been identified as characteristics of athletes with high MT, but the common designation of such constructs as components of MT is limited. With the potential that such constructs offer an underlying explanation for the superior levels of certain aspects of MT (e.g., control) amongst such athletes, it appears integral that an MT instrument is developed to examine these critical underlying aspects of MT, possibly in conjunction with or in addition to the current core or overarching components the current MT instruments assess.

If MT is considered a multi-dimensional construct, it should encompass the vast array of concepts that appear to relate to it or may offer explanation for the components that are currently designated as fundamental to the measurement of the construct. As recent sport-specific instrument development endeavours have indicated (e.g., CMTI; Gucciardi & Gordon, 2009), there are common aspects of MT that apply to all sporting domains (e.g., self-confidence) and others that are more sport-specific (e.g., cricket smarts). With this in mind, it appears challenging to develop a single MT instrument that can be applied generally and across a range of specific sports. Thus, understanding the pervasive components of MT that are not likely to be situationally specific would enable the development of general MT instruments for examining core MT components. Sport-specific research, however, would contribute to the development of inventories that measure the core MT components that apply to particular sports and the unique components that possibly only apply in each particular sport. This direction is proposed as sport psychology researchers work towards refining and developing sound MT instruments for application in a variety of sporting and non-sporting domains. At this stage, the dearth of MT attention in competitive tennis precludes the identification of the components of MT that are likely to be pervasive in competitive tennis. However, conducting a series of MT studies endeavouring to develop an MT instrument for tennis would provide preliminary evidence of the manifestation of MT and the MT requirements in competitive tennis, which may then be examined further for corroboration, substantiation, and validation.

7.3 Practical Interventions

Selected relationships between MT components and self-awareness components may be important areas for sport psychology practitioners to consider. In particular, the subscales of *confidence/self-efficacy* (MT) and *emotional/cognitive control* (MT) were strongly related to *engagement in self-reflection* (SRIS), *emotional/behavioural clarity* (SRIS), and *cognitive/behavioural analysis and awareness* (SRIS), and catering athlete interventions towards these self-awareness aspects may have positive MT outcomes. Tennis is unique in that athletes are allocated a particular time period between points before having to return to point play. Because these breaks are only a few seconds in duration, it may not be an appropriate moment to target or implement self-awareness or other intervention activities and techniques. In addition, though MT may also be critical during the participation of each point in a match, the difficulty and possible performance detriments (e.g., excessive thinking) associated with implementing interventions during open point play warrants the designation of particular interventions routes that may be engaged in prior to competition, during competition but between open point play, and post competition.

7.3.1 Self-Awareness and Improving Control

There are, however, breaks that are allocated at the completion of every odd game (except for the first game of a set) and at the end of each set. This may be a useful time for athletes to implement self-awareness techniques to sustain and enhance MT outcomes (e.g., control). For example, possibly with the aid of written prompts, athletes could examine the moments in which they experienced positive (e.g., "I'm going attack the second serve and move into net") or negative (e.g., "I'm going to lose my serve") thoughts as well as positive (e.g., fist pumps, positive affirmations, bouncing on toes) and negative (e.g., racquet tossing, self-degrading comments, shoulder slumping) behaviours. The reasons for these thoughts (e.g., thinking one is about to lose one's serve due to being a break point down) or behaviours (e.g., tossing one's racquet due to losing one's serve) could subsequently be examined, along with the outcome following such thoughts or behaviours. Although the allocated breaks would not permit detailed assessment, these few prompts could thoroughly enhance an athlete's understanding of what occurred in the past, why it occurred, and the consequences of such occurrences, and with this knowledge be equipped to control the negative thoughts and behavioural occurrences, and, perhaps, enhance the occurrence of the more positive aspects s/he experienced. This potentially self-perceived superior control over one's thoughts, emotions, and behaviours may have positive outcomes for an athlete's confidence or self-efficacy, because if there is a pattern that negative thoughts and behaviours are adversely affecting her or his performance, the knowledge of this and the potential increased control over these experiences may enhance her or his confidence that performance levels can be maintained better and heightened performance levels achieved.

This type of self-assessment routine may be employed across competitive situations, and, over time, is likely to enhance self-awareness levels and have cascading effects for MT, particularly emotional and cognitive control. The proposed routine may be enriched further through a behavioural observation component that is conducted by a knowledgeable tennis individual (e.g., coach) during the course of the match. This individual could record the occurrence of positive and negative behaviours and the events that occur subsequently or closely following such behaviours, potentially drawing links between these behaviours and competitive or performance outcomes. Post competition, the observer and athlete could then discuss the athlete's experiences, adding an additional outside perspective to the on-court transpirations. This process would be an enabling process for the athlete with the aim of drawing the athlete's attention to particular behaviour-outcome relationships that the athlete may not have initially recalled or been aware of. Longitudinal and developmental implications for self-awareness components as well as MT would likely necessitate continued use of such techniques for some time until the athlete becomes aware of the pattern of thoughts and behaviours (particularly more negative forms) that are likely to negative affect performance (e.g., routinely recites "I'm going to lose my serve" when a break point down). With increased knowledge of the moments in which these negative thoughts or behaviours are likely to occur, s/he is more likely to regulate them and perhaps replace them with more positive thoughts and behaviours (e.g., when facing a break point, the prior negative thought is replaced with a plan for executing the start of the next point).

7.3.2 Self-Awareness and Lowering Stress

Due to the indication that mentally tough individuals self-perceive superior control over stressors (Kaiseler et al., 2009), the potential to focus on self-awareness to enhance MT (particularly control aspects) may also have positive implications for lowering stress level perceptions of athletes. That is, perhaps efforts devoted towards increasing self-awareness of stress or pressure will have positive outcomes for reducing the extent to which stress (particularly psychological forms) adversely affects performance outcomes through the superior control athletes may experience. The pressure or stress athletes experience during competition are often exhibited in physical forms, including muscle tightening and tension, nervousness, and negative court behaviour (e.g., racquet tossing). Perhaps, an initial series of post tennis competition self-awareness related exercises with an outside observer (e.g., coach) is necessary to outline the particular moments during matches in which an athlete exhibits particularly negative behaviour or behaviour that deters from performance excellence. Through athlete-observer engagement, these exhibited behaviours can be linked to particular physical experiences as well as certain thoughts that provoke such experiences. Particular patterns may then be identified for each athlete (e.g., tightening of grip towards the end of particular games of importance), and, subsequently, an individually catered routine may be developed to avoid or reduce the extent to which these provoking thoughts or negative behaviours occur. For instance, a relaxation routine can be built into the time allocated between points during competition, which may involve a breathing technique or pattern, use of particular mental imagery, or physical relaxation techniques to alleviate tension. Through the development of self-awareness facets over time, athletes may more automatically become aware of the thoughts, feelings, and behaviours they are engaging in as well as the particular moments in matches that provoke such experiences and employ these techniques as required. This routine may develop, within the athlete, a sense of control over stress related experiences, with the possibility of increasing an athlete's confidence in performance outcomes because of a lower perceived negative impact of these stress experiences.

7.3.3 Stress Minimisation / Reduction Techniques

The direct assessment of relationship between stress and MT in this study may also inform potential interventions designed to enhance MT, or, at the very least, reduce the negative impact of stress on performance outcomes. Middleton et al. (2004a, 2004b, 2005) have posited stress minimisation as a facet of MT, denoting the ability of mentally tough individuals to reduce stressful experiences and the performance detriments associated with stress. Thus, it is possible that enhancing stress minimisation abilities of athletes will foster heightened levels of their MT. Although psychological and physical forms of stress were examined in this study, it is important to note that stress experiences and the manifestations of stress are specific to each individual. In a similar manner, it is likely that the types of stress and the manner in which stress is exhibited or even dealt with is different across sports (e.g., team versus individual sports). Therefore, attempts to assist tennis athletes to reduce stress experiences should be individually designed based on the types of stress each athlete experiences, the moments in which those forms of stress are manifested, and the degree to which such stressors impact performance.

Interventions to reduce or minimise stress are likely to benefit from baseline and historical assessments of pre competition, during competition, and post competition stress that each athlete experiences. This includes psychological stress (e.g., concerns about post match outcomes both before and during competition), physical manifestations or outcomes of psychological stress (e.g., concerns about post match outcomes resulting in sleep issues, physical tension, nerves), and physical stress (e.g., overtraining in preparation for upcoming competition). A longitudinal and holistic identification of such stress features may best be determined by incorporating the team of individuals the athlete is closely associated with in her or his sporting domain (e.g., parents, coach, athletic trainer).

Stressor identification and stress level determinations provide an indication of the stress minimisation techniques that may be relevant and appropriate for each athlete. For instance, a tennis player that is particularly overcome by physical tension at certain moments during competition may benefit from breathing techniques or positive thought processes, whereas a tennis player that enters matches physically fatigued and strained may benefit from efforts that limit her or his exertion leading up to tournaments. An athlete may also require a collection of stress minimisation techniques depending on the particular set of circumstances she or he is experiencing at a certain point in time. As an example, an athlete who does not engage in physical overtraining may need to be equipped with physical stress reduction techniques to assist them to minimise the impact of physical stress on performance during periods of continuous competition involvement (e.g., a four week period of back-to-back tournaments). Perhaps, Harris' (1986) suggested techniques for reducing or mitigating stress response arousals at various stages of pre, during, and post competition, which include meditation and progressive relaxation, may be applied. For instance, athletes may be trained and encouraged to develop meditation routines (e.g., daily) for implementation prior to competition to assist in reducing particularly high pre-competitive anxiety levels that may be detrimental to competitive performance.

Another prospective technique that may be applied when experiencing particularly cognitively-based stressors (possibly requiring varied application based on stressor type) is cognitive restructuring. Rooted in cognitive-behavioural therapy (Beck, 1970), cognitive restructuring oriented interventions may provide a potential route through which maladaptive thoughts and subsequent negative behaviours are disputed and replaced with more positive thoughts when experiencing various forms of stress (Gladding, 2009). Although cognitive restructuring has largely been applied to treat depression and anxiety symptoms (Larsen & Christenfeld, 2010), the reported propensity for cognitive restructuring to assist in avoiding or neutralising stressors (e.g., Guastella & Dadds, 2006) suggests that it may be an appropriate intervention to enhance the likelihood of positive athletic outcomes.

The ability to implore various techniques may increase an athlete's self-perceived control over such stressors, which may explain prior findings of lower perceptions of stressor severity amongst high mentally tough individuals (e.g., Kaiseler et al., 2009). Regardless of the types of techniques employed, the employment of such techniques is likely to assist in the reduction or minimisation of stress experiences, and, as a result, enhance the MT of tennis players.

7.3.4 Improving Coping

There are, however, alternative methods for improving MT outcomes amongst athletes, regardless of stress levels. If the notion that mentally tough individuals do not differ from their non-mentally tough counterparts in the intensity of their stress experiences (e.g., Horsburgh et al., 2009), perhaps it may be more effective to intervene by teaching athletes the coping strategies that mentally tough athletes are more likely to employ. Prior research has evidenced support for the greater use of problem-focused coping strategies as compared to avoidance coping strategies amongst athletes high in MT (e.g., Nicholls et al., 2008), which may explain mentally tough athletes' superior ability to overcome stress. Based on Gould, Finch, et al.'s (1993) findings, figure skaters employ a variety of coping strategies depending on the type of stressor experiences. That is, the types of coping techniques used when confronted with physical stress differed from other employed when experiencing psychological forms of stress. Perhaps, this pattern of coping application may apply to competitive tennis players, suggesting that tennis players should be equipped with a range of coping strategies and interventions designed to assist athletes to identify the particular moments prior to, during, and following competition that require or warrant the use of the most effective coping strategies for such situations. The coping strategies applicable at particular moments during a competitive tennis athlete's training, competitive and post competitive experiences should be examined to determine and effectively promote the appropriate application of such techniques as and when required.

7.3.5 Developing Resilience

The strong relationships between MT and resilience as well as the apparent overlap between the two constructs suggest that attempts to foster the development in one construct may have positive implications for the augmentation of the other. One of the approaches to develop MT through resilience facets may be focusing on the aspects of resilience that are positively related to MT. Specifically, perhaps attending to social bonds, familial relationships, and peer interactions or relations may derive supplementary benefit for the MT of tennis players, particularly before or after competition. Indeed, findings suggest that social support and interactions with significant others in and outside of sporting contexts are crucial for maintaining athletes' identity, motivation, commitment, and self-perceived ability to cope (e.g., van Heerden, 2012), so it is conceivable that attempts to improve interpersonal relationships and social functioning may have benefits for the maintenance of MT, particularly when experiencing disappoints, losses, and negative performance outcomes. With suggestions that interpersonal relationships and peer experiences have implications for the development of MT (e.g., Connaughton et al., 2010; Gucciardi, 2011), focusing on these aspects of an athlete's life may derive additional benefit for sustaining or enhancing athlete MT levels. For instance, relationships with parents or significant others may be critical for ensuring that confidence, achievement motivation, and commitment levels are maintained, all of which appear to be important in relation to MT.

Several approaches may be relevant to assessing and enhancing the nature and extent of social bonds and relationships. Determining the extent to which parents and other significant individuals are involved in an athlete's day-to-day life both in and out of sporting involvement is critical, which would enable determination of aspects such as the encouragement and support such individuals have for the athlete. Social interactions outside of the immediate family may also be essential, such as involvement with non-sporting friends that may detract from sport involvement and focus as well as the types of peers that contribute positively to sport participation and development. An indication of the existence of social and familial bonds as well as the nature and influence of such bonds may provide intervention directions to foster additional or selected bonds or possibly reduce the engagement in maladaptive bonds and relationships. For instance, group or family therapy may be considered appropriate during circumstances in which families are encouraging or supportive of the athlete but disagree on the fundamentals of participation (e.g., one parent considers it primarily for enjoyment purposes, whereas the other parent may have professional aspirations in mind) or in split families in which parents have entirely distinct perceptions about or involvement in the athlete's sport participation. Indeed, there is evidence suggesting that family systems therapeutic interventions have positive outcomes for family communication, problem-solving, and extreme beliefs held by members of the family (e.g., Barkley, Guevremont, Anastopoulos, & Fletcher, 1992), resulting in significant improvements in family relationships (e.g., Wysocki et al., 2000). Although particular therapeutic interventions would depend on family type as well as the age of the athlete, family, group, and other forms of therapeutic interventions aimed at enhancing an athlete's family and significant other bonds may have important outcomes for athlete MT. Parental or significant other involvement may also be required and implored to reduce an athlete's involvement in negative peer or social relations, particularly in the case of friendships that detract from sport involvement or maladaptive behaviour. Such interventions may involve enforcing more stringent rules, controls, and monitoring of the athletes behaviour, particularly in adolescence.

On the other hand, due to the individual nature of tennis participation, athletes may engage in limited social involvement and have few social interaction activities in and out of sport participation. In this case, interventions catered towards developing social bonds, interactions, friendships in and out of sport may have prospective outcomes for athletes, particularly post competition. For instance, an athlete who loses a close match but has a number of friends that do not participate in tennis may benefit from alternative perspectives on the degree to which the outcome is considered discouraging or disappointing. A tennis player with few social bonds may experience additional difficulty in overcoming the disappointment of losing matches, with the possibility of detrimental outcomes to MT over time.

Although interventions would require individual athlete assessment and a strong possibility of the involvement of family, significant others, friends, and peers, focusing on social and interpersonal bonds as a method for sustaining or possibly enhancing the MT of athletes may have a number of benefits for tennis players. Despite these types of interventions receiving a dearth of attention in relation to MT, the novel and alternative perspective may provide additional insight and broaden the scope of MT intervention studies and implications for athletes.

7.3.6 An Integrative, Multifaceted Approach

The multiple linear regression analysis incorporating the self-reflection and insight, resilience, and stress subscales denotes the prospective benefits of developing interventions that are directed towards particular aspects of self-awareness, resilience, and stress to collectively influence MT. That is, targeting interventions towards *personal resources* (R), *emotional/cognitive stress* (TS), *emotional/behavioural clarity* (SRIS), and *social competence* (R) may conjunctively assist in enhancing the MT of tennis players through a multifaceted approach to MT development. The particular moments in which each of these facets is targeted for intervention are likely to differ. For instance, attempts to enhance personal resources, such as through the development of goals, locus of control, and self-efficacy, are likely to occur between matches (e.g., create a list of realistic and attainable short, medium, and long-term tennis goals). Indeed, prior MT research outside of competitive tennis has evidenced the use of mastery-approach and performance-approach goals as opposed to performance-avoidance goals amongst mentally tough adolescent Australian Rules football players (Gucciardi, 2010). Although the situations, demands, and nature of tennis participation differ from Australian Rules football, examining the types of achievement goals mentally tough competitive tennis players are more inclined to possess may provide a prospective intervention trajectory for enhancing the personal resources of competitive tennis players, deriving subsequent benefits for MT. Developing social competencies will, in all likelihood, be employed out of competition, possibly through increasing social interactions or exposing athletes to social environments in which they may be uncomfortable.

Conversely, stress minimisation efforts, such as cognitive restructuring, may be devoted towards particular moments during competition, especially those periods each athlete is likely to experience or suffer detrimental performance consequences from psychological forms of stress (with the possibility of physiological manifestations). Interventions are also likely to differ based on individual athlete experiences, with stress minimisation attempts for those athletes more inclined to experience cognitive stress when behind in a match or facing particular moments of pressure (e.g., set point down) likely to differ from those that experience cognitive stress when in winning positions (e.g., serving for the set).

Although some degree of self-reflection or emotional or behavioural clarity may be engaged in during competition, perhaps longitudinal lucidity of competitive emotional and behavioural experiences are likely to benefit from post-competition examination to spend sufficient time understanding and determining the reasons for on-court emotional and behavioural experiences. Feasibly, particular types of interventions may derive subsequent benefits to other targeted areas for conjunctive positive results for MT. For example, engagement in emotional or behavioural clarity exercises may assist athletes to identify the particular match situations in which they are more inclined to experience emotional or cognitive stress (possibly contributing to physiological stress manifestation). This understanding may contribute to the development of appropriate stress minimisation techniques for implementation at relevant moments in matches based on prior experiences and requirements.

Therefore, interventions aimed at enhancing each of these areas would require multidimensional assessment and implementation according to individual athlete needs as well as the appropriate incorporation of such interventions prior to, during, and post competition. Jointly, focusing interventions towards each of these areas will likely develop the MT levels of tennis players to a greater degree than seeking to enhance any single area alone.

7.4 Recommendations for Further Research

With consideration to the originality of the current study as well as the primary findings from the study, there are a number of areas in which further research is required, and investigations within each are encouraged:

(1) The discrepancies between the original and current study SMTQ factor structure item loadings as well as the limited number of validation studies involving the SMTQ, additional research is required to refine and psychometrically assess the SMTQ for appropriate application in general sport and specific sporting (e.g., tennis) contexts. With research suggestions that other MT instruments, such as the MT48, should be used cautiously and necessitate further assessment (Gucciardi et al., 2012), it is important that researched develop and agree on a sound MT instrument, whether it is for general or particular sporting use. Perhaps, in accordance with recent authorships that have developed MT instruments for Australian Rules football (Gucciardi et al., 2009b) and cricket (Gucciardi & Gordon, 2009), attention should be given towards developing valid and reliable measures of MT in each sporting domain.

(2) With the recent postulation of a resilience model in sport (Galli & Vealey, 2008), it would be appropriate to develop an instrument to measure resilience in sport. In doing so, further investigation and refinement of MT and resilience overlap and discrepancies may be obtained. The recommendation to develop a sport resilience measure is also supported by the divergent RSA factor structure that was reported in the present study, possibly denoting the difference between resilience manifestations in particular sporting groups.

(3) Considering the present study is the first to examine the self-awareness-MT relationship in competitive tennis, it would be important to replicate this type of quantitative assessment within tennis and other sports, particularly if MT requirements depend on the type of sport or sporting situations (Bull et al., 2005). These kinds of endeavours may promote a clearer understanding of whether self-awareness (and

associated facets) is a component of MT or an associated characteristic that mentally tough individuals are more likely to possess. In addition, it may offer support for the positive influence of a previously underexplored factor on the ability of mentally tough individuals to avoid performance detriments through the benefits to one or more MT areas (e.g., emotional and cognitive control).

Further delineation of the MT-self-awareness relationship may also provide an additional avenue that may be targeted by MT interventions, particularly if increasing self-awareness abilities can enhance MT levels. Indeed, this is an area that should be thoroughly explored in the future.

(4) The age and years of participation findings in the current study suggest that efforts towards determining the developmental trajectory of MT across the lifespan may be important for ascertaining some of the important influences on MT development. Future research should examine whether MT grows or develops differently across various stages of psychosocial development, whether certain stages or periods emphasise selected characteristics over others (possibly resulting in greater development of these components at such times), and whether there are differences in the extent to which athletes possess MT components as they age.

(5) There have been some indications that mentally tough athletes may be able to negate or avoid the negative effects of stress through optimistic perspectives and lower stressor intensity perceptions (Kaiseler et al., 2009) or through the use of more effective coping strategies (Nicholls et al., 2008). However, these suppositions have not received thorough investigation and should receive further research attention. Other potentially relevant factors (e.g., self-awareness) to the ability to evade stress or adversity

consequences also require consideration. These types of studies are likely to provide meaningful information about the manner in which MT functions in various situations.

(6) With the present findings denoting the likely overlap and potential influence of resilience amongst mentally tough individuals, further research is necessary to expand upon these initial MT-resilience findings to more comprehensively elucidate the overlap, divergence, and the contexts in which MT and resilience are emphasised or required. For instance, does resilience apply to pre competition, during competition, and post competition, or is it more likely to apply in selected sporting situations?

(7) Mentally tough individuals may be more inclined to appraise stressors as less intense (Kaiseler et al., 2009), have increased physical risk-taking attitudes (Crust & Keegan, 2010), and, based on the present findings, are likely to experience lower levels of stress. Therefore, determining whether competitive tennis athletes high in MT are more or less prone to fatigue, overexertion, or injury is essential for determining whether MT may have detrimental outcomes to athletes under certain conditions or whether such athletes have a greater tendency to monitor physical symptoms associated with fatigue and injury, and, as a result, are more likely to respond in an appropriate way that avoids further fatigue or greater injury (Crust & Keegan, 2010).

(8) Determining the nature and manifestation of MT in competitive tennis may promote an indication of the types of MT components that are most critical and should be focused on when designing interventions aimed at enhancing MT. For this reason, importance should be placed on these types of studies, with particular emphasis on developing a tennis-specific MT program or training schedule that increases the MT of competitive tennis players.

7.5 Conclusion

The current study (and associated findings) has generated integral information for further understanding the construct of MT in competitive tennis, including quantitatively determining the role of self-awareness in relation to MT, determining the interrelatedness between MT and resilience, and identifying whether resilience is a moderator of the stress-MT association. Though further exploration is warranted, the results may be beneficial to progressing MT intervention and training initiatives to benefit general, sport-specific athletes, and non-athletes.

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APPENDICES

APPENDIX A: Ethical Clearance Documentation

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

13 February 2014

Mr Richard G Cowden (213568241)
School of Applied Human Sciences - Psychology
Howard College Campus

Protocol reference number: HSS/0740/013D
Project title: Mental Toughness: The characteristic relevance of Self-Awareness and the role of resilience as a moderator of stress in competitive tennis

Dear Mr Cowden,

Full Approval – Expedited

With regards to your response to our letter dated 04 November 2013, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 5 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

....
Dr Shenuka Singh (Chair)

/ms

cc Supervisor: Professor Anna Meyer-Weitz
cc Academic Leader Research: Professor D McCracken
cc School Administrator: Ms Ausie Luthuli

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** [illegible]
Website: www.ukzn.ac.za

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APPENDIX B: KwaZulu-Natal Tennis Association Letter of Permission

KWA-ZULU NATAL TENNIS ASSOCIATION

Affiliated to Tennis South Africa

WESTRIDGE PARK
100 King Cetshwayo
(Jan Smuts)
Highway
Mayville

P.O. Box 30736
MAYVILLE 4058

Tel. 031-261 [illegible]
Fax. [illegible]

E-mail:
[illegible]

Website:
www.[illegible].co.za

February 3, 2013

To: Human Social Science Research Ethics (Ms. Phumelele Ximba)

The purpose of this memo is to approve the study of Mr. Richard Gregory Cowden, and to grant permission for him to obtain the data needed in support of his doctoral thesis. He has provided an explanation of the purpose and nature of the study, outlining the major objectives of the project as follows:

(1) Assessing the factor structure and psychometric properties of an MT instrument (the SMTQ in a sport-specific domain (i.e., tennis) amid South African athletes.

(2) Examining the relationship between self-awareness and mental toughness in competitive tennis.

(3) Evaluating the association between:

(a) Mental toughness and resilience in competitive tennis.

(b) Mental toughness and stress in competitive tennis.

(c) Resilience and stress in competitive tennis.

(4) Providing an understanding of:

(a) The resilience subfactors that relate to specific subcomponents of MT in competitive tennis.

(b) Whether resilience moderates stress in relation to mental toughness in competitive tennis.

(c) Whether resilience subcomponents moderate the association between stress and mental toughness in competitive tennis.

(d) Whether resilience moderates stress relative to specific mental toughness components in competitive tennis.

DUNLOP SPORT

KWA-ZULU NATAL TENNIS ASSOCIATION

Affiliated to Tennis South Africa

WESTRIDGE PARK
100 King Cetshwayo
(Jan Smuts)
Highway
Mayville

P.O. Box 20136
MAYVILLE 4058

Tel. 031-[illegible]
Fax. 086-[illegible]

E-mail:
info@kzntennis.co.za

Website:
www.kzntennis.co.za

It is understood that this support represents the completion of inventories from the participating tennis players affiliated with Kwazulu-Natal Tennis. He has outlined the requirements associated with the participation that he requires. He has indicated that institutional approval from the UKZN Ethics committee has been attained, and he has physically presented the document to me for verification. He also provided the contact details of himself, his research supervisor, and the Ethics committee for additional confirmation and for any communication that may be required. I understand that the participation of each individual is voluntary, that any questionnaires and information obtained from all parties will remain confidential, and that the anonymity of participants will be maintained throughout the participation, data collection, maintenance, and dissemination of the results.

Additionally, I am aware that informed consent from each participant will be obtained prior to their participation and that any study participant may withdraw from the study at any time without negative consequences.

Yours sincerely,

Mrs. Delva M. Schafer
Secretary/Treasurer

DUNLOP
SPORT

APPENDIX C: Mpumalanga Tennis Association Letter of Permission

MPUMALANGA TENNISVERENIGING TENNIS ASSOCIATION

POSBUS / P.O. BOX 14463
LERAATSFONTEIN 1038

TEL / FAX 013 - 692 4628

30 JANUARY 2014

To: Human Social Science Research Ethics (Ms. Phumelele Ximba)

The purpose of this memo is to approve the study of Mr. Richard Gregory Cowden, and to grant permission for him to obtain the data needed in support of his doctoral thesis. He has provided an explanation of the purpose and nature of the study, outlining the major objectives of the project as follows:

(1) Assessing the factor structure and psychometric properties of an MT instrument (the SMTQ) in a sport-specific domain (i.e., tennis) amid South African athletes.

(2) Examining the relationship between self-awareness and mental toughness in competitive tennis.

(3) Evaluating the association between:

(a) Mental toughness and resilience in competitive tennis.

(b) Mental toughness and stress in competitive tennis.

(c) Resilience and stress in competitive tennis.

(4) Providing an understanding of:

(a) The resilience subfactors that relate to specific subcomponents of MT in competitive tennis.

(b) Whether resilience moderates stress in relation to mental toughness in competitive tennis.

(c) Whether resilience subcomponents moderate the association between stress and mental toughness in competitive tennis.

(d) Whether resilience moderates stress relative to specific mental toughness components in competitive tennis.

It is understood that this support represents the completion of inventories from the participating tennis players in the [school, club, or whichever specific organization]. He has outlined the requirements associated with the participation that he requires. He has indicated that institutional approval from the UKZN Ethics committee has been attained, and he has physically presented the document to me for verification. He also provided the contact details of himself, his research supervisor, and the Ethics committee for additional confirmation and for any communication that may be required. I understand that the participation of each individual is voluntary, that any questionnaires and information obtained from all parties will remain confidential, and that the anonymity of participants will be maintained throughout the participation, data collection, maintenance, and dissemination of the results.

Additionally, I am aware that informed consent from each participant will be obtained prior to their participation and that any study participant may withdraw from the study at any time without negative consequences.

Yours sincerely,

(JPK JACOBS)
PRESIDENT MPUMALANGA TENNIS

APPENDIX D: Informed Consent Document

University of Kwazulu-Natal
Informed Consent Document for Research

Study Title: Mental Toughness: The Characteristic Relevance of Self-Awareness and the Role of Resilience as a Moderator of Stress in Competitive Tennis.

Principal Investigator: Richard Gregory Cowden

Name of participant: ____

The following information is provided to inform you about the research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have about this study and the information given below. You will be given an opportunity to ask questions, and your questions will be answered.

Your participation in this research study is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequences. Confidentiality and anonymity will be maintained, and records identifying you as a participant will be maintained by the Discipline of Psychology, UKZN. In the event new information becomes available that may affect the risks or benefits associated with this research study or your willingness to participate in it, you will be notified so that you can make an informed decision whether or not to continue your participation in this study.

For additional information about giving consent or your rights as a participant in this study, please feel free to contact the Ms. P. Ximba in the UKZN Research Office at (031) 260 3587.

1. **Purpose of the study:** The purposes of this study are to examine the perceived cognitions, emotions, and behaviours of competitive tennis athletes.

2. **Description of procedures to be followed and approximate duration of the study:** You will be asked to respond to basic demographical items and provide responses to questions or statements referencing cognitions, emotions, and behaviours. The process will take between 20 and 30 minutes to complete.

3. **Expected costs:** None.

4. **Description of the discomforts, inconveniences, and/or risks that can be reasonably expected as a result of participation in this study:** There are no risks, discomforts, or inconveniences anticipated.

5. **Compensation in case of study-related injury:** N/A.

6. **Anticipated benefits from this study:**

a) The potential benefits to science and humankind that may result from this study are (1) increased understanding of competitive tennis athletes self-perceived cognitions, emotions, and behaviours.

b) The potential benefits to you from this study are (1) participation and active involvement in research that may benefit all competitive tennis athletes, and (2) to gain insight into your common thoughts, emotions, and behaviours as a competitive tennis athlete.

c) The results of this study will be made available to all participants in providing insights into the types of common cognitions, emotions, and behaviours competitive tennis athletes possess and provide an understanding of how these facets interrelate amid competitive tennis players.

7. **Alternative treatments available:** N/A.

8. **Compensation for participation:** N/A.

9. **Circumstances under which the Principal Investigator may withdraw you from study participation:** The principal investigator and faculty advisor may withdraw you from participation in this research if circumstances arise which warrant doing so. The aforementioned researchers will make this decision and inform you if it is not possible for you to continue. The decision to withdraw you from participation will be

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made either to protect your health or safety. If the decision is made to withdraw you from participation, withdrawal will not result in any negative consequences.

10. **What happens if you choose to withdraw from study participation:** Participation in this particular study is completely voluntary. You may choose to withdraw from participation at any moment without any negative consequences.

11. **Contact Information:** If you should have any questions about this research study or possible injury, please feel free to contact the principal investigator, Mr. Richard Cowden at 073 338 2709 or the School of Applied Human Sciences Supervisor, Professor Anna Meyer-Weitz, Discipline of Psychology, at (031) 260 7618.

12. **Confidentiality and Anonymity:** All efforts, within reason, will be made to keep the personal information in your research record private but total privacy cannot be promised. Your information may be shared with UKZN or the government, such as the University of Kwazulu-Natal Institutional Ethical Clearance and Review Board if required to do so by law.

13. <u>STATEMENT BY PERSON AGREEING TO PARTICIPATE IN THIS STUDY</u>
I have read this informed consent document and the material contained in it has been explained to me verbally. I understand each part of the document, all my questions have been answered, and I freely and voluntarily choose to participate in this study.

Date	Signature of participant

Consent obtained by:

Date	Signature
	Printed Name and Title

APPENDIX E: Questionnaire

Part A

The following are basic demographic items. Please provide an appropriate response for each, acknowledging that your responses will remain confidential and your anonymity will be maintained.

1. Age:

2. Gender (mark the appropriate box):

F	M

3. Ethnicity (mark the appropriate box):

Black	Coloured	White	Other

4. In which South African povince do you currently live?

Western Cape	Eastern Cape	Northern Cape	KwaZulu -Natal	Free State	North West	Gauteng	Mpumalanga	Limpopo

5. Annual household income (Rands):____________________

6. Highest level of education (mark the appropriate box):

Below Grade 12 (i.e., Matric/Higher Education Certificate)	Grade 12 (i.e., Matric/Higher Education Certificate)	3-Year Undergraduate Degree/Diploma	Postgraduate Degree - Honours	Postgraduate Degree - Masters	Postgraduate Degree - Doctorate

Other (please specify)	:_____________________

7. **<u>Current tennis</u>** participation (indicate **<u>highest</u>** only – mark the appropriate box):

County Club (e.g., League, Club Championships)	Local County Tournaments (e.g., Night League)	National Tournaments	International Tournaments	University Team or League

8. In the last two weeks, have you participated in any form of tennis competition (e.g., tournaments, county, league, etc.)?

Yes	No

9. Number of years of **<u>tennis</u>** participation:____________________

Part B

The following statements refer to a number of emotions, thoughts, and behaviors. Carefully consider the response option for each statement and rate each statement according to how truthfully it applies to you. In providing your responses, please remember that there is no right or wrong answer, but what is important is your personal and honest perspective. Mark each of your responses in the appropriate box with an "X". Be certain to provide a **single response** for each of the statements below.

Personal strength/Perception of self

		1	2	3	4	5	
1. When something unforeseen happens:	I always find a solution	☐	☐	☐	☐	☐	I often feel bewildered
2. My personal problems:	Are unsolvable	☐	☐	☐	☐	☐	I know how to solve
3. My abilities:	I strongly believe in	☐	☐	☐	☐	☐	I am uncertain about
4. My judgments and decisions:	I often doubt	☐	☐	☐	☐	☐	I trust completely
5. In difficult periods I have a tendency to:	View everything gloomy	☐	☐	☐	☐	☐	Find something good that helps me thrive
6. Events in my life that I cannot influence:	I manage to come to terms with	☐	☐	☐	☐	☐	Are a constant source of worry/concern

Personal strength/Perception of future

		1	2	3	4	5	
7. My plans for the future are:	Difficult to accomplish	☐	☐	☐	☐	☐	Possible to accomplish
8. My future goals:	I know how to accomplish	☐	☐	☐	☐	☐	I am unsure how to accomplish
9. I feel that my future looks:	Very promising	☐	☐	☐	☐	☐	Uncertain
10. My goals for the future are:	Unclear	☐	☐	☐	☐	☐	Well thought out

Structured Style

		1	2	3	4	5	
11. I am at my best when I:	Have a clear goal to strive for	☐	☐	☐	☐	☐	Can take one day at a time
12. When I start on new things/projects:	I rarely plan ahead, just get on with it	☐	☐	☐	☐	☐	I prefer to have a thorough plan
13. I am good at:	Organising my time	☐	☐	☐	☐	☐	Wasting my time
14. Rules and regular routines:	Are absent in my everyday life	☐	☐	☐	☐	☐	Simplify my everyday life

Social Competence

		1	2	3	4	5	
15. I enjoy being:	Together with other people	☐	☐	☐	☐	☐	By myself
16. To be flexible in social settings:	Is not important to me	☐	☐	☐	☐	☐	Is really important to me
17. New friendships are something:	I make easily	☐	☐	☐	☐	☐	I have difficulty making
18. Meeting new people is:	Difficult for me	☐	☐	☐	☐	☐	Something I am good at
19. When I am with others:	I easily laugh	☐	☐	☐	☐	☐	I seldom laugh
20. For me, thinking of good topics for conversation is:	Difficult	☐	☐	☐	☐	☐	Easy

Family Cohesion

		1	2	3	4	5	
21. My family's understanding of what is important in life is:	Quite different than mine	☐	☐	☐	☐	☐	Very similar to mine
22. I feel:	Very happy with my family	☐	☐	☐	☐	☐	Very unhappy with my family
23. My family is characterized by:	Disconnection	☐	☐	☐	☐	☐	Healthy coherence
24. In difficult periods my family:	Keeps a positive outlook on the future	☐	☐	☐	☐	☐	Views the future as gloomy
25. Facing other people, our family acts:	Unsupportive of one another	☐	☐	☐	☐	☐	Loyal towards one another
26. In my family we like to:	Do things on our own	☐	☐	☐	☐	☐	Do things together

Social Resources

		1	2	3	4	5	
27. I can discuss personal issues with:	No one	☐	☐	☐	☐	☐	Friends/family-members
28. Those who are good at encouraging me are:	Some close friends/family members	☐	☐	☐	☐	☐	Nowhere
29. The bonds among my friends are:	Weak	☐	☐	☐	☐	☐	Strong
30. When a family member experiences a crisis/emergency:	I am informed right away	☐	☐	☐	☐	☐	It takes quite a while before I am told
31. I get support from:	Friends/family members	☐	☐	☐	☐	☐	No one
32. When needed, I:	Have no one who can help me	☐	☐	☐	☐	☐	Always have someone who can help me
33. My close friends/family members:	Appreciate my qualities	☐	☐	☐	☐	☐	Dislike my qualities

Part C

The following are statements referencing emotions, behaviors, and cognitions. The statements have four options for you to choose from: (1) *Not at all true*, (2) *Mostly untrue*, (3) *Mostly true*, and (4) *Very true*. You are to read each item carefully and rate each item according to how truthfully it applies to you. Circle the number associated with each statement that is most applicable to you. Be certain to provide a **single response** for each of the statements below.

	Not at all true	**Mostly untrue**	**Mostly true**	**Very true**
1. I interpret potential threats as positive opportunities.	1	2	3	4
2. I have an unshakeable confidence in my ability.	1	2	3	4
3. I have qualities that set me apart from other competitors.	1	2	3	4
4. I have what it takes to perform well while under pressure.	1	2	3	4
5. Under pressure, I am able to make decisions with confidence and commitment.	1	2	3	4
6. I regain my composure if I have momentarily lost it.	1	2	3	4
7. I am committed to completing the tasks I have to do.	1	2	3	4
8. I take responsibility for setting myself challenging targets.	1	2	3	4
9. I give up in difficult situations.	1	2	3	4
10. I get distracted easily and lose my concentration.	1	2	3	4
11. I worry about performing poorly.	1	2	3	4
12. I am overcome by self-doubt.	1	2	3	4
13. I get anxious by events I did not expect or cannot control.	1	2	3	4
14. I get angry and frustrated when things do not go my way.	1	2	3	4

Part D

Please read the following statements and circle the response that indicates the degree to which you agree or disagree with the each statement as applied to you (e.g., training, pre-competition, competition, and post-competition). The response options include: (1) *Strongly Disagree*, (2) *Disagree*, (3) *Disagree Slightly*, (4) *Agree Slightly*, (5) *Agree*, and (6) *Agree Strongly*. There are no correct or incorrect answers, but your personal and honest perspective is important. Be certain to provide a **single response** for each of the statements below.

	Disagree Strongly	Disagree	Disagree Slightly	Agree Slightly	Agree	Agree Strongly
1. I don't often think about my thoughts.	1	2	3	4	5	6
2. I am not really interested in analyzing my behavior.	1	2	3	4	5	6
3. I am usually aware of my thoughts.	1	2	3	4	5	6
4. I'm often confused about the way that I really feel about things.	1	2	3	4	5	6
5. It is important for me to evaluate the things that I do.	1	2	3	4	5	6
6. I usually have a very clear idea about why I've behaved in a certain way.	1	2	3	4	5	6
7. I am very interested in examining what I think about.	1	2	3	4	5	6
8. I rarely spend time in self-reflection.	1	2	3	4	5	6
9. I'm often aware that I'm having a feeling, but I often don't quite know what it is.	1	2	3	4	5	6
10. I frequently examine my feelings.	1	2	3	4	5	6
11. My behaviour often puzzles me.	1	2	3	4	5	6
12. It is important to me to try to understand what my feelings mean.	1	2	3	4	5	6
13. I don't really think about why I behave in the way that I do.	1	2	3	4	5	6
14. Thinking about my thoughts makes me more confused.	1	2	3	4	5	6
15. I have a definite need to understand the way that my mind works.	1	2	3	4	5	6
16. I frequently take time to reflect on my thoughts.	1	2	3	4	5	6
17. Often I find it difficult to make sense of the way I feel about things.	1	2	3	4	5	6
18. It is important to me to be able to understand how my thoughts arise.	1	2	3	4	5	6
19. I often think about the way I feel about things.	1	2	3	4	5	6
20. I usually know why I feel the way I do.	1	2	3	4	5	6

Part E

The following reference a number of thoughts, emotions, and behaviors. Carefully read and consider each statement and respond according to how each statement applies to you in the **past three days and nights**. For each statement, the response options include: (0) *Never*, (1) *Seldom* (2) *Sometimes*, (3) *Often*, (4) *More often*, (5) *Very often*, and (6) *Always*. There are no correct or incorrect answers, but your personal and honest perspective is important. Be certain to provide a **single response** for each of the statements below.

In the past (3) day/nights:	Never	Seldom	Sometimes	Often	More often	Very often	Always
General Stress							
1. …. I felt down	0	1	2	3	4	5	6
2. …. I felt depressed	0	1	2	3	4	5	6
3. …. I was fed up with everything	0	1	2	3	4	5	6
4. …. Everything was too much for me	0	1	2	3	4	5	6
Emotional Stress							
5. …. Everything bothered me	0	1	2	3	4	5	6
6. …. I was in a bad mood	0	1	2	3	4	5	6
7. …. I felt anxious or inhibited	0	1	2	3	4	5	6
8. …. I was annoyed	0	1	2	3	4	5	6
Social Stress							
9. …. I was annoyed by others	0	1	2	3	4	5	6
10. …. Other people got on my nerves	0	1	2	3	4	5	6
11. …. I was upset	0	1	2	3	4	5	6
12. …. I was angry with someone	0	1	2	3	4	5	6
Conflicts/Pressure							
13. …. I worried about unresolved problems	0	1	2	3	4	5	6
14. …. I couldn't switch my mind off	0	1	2	3	4	5	6
15. …. I felt I had to perform well in front of others	0	1	2	3	4	5	6
16. …. I felt under pressure	0	1	2	3	4	5	6

Fatigue							
17. .... I did not get enough sleep	0	1	2	3	4	5	6
18. .... I was tired from work	0	1	2	3	4	5	6
19. .... I was dead tired after work	0	1	2	3	4	5	6
20. .... I was overtired	0	1	2	3	4	5	6
Lack of Energy							
21. .... I was unable to concentrate well	0	1	2	3	4	5	6
22. .... I had difficulties in concentrating	0	1	2	3	4	5	6
23. .... I was lethargic	0	1	2	3	4	5	6
24. .... I put off making decisions	0	1	2	3	4	5	6
Somatic Complaints							
25. .... I felt physically bad	0	1	2	3	4	5	6
26. .... I had a headache	0	1	2	3	4	5	6
27. .... I felt uncomfortable	0	1	2	3	4	5	6
28. .... I felt physically tired	0	1	2	3	4	5	6
Disturbed Breaks							
29. .... I could not get rest during the breaks	0	1	2	3	4	5	6
30. .... I had the impression there were too few breaks	0	1	2	3	4	5	6
31. .... Too much was demanded from me during the breaks	0	1	2	3	4	5	6
32. .... The breaks were not at the right time	0	1	2	3	4	5	6
Burnout/Emotional Exhaustion							
33. .... I felt burned out by my sport	0	1	2	3	4	5	6
34. .... I felt emotionally drained from performance	0	1	2	3	4	5	6
35. .... I felt that I wanted to quit my sport	0	1	2	3	4	5	6
36. .... I felt frustrated by my sport	0	1	2	3	4	5	6

Fitness/Injury

37. …. Parts of my body were aching	**0**	**1**	**2**	**3**	**4**	**5**	**6**
38. …. My muscles felt stiff or tense during performance	**0**	**1**	**2**	**3**	**4**	**5**	**6**
39. …. I had muscle pain after performance	**0**	**1**	**2**	**3**	**4**	**5**	**6**
40. …. I felt vulnerable to injuries	**0**	**1**	**2**	**3**	**4**	**5**	**6**