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# The Development of Mental Toughness in Adolescents: Utilising Established Theories

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## ABSTRACT

My intention for this thesis was to explore the factors that contribute to mental toughness development by considering the perspectives of individuals during critical stages of personal growth, and to embed such understandings within established theories from broader fields of psychological enquiry. Initially, I explored the innate and environmental factors that adolescents believed contributed to mental toughness, as well as attempted to ground such knowledge within an established theory from broader fields of psychological enquiry. I recruited eighteen adolescents (9 boys, 9 girls, Mage = 15.6 years) with a 'reputation' of mental toughness and invited them to participate in focus group interviews. Seven of these adolescents also participated in follow-up 1-1 interviews. Both focus groups and 1-1 interviews began with questions pertaining to the conceptual components of mental toughness (e.g., "what allows you to regularly perform to the best of your abilities?") and its development (e.g., "where did these characteristics originate from?"). Inductive analyses of participants' perspectives revealed that mental toughness development was predicated by four factors: interactions with significant others, the provision of supportive social processes, exposure to critical incidents, and a personal propensity for curiosity. These findings were interpreted within the context of Bronfenbrenner's (2001) bioecological model. I concluded that, while my findings were one of the first to advocate for the combined role of innate and environmental factors in the development of mental toughness, it is the latter that is of greatest interest from an applied perspective and should be more closely considered in the future.

Subsequently, I sought to focus my efforts on the environmental factors that contribute to mental toughness development. Although the bioecological model is a useful framework for categorising the factors associated with mental toughness development, it is not easily applied to practice. That is, the framework is more descriptive than practical in nature. As such, I contested that there was a need to draw on another theory that, although consistent with the bioecological model, possesses strong applied implications.

As such, I investigated the utility of Self-determination theory (SDT, Deci & Ryan, 1985b) principles for understanding mental toughness development. I predicted that coaching environments (i.e., autonomy-supportive, controlling) would be related to mental toughness indirectly through psychological needs satisfaction, and that psychological needs satisfaction would indirectly relate with performance and psychological health (i.e., positive/negative affect) through mental toughness. I recruited 221 adolescent cross-country runners (136 male and 85 female, Mage = 14.36) and invited them to complete questionnaires pertaining to their perceived coaching environments, the degree to which their psychological needs were satisfied, mental toughness, and psychological health. Performance was measured by recording athletes' championship race times. In attending to my hypotheses I analysed my data using Bayesian analysis. My findings supported my hypotheses leading me to conclude that SDT principles are useful for understanding the development of mental toughness. In particular, I surmised that mental toughness and its associated adaptive outcomes are a result of coaching behaviours that promote psychological needs satisfaction.

I sought to build on the findings of my second study by designing a coach-centred intervention, grounded within SDT, with the intention of developing mental toughness in adolescent athletes. I hypothesized that, autonomy-supportive coaching behaviours, psychological needs satisfaction, mental toughness, vitality (an indicator of psychological health), and objective performance, would increase following the intervention. In contrast, I expected that controlling coaching behaviours, psychological needs thwarting, and burnout (an indicator of psychological ill-health) would decrease. Observational, qualitative, and quantitative data related to my hypotheses were collected with coaches (N = 18) and athletes (N = 61) prior to and immediately following an 8-week intervention, as well as 8-weeks following the end of the intervention. My results did not support my hypotheses. Specifically, my results indicated that coaches did not adopt autonomy-supportive behaviours following the intervention. I suggested that this lack of adherence was due to contextual barriers. As this study was, to my knowledge, the first to experimental evaluation of an intervention informed by SDT principles in sport for mental toughness or any other outcome, I

provided recommendations for researchers about how to overcome the barriers I encountered when conducting similar interventions in the future.

Based on the findings of my empirical studies, I composed a conceptual essay to summarise key theoretical concepts that I had generated across my research, particularly my final two studies. The aim of my essay was to demonstrate the utility of SDT for understanding mental toughness and its development. In particular, I proposed that SDT provides a sound basis for understanding the motivational antecedents of mental toughness. To achieve my aim, I considered concepts that appeared to bridge mental toughness and self-determination theory literature, namely notions of striving, surviving, and thriving. I concluded this essay with suggestions for future lines of empirical enquiry that could be pursued to further test my propositions.

## DECLARATION BY AUTHOR

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly authored works that I have included in my thesis.

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John William Mahoney

## PUBLICATIONS DURING CANDIDATURE

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**KEYWORDS**

Mental toughness development, bioecological model of human development, self-determination theory, basic psychological needs, autonomy-supportive environment, coach behaviours, interpretative phenomenological analysis, Bayesian analysis, mixed methods, mental toughness conceptualisation

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## LIST OF ABBREVIATIONS USED IN THE THESIS

| | |
|---|---|
| SDT | Self-determination theory |
| PCP | Personal construct psychology |
| PPCT | Process-Person-Context-Time |
| BPNT | Basic psychological needs theory |
| IPS | Interpretive phenomenological analysis |

# INTRODUCTION

## Identification of Research Topic

Many athletes and coaches identify mental toughness as a key predictor of athletic performance. Indeed, some have identified mental toughness as the principal psychological characteristic related to success in sport (Gould, Hodge, Peterson, & Petlichkoff, 1987). Responding to the perspectives of athletes and coaches, sport psychology researchers have expended considerable efforts attempting to define and conceptualise mental toughness (Gucciardi & Gordon, 2011). As a result of these efforts, researchers appear to agree that mental toughness is a personal capacity that allows athletes to regularly perform to the best of their abilities regardless of the circumstances they encountered, be they positive (e.g., a winning streak), negative (e.g., injury), or otherwise (e.g., opportunities to learn new skills). Further discussions about the definition of mental toughness are offered in Chapter I. Additionally, researchers have often conceptualized mental toughness with a degree of consistency. Drawing on Gucciardi, Mallett, Hanrahan, and Gordon's (2011) synthesis of the literature, researchers have typically conceptualized mental toughness as comprising tenets that can be categorized into one of eight components: self-belief, resilience, attentional control, success mindset, context intelligence, emotional awareness and regulation, optimistic thinking, and the ability to handle challenge (these components are defined in the following chapter). More recently, researchers have turned their attentions to the development of mental toughness (Connaughton, Hanton, & Jones, 2010; Weinberg, Butt, & Culp, 2011). However, assumedly because of the infancy of such research, the topic of mental toughness development is relatively unchartered. The intention of my thesis was to address the topic of mental toughness development and to build and improve on previous research.

One topic scarcely addressed in the extant literature concerns the innate factors that are associated with mental toughness development. Innate factors have been alluded to in early works (Golby & Sheard, 2006), and indeed some definitions of mental toughness (Coulter, Mallett, & Gucciardi, 2010), yet little empirical research has considered this topic. Instead, researchers have

largely focused on the environmental factors that contribute to mental toughness development. In order to build a clear and complete understanding of the field, it is necessary to consider how both innate and environmental factors contribute to the development of mental toughness. As such, one topic area I addressed in my thesis was identifying the factors, both innate and environmental, that contribute to mental toughness development.

A second potential avenue for future research concerns the grounding of understandings of mental toughness development within established theories from broader fields of psychological enquiry. Embedding understandings of mental toughness within established theories would provide researchers with a core knowledgebase to contrast results, synthesize findings, and focus attentions on answering substantive research questions. In light of arguments above, it is likely necessary to consider theories that detail the innate and environmental factors that contribute to mental toughness development. Several theories exist in the extant literature, but one that is appealing because of its expansive knowledgebase (both theoretical and empirical) and its ability to account for other prominent theories of development is the bioecological model (this theory is described in greater detail in Chapters I & II). As such, a second area I addressed in my thesis was the utility of the bioecological model as a framework within which to house the factors that contribute to mental toughness development.

While the bioecological model is substantive and appealing to understanding mental toughness development, it lacks application. That is, the bioecological model is predominately descriptive in nature and use. As such, it may be necessary to consider other theories in order to deepen knowledge and understand the mechanisms that underscore mental toughness development. Identification of a theory with strong applied implications would also attend to a meaningful gap in the literature, namely the need to identify and evaluate mental toughness interventions. One theory that is appealing for the applied study of mental toughness development is self-determination theory (SDT, Deci & Ryan, 1985b, 2000). This theory is underscored by principles that resonate with previous findings pertaining to the development of mental toughness, particularly the environmental

factors identified in past research. Consequently, I considered the usefulness of SDT as a theory for detailing the mechanisms associated with the factors that drive mental toughness development and for informing a mental toughness intervention (SDT and its application is described in greater detail in Chapters I & III-V).

One other avenue of research that would extend on previous attempts to understand mental toughness development concerns participant recruitment. Some researchers have contested that mental toughness undergoes greatest development during critical years of life, in particular, adolescence (Connaughton, Wadey, Hanton, & Jones, 2008). While adolescence has been identified as a critical developmental period for mental toughness, researchers have rarely considered this group in their investigations. Consideration of adolescents' insights and perspectives would provide researchers with rich data from relevant sources about the development of mental toughness. This is particularly likely when one considers that previous research (Connaughton et al., 2008) has arrived at substantive conclusions about the development of mental toughness based on the recalling of events that occurred, at worst, over 40 years ago (the value of considering adolescents' perspectives is attended to in Chapters I-IV). Nevertheless, there is a need to acknowledge that recruiting adolescents may present other concerns such as their abilities to articulate introspectively and how best to garner rich data from this group.

Summarizing the current state of the literature and the opportunities to advance the field discussed above, my intentions for this thesis were to address four key objectives. The first was to study the innate and environmental factors that contribute to mental toughness development. My second objective was to embed understandings of mental toughness development within established theories from broader fields of psychological enquiry. To attend to this objective, I considered two theories: the bioecological model of human development and self-determination theory. The former was employed to categorize and describe both the innate and environmental factors that contribute to mental toughness development. While I used SDT as a means to more comprehensively understand the environmental factors that contribute to mental toughness development and how

such knowledge informs applied research. The third objective of my thesis was to employ knowledge derived from SDT to design and evaluate a mental toughness intervention. Finally, I explored the above objectives by considering the opinions, insights, and perspectives of adolescents. My intentions regarding these three objectives were to open lines of enquiry that might serve to direct future research. In other words, I acknowledged that substantive conclusions would be limited from my research, but that I could offer new insights to the field of mental toughness research.

## Research Questions

In light of the four objectives of my thesis, I generated three broad research questions. These research questions included:

1) How do individuals in critical stages of life, in particular adolescence, understand mental toughness development?
    a. What role, if any, do innate characteristics play in the development of mental toughness?
    b. Do adolescents view mental toughness development in similar ways to participants from previous research?
2) What theory or theories are useful for understanding mental toughness development in adolescents?
    a. Is the bioecological model useful as a framework for understanding the innate and environmental factors that contribute to mental toughness development?
    b. Are principles that underscore self-determination theory consistent with the environmental factors believed to contribute to mental toughness development?
3) Are interventions informed by self-determination theory principles effective in developing mental toughness in adolescents?

## Organisation of Thesis

I have separated my thesis into six chapters. Chapter I includes a review of mental toughness literature. It is my intention in this chapter to provide the reader with an understanding of previous mental toughness research, as well as evidence pertaining to the current state of the literature concerning mental toughness development. In this chapter I also introduce the potential utility of established theories from broader fields of psychological enquiry for understanding the development of mental toughness. I provide an overview of each theory, but also detail these theories further in other chapters (especially Chapter II, the bioecological model; and Chapters III, IV, & V, SDT). Chapters II, III, and IV are empirical studies that attend to the aims and research questions of my thesis. Chapters II and III have been accepted for publication prior to my thesis submission, and Chapter IV is under review. Chapter V is a conceptual essay that reflects the insights I generated throughout my studies. In this chapter I attempt to bridge research on mental toughness and its development with evidence from SDT. Further, to structure my discussion, I propose a tripartite conceptualisation of mental toughness. Specifically, I propose that mental toughness can be understood as the mechanisms that allow individuals in performance contexts to strive, survive, and thrive. This conceptual essay has also been accepted for publication prior to the submission of my thesis. Finally, in Chapter VI I offer a summary of my thesis and recommend avenues for future research.

# CHAPTER I. CURRENT PERSPECTIVES AND FUTURE DIRECTIONS IN MENTAL TOUGHNESS RESEARCH

The purpose of this chapter was to provide the reader with a review of mental toughness literature. In particular, I reviewed the historical foundations of mental toughness and current perspectives, paying particular attention to definitions and conceptualisations posited by scholars. These topics are important for establishing a context for my subsequent chapters and for acknowledging the current state of mental toughness research. I then reviewed research on the development of mental toughness and proposed that further investigations were needed in order to extend current understanding. I contested that embedding understandings of mental toughness development within established theories from broader fields of psychological enquiry would be generative to these ends. Specifically, I detailed how the bioecological model (Bronfenbrenner, 2001) and self-determination theory (Deci & Ryan, 1985b, 2000) might inform understandings of mental toughness development. I also contested that considering the opinions, insights, and perspectives of adolescents would enrich evidence about the factors that contribute to mental toughness development.

There are numerous examples from the world of sport where individuals who were not expected to 'make it' have achieved greatness – stories of underdog victories, come-from-behind triumphs, and success despite the odds. Coaches, athletes, and the media often reserve a particular label to describe athletes who achieve such feats, *mentally tough.* However, mental toughness is a phrase often overused in sport, with little understanding or consideration about what is meant by the term (Andersen, 2011). In an attempt to clarify what is meant by the term, researchers have directed their efforts to exploring mental toughness in greater detail. In this chapter I discuss the evolution of mental toughness research and the attention that has been paid in recent years to understanding this concept. Throughout, I provide a critique of the current state of mental toughness research and emphasise the need to extend on earlier works by exploring the concept beyond traditional methods and championing evidence with established theory. Specific to this latter point, I advocate for research on mental toughness development through theoretical lenses and within relevant samples.

## Mental Toughness

### Early Beginning

Mental toughness, like so many concepts thought to influence performance, is not one that researchers can claim as having coined. Instead, it has typically been individuals from the world of sport such as athletes, coaches, and the media that have referenced the term. It is only over the past decade that researchers have invested significant efforts towards understanding the concept. Prior to this interest, discussions and suggestions pertaining to mental toughness included little empirical support or theoretical grounding. Loehr (1986, 1994), for example, was one of the first to write about mental toughness based on his observational work and experiences as an applied sport psychologist. Loehr's (1986; 1994) works culminated in the development of a mental toughness measure that, while possessing strong face validity, lacked factorial validity (see Golby, Sheard, & Van Wersch, 2007; Gucciardi, 2012; Middleton et al., 2004). Loehr's (1986; 1994) works, while limited, represent the majority of early attempts to understand mental toughness. Other works around this time included personal commentaries from retired athletes or other 'experts' (e.g.,

Goldberg, 1998; Looney, 1998). Although such works are intuitively appealing, they are unsystematic (i.e., they lack empirical foundations and attention to scientific methodologies) and are limited for understanding mental toughness.

**Defining and Conceptualising Mental Toughness**

Following Loehr's (1986; 1994) works, researchers began to employ scientific methodologies in an effort to systematically approach the study of mental toughness. Researchers attempted to define and conceptualise mental toughness by garnering the opinions of those people believed to be most knowledgeable about the concept. In particular, researchers (Coulter et al., 2010; Jones, Hanton, & Connaughton, 2002; Thelwell, Weston, & Greenlees, 2005; Weinberg et al., 2011) interviewed mentally tough athletes, coaches of elite athlete groups, sport psychologist, and other knowledgeable individuals (e.g., parents). These investigations were conducted with sub-elite, elite, and 'super elite' individuals from both sport-specific and sport-general populations, and employed a number of different methodological protocols. Despite these varied approaches, researchers have reported consistent findings in their attempts to define and conceptualise mental toughness – a perspective that has been noted by other scholars previously (Weinberg et al., 2011).

Researchers (Gucciardi, Hanton, Gordon, Mallett, & Temby, in press; Jones et al., 2002) have identified that definitions of mental toughness are underscored by three properties. First, scholars have described mental toughness as a psychological capacity. In other words, mental toughness describes the thoughts, emotions, and behaviours of an individual as opposed to the influences of contexts or social settings. Second, researchers have referred to mental toughness as a concept that facilitates consistently high performances (it should be acknowledged that other facets – including physical, technical, and tactical facets – are important variables in performance, hence the aforementioned focus on mental toughness as a psychological capacity). As such, while a single performance to a high level of competency is necessary to identify an individual as mentally tough, it is not sufficient. To be considered mentally tough, individuals need to be able to regularly repeat such performances. Within this property, objective (e.g., competition ranking, matches won),

subjective (e.g., personal goals), and self-referenced (e.g., personal best) outcomes could be used as an indicator of consistent high performance. Third, researchers have referred to mental toughness as a concept that is pertinent to a variety of situations. That is, individuals can exhibit mental toughness in positive (e.g., success, victory, achievement), negative (e.g., failure, hardship, adversity), and benign (e.g., training, off-season, post-competition recovery) situations. This property is unique to mental toughness and differentiates it from other, like concepts that typically only concern individuals' responses to negative situations (e.g., resilience). In light of the properties identified in past research, mental toughness can be defined as a psychological capacity that allows individuals to regularly perform to the best of their abilities regardless of circumstances faced, be they positive, negative, or benign. In light of this definition, researchers have often view mental toughness on a continuum from low to high (Gucciardi & Gordon, 2011).

Like its definition, researchers have also identified that mental toughness is conceptualised by a number of properties. One might argue that researchers have not yet agreed on the conceptual properties of mental toughness when considering the exhaustive lists reported in previous research (Andersen, 2011). However, on closer inspection, one would also note the shared space between, as well as the repetition within these conceptualisations. As evidence of the consistency of mental toughness conceptualisations, Gucciardi, Mallett, Hanrahan, and Gordon (2011) synthesised the findings reported in previous research into eight key properties: self-belief (a belief in your abilities to achieve success); resilience (the ability to persevere through adversity and bounce back from setbacks); attentional control (the ability to focus on what is relevant while minimizing irrelevant information); a success mindset (the desire for achieving success and ability to act upon such thoughts); context intelligence (an awareness and understanding of the performance environment and how to apply this knowledge to achieve success); emotional awareness and regulation (an awareness of and ability to use emotionally relevant processes to facilitate optimal performance); optimism (the tendency to expect positive events in the future, and to perceive oneself in a positive manner); and the ability to handle challenges (the ability to thrive when challenged (i.e., execute the

required skills and procedures effectively). These findings were derived from an analysis of the extant literature that has examined the conceptualisation of mental toughness. Taken together, the consistencies across definitions and conceptualisations from past research are promising. For researchers, these consistencies support the value in exploring further substantive questions related to mental toughness. One aspect of the research field worthy of further consideration concerns the development of mental toughness.

## The Development of Mental Toughness

### Innate and Environmental Factors

The 'nature-versus-nurture' debate concerning the development of mental toughness has received some, albeit little, attention in previous research. Some scholars have alluded to the stable qualities of mental toughness, even going as far as to include such notions in definitions of the concept (e.g., Coulter et al., 2010). However, the majority of research that has explored mental toughness development has supported the state-like nature of the concept and the notion that certain environmental influences foster (as well as forestall) mental toughness development (Connaughton et al., 2010; Gucciardi, Gordon, Dimmock, & Mallett, 2009; Thelwell, Such, Weston, Such, & Greenlees, 2010). As a consequence of such investigations, researchers have generated a long list of environmental factors that contribute to mental toughness development (Connaughton, Thelwell, & Hanton, 2011). Generally speaking, these factors reflect two broad categories, namely the provision of physically and mentally challenging environments (e.g., exhausting training, simulated competitive scenarios), and the presence of nurturing, supportive, and encouraging social agents (e.g., coaches, parents, siblings, peers, teammates). Factors such as these have also been cited in research separate, but related to mental toughness. For example, researchers have shown that the development of resilience – a concept cited in almost every conceptualisation of mental toughness – is contingent on the similar factors as those identified in research on mental toughness development (Luthar & Cicchetti, 2000). However, researchers have also demonstrated that personal factors contribute to the development of concepts similar to mental toughness. Again using the example of

resilience, researchers have argued that personal factors such as positive perceptions of the self, optimism, and extraversion facilitate resilience (Luthar & Cicchetti, 2000). In light of evidence from broader fields of psychological enquiry related to mental toughness, there is reason to believe that both innate and environmental factors contribute to mental toughness development and, therefore, should be considered in future research.

**Timing of Mental Toughness Development**

One approach to investigating the innate and environmental factors associated with mental toughness development would be to consider the perspectives of individuals during critical years of growth. Individuals who are undergoing physical and psychological growth may be able to provide rich insights into how innate qualities or environmental influences affect the development of mental toughness (Caprara, Steca, Gerbino, Paciello, & Vecchio, 2006). One development bracket that appears particularly meaningful to consider for these ends is adolescence. Adolescence is appealing to the study of mental toughness development as it is widely recognised as a particularly stressful period in which many developmental changes occur – physical, psychological, social, emotional, and cognitive (Boekaerts, 1996; Compas, Connor-Smith, Saltzman, Thomsen, & Wandsworth, 2001; Williams & McGillicuddy-De Lisi, 1999). For example, if mental toughness were innate, mentally tough adolescents would be able to identify that they continue to perform to the best of their abilities despite the stresses and changes in their environments. On the other hand, if mental toughness were malleable, mentally tough adolescents would be able to identify key environmental influences that allowed them to thrive through stresses and changes and perform to the best of their abilities. There is also the possibility that adolescents would identify that both innate and environmental factors contributed to the development of mental toughness.

**Theoretical Foundations of Mental Toughness Development**

Integrating theory and evidence would also help to strengthen understandings of mental toughness development. A number of theories are appealing for these ends, hence it is necessary to consider preliminary findings from the field when grounding the origins of mental toughness within

established theory. In light of discussions above, it would be apt to consider a theory that encapsulates both innate and environmental origins of mental toughness. One framework that appears suitable for grounding understandings of the origins of mental toughness is Bronfenbrenner's (2001) bioecological model. The bioecological model is a framework of human development that details the interplay between the personal characteristics of developing individuals (i.e., innate qualities) and the contexts within which they reside (i.e., environmental influences). More, this model offers a broad, heuristic framework for understanding development. While other social cognitive theories (e.g., social cognitive theory, Bandura, 1977) identify that personal and situational factors affect development, the biodecological model goes further, explicitly categorising and defining key features of each – as well as others such as time.

At the core of this framework lies the individual. Bronfenbrenner posited that three personal characteristics contribute to development: forces (i.e., temperaments, motivation), resources (i.e., past experiences, skills, intelligences), and demands (i.e., stimulus and information that others observe and respond to in line with social expectations such as gender and age). Contextual factors that contribute to development are also heavily detailed in the bioecological model. Bronfenbrenner refers to the physical and social environments that surround developing individuals as ecological contexts and distinguishes four principle systems: microsystems, mesosystems, exosystems, and macrosystems. The microsystem refers to contexts that directly involve the developing individual and the environment (e.g., parent-child interactions). The mesosystem concerns the interactions of two environments that directly involve the developing individual and their influences on development (e.g., parent-teacher interactions). According to Bronfenbrenner, environments that do not directly involve the developing individuals also influence development. The exosystem (i.e., interactions between environments that do not involve the developing individual such as parent-workplace interactions) and the macrosystem (i.e., features of the community or culture that surround the developing individual) are examples of how the developing individual may not be directly involved with the environments that affect development. In support of the value of

grounding understandings of mental toughness within established theories, contexts that do not involve the developing individual highlight a fruitful avenue for research as such concepts have not been previously considered (Gucciardi & Gordon, 2011).

How personal characteristics and ecological contexts interact to influence development are also detailed in the bioecological model. Interactions between developing individuals and their environment that become progressively more complex and are reciprocated over time are posited by Bronfenbrenner to be the most substantive and theoretically significant factors in development. These interactions are referred to as proximal processes and are the primary and direct producers of development. In other words, repeated exposure of the developing individual to environments that challenge (e.g., require individuals to demonstrate the upper limit of their capabilities) and continue to challenge learning, understanding, and ability have the most profound influence on enduring developmental change.

A final property detailed in the bioecological model and influencing developing is time. According to Bronfenbrenner, it is not simply the occurrence of events that influence development, but also when they occur. Historical (e.g., a funding scheme for sports) and personal (e.g., onset of puberty, age of entry to sport) events are examples of occurrences that are time-dependent and that can influence development. Taken together, the individual, the context, proximal processes, and timing of events form the framework of the bioecological model, which may serve to ground understanding of mental toughness development.

The bioecological model allows the innate and environmental origins of mental toughness to be categorised into an organised framework that captures their interplay, but does not detail the specific mechanisms that underscore mental toughness development. As such, in an attempt to offer value to applied research, scholars, although acknowledging that the origins of mental toughness are in part innate, could identify a theory that describes the mechanisms that underscore the environmental origins. This knowledge could then be employed to inform applied practice. One theory that may be useful for understanding the mechanisms that underscore mental toughness

development beyond the descriptive manner of the bioecological model is self-determination theory (Deci & Ryan, 1985b, 2000).

Deci and Ryan (1985b, 2000) proposed SDT in an attempt to explain why humans engage in certain behaviours. The certain behaviours they were particularly interested in were spontaneous actions, curious explorations, investigatory play, and the like; in other words, behaviours for the sake of behaviours. The interest in these behaviours arose from a limited utility of other theories to explain why humans engaged in such actions. These other theories detailed why humans engaged in some behaviours, but not all. For example, theorists such as Hull (1943) and Freud (1923/1989) proposed that humans were products of the need to satisfy physiological drives (e.g., for food, water, sex), and that behaviours were predicted by a number of stimulus-response associations that developed as a result of satisfying such drives. Although much of the research that prescribed to these traditions produced rich supporting evidence, it also began to expose shortcomings of such theories. Specifically, the contention that human beings were pushed and pulled by external motives was not enough to explain all behaviours.

As a result of the shortcomings of theories, Deci and Ryan (1985b) proposed their SDT. In their theory, Deci and Ryan proposed that individuals were not passive, but active beings that were driven by internal motives. It is this primary contention that creates the first conceptual bind between SDT and mental toughness. Indeed, the notion that individuals are active beings is a concept that self-determination theory appears to share with mental toughness research. Jones et al. (2002) and Gucciardi et al. (2008), for example, both include *internalised motives* and *self-motivation* in their conceptualisation of mental toughness, respectively. As such, individuals who are mentally tough could be said to demonstrate self-directed actions and have internalised motives because they satisfy their need to be active agents. However, the provision of conditions that support individuals' to be active agents may not have been instigated with the explicit intention of supporting the development of mental toughness. For example, a coach who appropriately encourages athletes to be active in their endeavours may not intend to influence athletes' self-belief,

resilience, or winning mentality, yet mental toughness facets such as these may naturally develop as a result of such conditions. Beyond the primary contention of SDT theorists that individuals are driven by a desire to be active agents, other conceptual links can be draw between Deci and Ryan's theory and mental toughness research.

In explaining the properties of their theory, Deci and Ryan (1985b, 2000) forwarded the notion of an organismic dialectic. In their organismic dialectic, Deci and Ryan stipulated that in order for growth and development to occur, three fundamental nutriments need to be present, namely autonomy, competence, and relatedness. These three nutriments were explained under the banner of basic psychological needs theory, a micro-theory of SDT. Briefly, autonomy refers to the perception that one's actions are volitional; competence is the belief that one is effective in a particular task; and relatedness refers to the perception that one is connected with a wider social structure. These three psychological needs have emerged in research dedicated to understanding mental toughness development as well. For example, researchers have suggested that individuals who perceive ownership over training programs, self-set challenging goals, and explore new and different situations are likely to develop mental toughness (Connaughton et al., 2010; Connaughton et al., 2008; Gucciardi, Gordon, Dimmock, et al., 2009). Importantly, these themes reflect Deci and Ryan's notion of autonomy, suggests a conceptual link between SDT and mental toughness development. Additionally, themes such as demonstrating ability, task mastery, encountering vicarious experiences, achieving goals, and enduring critical and challenging experiences have all been cited in research explaining how mental toughness is developed (Connaughton et al., 2010; Connaughton et al., 2008; Gucciardi, Gordon, Dimmock, et al., 2009). These themes are congruent with Deci and Ryan's notion of competence and suggest yet another conceptual link between mental toughness and SDT. Finally, researchers have suggested that mental toughness can be developed through quality, positive relationships in and outside sport with coaches, teammates, peers, and parents (Gucciardi, Gordon, Dimmock, et al., 2009). These themes reflect Deci and Ryan's notion of relatedness and again highlight how SDT and mental toughness development are

conceptually linked. Taken together, themes that have been reported as central to the development of mental toughness appear to be explained by principles common to SDT.

In addition, SDT theorists have explored how nurturing or thwarting the aforementioned basic psychological needs affects individuals' perceptions of self-determination and, consequently, influences growth and development (Deci & Ryan, 1985b; Ryan & Deci, 2000). Deci and Ryan posited that social contexts are instrumental in providing interactions that nurture self-determination, or individuals' basic needs of autonomy, competence, and relatedness. Deci and Ryan also posited that social contexts that offer extrinsic incentives for behaviour (e.g., rewards, punishment, ego-involvement) are unsupportive of, and thwart, self-determined ends, often resulting in ill-being and sub-optimal functioning, and can even be used to explain the development of certain types of psychopathology. Hence, SDT scholars place strong emphasis on the role of social agents such as parents, coaches, teachers, and the like, and how the provision of certain conditions either nurture or thwart individuals' perceptions of autonomy, competence, and relatedness.

Research by Gucciardi et al. (2009) offers evidence about how the provision of certain conditions, alike to those stipulated by Deci and Ryan (1985; Ryan & Deci, 2000), influences the development of mental toughness in athletes. Specifically, the methods suggested to enhance individuals' perceptions of autonomy (see Mageau & Vallerand, 2003) are alike to aspects of the coach-athlete relationship (e.g., open communication) and the training environment (e.g., seeking out challenges) referenced in Gucciardi et al.'s study on how coaches facilitate the development of mental toughness in athletes. Additionally, Gucciardi et al.'s description of coaching philosophies (e.g., prioritising athlete development), training environments (e.g., providing challenging experiences), and specific strategies (e.g., enhancing game awareness) required to develop mental toughness in athletes is consistent with how perceptions of competences are allegedly enhanced through nurturing social contexts (Mageau & Vallerand, 2003). Further, the coach-athlete relationship (e.g., supportive and positive relationships) and specific strategies (e.g., positive

reinforcement and encouragement) proposed by Gucciardi et al. as contributing to mental toughness development are aligned with notions about how to attend to individuals perceptions of relatedness (Mageau & Vallerand, 2003).

In addition, Gucciardi et al. (2009) outlined how coaches might impede mental toughness development. Again, the evidence provided by Gucciardi et al. is congruent with SDT principles and how thwarting basic psychological needs results in restrictions to growth and development (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009). Gucciardi et al. reported that mental toughness development could be impeded if coaches: prioritised success rather than athlete development, focused on athlete weaknesses rather than strengths, had low and unrealistic expectations, and created easy or unchallenging training environments. These examples are consistent with evidence from research informed by SDT that shows how social agents can both satisfy and thwart the basic psychological needs of autonomy, competence, and relatedness (Bartholomew et al., 2009; Mageau & Vallerand, 2003). In summary, autonomy-supportive coaching appears to facilitate need satisfaction and may be conducive to the development of mental toughness, whereas controlling coaching thwarts psychological needs and presumably undermines efforts to develop mental toughness.

## Summary of Literature Review

Mental toughness research is still in its infancy and, as such, requires further investigation and stronger consideration of methodological approaches and theoretical underpinnings. Specifically, mental toughness researchers need to extend beyond examining the homogeneous participants groups typical of previous research. The field would benefit from the examination of individuals from key development periods of life, especially adolescence. Additionally, although some researchers have attempted to investigate how mental toughness is developed (e.g., Connaughton et al., 2010; Connaughton, et al., 2008), greater consideration could be paid to understanding development using appropriate theoretical perspectives; herein lies a key extension of previous research in this thesis. Specifically, the bioecological model and self-determination

theory offer insightful perspectives from which to consider how mental toughness may be developed. SDT in particular places strong emphasis on the satisfaction of basic psychological needs and the conditions that nurture or thwart them. Further, researchers who have leveraged off self-determination theory have highlighted the positive effects prescribing to such practices has on self-actualisation – highlighting the usefulness of this theory in understanding mental toughness development. In addressing the limitations and advancing the standards of research, the field may come to better understand the seemingly clouded notion of mental toughness development.

# CHAPTER II. ADOLESCENT PERFORMERS' PERSPECTIVES ON MENTAL TOUGHNESS AND ITS DEVELOPMENT: THE UTILITY OF THE BIOECOLOGICAL MODEL.

The purpose of this chapter was to elucidate some of the arguments proposed in Chapter I. I attempted to achieve this aim by investigating the value of the bioecological model for understanding adolescents' perspectives of mental toughness development. This chapter has been subjected to peer-review and has been accepted for publication by *The Sport Psychologist*. The text presented below is similar to that accepted for publication.

The coniferous Redwood is the tallest tree species on earth. However, the likelihood of a Redwood seedling reaching its expected height is slim. In order to germinate, a single Redwood seedling not only needs to possess hardy qualities such as a strong outer cone, but also requires fertile soil, adequate sunlight and water, and to evade herbivorous diseases and predators. Despite being engineered to stand taller than all other tree species, few Redwood seedlings reach the soaring heights expected of them. The human journey is markedly similar to that of the Redwood in the sense that humans are also said to aspire to realize their full potentials and are vulnerable to challenges to their growth (Maslow, 1943). Like the Redwood, the qualities humans possess, the environments that surround them during critical and sensitive periods of growth, and the timing of events during their development play a significant role in determining the 'heights' they will reach in later life (e.g., Huurre, Eerola, Rahkonen, & Aro, 2007; Johnson, Hicks, McGue, & Iaconno, 2007).

Drawn from sport psychology literature, research on mental toughness offers a potentially informative standpoint from which to consider the processes that predict whether or not individuals will reach their full heights. A variety of mental toughness definitions and conceptualizations have been developed over the past decade, either inductively from key stakeholders' perspectives (Bull, Shambrook, James, & Brooks, 2005; Gucciardi, Gordon, & Dimmock, 2008; Jones, Hanton, & Connaughton, 2007) or deductively by integrating anecdotal reports and applied work in sport psychology with established theory on hardiness from health psychology (Clough, Earle, & Sewell, 2002) as well as innovatively drawing from neuropsychological perspectives (Hardy, Bell, & Beattie, 2013). Common themes amongst the extant literature suggests that mental toughness can be defined as a collection of personal characteristics (i.e., *forces*, *resources*, and *demands*, discussed later) that allows individuals to regularly perform to or around the best of their abilities regardless of circumstances faced (Clough et al., 2002; Coulter et al., 2010; Hardy et al., 2013; Jones et al., 2007). Researchers have generally agreed on conceptualizations of mental toughness, despite superficial, nomenclature differences. Elucidating this point, Connaughton, Thelwell, and Hanton

(2011), in their recent synthesis of previous mental toughness conceptualizations from sport settings, proposed that mental toughness was comprised of nine personal characteristics: belief, coping, focus, motivation, control, sporting intelligence, resilient attitude, personal values, and physical toughness. Connaughton et al.'s (2011) synthesis, whilst drawn from the extant literature from sport settings alone, offers a meaningful starting point from which to understand mental toughness beyond the homogeneous samples.

Previous research has provided an important foundation upon which to clarify my understanding of mental toughness, yet these conceptualizations are based primary on the viewpoints of adult athletes. As such, while mental toughness appears to reflect a form of optimal functioning pattern that transfers across development (Connaughton et al., 2010), it is possible that these conceptualizations of mental toughness might not generalize to individuals from other developmental periods of life (i.e., adolescence). For example, mental toughness might be conceptualized differently by adolescents (approximately 11-18 years of age; e.g., Dubow, Huesmann, Boxer, Pulkkinen, & Kokko, 2006; Ericsson, Krampe, & Tesch-Römer, 1993; Johnson et al., 2007) because of the different demands (e.g., time demands) and personal pursuits (e.g., the search for social identity in adolescents) characteristic of this life stage. Research on resilience – a concept related to, but distinguishable from mental toughness (see, Gucciardi, Gordon, & Dimmock, 2009b) – highlights that the personal characteristics that facilitate human functioning during times of adversity can vary across different life stages (Ryff, Singer, Love, & Essex, 1998). Such knowledge foregrounds the contention that past conceptualizations of mental toughness are not necessarily generalisable to adolescents. Adolescence is an ideal development phase in which to study mental toughness because it is a period characterized by more maturational, educational, and interpersonal challenges and changes than any other stage of life (Montemayor, Adams, & Gullotta, 1990). The ability to not only successfully negotiate these challenges and changes, but to also thrive during them is consistent with the aforementioned definition of mental toughness.

Additionally, with research isolated to sport settings alone, it is difficult to generalize previous understandings of mental toughness to other performance contexts (e.g., academia, music). Although some scholars have speculated about the generalisability of mental toughness to other performance contexts (Colbert, Scott, Dale, & Brennan, 2012), researchers need to empirically explore the merit of such contentions. According to Lazarus (2000), all performance contexts are underscored by similar motivational (e.g., to score a top grade in a school exam), attentional (e.g., focusing on finger placement when playing the violin), and strategic (e.g., exposing opponent's weaknesses in invasion sports) elements that place cognitive demands on individuals. As such, it is possible that there are a group of personal characteristics that, in combination, allow individuals, regardless of performance context, to regularly perform to their abilities regardless of circumstances faced. However, it is difficult to be certain about such speculations without appropriate supporting evidence.

Considering that mental toughness could present variations between different life stages, researchers should consider how this construct is acquired from a developmental perspective. Gould and colleagues (Gould, Dieffenbach, & Moffett, 2002; Gould et al., 1987), have suggested that mental toughness is one of the central psychological traits key to the attainment and sustainment of performance standards. As such, an understanding of how to develop mental toughness is important for the fulfilment of individuals' performance capabilities. Drawing from broader psychological enquiry (Gottesman & Hanson, 2005), human development is often recognized as being predicated on by a combination of genetic predispositions (i.e., nature) and lived experiences (i.e., nurture). In line with such knowledge, some researchers have contested that genetic factors determine differences in individuals' levels of mental toughness. However, the body of research that has theorized a genetic basis for mental toughness (Crust, 2007; Hardy et al., 2013; Mallett & Coulter, 2011) is small and, in the case of quantitative evidence (Horsburgh, Schermer, Veselka, & Vernon, 2009), limited by the use of measures with unsubstantiated psychometric support (Gucciardi, Hanton, & Mallett, 2012). More typically researchers (e.g., Connaughton et al., 2010; Weinberg et

al., 2011) have contested that the personal characteristics that comprise mental toughness are developed through lived experiences. Researchers have identified more than 20 factors as contributing to the development of mental toughness (Connaughton et al., 2010; Connaughton et al., 2008; Gucciardi, Gordon, Dimmock, et al., 2009; Thelwell et al., 2010; Weinberg et al., 2011). Although a meaningful starting point, many of these factors are conceptually equivalent (e.g., *mastery*, *skill mastery*, and *achievement of performance gains*) and prompt the need for a clearer understanding of the factors that contribute to mental toughness development.

One approach for better understanding the interplay between nature and nurture, as well as clarifying the factors that contribute to the development of mental toughness is to draw on established theoretical models of human development. Although some researchers have proposed sport-specific models of mental toughness development (e.g., Bull et al., 2005), the generalisability of such models to wider populations has yet to be determined. As an alternative, and to ensure the generalisability of a model of mental toughness development, I consider literature from broader fields of psychological enquiry. Brofenbrenner's (2001) bioecological model is one such theory that has the potential to provide an integrative framework for previous research, as well as new findings pertaining to mental toughness development (also see, Krebs, 2009a). This model was selected over other general models of development at it represents a broad, robust theoretical foundation upon which to build an understanding of mental toughness development, as well as taking into account a number of key principles present in other developmental theories (see, Bronfenbrenner & Morris, 2006). In accordance with the bioecological model, development is defined as "the phenomenon of continuity and change in the biopsychological characteristics of human beings" (Bronfenbrenner & Morris, 2006, p. 793). Along with this definition, four properties serve as the foundations for elucidating how development occurs: *proximal processes*, *personal characteristics*, *ecological contexts*, and *time*.

Proximal processes are described as the primary and direct producers of development and are posited within the bioecological model as the most substantive and theoretically significant

property that drives development (Bronfenbrenner, 2005; Krebs, 2009b). Such processes refer to the progressively more complex, reciprocal interactions that occur between developing individuals and their environments. In other words, enduring developmental changes, of both a functional and dysfunctional nature, occur in individuals following repeated encounters with experiences that challenge and continue to challenge learning, understanding, and ability. Examples of proximal processes from past mental toughness research include *competitive* and *vicarious experiences*, *competitive* and *sibling rivalries,* and *challenging* and *demanding training environments* (Butt, Weinberg, & Culp, 2010; Connaughton et al., 2010; Connaughton et al., 2008; Gucciardi, Gordon, Dimmock, et al., 2009; Thelwell et al., 2010).

Personal characteristics, as described in the bioecological model, foregrounds the agentic role of individuals in their development. Bronfenbrenner and Morris (2006) asserted that human development is determined, in part, by three process-relevant personal characteristics: *forces*, *resources*, and *demands*. Forces refer to the temperaments and motivations of individuals that promote both the degree and endurance of emotional and behavioural control. In line with the notion of personal forces, Connaughton and colleagues (Connaughton et al., 2010; Connaughton et al., 2008) reported that mental toughness was subject to development through athletes' heightened *competitive drive* and their *insatiable desire and internalized motives to succeed*. Resources pertain to the past experiences, skills, and intelligences of developing individuals. The notion of personal resources has also been highlighted in previous research exploring mental toughness development. In particular, researchers have highlighted that *past successes*, *the ability to reflect on experiences*, and *knowledge of a wide repertoire of skills and strategies* contribute to the development of mental toughness (Connaughton et al., 2010). Finally, demands refer to the stimuli and information immediately available to others upon encountering developing individuals (e.g., gender, age, physical strength) and are presumed to influence development through social expectations. An example of a demand characteristic from past mental toughness research includes physical toughness. Coaches may view athletes with high degrees of physical toughness as capable of

enduring advanced challenges and more demanding activities and, as such, expose them to greater opportunities that would accelerate their development. Such demands illustrate the influence of subjectivity and the affects of self-fulfilling prophecies on development. In line with the bioecological model, personal characteristics "function both as an indirect producer and as a product of development" (Bronfenbrenner & Morris, 2006, p.798). In line with this contention, I not only consider the agentic role of individuals in their development, but also how notions of forces, resources, and demands can help categories and explain mental toughness conceptualizations (hence the explicit use of the term, personal characteristics, in the definition of mental toughness presented above).

The third property detailed in the bioecological model as influencing development is ecological contexts. Ecological contexts refer to the physical and social environments that surround developing individuals and are theorized to constitute four principal systems: the *microsystem*, mesosystem, exosystem, and macrosystem. The microsystem concerns the direct influence of others' and environments on the development of individuals (e.g., how parents rear their children). Mesosystem concern the affect of the relationship between two or more microsystems (e.g., the relationship between family and school) on the development of individuals. Exosystems detail how the relationship between microsystems and individuals or groups not directly involved in an individuals' life affect development (e.g., how the demands of work influences parents' time spent with their children). Finally, macrosystems refer to the features of the community or culture to which a developing individual belongs (e.g., community and cultural beliefs and practices surrounding social justice). The variety of these contexts illustrates that development is predicated on by individuals' direct interactions with individuals within their immediate environments, but also the activities occurring in broader contexts that do not necessarily involve them. Thelwell et al. (2010), in a study with elite gymnasts, identified that mental toughness development was not only predicated by athletes' interactions with individuals from their immediate social environments (i.e.,

microsystems), but also interactions between ecological contexts such as family and club environments (i.e., mesosystems), as well as societal expectations (i.e., macrosystems).

Finally, the bioecological model includes time as a property that affects development. Historical (e.g., past events, such as compulsory education, that have altered trends in academic curricular) and personal (e.g., age of entry to sport, age of first music lesson) events are two ways in which time is argued to influence development. In other words, it is not only the occurrence of events that influence individuals' development, but also when they occur. Similar notions have been purported in mental toughness literature. For instance, Connaughton and colleagues' (2010; 2008) illustrated that the factors that contribute to mental toughness development varied as athletes specialized in their chosen sport. Taken together, the properties that underscore the bioecological model appear to have the potential to provide an integrative framework for previous research, as well as new findings pertaining to mental toughness development.

In light of the information detailed above, the first aim of the current study was to investigate adolescents' perspectives on mental toughness and its development across different performance contexts. Investigating adolescent performers' perspectives provides an opportunity to alleviate methodological concerns of previous research (i.e., retrospective recall bias; Connaughton et al., 2010; Connaughton et al., 2008), as well as contribute substantive insights into the personal characteristics considered most important during a critical developmental stage. The inclusion of multiple performance contexts in the current study also advances the literature by extending the focus of mental toughness research beyond sport settings alone. It is for these two aforementioned reasons that I undertook exploratory research as opposed to reviewing the extant literature. I believe my attempts to address the limitations of previous research and advance understanding beyond sport settings alone will garner new evidence about mental toughness and its development and, as such, serve as a meaningful and contemporary foundation upon which to address the second aim of the study. The second aim of the current study was to investigate the utility of the bioecological model

as an integrative framework useful for understanding mental toughness and its development in adolescent performers.

## Method

### Participants

Two independent single-sex high schools (one all boys; one all girls) were contacted to participate in the study. Both schools were purposely selected based on their publicly recognized high performances across sport (i.e., both schools consistently placed within the top three in regional inter-school sport competitions), academia (i.e., both schools were categorized as 'substantially above' the national average according to the Australian Curriculum Assessment and Reporting Authority, 2012) and music (i.e., both schools consistently placed within the top three in regional and national inter-school recitals). This approach to recruitment is consistent with qualitative methodologies (Lincoln & Guba, 1985; Patton, 2002) and previous mental toughness research (e.g., Jones et al., 2002).

Because of their knowledge of the student body, faculty Deans (i.e., Dean of Sport, Dean of Music, Dean of Studies) at each school were asked to identify pupils from sport, academia, and music to participate in the study. The following description was provided to these staff to guide their selections: "Individuals who regularly perform to or around the best of their abilities regardless of circumstances faced – positive, negative, or otherwise." This description, consistent with and adapted from mental toughness definitions (Coulter et al., 2010; Gucciardi et al., 2008; Jones et al., 2007), was selected because it avoided the use of wordy and complex academic jargon and directed school staff past norm-referenced high performers toward self-referenced high performers (i.e., those who perform to or around the best of *their* abilities). It was deemed important to qualify mental toughness as a self-referenced concept to garner information from individuals who were not categorized solely as 'elite' performers. This qualification is supported by research findings in sport that highlight that 'elitism' is not necessarily indicative of positive or sustainable growth (Schaal et al., 2011) and also addresses a major criticism of past mental toughness research

(Andersen, 2011). The recruitment of 'mentally tough' individuals in the manner described above is consistent with previous research in the field (Connaughton et al., 2010; Connaughton et al., 2008).

Eighteen adolescents (9 boys, 9 girls, $M_{age}$ = 15.6 years, age range: 13-17) were recruited to participate in the study. Three male and three female adolescents represented each context (e.g., 3 male and 3 female musicians). One male participant represented both sport and academia. Participants who represented sporting domains competed in the highest or second highest level of competition for their age group in inter-school competitions (e.g., 1st VIII rowing; under 14 'B' basketball squad). Similarly, participants who represented music performed in either the highest or second highest school ensembles for their school in inter-school and national recitals. Those who represented academia achieved within the top 20% of their cohort on state-wide examinations. The standings and performances of participants portrayed them as a high performing group, but not necessarily elite.

**Procedure**

Institutional ethical approval and participant and parental consent was obtained prior to the commencement of data collection (see Appendixes A-C for all questionnaires, example consent forms, and example information sheets for all empirical studies). The study consisted of two semi-structured focus group interviews with equal numbers of participants separated by gender (e.g., 9 female adolescents: 3 musicians, 3 students, and 3 athletes) and follow-up 1-1 interviews. Focus groups were selected for two reasons (Vaughn, Schumm, & Sinagub, 1996). First, focus groups provide a non-hostile environment where individuals often feel encouraged to voice their own opinions, especially in the presence of unfamiliar social agents (e.g., the focus group coordinator). Creating a non-hostile environment was important considering the participants' ages, as adolescents are more likely to conform with others if they feel socially uncomfortable (Costanzo & Shaw, 1966). As such, adolescents participated in focus groups with peers from the same school, as it was believed that this would likely create a safe and comfortable social environment. Second, focus groups were selected as they often encourage deeper thought as individuals are presented with ideas

that they may disagree with (and therefore have to argue against) or that they may not have contemplated previously (and therefore have to integrate with their own beliefs). For this reason each performance setting was equally represented in an attempt to generate discussions both between and within performance groups.

To facilitate focus group discussions, a brief worksheet, developed in line with performance profiling procedures (Gucciardi & Gordon, 2009b), was used initially to elicit the personal characteristics that participants believed allowed them to regularly perform to or around the best of their abilities regardless of circumstances faced. These characteristics were categorized under the heading "emergent characteristics." In line with performance profiling procedures and to form a robust understanding of adolescents' perspectives, participants were then asked to consider the opposite pole of these emergent characteristics. These personal characteristics were categorized under the heading "opposite characteristics". Subsequent to this task, participants were requested to provide definitions of both the emergent and opposite personal characteristics they recorded. As a guide, and before attempting the worksheet, participants were presented with a worked example of an unrelated topic (i.e., the qualities of a 'good friend'). Following the completion of the worksheet, the focus group coordinator led a discussion to elucidate participants' perspectives and opinions about the personal characteristics and definitions they had recorded. An example question included, "how does [personal characteristics] help you in your performances, if at all?"

The worksheet activity was followed by group discussions about what factors contributed to the development of the identified personal characteristics. Participants were first asked to generate a list of factors that they believed contributed to the development of the personal characteristics they reported. As a group, participants were then probed about how such factors contributed to the development of specific personal characteristics listed during the worksheet activity. An example question included, "how, if at all, does [factor] contribute to the development of the list of personal characteristics discussed before?"

Approximately 2 weeks after the focus groups 7 adolescents (3 male: 1 sport, 1 music, 1 sport and academia; 4 female: 2 academia, 2 music) were invited to participate in follow-up 1-1 interviews. The intention of these 1-1 interviews was not to increase the breadth of information gathered during the focus groups, but rather to garner deeper perspectives about mental toughness conceptualizations and development. To service this aim, participants were selected based on their abilities to articulate and think critically about their points of view (as deemed by the research team following inspection of the focus group transcripts and in consultation with the faculty Deans at each school). The purposeful selection of information-rich cases for the purposes of enhancing the depth of knowledge of a research field is supported in commentaries about best practices in qualitative research design (Patton, 2002). The established relationships with participants following the focus groups facilitated 1-1 interviews appeared to encourage participants to think critically about their responses, further servicing the aforementioned aim.

Prior to the commencement of the follow-up interviews, a third-party researcher and I – both trained in qualitative methodologies – devised a set of questions pertaining to the development of the personal characteristics believed central to performing to the best of one's abilities based on transcripts from the focus groups. These questions were then presented, discussed, and altered as deemed necessary by the second and third authors. An example question was, "How, if at all, did your parents contribute to the development of your self-belief?" . This mixed approach reflects the contentions of Yardley and Bishop (2007) who argued that analysing composite procedures enhances the validity of qualitative data.

Attention was paid during the focus groups and 1-1 interviews to ensuring responses were not influenced by biased or leading questions. Protocols drawn from personal construct psychology (cf. Gucciardi & Gordon, 2009b) were followed to uphold the integrity of data collection procedures and provide participants with opportunities to respond in line with their own insights. For example, the initial worksheet activity was completed with minimal, if any, guidance from the focus group coordinator. A final point worthy of acknowledgement is the appropriateness of the

sample for addressing the research questions. A considerable amount of research now exists that suggests that adolescents can serve as a meaningful source of information about their lived experiences. Researchers (Caprara et al., 2006; Shaw, Caldwell, & Kleiber, 1996; K. Williams & McGillicuddy-De Lisi, 1999) have demonstrated that individuals during this stage of development can offer rich data about their encounters, coupled with insightful interpretations.

**Data Analysis**

The focus groups and individual interviews were transcribed verbatim (55 pages of single-lined text) and coded using a four-stage interpretative phenomenological procedure (Storey, 2007). This procedure was employed because it allowed participants' responses pertaining to personal characteristics to be analyzed in an inductive manner. Stage one of the procedure involved the reading and re-reading of transcripts (and, in this case, worksheet responses as well), and the journaling of notes relevant to the text. The second stage involved returning to these notes to identify themes that integrated participants' phenomenologies (i.e., their subjective understandings). Single words or short phrases that summarized and conveyed meaning were written alongside the notes from stage one. The third stage involved the linking of themes and identification of thematic clusters. The analysts (i.e., members of the supervisory team and me) categorized words and phrases from the previous stage together based on apparent similarities. In the fourth stage, the actions from the previous three tasks were compiled and presented in summary tables (see Table 1 and 2). Following this four-stage procedure, factors thought to contribute to mental toughness development were analyzed alongside the four properties of the bioecological model (i.e., proximal processes, person factors, ecological contexts, and time).

**Trustworthiness**

Three traditional techniques were employed to ensure trustworthiness of the data (Lincoln & Guba, 1985). First, two researchers – a third-party researcher (unaware of the aims of the study) and me – both experienced with qualitative research methods independently analyzed the data. This initial round of transcript assessments revealed 80% agreement between the two analysts.

Subsequently, the members of my supervisory team made comments about discrepancies and, together, the third party analyst and me, discussed their interpretations of the data until consensus was reached. Finally, a detailed overview of the results was presented to all participants following analysis. Participants were asked to reflect on and verify the accuracy of the analysts' interpretations. Participants voiced no disagreements during this presentation.

## Results and Discussion

I begin this section with an overview of the personal characteristics identified by participants across performance contexts, employing notions drawn from the bioecological model to help categorise each. Subsequently, the factors that emerged from the interviews as contributors to the development of these personal characteristics are then discussed. These findings are then interpreted in light of the bioecological model. Finally, general conclusions about the findings of the current study are discussed, especially with regards to the unique contributions of the research and proposed directions for future research.

### Personal Characteristics

Nine personal characteristics emerged from the data collected during the worksheet activity. They included four personal forces – *persistence, drive, high self-expectations, and support seeking* – and five personal resources – *forethought, social intelligence, heightened awareness, self-belief, and optimistic thinking* (see Table 1 for descriptions, opposite poles, and representative quotes of each). In line with the bioecological model, personal forces were characterized by temperaments and motivations of individuals that promote both the degree and endurance of emotional and behavioural control. Further, personal resources were characterized by the past experiences, skills, and intelligences of developing individuals. Participants reported no personal demands, which is contrary to previous mental toughness research. A possible speculative explanation for this omission may be that adolescents are naïve about how characteristics such as their age and gender influence the actions of those around them and, as a consequence, affect their development.

Despite the omission of personal demands, the nine personal characteristics reported were otherwise consistent with previous research that has examined mental toughness in sport. Self-belief (cf. belief), drive (cf. motivation), heightened awareness (cf. sport intelligence), optimistic thinking (cf. resilient attitude) and high self-expectations (cf. personal values) are mirrored in those personal characteristics reported in Connaughton et al.'s (2011) synthesis of the mental toughness literature. Persistence shared conceptual territory with how Connaughton et al. (2011) described coping, but extended beyond simply overcoming obstacles to also include sustained efforts during non-challenging tasks. Control and physical toughness did not emerge in the current study despite evidence for these two personal characteristics in previous conceptualizations of mental toughness. The former may not have emerged as the ability to control one's experiences may be indicative of advanced development and more likely to emerge in more mature, older samples (Chubb, Fertman, & Ross, 1997). Physical toughness may not have emerged for two reasons. First, physical attributes are unlikely to be deemed important to performances in non-athletic pursuits (e.g., music, academia). Second, even within athletic pursuits, if physical attributes are ever-changing, as they are during adolescence, performers may be more inclined to place greater value on more stable personal characteristics, especially those under their control. Additionally, the notion of a disciplined focus, which has appeared in numerous past conceptualization of mental toughness and which is theorized as central to performance contexts (Lazarus, 2000), was only discussed by participants from sport and music settings. For this reason, it was not included in the final conceptualization. It is possible that a disciplined focus is central to performing to the best of one's abilities, but only in settings where external distractions (e.g., audience noise, the conductor, opponents) are salient during performance, as in sport and music settings.

Forethought, social intelligence, and support seeking were unique personal characteristics that emerged in the current study. The emergence of forethought may be due to the perceived increased

Table 1.

Personal Characteristics that Comprise Mental Toughness with Corresponding Contrasting Poles, Descriptions, Representative Quotes, and Frequencies per Performance Context.

| | Emergent pole (frequency) | Representative quote | Opposite pole | Representative quote |
|---|---|---|---|---|
| Personal Forces | Persistence: The ability to be effortful on tasks even and especially when faced with obstacles. (S = 5; A = 5; M = 3) | I'm motivated to achieve goals even if the situation isn't ideal. | Lazy: A tendency to give up, leave tasks unfinished, or complete the bare minimum. | If tasks are too difficult or time consuming they are not complete. |
| | Drive: A strong appreciation for and/or desire to engage in familiar as well as novel tasks (often motivated by passion or enjoyment). (S = 4; A = 3; M = 3) | I like learning about the topic and enjoy working on it. | Unmotivated: A waning enthusiasm to participate in familiar and novel tasks. | They aren't interested in the task or, otherwise, feign interest in it. |
| | High self-expectation: A desire to achieve one's potential. (S = 5; A = 5; M = 4) | I'm always trying to make my work or my form better. | Compromising: A tendency to be satisfied with mediocrity. | When people can't be bothered to try their best. |
| | Support seeking: A willingness to ask for and accept the help of others. (S = 2; A = 3; M = 1) | I ask questions constantly to gain the information I need to achieve good outcomes. | Support avoider: An arrogance and/or fear of seeking the support of others. | They are too proud or too shy to ask for assistance. |

| | | | | |
|---|---|---|---|---|
| Personal Resources | Forethought: The ability to set, balance, and commit to competing life demands. (S = 1; A = 3; M = 3) | I plan specific times to complete tasks and also consider rest times and extra curricular activities. | Unorganised: An inability to manage more than one task at a time or balance multiple tasks | They complete tasks at random and don't consider other commitments. |
| | Social intelligence: An awareness of and ability to engage with others using pro-social behaviours to facilitate goal achievement. (S = 5; A = 3; M = 5) | I can easily work with others to achieve positive outcomes. | Inconsiderate: A cold, disrespectful, and/or selfish disposition towards others. | They can't work with others or be trusted to complete things. |
| | Heightened-awareness: The ability to use a knowledge of one's self, immediate surroundings, and in-the-moment experiences to being about goal achievement. (S = 2; A = 4; M = 1) | I am able to watch and understand what is happening around me. | Ignorant: Take experiences for granted and fails to contemplate what is occurring in and around them. | They are disinclined to question current pr provided methods. |
| | Self-belief: A belief in one's abilities to bring about goal achievement. (S = 2; A = 2; M = 1) | I believe I can achieve my goals. | Self-doubt or arrogant: Either having too little or too much confidence. | Never being sure of what to do; an overconfidence. |
| | Optimistic thinking: The tendency to expect positive outcomes in the future. (S = 2; A = 2; M = 4) | I keep a positive frame of mind and don't get caught up in the negative aspects. | Pessimistic thinking: A tendency to expect negative outcomes in the future. | Have a negative outlook on life. |

*Note*. S = Sport; A = Academia; M = Music; numbers in parentheses indicates how many participants, by context, reported each emergent and opposing personal resource.

demands on time characteristic of adolescence (e.g., de Anda et al., 2000; Hilbrecht, Zuzanek, & Mannell, 2008). Further, the emergence of social intelligence and support seeking in the current study may be explained by the increased importance placed on social identity and social roles during adolescence (Keating, 2004; Montemayor et al., 1990; Susman & Rogol, 2004). Adult samples from previous mental toughness research may not have identified these personal characteristics because they had already undergone and resolved such experiences and, therefore, did not view them as salient to facilitating their performances. Taken together, my findings suggest that a core group of personal characteristics contribute to the attainment and sustainment of performance standards and that such personal characteristics are consistent across performance contexts and diverge from those thought important by adult athlete samples.

**Developing Personal Characteristics**

Four higher order themes – *significant others*, *supportive social processes*, *critical incidents*, and *curiosity* – emerged as the factors believed to contribute to the development of the aforementioned personal characteristics. Supportive social processes were further characterized by four lower order themes (*autonomy, encouragement, challenge,* and *role modelling*), whereas critical incidents encompassed three lower order themes (*early successes, varied experiences,* and *failures/setbacks*). Significant others and curiosity were not categorized by any lower themes. Table 2 includes definitions and representative quotes of each theme. As with the participants' perspective of the key personal characteristics, considerable consistencies were observed between the adolescents in terms of the factors they believed contributed to mental toughness development. These findings provide preliminary support for the contention that the development of personal characteristics that comprise mental toughness appear to share consistencies across performance contexts. To elucidate these contentions further, the findings of the current study are interpreted in light of the tenets of the bioecological model.

**Integrating Participants' Perspectives with the Bioecological Model**

The four tenets of the bioecological model – proximal processes, personal characteristics, ecological contexts, and time – were visible in the participants' discourse. Both supportive social processes and critical incidents resonated with Bronfenbrenner's (2001) notion of proximal processes. Specifically, my findings revealed that repeated exposure to autonomy, encouragement, challenges, and role modelling was key to mental toughness development in adolescent performers. As one male musician noted about his teacher, "He's *always* [italics added] giving me different forms for competitions and things I wouldn't normally do". Similarly, participants indicated that, rather than isolated incidents, repeated encounters with critical incidents (i.e., early successes, varied experiences, and failures/setbacks) contributed to the development of mental toughness. The critical incidents reported in the current study were also consistent with the bioecological model and emphasise how proximal processes contribute to mental toughness development. Critical incidents contributed to mental toughness development through the continual challenging of individuals' learning, understandings, and abilities. Illustrating this point, one male athlete stated, "I'd rather work off something I did wrong last week thinking how I'm going to do it better next week." As such, a single event was not viewed as contributing to mental toughness development, but rather ongoing, regular exposure to positive and challenging environments. In line with the bioecological model, as proximal processes are the principle property that drives development, it is unsurprising that participants' responses were dominated by themes that reflected this category.

Consistent with personal characteristics, in particular personal forces, as details in the bioecological model, the emergence of curiosity illustrated the agentic role individuals play in their development of the personal characteristics that conceptualize mental toughness. One male musician, for example, described himself as a "black hole" that "takes in all those qualities that are good". In consideration of the bioecological model, person factors are argued to influence the mechanisms that drive development (i.e., proximal processes). In other words, curiosity may

Table 2.

The Higher and Lower Order Themes and Representative Quotes Pertaining to the Development of the Emerging Personal Attributes.

| Higher order theme | Lower order theme (frequency cited) | Representative quote |
|---|---|---|
| Significant others | Supportive social agents viewed as having a direct and significant influence during occasions related to performance . | Dad … Mom … Brother … Sister … Teacher … Coach … Friends … (S = 6; A = 6; M = 6) |
| Supportive social processes: Activities within one's social environment that advances the learning, understandings, and abilities of an individual. | Autonomy: The provision of choice for individuals to self-direct actions. | Dad's a cyclist, but was never pushy, which I liked because I got to develop how I wanted to develop. (S = 2; A = 1; M = 3) |
| | Encouragement: The provision of positive verbal support. | For me there was that close group of [friends] who would help me out much like my parents would. They would affirm me. (S = 6; A = 6; M = 6) |
| | Challenge: The provision of scenarios where individuals are pushed to the limits of their abilities. | The first commandment of an instructor should be to constantly have others out of their comfort zone because in that environment that is where people develop skills whether they believe they can or not. When [instructors] pushed me out of my comfort zone it fed the fire that made me want to keep developing and keep on going. (S = 5; A = 4; M = 5) |
| | Role modelling: The demonstration of adaptive behaviours that result in performance gains. | My family is pretty musical and that made me determined to be as good as them. They gave me a lot of self-belief because they had done so well. (S = 5; A = 4; M = 4) |

| | | |
|---|---|---|
| Critical incidents: Encounters with experiences that offer meaningful opportunities to receive feedback about one's abilities. | Early successes: Positive outcomes experienced during initial encounters with a performance context. | I think starting at a young age is really beneficial because you pick up things quickly and easily, so when you're older, and trying to learn an instrument and you can't pick it up, you might get put off really easily. (S = 4; A = 5; M = 5) |
| | Varied experiences: Exposure to a number of different environments requiring a number of different abilities. | If you start really young, particularly in sport, you can get pushed really hard because you're achieving so well. When you get older that passion goes away because you're doing it so much. (S = 2; A = 1; M = 2) |
| | Failures/setbacks: Exposure to experiences that demonstrate inability on a performance task. | I think the failures that I have motivate me more than the success I might have. I'd rather work off something I did wrong last week and thinking how I'm going to do it better next week. (S = 6; A = 4; M = 5) |
| Curiosity: An interest in one's world and experiences without judgement. | | I guess I'm a very curious person, which is why I pick up a lot of things from the environment that I'm in. (S = 3; A = 4; M = 3) |

*Note*. S = Sport; A = Academia; M = Music; numbers in parentheses indicates how many participants, by context, reported each developmental factor.

influence how supportive social processes and critical incidents contribute to individuals' development. Illustrating this person-environment interaction, curious individuals who encounter failures may be more likely to approach such experiences as opportunities to learn compared to close-minded individuals. Such contentions are further supported by theory and research on curiosity from broader psychology domains (Kashdan & Steger, 2007). It is important to note that curiosity was viewed as a factor that influenced the development of, but that did not conceptualize mental toughness. The notion that personal factors are both producers and products of development is consistent with the bioecological model (Bronfenbrenner & Morris, 2006).

The identification of significant others and the description of how supportive social processes contributed to mental toughness development was consistent with Bronfenbrenner's detailing of ecological contexts, or the physical and social environments that surround developing individuals. Participants highlighted that individuals such as parents, siblings, teachers, coaches, and peers (i.e., significant others) were instrumental in the development of the aforementioned personal characteristics through the types of support they demonstrated (i.e., supportive social processes). Bronfenbrenner, in his bioecological model, stressed that the immediate environments that surround individuals (i.e., microsystems) have a profound effect on development. There were also suggestions from the participants' discourses to support the role of mesosystems and exosystems in the development of mental toughness. For example, role modelling illustrated how individuals, groups, and contexts, could interact, independently of the developing individual, to facilitate mental toughness development. For example, one participant described how his siblings role modelled persistent behaviours in his chosen sport, "I saw my brothers rowing in the first VIII and pushing themselves so hard, that inspired me" (i.e., mesosystems)", but also how his father role modelled similar actions in his work, "dad just manages to keep pushing himself so hard through his work and I've always found that inspiring" (i.e., exosystems). The results of the current study support such tenets of the bioecological model, emphasizing that individuals' immediate and surrounding environments facilitate the development of mental toughness. However, macrosystems

did not emerge and may be explained by participants' limited awareness of the processes that do not closely include or affect them, but that may still contribute to their development.

Time, or the onset of events, in particular critical incidents, was viewed by participants as pertinent to mental toughness development. The reference to *early* successes indicated that not only were positive experiences viewed as central to the development of mental toughness, but also just as central was the timing of such experiences. Further, there appeared a critical phase by which failure and/or setbacks needed to be experienced to develop mental toughness. As examples, one male athlete stated, "more recently, I think the failures that I have had have motivate me more than my successes", whilst one female musician commented, "if you win everything, then when you lose you won't know how to learn from your mistakes, you won't know how you have to improve". This finding, in particular those pertaining to failures and setbacks, comes as a surprise, as intuitively and empirically (e.g., Boekaerts, 1996; Folkman & Lazarus, 1985) negative experiences are more likely to be associated with developmental disruptions. However, it is possible that not only the experience, nor timing, but also personal factors such as a curious disposition, determine the likelihood that failures/setbacks will contribute generatively to individuals' development (Krebs, 2009a). Based on participants' perspectives, if individuals are exposed to failure/setbacks – and/or successes for that matter – at inopportune times then mental toughness development may be impeded. With the aforementioned in mind, time is an important addition to person-environment interactions that facilitate mental toughness development. Participants made no reference to historical time, but, as before, this may be due to adolescents' limited awareness of the events occurring outside those in which they are immediately involved.

Based on the aforementioned discussion, the bioecological model appears to have utility for understanding mental toughness and its development. Importantly, in line with participants' perspectives, the model illustrates the process-person-context-time (PPCT, Bronfenbrenner & Morris, 2006) interactions that contributes to mental toughness development. Previous research, whilst acknowledging these ideas broadly, has not identified the manner in which PPCT properties

interact to facilitate mental toughness development. Support for PPCT interactions provides unique insight into mental toughness development and highlights a substantive contribution of the current study. Despite this contribution, no evidence emerged to support the role indirect ecological contexts or historical time plays in the development of mental toughness. Whilst, as suggested, this might be due to the limited insights of participants, it may also reflect inconsistencies between mental toughness development and tenets of the bioecological model. Further research is required to resolve this uncertainty.

**Conclusion**

This study is among the first to examine adolescents' perspectives on mental toughness and its development in three performance contexts, thereby providing an insight into the generalisability of previous work that has been conducted primarily with elite, adult athletes. Unique to the current study was evidence for three personal characteristics not previously reported in mental toughness research with adult athletes (i.e., forethought, social intelligence, and support seeking). The emergence of these personal characteristics in the current study suggested that mental toughness is conceptualized differently depending on developmental brackets to which individuals belong. Specifically, compared to adults, adolescents appear to require a group of personal characteristics that more closely reflect the developmental milestones they are pursuing (e.g., social and self-identity) in order to regularly perform to or around the best of their abilities regardless of circumstances faced.

Most notably, however, the factors reported as contributing to the development of mental toughness were largely consistent with established theory. The utility of the bioecological model (Bronfenbrenner, 2001) for interpreting participants' perspectives paves the way for a deeper understanding of and investigation into mental toughness development. The congruence between participants' perspectives and the tenets of the model provide preliminary support for the utility of a PPCT interactional approach in future research, as opposed to biasing environmental factors alone. My findings reveal that, for example, whilst individuals might be exposed to meaningful

environmental factors (e.g., task challenges), the influence of such factors on mental toughness development may be in vein unless coupled with adequate support from significant others, appropriate timing, and a curious disposition. Regarding this latter factor, my results suggested that innate qualities may play an important role in the development of mental toughness. While only curiosity was identified, there are grounds to continue research into the agentic role of individuals in their own development. Specifically, the notion of curiosity may highlight the usefulness of other theories in understanding mental toughness and its development (e.g., self-determination theory, Deci & Ryan, 1985). In a similar vein, due to the lack of evidence for particular aspects of the model (i.e., certain ecological contexts and historical time), future research could explore how environments and events that indirectly affect adolescents influence mental toughness development, if at all.

The current study extended upon past research by considering mental toughness and its development in populations beyond those previously considered. Despite this contribution, future research is needed to overcome the limitations of the current study. Specifically, the current study examined adolescence as a broad developmental group. However, some scholars have theorized that development, particularly in performance contexts such as sport, can be separated into smaller developmental brackets (Bloom, 1985). As such, future research could explore mental toughness development in both younger and older adolescents. Another limitation of the current study was the consideration of the perspectives of adolescents from higher socio-economic backgrounds. In light of the emphasis the bioecological model places on ecological contexts, researchers should compare different socio-economic groups to ascertain how the exposure to different environments might contribute to mental toughness development. Enquiry along such lines might also overcome an omission of the current study by also exploring the factors that disrupt or thwart mental toughness development. Such omissions could also be addressed by leveraging off past mental toughness research (Gucciardi, Gordon, Dimmock, et al., 2009) and sampling individuals involved in the development process (e.g., coaches, parents, teachers). Further still, the inclusion of significant

others in future research could also be used as a means of stabilizing the recruitment of performers, especially considering my argument that mental toughness should be considered a self-referenced, as opposed to an other- or task-referenced construct. A final limitation of the current research was the use of cross-sectional data collection. The use of longitudinal qualitative approaches would serve to illustrate individuals' changing experiences and life courses, and would be a fruitful addition to future research (McLeod, 2009). By leveraging off the findings and addressing the limitations of the current study, researchers and practitioners will likely be better placed to support adolescents in their performance pursuits and, potentially, initiate positive trajectories to adult performance.

# CHAPTER III. MENTAL TOUGHNESS IN SPORT: MOTIVATIONAL ANTECEDENTS AND ASSOCIATIONS WITH PERFORMANCE AND PSYCHOLOGICAL HEALTH.

The purpose of Chapter III was to advance the line of enquiry initiated in the preceding study. However, in preparing this chapter I noted that although the bioecological model was a useful framework for understanding the general factors that contribute to mental toughness development, it does not detail the specific mechanisms that underscore these processes. For example, the bioecological model allows researchers to group developmental factors into separate ecological contexts (e.g., coach leadership aligns with notions of the microsystem), but does not indicate how these factors foster or forestall development. As such, I decided to consider a second theory that was consistent with central features of the bioecological model and also appeared useful for understanding the mechanisms that drive the development of mental toughness. In particular, I investigated the utility of self-determination theory, which compliments the bioecological model, as well as evidence from mental toughness research in how it details the contextual processes that contribute to human development. This chapter has been subjected to peer-review and has been accepted for publication by the *Journal of Sport and Exercise Psychology*.

Mental toughness is a term that is often used to describe a collection of psychological characteristics thought to be central to high performance (Butt et al., 2010; Jones et al., 2002). Over the last decade, researchers have expended considerable efforts in attempting to define and conceptualize mental toughness. As such, there have been recent advancements in understanding this concept. To progress this research field further, there is a need to investigate the positioning of mental toughness within a nomological network of relations that includes variables from established theories within the broad field of psychological enquiry. One such theory proposed in the literature as being connected to mental toughness (Gucciardi & Mallett, 2010) is self-determination theory (SDT; Deci & Ryan, 2002). These speculations are also supported in the findings Chapter II of this thesis (e.g., autonomy-supportive environments emerged as a factor important in the development of mental toughness and is also a concept imbedded within SDT). Drawing on a theory such as SDT – the connection between this theory and mental toughness are described in greater detail in the penultimate chapter of this thesis – would expand the boundaries of mental toughness research and provide new perspectives in understanding the development and consequences of this concept. The present investigation is a step toward this direction as it aims to examine how mental toughness is linked to motivational variables encompassed by self-determination theory, as well as psychological health, and objective sport performance.

## Mental Toughness in Sport

Gucciardi, Hanton, Gordon, Mallett, and Temby (in press) recently defined mental toughness as a personal capacity to produce consistently high levels of subjective (e.g., personal goal achievement) or objective (e.g., race times) performance despite everyday challenges and stressors as well as significant adversities. This capacity has been discussed as a collection of personal characteristics including attributes such as self-confidence, optimistic thinking, and psychological resilience, leading to a general consensus that mental toughness is a multidimensional concept (Butt et al., 2010; Jones et al., 2002). In testing this assumption regarding the dimensionality of mental toughness, Gucciardi et al. (in press) found that there was considerable

empirical overlap among such personal characteristics and that a multidimensional construct was limited in terms of discriminant validity. As a result, they proposed and found support for a direct, unidimensional model of mental toughness. They found excellent model fit and good-to-excellent factor loadings for the unidimensional model across three performance groups (i.e., sport, academia, business), as well as strong correlations with theoretically related properties (i.e., perceived stress, performance, goal attainment, thriving). Such evidence highlighted that the personal characteristics reported in previous studies aimed at conceptualizing mental toughness are not readily distinguishable by individuals in performance contexts and therefore called into question the multidimensionality of this concept. Gucciardi et al.'s (in press) work provides a foundation upon which to consider further lines of enquiry that would position mental toughness alongside variables from other theoretical frameworks and help identify associated predictors and outcomes of the concept.

## Linking Mental Toughness with SDT

Although I focus on the links between mental toughness and SDT in this paper, I acknowledge that other theories of motivation (e.g., self-efficacy theory; Bandura, 1977; achievement goal theory; Elliot & McGregor, 2001) are potentially useful for understanding consistently high performance. For example, in line with self-efficacy theory, the degree to which individuals perceive their actions as efficacious will determine how much effort they expend and for how long they persist on tasks (Bandura, 1977). Similarly, findings from achievement goal theory (e.g., Puente-Diaz, 2012) suggest that effortful and persistent actions are determined by how individuals define (i.e., absolute, intra-individual, or normative) and valance (i.e., positive or negative) notions of competence. These motivational theories evidence strong links with behaviours implicit in Gucciardi et al.'s (in press) definition and, hence, are potentially useful in understanding mental toughness. Despite motivational theories such as these holding currency for understanding mental toughness, I focus on SDT in the current study because of previous proposed links between this particular theory and mental toughness (e.g., Gucciardi & Mallett, 2010), as well as to open

debate about the theoretical underpinnings of mental toughness and its development – an avenue researchers have largely neglected in previous research.

Self-determination theory is comprised of five mini-theories, one of which is particularly apt for the present study, namely basic psychological needs theory (BPNT, Deci & Ryan, 2002). In line with BPNT, the optimization of human functioning is contingent on the degree to which individuals perceive the satisfaction of three fundamental psychological needs: autonomy (the belief that one's actions are self-chosen), competence (the belief that one can bring about desired outcomes), and relatedness (the belief that one is meaningfully connected with a wider social network).

I propose that mental toughness is connected to notions that underscore BPNT as it too concerns the optimization of human functioning in performance contexts. In addition, researchers have shown that BPNT variables are predictive of behaviours or characteristics consistent with the definitional and conceptual properties of mental toughness. For example, there is evidence to support associations between psychological needs satisfaction and persistence (e.g., Pelletier, Fortier, Vallerand, & Brière, 2001), effort (e.g., Boiché, Sarrazin, Grouzet, Pelletier, & Chanal, 2008), concentration (e.g., Standage, Duda, & Ntoumanis, 2003), adaptive coping (e.g., Smith, Ntoumanis, Duda, & Vansteenkiste, 2011), and challenging-seeking (e.g., Standage et al., 2003).

Other principles detailed in BPNT are also useful for interpreting mental toughness. In particular, within BPNT, psychological needs satisfaction is dependent on the degree to which autonomy, competence, and relatedness are supported by social environments. Social environments that nurture all three psychological needs are termed autonomy-supportive (despite the title, autonomy-supportive environments support all three psychological needs), whereas those that thwart psychological needs are termed controlling (Bartholomew et al., 2009; Deci & Ryan, 2000). Su and Reeves (2011), in their meta-analysis of the extant literature, identified autonomy-supportive environments as being characterized by the offering of choice (within boundaries), the acknowledgement of feelings or perspectives, the use of non-controlling actions and feedback, the provision of meaningful rationales, and the nurturing of individuals' inner motivational resources

(e.g., curiosity, enjoyment, belonging). In comparison, controlling environments are characterized by the manipulative use of rewards, negative conditional regard, intimidation, and excessive personal control (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010).

In line with previous findings (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011) and recent speculations in the literature (Gucciardi & Mallett, 2010), I propose that the provision of autonomy-supportive environments may lead to the facilitation of mental toughness, whereas controlling environments may lead to the forestalment of mental toughness. Elucidating these suggestions further, previous findings show that factors believed to be responsible for the development of mental toughness share the characteristics of autonomy-supportive environments. In particular, researchers (e.g., Connaughton et al., 2008; Gucciardi, Gordon, Dimmock, et al., 2009) have suggested that mental toughness development is contingent on athletes being afforded opportunities to explore and engage in tasks volitionally (e.g., self-directed learning), perceiving themselves as competent and feeling challenged during learning (e.g., being able to demonstrate skill mastery, engage in competitive challenges), and feeling respected, cared for, and needed by those around them (e.g., positive social support, a sense of belonging). In line with BPNT, autonomy-supportive environments are key to the optimization of human functioning because of how they nurture psychological needs satisfaction, suggesting an indirect association between social environments and functioning through psychological needs satisfaction.

As architects of athletes' experiences, coaches are pivotal in the provision of the social environments that may either foster (i.e., autonomy-supportive) or forestall (i.e., controlling) mental toughness. Although not explicitly focused on BPNT principles, Gucciardi et al. (2009) proposed that coaches who exhibit behaviours consistent with the notion of autonomy-supportive environments (e.g., encourage athlete input, challenge learning, promote mastery, create non-hostile social environments) were more likely to facilitate mental toughness. Gucciardi et al. (2009) also found that coaches who engage in behaviours consistent with notions of controlling environments (e.g., emphasize ego involvement) are likely to thwart mental toughness development. As

articulated above, it is likely that coaching environments are associated with mental toughness indirectly depending on the degree to which such environments nurture individuals' psychological needs.

**Linking BPNT to Adaptive Outcomes through Mental Toughness**

Researchers have shown that athletic performance (e.g., Gillet, Vallerand, Amoura, & Baldes, 2010), as well as positive and negative affect (e.g., Aide, Duda, & Ntoumanis, 2008) are contingent on the satisfaction of psychological needs that result from the provision of autonomy-supportive environments. Findings from related fields of psychological enquiry provides evidence demonstrating that better athletic performances, higher levels of positive affect, and lower levels of negative affect are associated with the personal characteristics consistent with mental toughness conceptualizations (e.g., self-belief, Caprara et al., 2006; success mindset, Elliot & McGregor, 2001; emotional awareness and regulation, Salami, 2011). Further, preliminary research has supported theoretically expected relations between mental toughness and performance (Bell, Hardy, & Beattie, 2013; Gucciardi et al., in press), positive affect, and negative affect (Gucciardi et al., in press). Given the plausible links and preliminary evidence of relations between mental toughness and BPNT variables, performance, and both positive and negative affect, I contest a nomological network of relations that details the antecedents and outcomes of mental toughness. In particular, I propose that BPNT variables facilitate mental toughness that, in turn, results in adaptive athlete outcomes.

The aim of the current study was to explore 1) how motivational variables detailed in BPNT relate to adolescent athletes' mental toughness levels; and 2) the associations between both motivation variables and mental toughness and adaptive outcomes (i.e., performance and positive and negative affect). I was also interested in exploring the indirect relations between coaching environments and mental toughness through psychological needs, as well as the indirect relations between psychological needs and adaptive outcomes through mental toughness. Adolescence was considered because it is a stage of development most commonly associated with interpersonal

differences in mental toughness and, therefore, arguably the most pertinent age group to investigate questions of substantive interest (Bell et al., 2013).

In line with previous research on BPNT, I predicted that athletes who reported higher levels of autonomy support from their coaches would perceive higher levels of psychological needs satisfaction and lower levels of psychological needs thwarting (*H1a*). In contrast, higher levels of perceived coach control was expected to be associated with lower levels of psychological needs satisfaction and higher levels of psychological needs thwarting (*H1b*). Further, athletes who perceived higher levels of psychological needs satisfaction would report higher levels of positive affect, lower levels of negative affect, and faster race times (*H2a*), whilst greater psychological needs thwarting would be associated with lower levels of positive affect, higher levels of negative affect, and slower race times (*H2b*).

Based on the arguments articulated above pertaining to how BPNT variables inform an understanding of mental toughness, I predicted that athletes who perceived higher levels of psychological needs satisfaction would report higher levels of mental toughness (*H3a*) and athletes who perceived higher levels of psychological needs thwarting would report lower levels of mental toughness (*H3b*). I also predicted that, based on preliminary findings (Bell et al., 2013; Gucciardi et al., in press) athletes who reported higher levels of mental toughness would also report higher levels of positive affect, lower levels of negative affect, and quicker race times compared to adolescent athletes who reported lower levels of mental toughness (*H4*). These hypothesized direct relations can are illustrated in Figure 1. Finally I made several predictions pertaining to indirect relations. I predicted that autonomy-supportive coaching environments would be positively (*H5a*) and controlling environments would be negatively (*H5b*) related with mental toughness through psychological needs satisfaction. Conversely, I expected that autonomy-supportive coaching environments would be negatively (*H5c*) and controlling environments would be positively (*H5d*) related with mental toughness through psychological needs thwarting. I also expected that psychological needs satisfaction would be positively (*H6a*) and psychological needs thwarting

would be negatively (*H6b*) associated with positive affect through mental toughness, whilst psychological needs satisfaction would be negatively (*H6c*) and psychological needs thwarting would be positively (*H6d*) associated with negative affect and race times through mental toughness.

## Method

### Participants

Participants were 136 male ($M_{age}$ = 14.39, *SD* = 1.44) and 85 female ($M_{age}$ = 14.29, *SD* = 1.53) cross-country runners recruited from high schools in Australia (*N* = 221). On average, participants had been competing in inter-school cross-country events for 4.47 years (*SD* = 2.57) and trained 2.10 hours per week (*SD* = 1.63).

### Measures

**Demographics.** Participants' age, gender, years competing in cross-country, and number of training hours per week were garnered using single item measures.

**Mental Toughness Index (MTI).** The MTI (Gucciardi et al., in press) is an eight-item direct measure of mental toughness (e.g., "I am able to regulate my focus when performing tasks"). Each question represents one of the eight facets of mental toughness proposed in Gucciardi et al.'s (2011) synthesis of the literature. Participants respond to each item on a 7-point scale (1 = *false, 100% of the time* and 7 *true, 100% of the time*). The scale has received psychometric support with samples of university students, athletes, and employees, and theoretically consistent relations with performance, stress, and psychological health (Gucciardi et al., in press).

**Sport Climate Questionnaire – Short Form (SCQ-SF).** The SCQ-SF is a sport-adaption of the Learning Climate Questionnaire (G. C. Williams & Deci, 1996), which measures athletes' perceptions of coach autonomy support (e.g., "I feel that my coach provides me with choices and options"). Participants respond to the 6-item questionnaire using a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The SCQ-SF has been validated in sport samples (e.g., Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003).

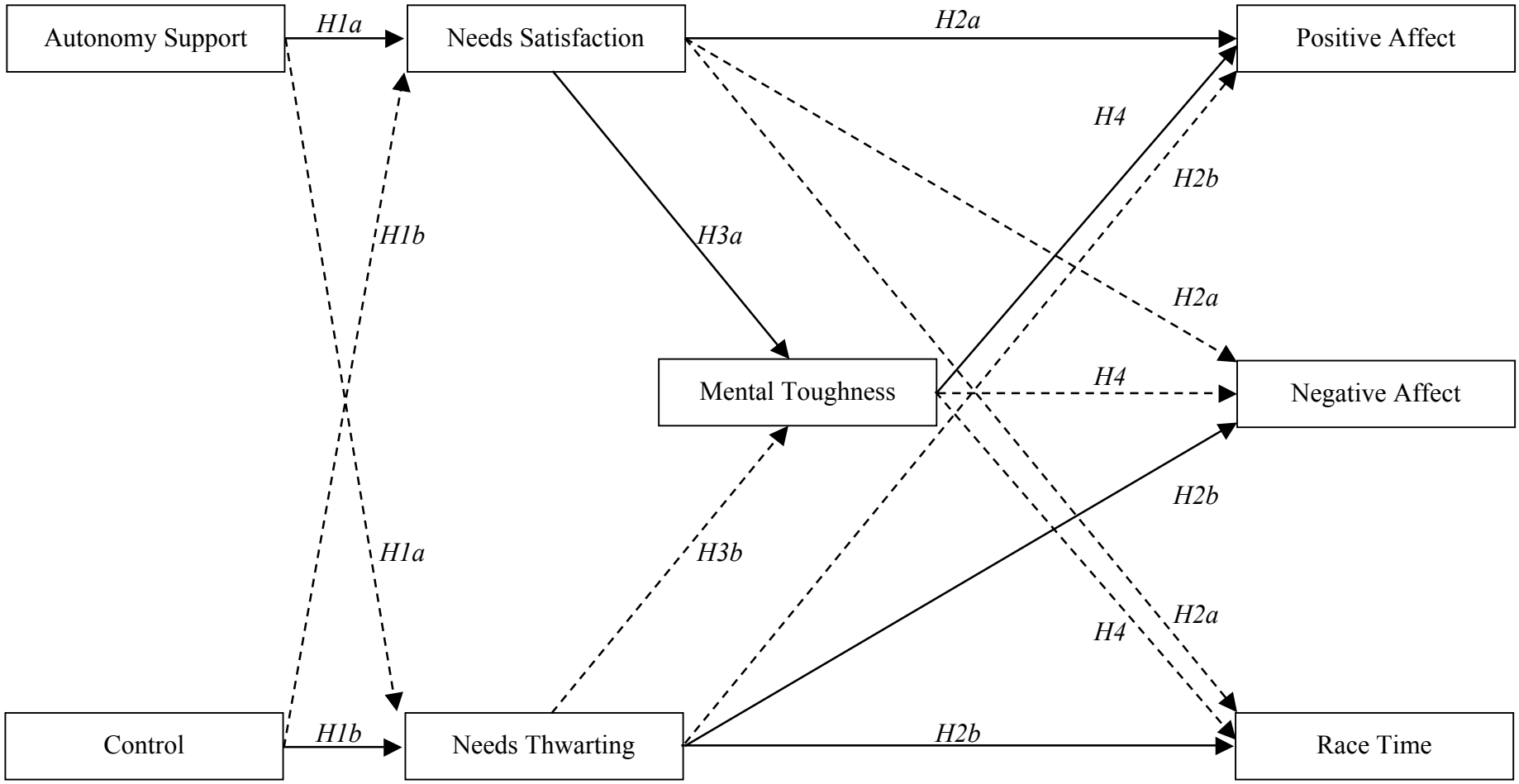


*Figure 1*. Hypothesized direct relations between coaching environments, psychological needs, mental toughness, performance, positive affect, and negative affect (dashed lines denote negative relations).

**Basic Needs Satisfaction in Sport Scale (BNSSS).** The BNSSS (Ng, Lonsdale, & Hodge, 2011) measures athletes' perceptions of competence (e.g., "I am skilled at my sport"), relatedness (e.g., "I show concern for others in my sport"), and autonomy. Ng et al.'s (2011) measure separates autonomy into three categories, namely volition (e.g., "I feel I participate in my sport willingly"), choice (e.g., "In my sport, I get opportunities to make choices"), and internal perceived locus of causality (e.g., "In my sport, I feel I am pursuing goals that are my own"). Participants respond on a scale ranging from 1 (*not at all true*) to 7 (*very true*). Psychometric analyses showed the 20-item measure to have satisfactory internal consistency scores and model fit, and good nomological validity and test-retest reliability (Ng et al., 2011).

**Psychological Needs Thwarting Scale (PNTS).** The PNTS (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011) is a 12-item measure of athletes' perceptions of psychological needs thwarting. This measure includes statements pertaining to the thwarting of autonomy (e.g., "I feel pushed to behave in certain ways"), competence (e.g., "There are situations where I am made to feel inadequate"), and relatedness (e.g., "I feel rejected by those around me"), and requires participants to respond on a seven-point scale (1 = *strongly disagree* and 7 = *strongly agree*). Analyses have revealed support for the three-factor model and internal consistency (Bartholomew et al., 2011).

**Controlling Coach Behaviours Scale (CCBS).** The CCBS (Bartholomew et al., 2010) includes 15 items pertaining to athletes' perceptions of their coaches' behaviours. The scale is comprised of four factors: controlling use of rewards (e.g., "my coach only rewards/praises me to make me train harder"), negative conditional regard (e.g., "my coach pays me less attention if I have displeased him/her"), intimidation (e.g., "my coach threatens to punish me to keep me in line during training"), and excessive personal control (e.g., "my coach tries to control what I do during my free time"). Reponses are rated on a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Statistical analyses have revealed sound content and factorial validity for the measure, as well as internal consistency and invariance across gender and sport type (Bartholomew et al., 2010).

**Psychological health.** Positive affect was measured using the Mental Health Continuum Short Form (MHC-SF, Keyes, 2005). This 14-item questionnaire requires individuals to indicate the degree to which they have experienced certain thoughts and feelings over the past month on a 6-point scale (1 = *never* and 6 = *every day*). Questions are categorized into three factors, emotional (e.g., "happy"), psychological (e.g., "that your life has a sense of direction or meaning to it"), and social (e.g., "that people are basically good"). High internal consistency scores and evidence of discriminatory validity support the use of the MHC-SF (Keyes, 2005).

The 21-item Depression Anxiety Stress Scale (DASS-21) was employed to measure negative affect (Lovibond & Lovibond, 1995). The DASS-21 measures depression (e.g., "I felt down-hearted and blue"), anxiety (e.g., "I felt I was close to panic"), and stress (e.g., "I found it difficult to relax"), and requires individuals to respond on a 4-point scale (0 = *did not apply to me*, 1 = *applied to me to some degree, or some of the time,* 2 = *applied to me a considerable degree, or a good part of time*, and 3 = *applied to me very much, or most of the time*). The DASS-21 has been shown to have strong factor loadings, discriminator validity, and internal consistency (Antony, Bieling, Cox, Enns, & Swinson, 1998).

**Performance.** Race times over varying distances (depending on age and gender) were collected during the end-of-season championship and served as a measure of performance. This event was selected because of the high attendance of athletes and because mental toughness is thought to be most pertinent during pressure-filled performances such as end-of-season championships (Bell et al., 2013). Race times were standardized to account for differences in race distance across age and gender (e.g., 15 year old boys ran 4 km, 15 year old girls ran 3 km). A higher race time equated to poorer performance.

**Procedure**

Following university ethics approval, school staff (i.e., principals and/or sport directors) were approached and informed about the aims and procedures of the research. Information sheets and written consent forms were then distributed to parents/guardians and adolescent athletes during

training sessions. Once parent/guardian and participant written consent was received, participants were asked to complete a booklet that included the abovementioned questionnaires. Participants completed the questionnaires roughly one month before the end-of-season inter-school championship. The demographic questions appeared first in all booklets and the remaining questionnaires were randomly counter-balanced. Race times were recorded during the championship event by race organizers.

**Data Analysis**

Path analysis with a Bayesian estimator was applied in Mplus 7.11 (Muthén & Muthén, 1998-2012) to examine the hypothesized model depicted in Figure 1 (for general examples and descriptions of Bayesian analysis see, van de Schoot et al., 2014; Zyphur & Oswald, in press) including both direct and indirect pathways (see, Yuan & MacKinnon, 2009). Bayesian analysis is an approach that has garnered the interests of sport and exercise psychology researchers in recent years (Doron & Gaudreau, 2014; Jackson, Gucciardi, & Dimmock, 2014). This approach leverages off theory and previous research to form a *prior distribution* – a combination of the specific magnitude and variability of effect sizes. Prior distributions are then incorporated into the analysis to determine the probability of a hypothesized model, given the data (Muthén & Asparouhov, 2012). Prior distributions can range from non-informative, where no prior knowledge is asserted about the magnitude or variance of the parameter, to highly informative, where the distribution is constrained by very precise parameter estimates. These prior distributions are combined with new data to form the *posterior distribution* – an updated understanding of the prior distribution in light of the given data. In totality, all available evidence – prior and current – is considered in the process of Bayesian analysis. Additionally, Bayesian analysis does not depend on asymptotic (large-sample) theory and, as such, provides more accurate estimates of parameters and model fit than frequentist approaches when sample size is small. Another benefit of Bayesian analysis over traditional approaches is that it is more flexible when handling complex models, as the use of prior knowledge incorporates additional information into the analysis that help identify parameter

solutions that otherwise might not be achieved by using a frequentist approach (Asparouhov & Muthén, 2012, July 18).

I used both empirical evidence and theoretical knowledge to guide the specification of priors in my analysis. First, prior knowledge regarding the relations between coaching climate and psychological needs, and psychological needs and psychological health were guided by empirical evidence (Bartholomew et al., 2011). I utilized Bartholomew et al.'s findings because of the similarity between the aims, sample, and measures of their study and ours. For similar reasons, I utilized Gucciardi et al.'s (in press) findings to inform the selection of priors for the relations between mental toughness and both positive and negative affect. The empirically informed priors and their respective variances can be seen in Table 3.

Although the effects of both BPNT variables (Gillet et al., 2010) and mental toughness (Bell et al., 2013; Gucciardi et al., in press) on performance have been examined in previous research, it is difficult and often inappropriate to guide priors when exploring unrelated performances (e.g., mean performances in closed sports are not equivalent to mean performances in endurance sports). Hence, drawing on statistical recommendations (Muthén & Asparouhov, 2012; Zyphur & Oswald, in press) and theoretical expectations, the priors for the effects of psychological needs satisfaction/thwarting on mental toughness were set with a mean of -.40 and a variance of .03, meaning that 95% of the loadings should fall between -.06 and -.74. These means and variances were selected to reflect the expected direction of relations between mental toughness and race times (i.e., inverse relations), as informed by past research, whilst limiting constraints on the strength between these associations (for further details about the use and selection of theoretically informed priors see, Zyphur & Oswald, in press). As the use of different priors can influence the relations between variables (Zyphur & Oswald, in press), I conducted a sensitivity analysis by comparing the hypothesized model (i.e., informed by empirical and theoretical priors) with two other models; one with the same mean parameters but with variances around the expected parameter estimates set to

be highly precise, and another with low precision for the variance of the parameter distribution (see Table 3).

Model convergence is an important consideration for valid estimation and inference with Bayesian modelling. Bayesian analysis employs a sophisticated estimation process known as Markov Chain Monte Carlo (MCMC) whereby the prior distribution is specified and through an iterative process an accurate representation of the posterior distribution is approximated from representative samples of parameter values from the entire posterior distribution (for detailed discussions about MCMC methods and application, see Chen, Shao, & Ibrahim, 2000; Gamerman & Lopes, 2006). At least two MCMC estimation "chains" are run in parallel, each using different starting values for model parameters to ensure the iterative process provides an opportunity to monitor convergence (Muthén & Asparouhov, 2012). Two diagnostic tools can be created from these chains: (i) the potential scale reduction (PSR) factor, which takes into account the overall parameter variability both within and between the chains; and (ii) trace plots, which graphically represent the fluctuation in parameter values as the MCMC estimator iterates toward the solution. A PSR value of $\leq 1.1$ provides evidence in support of convergence to the true posterior distribution, as it suggests that parameter variability could not be appreciably reduced with further iterations (Asparouhov & Muthén, 2010, September 29). Visual inspection of trace plots should indicate that the multiple independent chains have all stabilized to essentially the same distribution (Asparouhov & Muthén, 2010, September 29).

Model fit is subsequently assessed using posterior predictive checking (for more detail, see Lynch & Western, 2004). This method compares the probability of
the observed data against that of the generated posterior distribution of parameters, while taking into account variability in the parameters. Specifically, the posterior predictive *p* (PPP) value indicates the degree of deviation between the observed and generated data and is accompanied by a 95% confidence interval. In line with recommendations (Muthén & Asparouhov, 2012), PPP values

Table 3.

Comparison of Unstandardised Weights of Parameter Estimates of Bayesian Estimates using Different Priors, including Prior Means and Variances of Hypothesized Model.

| | Hypothesized Model | Model A | Model B | Model C |
|---|---|---|---|---|
| Model Fit | | | | |
| PPP (95% CI) | | .43 [-25.00, 29.47] | .43 [-25.06, 29.37] | .43 [-25.19, 29.84] |
| Parameters | Prior Mean (Variance) | μ [95% PPI] | μ [95% PPI] | μ [95% PPI] |
| AS → NS | .46 (.03) | .45 [.18, .74]* | .46 [.40, .52]* | .43 [-.07, .95] |
| AS → NT | -.22 (.01) | -.24 [-.42, -.05]* | -.22 [-.28, -.16]* | -.32 [-.81, .17] |
| CO → NS | -.07 (.001) | -.07 [-.13, -.01]* | -.07 [-.13, -.01]* | -.08 [-.78, .69] |
| CO → NT | .50 (.03) | .50 [.18, .81]* | .50 [.44, .56]* | .50 [-.24, 1.25] |
| NS → MT | .40 (.03) | .43 [.14, .72]* | .40 [.34, .46]* | .47 [-.02, .96] |
| NS → PA | .66 (.03) | .48 [.18, .79]* | .65 [.59, .71]* | .30 [-.34, .95] |
| NS → NA | -.16 (.005) | -.15 [-.28, -.02]* | -.15 [-.21, -.09]* | -.12 [-.78, .44] |
| NS → RT | -.40 (.03) | -.39 [-.72, -.05]* | -.40 [-.46, -.34]* | -.35 [-1.20, .46] |
| NT → MT | -.40 (.03) | -.37 [-.70, -.05]* | -.40 [-.46, -.34]* | -.31 [-.99, .39] |
| NT → PA | -.10 (.001) | -.10 [-.17, -.04]* | -.10 [-.17, -.04]* | -.18 [-.88, .52] |
| NT → NA | .24 (.01) | .22 [.04, .41]* | .24 [.18, .30]* | .14 [-.43, .85] |
| NT → RT | .40 (.03) | .38 [.05, .72]* | .40 [.34, .46]* | -.29 [-.51, 1.13] |
| MT → PA | .57 (.03) | .39 [.09, .69]* | .56 [.50, .62]* | .21 [-.45, .90] |
| MT → NA | -.18 (.005) | -.18 [-.31, -.05]* | -.18 [-.24, -.12]* | -.20 [-.81, .40] |
| MT → RT | -.40 (.03) | -.39 [-.72, -.05]* | -.40 [-.46, -.34]* | -.35 [-1.22, .48] |

*Note.* Model A = originally hypothesized model; Model B = variance around the expected parameter estimates of original model was set to be highly precise (i.e., .001 or a 95% limit of ± .06 around the mean); Model C = variance around the expected parameter estimates of original model was specific with low precision (i.e., .20 or a 95% limit of ± .87 around the mean). AS = autonomy support; CO = controlling; NS = needs satisfaction; NT = needs thwarting; MT = mental toughness; PA = positive affect; NA = negative affect; RT = race times.
*CI did not encompass zero.

closer to .50 reflect good fitting models where the real data is just as probable as the generated data and, as such, should be preferred when comparing competing models. Throughout my analyses I considered parameters to have gained substantive support when the 95% credibility interval (95% CI) did not encompass zero. It is necessary to note that credibility intervals are different from the more common confidence intervals from Frequentist approaches. Both credibility and confidence intervals service a similar aim: to provide the best estimate of the true nature of the parameter. However, credibility intervals incorporate prior knowledge into the estimate and represent an

estimation of the probability that the true value of a parameter falls between two bounds (i.e., upper and lower intervals), whereas confidence intervals are based solely on the data and estimate a range in which the parameter would occur over time with repeated sampling (Curran, 2005). In interpreting credibility intervals, researchers can conclude, for example, that they are 95% certain that the true value of the parameter exists between the upper and lower bounds. In comparison, researchers interpreting confidence intervals could conclude that, on average, 95% of intervals generated via repeated sampling would contain the true value of the parameter (for further discussions, see, Curran, 2005)

## Results

Table 4 includes descriptive statistics, reliability scores, and correlations of the study variables and relevant demographic markers. Model convergence was supported through a smooth decrease in PSR values at the first iteration and PSR stability once < 1.1 was reached, as well as visual inspection of trace plot. All three models (see Table 3) demonstrated sound fit indices. In light of these results, and in keeping with prior findings, I focus my discussions on the hypothesized model (i.e., Model A).

Bayesian estimates and 95% CIs for the associations between the study variables for all three models are summarized in Table 3. Theoretically consistent relations were evidenced between social environments and psychological needs. In particular, autonomy-supportive environments were positively associated with psychological needs satisfaction and negatively associated with psychological needs thwarting. Further, controlling environments were positively associated with psychological needs thwarting and negatively related with psychological needs satisfaction. Psychological needs were also strongly associated with mental toughness, as well as positive and negative affect, and performance. Specifically, psychological needs satisfaction was positively associated with mental toughness and positive affect, and negatively associated with negative affect and race times. Further, psychological needs thwarting was positively associated with negative affect and race times, and negatively associated with mental toughness and positive affect. Finally,

Table 4.

Descriptive Statistics, Reliability Scores, and Correlations for all Study Variables.

| | Variables | *M (SD)* | Skew. | Kurt. | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Age | 14.36 (*1.47*) | | | - | | | | | | | | | |
| 2 | Years | 4.47 (*2.57*) | | | 0.22** | - | | | | | | | | |
| 3 | Hrs/wk | 2.10 (*1.63*) | | | 0.02 | 0.08 | - | | | | | | | |
| 4 | AS | 5.27 (*1.16*) | -.74 | .61 | 0.27** | 0.12 | 0.16* | (.88) | | | | | | |
| 5 | CO | 2.22 (*0.92*) | .77 | .31 | -0.15* | 0.01 | 0.05 | -0.32** | (.88) | | | | | |
| 6 | NS | 5.53 (*0.80*) | -.60 | .39 | 0.07 | 0.03 | 0.20** | 0.53** | -0.26** | (.89) | | | | |
| 7 | NT | 2.57 (*1.05*) | .53 | -.21 | -0.23** | -0.07 | -0.05 | -0.52** | 0.58** | -0.40** | (.88) | | | |
| 8 | MT | 5.48 (*0.78*) | -.63 | 1.00 | 0.06 | -0.01 | 0.18** | 0.31** | -0.24** | 0.59** | -0.38** | (.79) | | |
| 9 | PA | 4.97 (*0.74*) | -1.34 | 2.59 | 0.05 | 0.05 | 0.05 | 0.33** | -0.13 | 0.46** | -0.34** | 0.40** | (.90) | |
| 10 | NA | 0.53 (*0.41*) | 1.18 | 1.36 | -0.30** | -0.07 | -0.06 | -0.23** | 0.25** | -0.29** | 0.43** | -0.37** | -0.38** | (.84) |
| 11 | Race time | 0.00 (*0.98*)[†] | .71 | .26 | -0.02 | -0.21** | -0.22** | -0.16* | -0.04 | -0.22** | 0.43** | -0.21** | 0.02 | 0.08 |

*Note*. Skew = Skewtosis; Kurt = Kurtosis Years = years competing in cross-country; Hrs/wk = hours per week spent training in cross-country; AS = autonomy-supportive environments; CO = controlling coaching environments; NS = psychological needs satisfaction; NT = psychological needs thwarting; MT = mental toughness; PA = positive affect; NA = negative affect; Race time = performance times standardized across age, gender, and distance run; internal reliability estimates (Cronbach's alpha) provided on the diagonal in parentheses.

* $p < .05$. ** $p < .01$. [†] Z-scores, race time standardized across age, gender, and distance run.

mental toughness was strongly associated with positive and negative affect, and race times as hypothesized. Specifically, mental toughness was positively related to positive affect and negatively associated with negative affect and race times.

Psychological needs satisfaction mediated the relation between autonomy-supportive environments and mental toughness, as well as the relations between controlling environments and mental toughness. Similarly, psychological needs thwarting mediated the relations between autonomy-supportive environments and mental toughness, as well as controlling environments and mental toughness. Further, mental toughness mediated the relations between psychological needs satisfaction and positive and negative affect, and performance, as well as psychological needs thwarting and positive and negative affect, and performance (Table 5).

## Discussion

Guided by basic psychological needs theory (Deci & Ryan, 2002), mental toughness is a concept that can be positioned within a nomological network of relations that provides an insight into to its motivation antecedents and relations with performance and psychological outcomes. The aims of the current study were to explore 1) how motivational variables detailed in BPNT relate to adolescent athletes' subjective levels of mental toughness and 2) the associations between both motivation variables and mental toughness and adaptive outcomes (i.e., performance and positive and negative affect). I was also interested in exploring how coaching environments and mental toughness were indirectly related through psychological needs, as well as how psychological needs and adaptive outcomes were indirectly associated through mental toughness.

In the first instance, all direct relations between the coaching climate and psychological needs (*H1a-b*), and between psychological needs and outcome variables (*H2a-b*) were supported. These findings compliment previous research that has identified associations between social environments and psychological needs, and between psychological needs and outcome variables (Deci & Ryan, 2000; Ntoumanis, 2012). Beyond these results, the major substantive findings of my

Table 5.

Unstandardised Weights of Parameter Estimates for Indirect Effects of Variables in Model A.

| Mediation variable<br>Indirect path | Estimate (*SE*) | 95% PPI |
|---|---|---|
| Needs satisfaction | | |
| Autonomy-supportive → Mental toughness | 0.18 (*.03*) | [0.04, 0.41]* |
| Controlling → Mental toughness | -0.03 (*.02*) | [-0.07, -0.01]* |
| Needs thwarting | | |
| Autonomy-supportive → Mental toughness | 0.08 (*.02*) | [0.01, 0.22]* |
| Controlling → Mental toughness | -0.17 (*.02*) | [-0.42, -0.02]* |
| Mental toughness | | |
| Need satisfaction → Race time | -0.16 (*.04*) | [-0.39, -0.01]* |
| Need thwarting → Race time | 0.13 (*.02*) | [0.01, 0.37]* |
| Need satisfaction → Negative affect | -0.07 (*.02*) | [-0.17, -0.01]* |
| Need thwarting → Negative affect | 0.06 (*.01*) | [0.01, 0.16]* |
| Needs satisfaction → Positive affect | 0.16 (*.03*) | [0.02, 0.38]* |
| Needs thwarting → Positive affect | -0.13 (*.01*) | [-0.34, -0.01]* |

*Note.* SE = standard error, PPI = posterior probability interval.
*CI did not encompass zero.

study pertain to the direct and indirect associations involving mental toughness, which highlight a nomological network within which this concept can be understood. To my knowledge, this study is the first to show that psychological needs satisfaction is positively, whilst psychological needs thwarting is inversely associated with mental toughness (*H3a-b*). Although further research is required, one might speculate that to produce consistently higher levels of performance despite obstacles faced – that is, to demonstrate greater levels of mental toughness – individuals need to not only expend a great deal of cognitive and behavioural effort, but also maintain this effort over time. In line with BPNT, the quality and quantity of cognitive and behaviour effort available to individuals is contingent on the degree to which psychological needs are satisfied (Deci & Ryan, 2000). That is, psychological needs satisfaction promotes perceptions of personal control, self-

efficacy, and self-value that result in the maintenance of high levels of effort. In comparison, psychological needs thwarting inhibits individuals' sense of personal control, efficaciousness, and importance, resulting in a reduction or forfeiting of effort – behaviours that reflect lower levels of mental toughness.

I also found that mental toughness levels were positively associated with positive affect and inversely associated with negative affect and race times (*H4*). These relations are consistent with preliminary evidence in sport (Bell et al., 2013; Gucciardi et al., in press). Further, these data provide additional support for Gucciardi et al.'s (in press) definition of mental toughness (i.e., that higher levels of mental toughness are representative of better performances) and helps shore up the conceptual foundations of this concept by highlighting meaningful associations. However, there are numerous avenues that researchers need to consider before firmer conclusions can be drawn about the adaptive potential of mental toughness. A recommendation previously presented in the literature (Andersen, 2011) concerns the perceptions and actions of injured athletes who are more mentally tough. It is possible that such individuals would jeopardize their recovery by ignoring feelings of pain and not adhere to rehabilitation recommendations in order to pursue competition goals, meaning that mental toughness is maladaptive in particular contexts. Researchers could investigate such contexts to further explore whether or not mental toughness is solely adaptive or also relates to maladaptive outcomes.

I also found support for the expected indirect association between coaching environments and mental toughness through psychological needs (*H5a-d*). These findings are consistent with a body of previous research which has shown environmental supports and outcome variables to be indirectly related through psychological needs (e.g., Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011). However, my findings are unique as they are, to my knowledge, the first to identify associations between BPNT variables and mental toughness. My findings extend on previous research by Gucciardi et al. (2009) who reported that different coaching styles can foster or forestall mental toughness development. I agree with Gucciardi et al.'s (2009) conclusions, but also extend

them by contesting that the degree to which coaching environments nurture psychological needs is one mechanism through which coaches may contribute to mental toughness development.

A final substantive finding of my study was the indirect relations between psychological needs and adaptive outcomes through mental toughness (*H6a-d*). Above I proposed that psychological needs satisfaction promoted continuous, high effort because of an increased sense of personal control, efficaciousness, and self-value, and that this was reflective of mental toughness. I extended this line of thinking by suggesting that higher levels of continuous effort are more likely to result in individuals feeling as though they are mastering new skill, goal achievement, and a sense of productivity and, as such is likely to enhance perceptions of positive affect. The opposite could be said of individuals who expend little effort on tasks because their psychological needs are thwarted. That is, less effort is likely to result in stagnation, underachievement, and reduced productivity and, as such, is likely to produce greater levels of negative affect. However, due to the cross-sectional nature of this study, such conclusions are, at best, speculative and require alternative methods to those employed above to substantiate such claims.

Some shortcomings of the current study offer possible avenues for future research. The first notable limitation was the use of a cross-sectional methodology. The use of longitudinal methods in subsequent studies would allow researchers to monitor changes in social environments, psychological needs, mental toughness, and markers of human functioning (e.g., positive affect, performance). Another possible methodological avenue to overcome the cross-sectional limitation of the current study would be to conduct an experimental trial where coaches are exposed to a training program aimed at fostering more autonomy-supportive and less controlling interpersonal styles. Athletes' perceptions of coaching behaviours, psychological needs satisfaction, and mental toughness could then be monitored at the end of the intervention and at follow-ups to determine the causal effects of BPNT variables on mental toughness. A second limitation of the current study was the sole emphasis on coaching environments. Coaching environments were selected in the current study because of their prevalence in previous mental toughness literature (e.g., Connaughton et al.,

2008; Gucciardi, Gordon, Dimmock, et al., 2009), but also because coaches often form strong relationships with adolescents as they emancipate from their primary caregivers (Jowett & Timson-Katchis, 2005). Nevertheless, parents and peers are two other groups identified as playing a meaningful role in the provision of autonomy-supportive or controlling environments (Su & Reeve, 2011), as well as mental toughness development (e.g., Connaughton et al., 2008). Researchers could explore how other social agents contribute to psychological needs, mental toughness, and associated outcomes. A third limitation of this study concerns the manner in which prior distributions in the Bayesian analysis were informed. Specifically, a single source informed the selection of some priors, whereas others were theoretically informed. I acknowledge that ideally these priors would have been informed by point and variance estimates of effect sizes obtained from meta-analyses and that it is impossible to account for variability across contexts with such sparse prior knowledge. In line with changing trends in statistical enquiry and the growing interests in Bayesian approaches in particular, I suggest that researchers continue to add to the pool of available data on topics such as mental toughness in order to allow substantiated conclusions to be formed. Finally, as alluded to in the introduction of this paper, SDT is but one lens through which to consider mental toughness and its development. Other theories such as self-efficacy theory (Bandura, 1977) and achievement goal theory (Elliot & McGregor, 2001) may be useful for understanding mental toughness and its development and should be considered in subsequent research.

Taken together, my findings represent several meaningful contributions for understanding mental toughness. They provide new insight into how motivational variables proposed by BPNT are linked to mental toughness and highlight a conceptual model that helps researchers to understand some of the antecedents and consequence of mental toughness. Conceptually, I believe findings such as those reported in this study advances mental toughness research by directing it into a new wave of enquiry. Further exploration along these lines is required to offer a more comprehensive understanding of the positioning of mental toughness amongst other psychological concepts and its value in supporting optimal human functioning.

# CHAPTER IV. AN AUTONOMY-SUPPORTIVE INTERVENTION INTENDED TO DEVELOP MENTAL TOUGHNESS IN SPORT.

The intention of this chapter was to build on evidence garnered in the previous study to examine cause and effect relationships. Based on the findings of the study presented in Chapter III, I wanted to explore if manipulating SDT principles would alter mental toughness. In particular, I was interested in evaluating the effectiveness of an intervention that educated sport coaches about the why and how of autonomy-supportive coaching. Autonomy-supportive interventions have been evaluated in other contexts, but surprisingly not sport. Also, other interventions have been investigated for the development of mental toughness, but none have considered motivational principles as a possible avenue for developing mental toughness. As such, an autonomy-supportive intervention intended to develop mental toughness is sport is both timely and meaningful.

With an increased understanding of mental toughness and its key components (see, Gucciardi & Gordon, 2011), researchers have shifted their attentions and efforts from these foundational topics to exploring the factors that predict mental toughness development (Gucciardi, Gordon, Dimmock, et al., 2009; Weinberg et al., 2011). In so doing, researchers have attempted to ground understanding of mental toughness development in established theory from broader fields of psychological enquiry. In particular, one group of researchers have argued for (Mahoney, Gucciardi, Ntoumanis, & Mallett, 2014b) and provided preliminary evidence (Mahoney, Gucciardi, Ntoumanis, & Mallett, 2014a) to support the usefulness of self-determination theory (SDT, Deci & Ryan, 1985b) for understanding mental toughness development. The purpose of the current study was to extend on these recent advances by evaluating the effectiveness of an SDT-informed intervention for developing mental toughness in a sport setting.

## An Overview of Mental Toughness and SDT

Although a thorough review of mental toughness literature is beyond the scope of the current paper, a basic comprehension of the theoretical proponents of this concept is necessary for understanding the proposed link between mental toughness development and SDT principles. A number of definitions of mental toughness have been offered in the past decade (e.g., Gucciardi et al., 2008; Jones et al., 2007). Despite some differences, these definitions share considerable conceptual space. Gucciardi, Hanton, Gordon, Mallett and Temby (in press) acknowledged these similarities, and defined mental toughness as the capacity to consistently reach high performance standards, especially when faced with challenges, stresses, and adversities. Based on this definition, mental toughness is a concept that broadly references the optimisation of human functioning. Like mental toughness, the optimisation of human functioning is also a central focus of SDT – in particular, the processes and conditions that foster and forestall such functioning (Deci & Ryan, 2000). As such, the notion of optimal human functioning forms the conceptual bridge that joins understandings of mental toughness development and SDT principles.

Within the context of SDT (for a review see, Deci & Ryan, 2000), the optimisation of human functioning is predicated by the satisfaction of three fundamental psychological needs, namely autonomy (i.e., the perception that one's actions are self-directed and volitional), competence (i.e., the perception that one has the ability to bring about desired outcomes), and relatedness (i.e., the belief that one is valued by and connected to wide social networks). Indeed, researchers have consistently demonstrated strong associations between psychological needs satisfaction and indicators of optimal human functioning (for reviews, see, Deci & Ryan, 2000; Van de Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2014). Scholars have also demonstrated that psychological needs satisfaction is contingent on the provision of particular psychosocial conditions, as well as the absence or restriction of others (Bartholomew et al., 2009; Deci & Ryan, 2000). Researchers have contested that, within sport, coaches are the primary social agent who determine the degree to which athletes' psychological needs are satisfied or thwarted. Mageau and Vallerand (2003) suggested that certain coach behaviours promote psychological needs satisfaction in athletes, such as offering choices, providing rationales for tasks and limits, acknowledging feelings and perspectives, promoting initiative taking and independent work, and providing non-controlling competence feedback. These coaching behaviours, although suggested (Ntoumanis, 2012) to nurture all three psychological needs, are collectively referred to as autonomy-supportive coaching behaviours.

Bartholomew et al. (2009) suggested that coaches not only need to display autonomy-supportive behaviours, but also avoid or minimize the use of controlling behaviours. These researchers identified that coaches could thwart psychological needs by using rewards to control behaviours, displaying negative conditional regard, intimidating athletes, and enforcing excessive personal control (Bartholomew et al., 2010). Researchers from mental toughness (Gucciardi, Gordon, Dimmock, et al., 2009), have echoed the above arguments, reporting that coaches can support mental toughness development by displaying behaviours similar to autonomy-supportive behaviours (e.g., building meaningful coach-athlete relationships; challenging athletes'

competencies), as well as avoiding or restricting actions similar to controlling behaviours (e.g., bullying athletes; setting unchallenging training goals).

Recently, Mahoney, Gucciardi, Ntoumanis, and Mallett (2014b) provided preliminary evidence connecting SDT principles and mental toughness development. In a group of 220 adolescent cross-country athletes, they found that athletes' perceptions of autonomy-supportive coach behaviours were indirectly related to mental toughness through psychological needs satisfaction (in a positive direction) and psychological needs thwarting (in a negative direction). These authors also reported that controlling coach behaviours were related with mental toughness indirectly through psychological needs satisfaction (in a negative direction) and psychological needs thwarting (in a positive direction). Further still, these authors reported positive associations between mental toughness and adaptive outcomes (i.e., positive affect, performance), and negative associations between mental toughness and maladaptive outcomes (i.e., negative affect). In line with SDT, these authors argued that mental toughness was enhanced through the energizing effects of psychological needs satisfaction (and inhibited through the de-energizing effects of psychological needs thwarting). That is, individuals are more likely to sustain their efforts and persist on tasks – characteristics of mental toughness – when their psychological needs are satisfied because they perceive their actions as emanating from a sustainable internal source (e.g., interests, values), as opposed to uncontrollable external forces and sanctions (e.g., coercion, rewards). Unfortunately, because of the cross-sectional nature of their study, it is not possible to infer causality from Mahoney et al.'s (2014b) findings. However, when considered alongside the theoretical links between SDT and mental toughness mentioned above, Mahoney et al.'s (2014b) study highlights the need for experimental research into the effectiveness of a coach intervention aimed at supporting athletes' psychological needs with the intention of promoting mental toughness development.

To date, only two groups of researchers have evaluated mental toughness interventions. Gucciardi, Gordon, and Dimmock (2009b) evaluated the effectiveness of an athlete-centred

psychological skills mental toughness intervention that was informed by their previous conceptual work (Gucciardi et al., 2008). Bell, Hardy, and Beattie (2013) evaluated a mental toughness intervention informed by literature on stress, in particular, stress-inoculation training. Both research groups garnered support for their respective interventions. My approach differs from these previous works because it focuses on mental toughness development through the provision of optimal motivational coaching environments, thereby adding to the limited body of literature on mental toughness intervention, while also attending to the need for more experimental research in sport informed by SDT principles.

Meta-analytic data has supported the effectiveness of autonomy-supportive interventions implemented across a variety of contexts including healthcare, education and workplace settings (k = 20; N = 916; d = .63; Su & Reeve, 2011). These authors found that autonomy-supportive interventions were most effective when delivered to relatively inexperienced individuals in teaching roles (compared to professionals, parents, and workplace managers). Further, interventions were more effective if they included various forms of media (e.g., reading materials, electronic media), both knowledge- and skill-based content, an instructional period, and were between 1–3 hours in duration.

## The Current Study

This study advances previous work in three important ways. First, it is the first SDT-based intervention with mental toughness as an outcome variable, hence, it makes a unique contribution to both SDT and mental toughness literatures. Second, it experimentally tests previous arguments and correlational evidence that have indicated associations between SDT variables and mental toughness (Mahoney et al., 2014a, 2014b). Third, it provides both quantitative and qualitative evaluations of the effectiveness of the intervention and identifies barriers and solutions for future intervention work in this area.

I hypothesized that coaches would display more autonomy-supportive behaviours and less controlling behaviours following exposure to an autonomy-supportive intervention. Additionally, I

predicted that athletes' perceptions of autonomy-supportive coach behaviours, psychological needs satisfaction, mental toughness, and vitality (as a measure of positive psychological functioning), as well as objective performance would increase after coaches had undergone the intervention. In contrast, I expected that athletes' perceptions of controlling coach behaviours, psychological needs thwarting, and burnout (as a measure of negative psychological functioning) would decrease following the intervention. I expected that these changes would be sustained eight weeks after the end of the intervention. As this study represented one of the very few controlled experiments designed to assess the effectiveness of an autonomy-supportive intervention with coaches, I also interviewed coaches to gather their thoughts on the strengths and weaknesses of the intervention. The aim of these interviews was to gather information that could help strengthen future efforts in this area of research and practice.

## Method

### Participants

Adolescent athletes and their respective coaches were recruited from four rowing clubs in the UK. All four clubs competed in locally and nationally coordinated rowing events. Within each club, coaches were not designated to one or more particular groups of rowers. Instead, coaches took a collective approach to training and shared coaching responsibilities across athlete cohorts. All coaches had been awarded their primary coaching certificates in the past year. As such, the recruitment of coaches complimented Su and Reeve's (2011) recommendations regarding the implementation of autonomy-supportive interventions with individuals in early-career 'teaching' roles. Each club was randomly assigned to either a treatment or delayed treatment condition.

***Group 1: Treatment condition.*** The treatment condition comprised 10 male coaches ($M_{age}$ = 53.88; *SD* 7.51) from two of the four clubs, along with their respective rowers ($n$ = 53; 17 male, 36 female; $M_{age}$ = 15.33, *SD* = 1.31). Rowers in this group had, on average, competed for 1.65 years (*SD* = 1.51) and trained 6.00 hours/week (*SD* = 3.13).

***Group 2: Delayed treatment condition.*** The delayed treatment condition comprised 8 coaches ($M_{age}$ = 47.80; *SD* = 5.26; 1 female coach) from the remaining two clubs. Participants in this group also included rowers from these clubs (*n* = 60; 18 male, 42 female, $M_{age}$ = 14.77, *SD* = 1.68) who had, on average, competed for 2.35 years (*SD* = 1.58) and trained 7.18 hours/week (*SD* = 2.65).

**Measures**

A number of self-report measures, as well as observational checklists and qualitative interviews were employed to address the aims and hypotheses of the study.

**Self-reports.**

*Demographics.* Rowers were asked to respond to single-item questions pertaining to demographic information including age, gender, years rowing, and hours per week rowing. Coaches were asked to respond to single-item questions pertaining to their age, gender, and highest coaching qualification achieved.

*Sport Climate Questionnaire – Short Form (SCQ-SF).* The SCQ-SF is a 6-item questionnaire that assesses individuals perceptions of autonomy support (e.g., "I feel that my coach provides me with choices and options") on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Adapted from Williams and Deci's (1996) Learning Climate Questionnaire, researchers have demonstrated strong internal reliability (Cronbach's $\alpha$ = .93) for the SCQ-SF with sport samples (e.g., Hagger et al., 2003).

*Controlling Coach Behaviour Scale (CCBS).* The CCBS (Bartholomew et al., 2010) is a multidimensional self-report measure that assesses athletes' perceptions of their coaches' controlling interpersonal styles. The measure comprises four factors: controlling use of rewards (e.g., "my coach only rewards/praises me to make me train harder"), negative conditional regard (e.g., "my coach pays me less attention if I have displeased him/her"), intimidation (e.g., "my coach threatens to punish me to keep me in line during training"), and excessive personal control (e.g., "my coach tries to control what I do during my free time"), and is rated on a 7-point scale (1 =

*strongly disagree;* 7 = *strongly agree*). Initial investigation into the psychometric properties of this measure revealed sound content and factorial validity, as well as internal consistency and invariance across gender and sport type (Bartholomew et al., 2010).

*Basic Needs Satisfaction in Sport Scale (BNSSS).* The BNSSS (Ng et al., 2011) measures the degree to which athletes perceive their psychological needs as being satisfied. The 20-item measure contains three factors: competence (e.g., "I am skilled at my sport"), relatedness (e.g., "I show concern for others in my sport"), and autonomy, of which autonomy is further separated into volition (e.g., "I feel I participate in my sport willingly"), choice (e.g., "In my sport, I get opportunities to make choices"), and internal perceived locus of causality (e.g., "In my sport, I feel I am pursuing goals that are my own"). Participants are required to respond to a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*). Initial investigations have revealed sound internal consistency scores and model fit indices for the measure, as well as evidence for nomological validity and test-retest reliability (Ng et al., 2011).

*Psychological Needs Thwarting Scale (PNTS).* The PNTS (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011) is a 12-item measure that requires participants to respond using a seven-point scale (1 = *strongly disagree* and 7 = *strongly agree*). The measure assesses athletes' experiences of their needs being thwarted, namely those for autonomy (e.g., "I feel pushed to behave in certain ways"), competence (e.g., "There are situations where I am made to feel inadequate"), and relatedness (e.g., "I feel rejected by those around me"). Researchers have demonstrated support for this three-factor model, as well as high internal consistency for the measure (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Myers, Martin, Ntoumanis, Celimli, & Bartholomew, 2014).

*Mental Toughness Index (MTI).* The MTI is an eight-item measure of mental toughness (e.g., "I am able to regulate my focus when performing tasks") that requires participants to respond to each item on a 7-point scale (1 = *false, 100% of the time* and 7 *true, 100% of the time*). Initial investigations by Gucciardi et al. (in press) with individuals across performance contexts (e.g.,

education, sport, workforce) supported the psychometric properties of this measure, as well as links with theoretically connected concepts such as performance, stress, and psychological health.

*Athlete Burnout Questionnaire (ABQ).* In its original form, the ABQ (Raedeke & Smith, 2001) comprises three subscales: reduced sense of accomplishment, devaluation, and emotional/physical exhaustion. However, given the length of the overall questionnaire pack in my study, only the emotional/physical exhaustion subscale was included (e.g., "I just feel like I don't have any energy"). This subscale was selected because of its association with markers of psychological needs support (Quested & Duda, 2011), as well as its apparent pertinence to rowing (i.e., a sport with large physical demands as demonstrated by the hours/week spent training). The emotional/physical exhaustion subscale included 5 items, which were each rated on a 5-point scale ranging from 1 (*not at all true*) to 5 (*very true)*. Researchers have found support for the psychometric properties of the measure including internal reliability, as well as factorial, convergent, and divergent validity (Raedeke & Smith, 2001).

*Subjective Vitality Scale (SVS).* Bostic, Rubio, and Hood's (2000) adaptation of the original SVS (Ryan & Fredrick, 1997) was used to measure participants' perceived levels of vitality. This measure comprises 6-items (e.g., "I feel alive and vital"), with respondents indicating their agreement with statement on a 7-point scale (1 = *not at all true*; 7 = *very true*). Bostic et al. (2000) reported support for the single-factor model after removing one item from the original 7-item questionnaire.

**Observations.**

An adaptation of the observational rating scale for teacher and student behaviour employed by Tessier, Sarrazin, and Ntoumanis (2010) was used to assess coaches' behaviours. This checklist requires trained observers to score coaches' behaviours on a 7-point scale across three broad categories: autonomy support (comprising organizational instructions, rationales, coach guidance), interpersonal involvement (comprising coach-athlete interaction), and structure (comprising introduction, leadership, workload, scaffolding, and debrief). Higher scores are reflective of a

greater prevalence of autonomy supportive/need supportive behaviours and the measure has been shown to have adequate intra- and inter-rater reliability (Tessier et al., 2010). Audio-recordings ranged from 37-113 minutes in duration.

**Performance.**

Performance was measured using Model E Concept2 ergometers. Ergometers are land-based training machines designed to simulate rowing technique. Following a five-minute warm up, athlete participants completed 1 km time trials with moderate resistance (gauge 4 on the ergometers).

**Coach interviews.**

Garnered through 1-1 semi-structured interviews, coaches were asked about their impressions of the intervention (e.g., "what did you like/dislike about the workshops?"), as well as their recommendations for future interventions (e.g., "what, if anything, could have been done differently, and how could it have been done?").

**Procedure**

Participant recruitment occurred following ethical approval from an ethics committee of a UK university and coincided with the mid-stage of the summer season (final data collection occurred during the mid-stage of the winter season). In the UK, rowing is a year-round sport that is traditionally separated into two seasons: summer (water-based training) and winter (land-based training). Following recruitment, all coaches and rowers completed their respective questionnaires; rowers also underwent ergometer time trials. Due to limited resources, it was not feasible to collect such data with all 18 coaches. Coach behaviour data were collected from a randomly selected subsample of coaches ($n$ = 6, that is, three coaches per condition) by audio-recording one training session per coach using a lapel microphone attached to an Olympus VN-712PC recorder .

Following baseline data collection, coaches in Group 1 participated in the 8-week intervention (see below). Upon completion of the intervention, athletes from both groups completed again the aforementioned questionnaire package, and underwent the same ergometer time trial. These activities formed the post-intervention and second baseline data collection points for Group 1

and Group 2, respectively. Coaches in Group 2 then participated in the 8-week intervention, before athletes completed the questionnaire package and ergometer time trials for a third time. At this data collection point, coaches' behaviours were again recorded as before, and a randomly selected sub-sample of coaches ($n$ = 5; three coaches from the autonomy-supportive intervention without delay) participated in the semi-structured interviews. These activities formed the follow-up and post-intervention data collection points for Group 1 and Group 2, respectively (see Table 6 for an illustration of the data collection points for the study). The collection of follow-up data 8-week following the completion of the intervention was deemed necessary to establish any maintenance effects of the intervention.

**Intervention**

Consistent with Su and Reeve's (2011) recommendations, coaches attended two 2-hour workshops. The last author, who was knowledgeable about SDT principles and experienced in the delivery of workshops, but who was unaware of the aims and hypotheses of the study (to avoid placing unnecessary emphasis on mental toughness development) and not involved in data collection, delivered these workshops.

The first workshop included both knowledge-based and skill-based activities and was divided into four broad sections. Firstly, coaches were presented with an overview of the theoretical underpinnings of SDT. During this presentation, emphasis was placed on the associated outcomes (e.g., benefits associated with task persistence and engagement, goal achievement, psychological well-being, as well as enhanced creativity, problem-solving skills, and coping abilities) of individuals who perceived psychological needs satisfaction compared to psychological needs thwarting. Secondly, coaching behaviours that have been demonstrated to enhance perceptions of psychological needs satisfaction were detailed (cf. Mageau & Vallerand, 2003). Controlling coach behaviours were also discussed during this time and coaches were encouraged to avoid or minimize the use of such behaviours (cf. Bartholomew et al., 2010). Following this stage of the workshop, a number of worked examples and small group activities were used to offer coaches the opportunity

to demonstrate their knowledge of the information presented. Coaches were presented with workshop booklets that included a number of quizzes pertaining to SDT principles, unfinished practical examples to complete, and questions about autonomy-supportive and controlling coaching scenarios. The first workshop concluded with coaches preparing a training session informed by autonomy-supportive practices. As part of this activity, coaches were asked to action their plans prior to the second workshop.

The second workshop, delivered 1 week after the first, was designed for coaches to discuss their experiences when implementing their training plans. During this workshop, the presenter facilitated discussions, but predominately encouraged coaches to use their knowledge and experiences from the first workshop to identify learning points, as well as help each other troubleshoot difficulties implementing autonomy-supportive behaviours. The second workshop concluded with a summary led by the presenter who reiterated the value and importance of employing coaching behaviours that support athletes' psychological needs.

In the 6 weeks following the second workshop, coaches were emailed supplementary information that related to SDT principles and autonomy-supportive behaviours. These materials included brief educational videos, media articles, and illustrated handouts. Again, the dissemination of these supplementary materials were consistent with Su and Reeve's (2011) recommendations.

Table 6.

Study Timetable Separated by Experimental Group

| Week 1 | | Week 10 | | Week 19 | |
|---|---|---|---|---|---|
| Treatment | Delayed | Treatment | Delayed | Treatment | Delayed |
| Baseline | Baseline 1 | Post-intervention | Baseline 2 | Follow-up | Post-intervention |
| Questionnaire package | | Questionnaire package | | Questionnaire package | |
| Ergometer time trials | | Ergometer time trials | | Ergometer time trials | |
| Audio-recorded coach behaviours | | | | Audio-recorded coach behaviours | |
| Demographic questionnaires | | | | Coach interviews | |

**Coding and analysis of interviews**

Interviews ranged from 35-42 minutes in duration. Due to the intention to investigate coaches' perspectives in an explorative manner, protocols in line with interpretative phenomenology analysis (IPA) were employed to interpret interview data. Protocols in line with IPA allow researchers to garner participant's insights in a way that allows their personal perspectives to emerge without the researcher directing or leading discussions (Sparkes & Smith, 2014). Researchers (e.g., Sparkes & Smith, 2014) have advocated a structured 6-step protocol for IPA.

Steps 1-4 involve the consideration of a single participant's transcript. First, the researcher reads and re-reads the transcript and journals comments next to interesting or significant statements. Employing a higher level of abstraction, the second step requires the researcher to identify and label themes that characterize the comments made during the initial step. The third step involves the marrying of related themes identified in the previous step. Subsequently, the researcher develops a table that synthesized the previous steps. The table includes superordinate and subordinate themes, as well as identifiers that the researcher can use to locate representative quotes. This table serves to guide the fifth step, which involves the identification of similar patterns across other participants' transcripts, allowing for refinements and additions to be made to the original table. Finally, the researcher interprets the results, paying particular attention to translating the themes in light of contextual factors by providing descriptions and examples of each.

Two third-party researchers, trained in IPA but unaware of the aims and hypotheses of the study, conducted the analysis. One researcher completed steps 1-6, whereas the second researcher was provided with a deconstructed version of the results table (including superordinate and subordinate themes, as well as descriptions and representative quotes), and was requested to reconstruct the table. The second researcher's reconstruction was 86% consistent with the first researcher's initial table. The lead author then met with both researchers to discuss disagreements

until a consensus was formed about the hierarchical structure of the analysis. Finally, a detailed overview of the results was presented to the participants following analysis. Participants were asked to reflect on and verify the accuracy of the analysts' interpretations; participants voiced no disagreements.

## Results

### Retention

All 18 coaches participated across the entire duration of the study. However, athlete retention was comparatively poor. Only 61 of the original 113 rowers completed all data collection points. This attrition was due largely to athletes terminating their participation in rowing, and absenteeism during data collection points. With regards to the latter, coaches from all four clubs speculated that school holidays and examinations were the main causes of participant absenteeism. This attrition occurred despite attempts to schedule data collection points outside school holidays and examination periods. The attrition rate of athlete participants across the study is depicted in a CONSORT flow diagram in Figure 2.

### Quantitative Data Analysis

A series of mixed-design (3 time points x 2 conditions) ANOVAs were conducted to analyse the study hypotheses. There were no significant main effects for the study variables across time, except for psychological needs thwarting and burnout. Contrasts revealed that both psychological needs thwarting and burnout scores were significantly higher at follow-up compared to post-intervention, $t(60) = -3.22$, $p < .01$, $d = -0.37$ CI [-0.56, -0.18] and $t(60) = -2.32$, $p = .02$, $d = -0.25$ CI [-0.41, -0.09], and follow-up compared to baseline, $t(60) = -2.40$, $p = .02$, $d = -0.28$ CI [-0.48, -0.09] and $t(60) = -3.34$, $p < .01$, $d = -0.33$ CI [-0.49, -0.16], respectively (these effects were still significant when intention-to-treat protocols were employed). There were no significant main effects for condition, or any significant time x condition interactions across the study variables (see Table 2 for descriptive statistics and a summary of results).

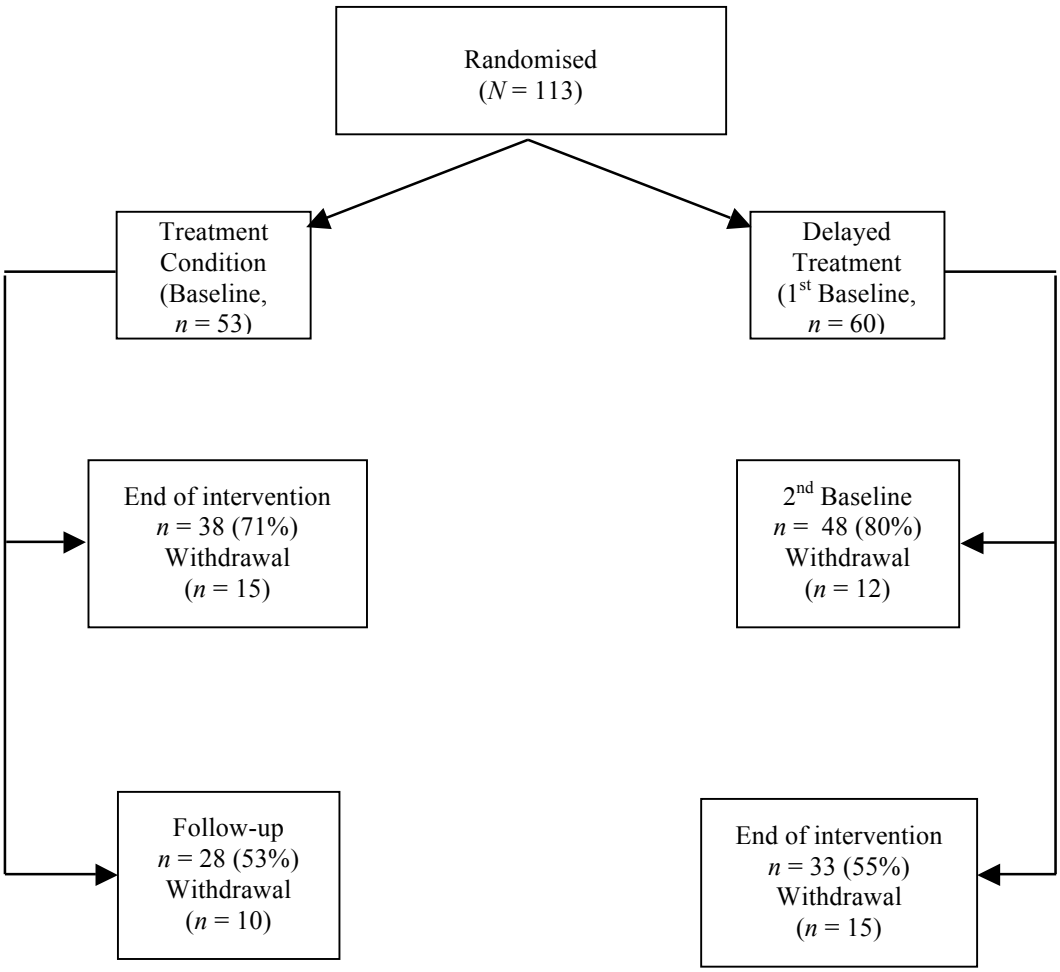


*Figure 2*. CONSORT flow diagram.

**Observational Data Analysis**

Intra-rater reliability analyses were conducted and revealed acceptable consistencies between the scores of the two raters (Ó = .84, 95% *CI* [0.58, 0.97]). A mixed-design ANOVA revealed no main effects for time or condition, or any significant time x condition (2x2) interactions (see Table 7 for descriptive statistics and summary of results).

**Qualitative Data Analysis**

Coaches identified a number of benefits and barriers related to the intervention. Implicit within these comments were recommendations for future interventions. Below I discuss the themes that emerged from the interviews, providing descriptions and examples of each (see Table 8 for a summary of the IPA).

**Intervention benefits.** Coaches identified five benefits of the workshops: the opportunity to share ideas in a group setting, enhanced insight, affirmation of current coach practices, application of

skills beyond rowing, and practical skill use. Coaches expressed the value of the group-based nature of the workshops and how sharing opinions, ideas, and perspectives helped facilitate learning. Most coaches commented that they rarely met with fellow coaches to discuss their practices and that the workshops benefitted from encouraging question asking, discussion, and debate. As an example, one coach stated:

> You got to hear about other people's perspectives. Whether you agreed or disagreed, they're still coaching in that style, they still have that point of view. That helps you make better decisions when you're working with your athletes and it helps you understand your colleagues better when you're coaching with them.

Coaches also reported that their insights about their coaching practices were enhanced through their participation in the workshops. Coaches commented that they typically did not engage in self-reflection and that the workshops offered a unique opportunity to examine their practices, why they engaged in particular behaviours, and the athlete outcomes they were targeting through their coaching. As one coach stated:

> What was interesting was to take a step back and evaluate how much my coaching fits into the different styles and ways of coaching. It was good taking a step back and looking at the research that I could apply to my coaching.

Coaches also identified that the workshops affirmed their current coaching practices. Although such perspectives are supported through athletes' responses to the questionnaires at baseline (e.g., athletes' perceived their coaches as largely autonomy-supportive), they may also explain why some coaches did not report adopting new skills following the workshops. That is, coaches already believed they possessed the skills being discussed in the workshops and, as such, had little room for improvement in these areas. As an example of coaches' perceptions of their knowledge, one coach stated, "[the workshops] affirmed some of my beliefs and approaches. It was a reflection of my value system and what I've been trying to do".

Table 7.

Descriptive Statistics and Results of the Mixed-Design ANOVAs

| Variable and group | Time 1 | | Time 2 | | Time 3 | | Time | Condition | Time x Condition |
|---|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | | | *F* ( $\eta_p^2$) |
| Rowers measures | | | | | | | | | |
| SCQ-SF | | | | | | | | | |
| Treatment | 5.24 | 1.14 | 5.26 | 0.98 | 5.14 | 1.33 | 0.04[a] | 0.50[a] | 0.37 (0.01) |
| Delayed | 5.34 | 1.21 | 5.38 | 1.06 | 5.45 | 1.23 | | | |
| CCBS | | | | | | | | | |
| Treatment | 2.77 | 1.18 | 2.60 | 1.15 | 2.82 | 1.23 | 2.97[b] | 0.39[b] | 0.09 (0.01) |
| Delayed | 2.57 | 0.71 | 2.47 | 0.72 | 2.71 | 1.02 | | | |
| BNSSS | | | | | | | | | |
| Treatment | 5.26 | 0.75 | 5.36 | 0.73 | 5.35 | 0.74 | 0.14 | 0.23 | 0.38 (0.01) |
| Delayed | 5.43 | 0.89 | 5.36 | 0.95 | 5.44 | 0.77 | | | |
| PNTS | | | | | | | 5.87[*] | 0.03 | 0.61 (0.01) |
| Treatment | 2.58 | 1.07 | 2.38 | 0.97 | 2.76 | 1.18 | | | |
| Delayed | 2.47 | 1.07 | 2.47 | 0.99 | 2.90 | 1.16 | | | |
| MTI | | | | | | | 0.05[c] | 0.90[c] | 0.36 (0.01) |
| Treatment | 5.29 | 0.77 | 5.35 | 0.76 | 5.40 | 0.99 | | | |
| Delayed | 5.54 | 0.80 | 5.52 | 0.73 | 5.48 | 0.88 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ABQ | | | | | | | 5.01* | 1.77 | 1.47 (0.02) |
| Treatment | 2.61 | 0.93 | 2.52 | 0.82 | 2.81 | 0.95 | | | |
| Delayed | 2.17 | 0.90 | 2.14 | 0.92 | 2.68 | 0.92 | | | |
| SVS | | | | | | | 0.20 | 0.04 | 0.37 (0.01) |
| Treatment | 4.92 | 1.11 | 5.05 | 1.20 | 5.06 | 1.26 | | | |
| Delayed | 5.08 | 1.16 | 5.12 | 1.19 | 4.98 | 1.05 | | | |
| Performance | | | | | | | 2.70[d] | 0.01[d] | 1.00 (0.03) |
| Treatment | 4.16 | 0.35 | 4.15 | 0.34 | 4.04 | 0.32 | | | |
| Delayed | 4.06 | 0.47 | 4.27 | 0.87 | 4.02 | 0.51 | | | |
| Coach behaviours | | | | | | | 0.45 | 0.04 | 0.94 (0.03) |
| Treatment | 4.33 | 1.06 | | | 4.18 | 0.57 | | | |
| Delayed | 3.96 | 0.85 | | | 4.78 | 1.09 | | | |

*Note.* Epsilon corrected *df* values, [a]*df* = 1.81, 106.92; [b]*df* = 1.70, 100.27; [c]*df* = 1.68, 99.17; [d]*df* = 1.17, 41.95; where not otherwise specified, Time *df* = 2, 118, Condition *df* = 1, 59, Time x Condition *df* = 2, 118; *$p < 0.01$.

Table 8.

Summary of Superordinate and Subordinate Themes, as well as Descriptions, Following IPA

| Superordinate theme and description | Subordinate theme | Description |
|---|---|---|
| Intervention benefits – Positive aspects of and reflections about the autonomy-supportive intervention | Group work | Group discussions and activities supported learning and enhanced understanding (4) |
| | Enhanced insight | Sharing ideas allowed for a deeper understanding of how coaches practiced their trade (3) |
| | Affirming | Workshops emphasized that current coaching behaviours were supported by research (2) |
| | Application beyond rowing | Use of skills from workshop outside coaching (2) |
| | Practical skill use | Use of skills from the workshop in coaching (1) |
| Intervention barriers – Obstacles that inhibited the adoption of autonomy-supportive behaviours | Limited comprehension | Coaches misinterpreted aspects of the workshops, especially notions of coach control and autonomy-support (3) |
| | Relevance to rowing | Coaches felt as though the workshop content was unrelated to rowing (3) |
| | Competing time demands | Coaches were unable to commit to the coaching behaviours suggested in the workshops because of time demands beyond rowing (2) |
| | Relapse to previous style | Reverted to previous coaching style (2) |

*Note.* Number in parentheses denotes number of coaches who referenced the subordinate theme (total $n = 6$)

Coaches identified that the skills that were presented in the workshops were applicable to settings outside of sport. Coaches reported using the skills in their home and work lives. “I liked the content emails where you provided a little snapshot or case study. I’ve passed them onto my own clients from a business sense.” One coach mentioned that he continued to practice the behaviours discussed in the workshops at follow-up. This coach stated: “I really liked the idea about developing autonomy on the water. I was playing with that today actually.” While this is a benefit of the intervention, the limited reference to the application of workshop skills by the other coaches raises questions about why autonomy-supportive behaviours were not more readily adopted (see below for further discussions).

**Intervention barriers.** Coaches also identified four barriers to adopting the autonomy-supportive behaviours discussed in the workshops including, restrictions on time, relapsing into previous coaching practices, limited understanding of the workshop materials, and a dissonance between the workshop content and the performance context. Although only noted by one coach, most coaches (not just those interviewed) appeared to be hindered by time demands. The majority of coaches ($n$ = 17) were employed in fulltime work and/or had family commitments outside rowing. Further, and in support of this point, during informal discussions between the lead researcher and the coaches, coaches often stated that their resources were stretched across large athlete cohorts and that additional coaching staff were needed to unburden their coaching workload. Coaches also believed that, while they engaged in autonomy-supportive behaviours immediately following the workshops, they reverted to their original coaching practices over time. As one coach remarked, “I think I have a default style. Because work is so busy, you try something new for a few weeks, then you become lazy and go back to how you were before”.

Coaches, during their interviews, also revealed, often unknowingly, that they had misinterpreted aspects of the workshops. An example of this theme was a coach who believed that autonomy-supportive coaching meant forfeiting ‘honest’ feedback, when, in reality, coaches who prescribe to autonomy-supportive coaching practices provide frequent, non-controlling feedback to

foster perceptions of competence and strong coach-athlete relationships. This coach said: "Sometimes I would give controlling feedback. [The athletes] prefer the honesty rather than me just being polite". The reason for these barriers may be best explained in light of previous assertions (Reeve, 2009) concerning the difficulties implementing autonomy-supportive behaviours (see below for a thorough discussion of these assertions).

Finally, coaches identified that the workshops did not appear specifically tailored to rowing, but were instead a generic program designed for any sports. One coach stated, "I suppose a bit more time to relate examples from a rowing setting would have been useful".

## Discussion

The aim of the current study was to evaluate the effectiveness of an autonomy-supportive intervention for the development of mental toughness in a sample of adolescent rowers. My hypotheses were not supported in that, according to observational data and athletes' perceptions, coaches did not display more autonomy-supportive behaviours and less controlling behaviours following exposure to the intervention. Additionally, athletes' perceptions of psychological needs satisfaction, mental toughness, and vitality, as well as their objective performances did not increase following the intervention. Further still, athletes' perceptions of psychological needs thwarting and burnout did not decrease following the intervention. These findings contrast with research that has previously evaluated the effectiveness of such interventions in settings similar to sport (Su & Reeve, 2011), and correlational data that has supported links between SDT variables and mental toughness (Mahoney et al., 2014b). Indeed, the only significant findings to emerge from this study were unexpected increases in athletes' perceptions of psychological needs thwarting and burnout. These changes occurred regardless of experimental condition, suggesting that these findings were a result of extraneous variables not directly examined in this study. Increases in land-based training (e.g., weights/ergometer training) over the course of the study may explain these unexpected findings. That is, coaches increased land-based training as the study progressed because of safety concerns following the commencement of the winter season. Some researchers have proposed that

land-based, compared to water-based training, undermines the interests and enjoyment of junior rowers, leading to burnout and dropout (Fraser-Thomas, Côté, & Deakin, 2007), as well as increased risk of injury (Bernstein, Webber, & Woledge, 2002).

There are various possible reasons why the intervention was unsuccessful in altering coaches' behaviours. Based on athletes' baseline scores on the SCQ-SF and CCBS, it might appear that the coaches may have already been engaging in autonomy-supportive and avoiding controlling behaviours prior to the intervention. Hence, it could be argued that researchers should establish specific selection criteria when recruiting coach participants. However, observational data do not closely match the self-reports. Coaches were rated by observers as only moderately autonomy-supportive (and moderately controlling), suggesting that they could have incorporated more autonomy-supportive and less controlling behaviours into their coaching practices. As such, it is worth addressing potential barriers to implementing autonomy-supportive interventions in sport. Researchers and practitioners could consider the barriers identified by coaches in the current study. Although autonomy-supportive interventions are suggested to be most effective when they consist of a theory-based instructional period (Su & Reeve, 2011), such concepts might be beyond the comprehension of individuals who have little exposure to post-secondary education (e.g., tertiary studies). Researchers could devise creative and innovative approaches for supplementing and facilitating the communication of this complex knowledge such as replaying recorded coach-athlete interactions that demonstrate autonomy-supportive or controlling coach behaviours, as well as conduct role-plays and practical examples during workshops. Such approaches should be specifically tailored for individual sports (e.g., rowing role-plays for rowing coaches) so as to highlight the relevance and application of autonomy-supportive behaviours in context.

While some barriers can be addressed by attending to workshop content, other barriers reflect the contextual complexities of implementing autonomy-supportive interventions. Coaches in the current study commented that they did not adopt autonomy-supportive behaviours because of time pressures. Controlling coach behaviours are typically regarded by individuals such as coaches

as a time-efficient approach to communicating information and gaining compliance (Bartholomew et al., 2009). While some controlling coach behaviours may be more efficient initially (e.g., "you'll keep doing this until you straighten your back" is a more efficient statement than, "if you're able to keep your back straight, you may lengthen your stroke and move the boat faster"), they do not promote sustained learning and may have associated long-term negative consequences (e.g., increased negative affect).

In addition to time pressures, coaches also acknowledged that they reverted to previous coaching styles following the intervention. Researchers have argued that individuals who are predominately oriented towards being controlled by external directions and sanctions are less likely to exhibit or, following an intervention, adopt autonomy-supportive behaviours (Deci & Ryan, 1985a; Reeve et al., 2014). These orientations have been discussed as a "pressure from within" that inhibits the adoption of autonomy-supportive behaviours (Reeve, 2009). Coaches' motivational orientations were not assessed in the current study, however, their resistance to adopt autonomy-supportive behaviours may reflect well-learned behaviours that align with controlling orientations. Reeve's et al. (2014) suggested that individuals' perspectives about the value of autonomy-supportive or controlling practices is a result of cultural norms. As sport tends to value controlling over autonomy-supportive coach behaviours (Mageau & Vallerand, 2003), it may be that, before autonomy-supportive interventions are implemented, researchers need to address the barriers perpetuated by these culture norms.

However, altering the cultural value placed on controlling behaviours may take considerable time and effort. Drawing on conceptual literature (Mageau & Vallerand, 2003; Reeve, 2009), coaches may feel pressured to employ controlling behaviours because of demands imposed on them. These pressures may emanate from above (e.g., the inherent power of their social roles as coaches, the belief that coaches are responsible and accountable for athletes' performance) or below (e.g., responding to passive athlete behaviour). Researchers could address pressures on coaches by developing strategies that help de-emphasise the power differential between coaches and athletes;

working with key stakeholders (e.g., parents, club executives, sport governing bodies) to loosen the responsibility and accountability of coaches; highlighting and providing examples of the differences between notions of control and structure; communicating that while not intended, controlling behaviours further undermine athletes' interests and engagement; and educating individuals that controlling coaching does not equate to competent coaching. These recommendations are a meaningful starting point, but researchers also need to acknowledge that certain pressures (e.g., the cultural value placed on controlling behaviours) would require considerable effort and time to reduce (Reeve et al., 2014). Part of this work might entail working with sport governing bodies to educate key stakeholders, as well as coaches, about the coaching behaviours that are most likely to promote positive athlete development and growth.

As a broader recommendation, autonomy-supportive interventions may be more effectively implemented and evaluated if greater efforts are made to collaborate with the recipients of the intervention prior to its commencement. Recently, scholars have suggested that researchers and key stakeholders (e.g., coaches) need to collaborate prior to the development and implementation of behaviour change interventions (Michie, West, & Spring, 2013). Researchers may even choose to follow current national guidelines for supporting the involvement of industry and community groups (INVOLVE, 2013). For example, prior to the commencement of interventions, coaches could be involved in identifying and prioritising what aspects they want to change, as well as offered the opportunity to comment on the intervention material developed. The reason for this bottom-up – as opposed to the traditional top-down – approach is to attend to the needs and values of individuals who participate in behaviour change interventions. Through collaboration, it is argued that individuals (e.g., coaches) will engage more in behaviour change because their own psychological needs will be nurtured (McLean & Mallett, 2011). If such measures can be introduced with success, researchers may have a greater chance of uncovering support for SDT informed approaches for the development of mental toughness.

# CHAPTER V. THE MOTIVATIONAL ANTECEDENTS OF THE DEVELOPMENT OF MENTAL TOUGHNESS: A SELF-DETERMINATION THEORY PERSPECTIVE.

Although my attempt to implement an autonomy-supportive intervention for the development of mental toughness was unsuccessful (Chapter IV), there are still strong grounds to believe that SDT principles inform the development of mental toughness. This perspective is established on conceptual discussions and empirical evidence. To highlight these works and to emphasise the value of SDT principles for understanding mental toughness and its development, I have composed a conceptual essay that bridges these two fields of research. In so doing, I offer a novel conceptualisation of mental toughness that also compliments notions consistent with SDT. Specifically, I conceptualise mental toughness as referring to notions of *striving*, *surviving*, and *thriving*. These concepts represent a synthesis of knowledge about mental toughness drawn from previous research. As such, they are not new ideas, simply an attempt to bring some clarity to the field. For example, thriving, while a 'new' concept to this thesis, is implicit in definitions and conceptualisations of mental toughness. Such points are discussed in detail throughout the following chapter. This chapter has been subjected to peer-review and has been accepted for publication by the *International Review of Sport and Exercise Psychology*. The text presented below is identical to that accepted for publication, with minor exceptions (e.g., where necessary, the voice of the narrator was changed from first person plural to first person singular).

In sport, athletes who sustain unprecedented winning streaks, are victorious against all odds, persist in the face of adversities, and, amongst other feats, come from behind to win are often described as possessing some degree of *mental toughness*. However, despite its constant use in sport settings – not to mention more than a decade of research (Gucciardi & Gordon, 2011) – an agreed upon understanding of mental toughness remains elusive. As an example of this ambiguity, Andersen (2011) highlighted that over 70 attributes, characteristics, behaviours, constructs, cognitions, and emotions have been cited in past literature conceptualizing mental toughness. Despite this conceptual ambiguity, researchers have often defined mental toughness similarly. In light of available empirical (Butt et al., 2010; Jones et al., 2002; Thelwell et al., 2005) and conceptual literature (Gucciardi, Gordon, & Dimmock, 2009a), mental toughness has commonly been defined as a collection of personal characteristics that allow individuals to regularly attain and sustain performances to the upper limits of their abilities. Why then might researchers define mental toughness similarly, yet conceptualize it differently? In answering this question and to foreshadow my discussions, I suggest that mental toughness may be less about *which* personal characteristics individuals have at their disposal and more about *what* the personal characteristics individuals possess allow them to do.

As mental toughness has been associated with the collective processes that allow individuals to pursue goals with effort and persistence, overcome the challenges of their goal pursuits, and experience positive and adaptive experiences throughout their encounters (Bell et al., 2013; Gucciardi, Gordon, et al., 2009a), I propose that mental toughness can be understood by the personal characteristics that facilitate human *striving*, *surviving*, and *thriving* (I define and elaborate on these concepts in the following section). A synthesis of components reported in past conceptualizations of mental toughness into themes of striving, surviving, and thriving is represented in Figure 3. My synthesis illustrates that the personal characteristics reported in previous conceptualizations of mental toughness often bridge more than one component of my tripartite reconceptualisation, but that all are able to be subsumed under these three themes.

Further to the discussions about *what* characterizes mental toughness, is *how* it is developed. Researchers have proposed a number of factors that contribute to the development of mental toughness (e.g., Connaughton et al., 2010; Gucciardi, Gordon, Dimmock, et al., 2009; Weinberg et al., 2011), but little effort has been made to synthesize this evidence in a collective and comprehensive fashion. A synthesis of the antecedents of mental toughness would provide further insight into those personal characteristics that are more common and central to conceptualizing this concept. One possibility is to consider mental toughness development in light of established theory and research from broader areas of psychological enquiry. I propose that self-determination theory (SDT, Deci & Ryan, 1985b; Deci & Ryan, 2000) provides a sound basis for understanding the motivational antecedents of mental toughness. Considering the recent interest in mental toughness in sport, but also in other contexts such as surgery (Colbert et al., 2012) where high performance is valued, I believe an understanding of mental toughness and its development via established theory is timely and will allow a foundation upon which to conduct further research.

## Delineating Between Striving, Surviving, and Thriving

For the purposes of this review, and in line with previous theory and research, I define *striving* as efforts individuals expend on achievement tasks (Oettingen & Gollwitzer, 2001), *surviving* as effectively overcoming both major adversities as well as other stressors in the ongoing pursuit of goals (Luthar & Cicchetti, 2000), and *thriving* as growth through daily lived experiences (Benson & Scakesm, 2009; Porath, Spreitzer, Gibson, & Garnett, 2012). I believe the concepts of striving, surviving, and thriving, whilst sharing some conceptual space, are largely distinguishable from each other. Elucidating this contention, individuals can strive for achievement gains, but not necessarily need to survive. For example, a golfer who sets a short-term goal to chip three consecutive balls onto the practice green and succeeds at the first attempt could be said to be

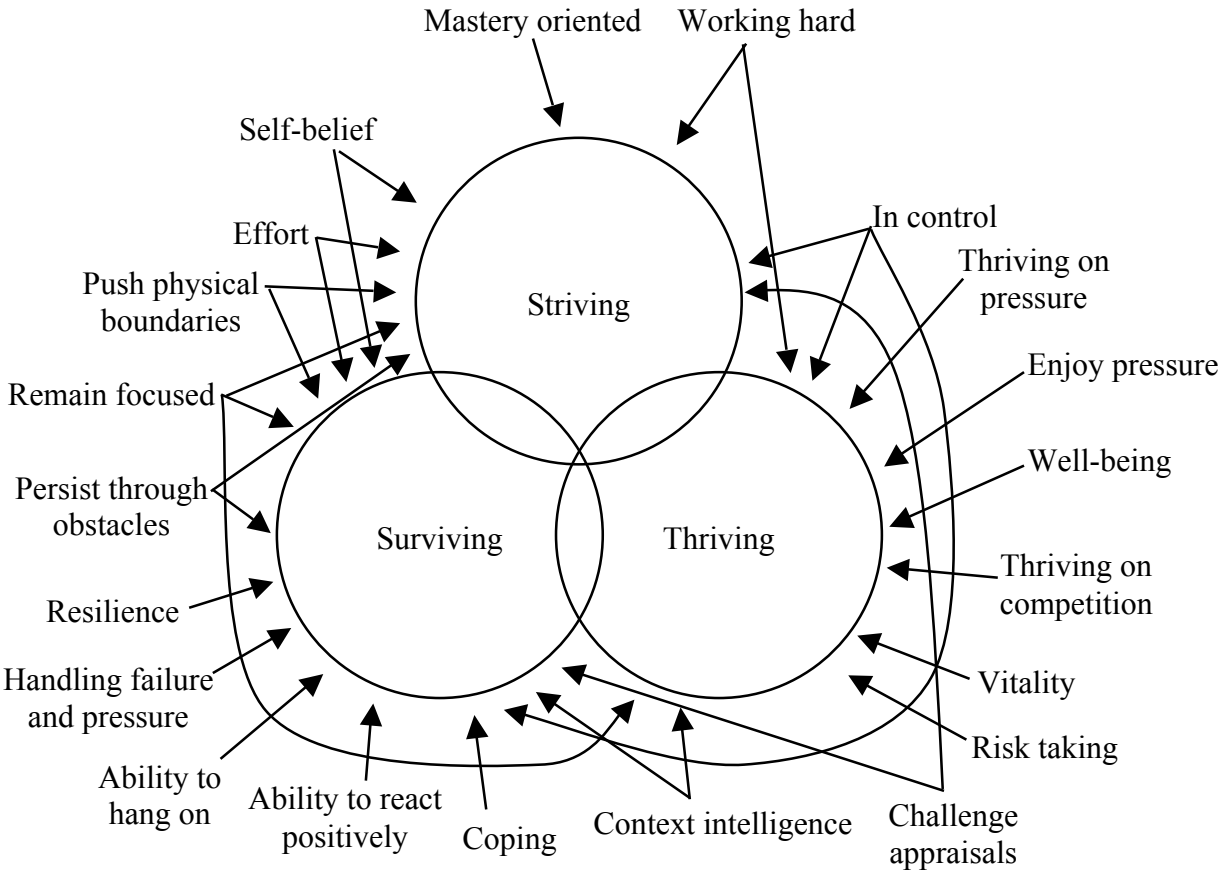


*Figure 3.* A synthesis of prominent previous conceptualizations of mental toughness (Bull et al., 2005; Butt et al., 2010; Clough et al., 2002; Coulter et al., 2010; Gucciardi & Gordon, 2009a; Gucciardi et al., 2008; Jones et al., 2002, 2007; Thelwell et al., 2005) into notions of striving, surviving, and thriving.

striving without needing to survive hardships. Individuals can also strive for goals, but not necessarily thrive in the process. A tennis player might be effortful in her pursuits to master a challenging repertoire of strokes, but might not necessarily feel energized during her performance or believe she has learned anything new if she finds the challenge too difficult. Further, athletes can thrive in their sport without necessarily striving for anything in particular. Athletes on a rugby team who are winning by a substantial margin might not be striving to score more points in the final stages of the match, but might still be energized and/or successfully implementing a new team tactic. Individuals can also thrive without needing to survive. A soccer player might feel energized and alive when participating in his sport or learning new skills, but encounter only negligible

challenges and, therefore, not need to survive any particular hardships. Athletes can also survive, but not be striving. For example, an archer who missed the opportunity to compete at a major event due to a poor performance during qualification might not be striving for achievement goals immediately following his setback, but might still be surviving the disappointment of his failure. Finally, athletes can survive hardships, but not thrive during or as a result. An athlete who incurs an injury, overcomes the associated emotional anguish, and returns to pre-injury levels of functioning personifies surviving, but at the same time she might not feel energized towards her sport or sense she has learned anything new (for further discussions about the distinction between thriving and like concepts, see Sarkar & Fletcher, 2014).

I also argue that mental toughness is characterized by the presence of all three concepts – striving, surviving, and thriving – together. Athletes who are not striving for goal achievement, but still survive and thrive throughout their lived experiences do not reflect mental toughness because they are unlikely to attain performance standards indicative of the upper limit of their abilities. Instead they might simply choose to engage in what is of interest to them, but not necessarily of importance to achieving regular performance standards. Similarly, athletes who strive for goal achievements and thrive throughout their experiences, but are not able to survive hardships, do not reflect mental toughness because they too are unlikely to attain performance standards to the upper limit of their abilities. Instead such individuals are restricted in their goal progressions because the fulfilment of performance standards is intuitively linked with, at some stage, overcoming obstacles. Finally, athletes who strive for goal achievements and survive hardships, but do not thrive throughout their experiences, are not reflective of mental toughness because they are unlikely to be able to sustain their performance standards. Constant, intense effort with the added need to survive hardships, coupled with perceptions of stagnation (i.e., not thriving), is likely to lead to exhaustion and the resignation of goal pursuits. Notions of striving, surviving, and thriving alone are important in their own right, but are not sufficient to define mental toughness, yet together they illustrate the underlying processes that allow individuals to attain and sustain regular high performances despite

circumstances faced. In light of these speculations, one may begin to contemplate how individuals develop the capacities to strive, survive, and thrive. Below I attempt to explore such contemplations and offer a particular theory as a useful foundation from which to better understand mental toughness.

## A Brief Overview of SDT

Self-determination theory (Deci & Ryan, 1985b, 2000) is a meta-theory of human motivation that considers the degree to which individuals' actions are freely chosen and enacted (i.e., self-determined) versus controlled. SDT comprises five mini-theories, one of which is particularly applicable to my reconceptualisation of mental toughness, namely basic psychological needs theory (Ryan, Sheldon, Kasser, & Deci, 1996). Within this mini-theory the degree to which three psychological needs – autonomy, competence, and relatedness – are satisfied is purported to influence the extent to which individuals will undergo positive psychological growth and development. Autonomy refers to the perception that one's actions are volitional; competence is the belief that one is effective in a particular task endorsed by the person; and relatedness refers to the perception that one is connected with wider social structures.

A central tenet of SDT is that the satisfaction or thwarting of psychological needs is contingent on the social contextual factors that surround them. Environments that nurture needs for autonomy, competence, and relatedness are likely to enhance perceptions of these fundamental psychological needs and, consequently, promote growth and development. Although supportive of all three needs, researchers have typically referred to such environments as autonomy-supportive (Deci & Ryan, 2012). According to Mageau and Vallerand (2003), autonomy-supportive environments are characterized by the provision of choice, rationales for task involvement, the acknowledgement of feelings, opportunities for independent learning, and the acknowledgement of negative feelings. Conversely, social contextual factors that undermine psychological needs (controlling environments) are likely to thwart perceptions of autonomy, competence, and relatedness and, consequently, result in stagnation and restrictions of psychological growth and

development. Controlling environments are characterized by the manipulation of behaviours through the provision of tangible rewards, the use of contingent feedback, actions and/or locutions that communicate personal control, intimidating behaviours, the promotion of ego-involvement, and the provision of conditional regard (for a review see, Bartholomew et al., 2009).

## SDT and Mental Toughness Development

I argue that the theoretical underpinnings of SDT make it an attractive backdrop from which to consider mental toughness development. Some authors have speculated that mental toughness development might be underscored by constructs consistent with SDT (e.g., Gucciardi & Mallett, 2010; Mallett & Coulter, 2011), however, to my knowledge, a detailed integration of literature across these research fields has not yet been undertaken.

Of foremost importance to my review is the conceptual premise that I believe binds mental toughness and self-determination research, namely the notion of self-actualization (i.e., the fulfillment of one's potentials, Maslow, 1943). Mental toughness is arguably a process that underscores self-actualization, where self-actualization concerns the degree to which individuals fulfil their psychological heights and reflects human growth and development (Maslow, 1943). In identifying a connection between mental toughness and self-actualization, I also acknowledge that the latter is bound to other notions such as morality and altruism and so mental toughness is not wholly, but rather partly, indicative of self-actualization. Self-actualization has been theorized and evidenced to be predicated on by the satisfaction of psychological needs (Deci & Ryan, 2000; Ryan, Curren, & Deci, 2013). In light of these conceptual binds, I review evidence that supports my contention that the degree to which psychological needs are satisfied precedes mental toughness development and is indicative of self-actualization. I aim to illustrate how autonomy-supportive environments might contribute to the development of mental toughness through the satisfaction of psychological needs. I also aim to evidence that the undermining of psychological needs, emanating from controlling environments, is likely to inhibit mental toughness development (see Figure 4). As mentioned above, to support my arguments I will focus on notions of striving, surviving, and

thriving as representative of mental toughness and detail how components of SDT are foundational to the development of these three concepts.

**Striving**

Drawing on broader psychological literature, striving refers to the efforts individuals expend on achievement tasks (Oettingen & Gollwitzer, 2001). Both the quality and quantity of effort individuals expend is positively related to goal attainment (Sheldon & Elliot, 1999; Silvia, McCord, & Gendolla, 2010). Also, central to the notion of striving is the distinction between individuals' intensity and duration of effort. Because of the positive associations between intensity and duration of effort and goal achievement (e.g., Yeo & Neal, 2004), I suggest that mentally tough individuals are those who maintain a high level of intensity over a prolonged duration. Conceptual elements reported in previous mental toughness research appear to resonate with notions of high, sustained effort, including pushing physical boundaries (Bull et al., 2005; Jones et al., 2002, 2007), working hard (Bull et al., 2005; Butt et al., 2010; Coulter et al., 2010; Gucciardi et al., 2008), remaining focused on a task (Jones et al., 2002, 2007; Thelwell et al., 2005) and persisting through obstacles (Coulter et al., 2010; Gucciardi et al., 2008; Jones et al., 2002, 2007; Thelwell et al., 2005). Actions that are initially effortful, but not sustained across repeated occasions are not indicative of mental toughness because they are unlikely to allow individuals to regularly attain and sustain performances standards (Silvia et al., 2010).

Key aspects of SDT pertinent to my reconceptualisation of mental toughness have been associated with sustained effort (e.g., Ntoumanis, 2001; Pelletier et al., 2001). Findings from this body of research reveal that

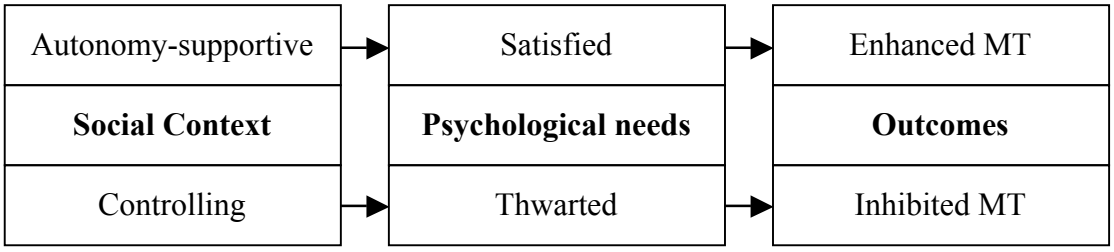


*Figure 4.* Motivational antecedents of the development of mental toughness: A SDT perspective.

individuals whose psychological needs are satisfied are more likely to pursue goals with greater sustained efforts than those whose needs are thwarted. Psychological needs satisfaction precedes individuals' sustained efforts (Vallerand, 1997) because of the internalized perceptions of causality, the belief in skills and abilities, and the sense of social connectedness that emanates from such individuals (Deci & Ryan, 2000). As an example, a hurdler is more likely to sustain her efforts if she believes her actions will affect task outcomes, her skills and abilities are efficacious for achieving task goals, and others support and encourage her during her pursuits. In contrast, individuals are likely to commit less effort over time or forfeit their efforts altogether if their psychological needs are undermined (Bartholomew et al., 2009). Explaining this point, individuals whose psychological needs are thwarted believe their actions are dictated to by external sources (e.g., coach demands), perceive their skills and abilities as being undermined through coercive actions or locutions, and feel bullied or ostracized by others.

In addition to this body of research, Sheldon and Elliot's (1999) self-concordance model of goal pursuits (embedded within SDT) illustrates links that support my point-of-view. Specifically, Sheldon and Elliot proposed that autonomous (i.e., self-selected) goals are pursued with sustained effort because such goals are likely to be aligned with individuals' developing interests and deep-seated values. Consequently, Sheldon and Elliot showed that sustained effort results in goal attainment. In contrast to autonomous goals, individuals who pursue goals for controlled reasons are more likely to forfeit their efforts and goal achievement, especially when faced with difficulties, because such goals hold little personal meaning and are disconnected from individuals' interests. Smith, Ntoumanis, and Duda (2007) have garnered support for Sheldon and Elliot's (1999) model in two studies with British athletes. In these studies, athletes who reported setting autonomous goals were more likely to sustain their efforts and achieve their goals compared to those who reported controlled motives for goal selection. Importantly, Smith et al. found that athletes were more likely to self-select goals if they also perceived that their coaches provided autonomy-supportive environments, whereas controlled goals resulted from controlling coaching environments.

In a recent study, colleagues and I (Mahoney et al., 2014b), explored the relationships between social contextual factors, psychological needs, and mental toughness. Adolescent cross-country runners ($N = 251$) completed a battery of questionnaires 4-6 weeks prior to their championship race. In line with our hypotheses, it was found that autonomy-supportive environments positively predicted mental toughness through psychological needs satisfaction and, conversely, that controlling environments negatively predicted mental toughness through psychological need thwarting. In addition, mental toughness positively correlated with performance. Although our study was limited by the use of self-report measures and cross-sectional methodology, the aforementioned findings suggest that components of SDT may have utility for understanding the striving concept that I argue is indicative of mental toughness.

**Surviving**

Notions of surviving have been evidenced in all previous conceptualizations of mental toughness (e.g., resilience, Gucciardi et al., 2008; handling failure and pressure, Jones et al., 2007; the ability to hang on, Thelwell et al., 2005). Theory and research from diverse fields of psychological enquiry support notions of surviving as central to the attainment and sustainment of high performance, in particular, theory and research on coping and resilience. Although coping and resilience concern individuals' responses following stressors or adversities, mental toughness is as much about these experiences as it is about how individuals respond to successes, achievements, winning streaks, times of rest, and benign situations. Hence, I argue that coping and resilience explain some, but not the entire concept of mental toughness.

Performers who employ effective coping strategies to overcome situational demands typically outperform those who employ ineffective coping strategies (Levy, Nicholls, & Polman, 2011). Although such findings indicate meaningful links between coping and mental toughness, they also raise questions about what is considered effective coping. Researchers (Folkman & Lazarus, 1985; Lazarus & Folkman, 1984) have proposed that individuals who appraise stressors as *challenging* (i.e., individuals feel energized, ardent, and confident about being able to overcome

stressors) are more likely to interpret situations, their personal characteristics, and their options as more controllable, whereas those who appraise stressors as *threatening* (i.e., individuals anticipate damage to their physical or psychological selves) or *harmful* (i.e., individuals perceive damage to their physical or psychological selves as having occurred) are more likely to appraise situations, their personal characteristics, and their options as less controllable. Individuals who appraise their experiences as more controllable are likely to employ problem-focused coping strategies (e.g., planning, effortful actions), whereas those who appraise their experiences as less controllable are more likely to employ emotional-focused coping strategies (e.g., distancing, rationalizing). Neither one of these coping strategies is viewed as inherently superior to the other (Lazarus & Folkman, 1984). Instead, the effectiveness of particular coping strategies is dependent on intra- and inter-individual differences.

Evidence from research on mental toughness appears to align with coping literature. Specifically, mentally tougher athletes have been described as those who use both problem-focused coping (e.g., competitive effort, Coulter et al., 2010; pushing self, Jones et al., 2007) and emotion-focused coping strategies (e.g., emotional intelligence and control, Coulter et al., 2010; accepting anxiety and coping, Jones et al., 2002). Further, mentally tough individuals have been described as those who have a superior knowledge of their performance contexts and their emotional experiences (Gucciardi et al., 2011). Arguably, it is this knowledge that allows mentally tougher individuals to select the coping strategy (either problem- or emotion-focused) that is most likely to facilitate regular attainment and sustainment of performance standards.

Autonomy-supportive environments are theorized to directly, as well as indirectly predict effective coping via the satisfaction of individuals' psychological needs (Ntoumanis, Edmunds, & Duda, 2009). Such theorizing complements my contention that surviving is fostered through concepts central to SDT. Individuals exposed to autonomy-supportive environments are more likely to appraise stressors as challenging because they are afforded opportunities to freely express their feelings, garner guidance and advice, and meet demands with the support of others, whilst not being

exposed to hostility, coercion, and/or judgment (Ntoumanis et al., 2009). For example, a golfer is more likely to view a poor mid-tournament round as an opportunity to grow, learn, and re-apply skills if his coach listens to his worries, offers guidance, and encourages him to meet the demands of the next round. In comparison, individuals exposed to controlling environments are more likely to appraise stressors as threatening and/or harmful because their surrounding social contexts offer little reprieve from the anticipated and feared damages associated with the stressor (Ntoumanis et al., 2009). For example, a golfer who is belittled, made to feel embarrassed, ignored by his coach, and told what to do following a poor mid-tournament round will be more likely to resign his efforts and forfeit his performance goals due to the perceived fear of, or the inability to escape, damage to his self-esteem.

Theory and research on resilience is also pertinent to the concept of surviving – indeed, resilience itself is a personal resource reported in a number of previous mental toughness conceptualizations (e.g., Gucciardi et al., 2008; Jones et al., 2007). Resilience is defined as individuals' abilities to experience positive adaptations or maintain healthy levels of physical and psychological functioning following experiences of adversity (Lepore & Revenson, 2006; Luthar & Cicchetti, 2000). Resilient individuals are often described as those who remain unaffected or return to usual levels of functioning following the experience of adversity (Luthar & Cicchetti, 2000). These views are echoed in research that has conceptualized mentally tough individuals as those able to resist (e.g., dedication and commitment, Bull et al., 2005; focus despite distractions, Jones et al., 2002; ignore distractions, knowing how to grind, the ability to hang on, Thelwell et al., 2005) and recover (bounce back from setbacks, regain psychological control, Jones et al., 2002; react positively, Thelwell et al., 2005) following major upheavals and minor challenges. Seemingly, resilience is inherently linked with the ability to maintain performance standards. That is, following adversities, resilient individuals are those who continue to pursue performance standards with little or no interruption. The link between resilience and performance has been reported in empirical research. For example, Seligman, Nolen-Hoeksema, Thornton, and Moe Thornoton (1990) showed

that swimmers who were rated as more resilient by their coach performed better following adversities compared to less resilient individuals (also see, Fletcher & Sarkar, 2013).

Literature on resilience can also be used to illustrate how each of the three needs proposed by SDT underscore the development of the surviving component of mental toughness. Specifically, autonomous athletes are more likely to perceive their actions as the catalyst for change (Deci & Ryan, 2000) and, as such, are arguably more likely to engage in behaviours directed towards making performance gains following adversities. For example, a tennis player who loses her tour privileges because of poor performances is not only more likely to continue to commit to her training and competitions, but also attempt to develop a stronger skill set if she endorses her actions. In comparison, a tennis player who believes sources other than herself determine her behaviours and outcomes is more likely to retire her efforts after losing her tour privileges or commit to training and competition for non-self-determined reasons (e.g., 'shoulds' and 'musts'). In such a case, the athlete's actions limit the likelihood that positive adaptations will occur.

Competent individuals also personify resilience because they perceive their actions as efficacious in overcoming the adversities they encounter (Fletcher & Sarkar, 2013). For example, upon returning from a long-term injury, a baseball player who perceives he is competent is more likely to attempt to advance his skills further by pursuing goals that challenge his current abilities because he feels able to bring about desired outcomes by personal means. In comparison, a baseball player who returns from a long-term injury and perceives himself as incompetent is more likely to engage in easier, less challenging activities and avoid opportunities for growth, meaning he is limiting the likelihood of positive adaptations occurring following the experience of adversity.

Finally, individuals who perceive themselves as connected with their wider social networks are more likely to experience positive adaptations following adversities because they are supported in their attempts to re-establish their levels of performance, functioning, and development (Galli & Vealey, 2008; Hjemdal, 2007). As an example, a boxer who loses the first rounds of a bout is more likely to direct her actions towards improving her performances in subsequent rounds if she

perceives strong support and encouragement from her coach and trainers. She is likely to act this way because she knows that she will receive unconditional support from those around her regardless of the outcome of the bout. In comparison, a boxer who views herself as being bullied and ostracized by her coach and trainers is more likely to engage in low risk behaviours (e.g., avoid delivering potential knock-out punches) following a losing opening round to avoid further social torment from significant others (Bartholomew et al., 2009).

To conclude, as with striving, research has shown that the provision of autonomy-supportive environments promotes individuals' perceptions of need satisfaction and, in turn, encourages effective coping and resilience (i.e., surviving). In comparison, controlling environments that thwart individuals' psychological needs are likely to undermine individuals' abilities to survive hardships. As such, components central to SDT are useful for understanding how the surviving concept of mental toughness is developed.

**Thriving**

Thriving has been described as an everyday experience where individuals not merely survive, but grow through their daily, lived experiences (Benson & Scakesm, 2009; Porath, Spreitzer, Gibson, & Garnett, 2012). Thriving is conceptualized as comprising two dimensions: feelings of vitality and a sense that learning is occurring (Spreitzer, Sutcliffe, Dutton, Sonenshein, & Grant, 2005). Mental toughness has been conceptualized as thriving on pressure (Jones et al., 2002), thriving on competition (Bull et al., 2005), enjoying pressure, and being in control of one's life (Thelwell et al., 2005). Arguably, these conceptual properties reveal mentally tough individuals as those who do not merely survive hardships, nor make gains through periods of rest alone; these individuals are more often than not experiencing a heightened sense of vitality and feel as though they are mastering new knowledge, skills, and abilities. Further, context intelligence, that is the acquirement and application of knowledge and skills reported in previous mental toughness conceptualizations (e.g., Gucciardi et al., 2011), aligns with the learning dimension of thriving. Illustrating these arguments with an example, a mentally tough weightlifter would be one who is

energized and enthusiastic about participating in her sport, whilst also sensing that she is acquiring and applying new skills, abilities, and knowledge about her performances.

In further support of the value of thriving for understanding mental toughness, individuals who experience ongoing thriving are likely to attain and sustain regular performance standards (Porath et al., 2012; Spreitzer & Sutcliffe, 2007). Individuals who are thriving have also been suggested to commit to performance tasks, practice initiative taking, and be proactive (Porath et al., 2012; Spreitzer & Sutcliffe, 2007). These findings align with evidence from mental toughness research that has emphasized the role of valuing hard work (Bull et al., 2005; Gucciardi et al., 2008), attending to task-cues and ignoring distractions (see, Gucciardi et al., 2011), taking risks (Bull et al., 2005; Coulter et al., 2010), and making the most of opportunities (Bull et al., 2005). As an example, a triathlete who is thriving works hard towards his goals and attempts to advance his knowledge of his sporting domain by taking calculated risks. A triathlete who is not thriving is less confident and committed to his goals, easily distracted, and cautious in his actions.

Researchers (Ryan et al., 2013; Spreitzer & Porath, 2013) have evidenced that thriving is facilitated by mechanisms consistent with SDT (this is particularly true when one considers thriving is often described as reflecting well-being, e.g., Ryan, Bernstein, & Brown, 2010). In particular, when individuals' psychological needs are satisfied, they are more likely to undergo psychological growth and development (Deci & Ryan, 2000). This growth and development is representative of a progression toward self-actualization – or reaching one's full psychological potentials. Not surprisingly then, when individuals are progressing towards self-actualization they emanate considerable psychological energy (e.g., enthusiasm, aliveness). It is this energy that is reflective of feelings of vitality (Deci & Ryan, 2000; Ryan et al., 2013; Spreitzer & Porath, 2013). Researchers have also shown that individuals' energies are maintained and enhanced when their psychological needs are satisfied, and depleted when their needs are undermined (Gagné, Ryan, & Bargmann, 2003; Nix, Ryan, Manly, & Deci, 1999; Ryan et al., 2010; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

Researchers have also illustrated the role social contextual factors play in facilitating the relationship between psychological needs and vitality. Specifically, autonomy-supportive environments have been found to enhance perceptions of vitality through psychological needs satisfaction, whilst the contrary is true of controlling environments (Gagné et al., 2003; Ryan et al., 2010; Vansteenkiste et al., 2004). Thus, it is reasonable to contest that thriving, as one underlying notion consistent with mental toughness, is fostered through the satisfaction of individuals' psychological needs in autonomy-supportive environments.

Although a strong link has been evidenced between SDT and feelings of vitality, support for links between SDT and Spreitzer et al.'s (2005) second facet of thriving, the sense that learning is occurring (Spreitzer & Sutcliffe, 2007), is less discussed in the extant literature. Nevertheless, some researchers have indicated that those individuals whose psychological needs are satisfied are more likely to engage in behaviours that are representative of a sense that learning is occurring. For example, individuals whose psychological needs are satisfied self-guide practice during 'free-choice' periods (i.e., a time when individuals can engage in self-chosen tasks), compared to those whose psychological needs are undermined (Ryan, Koestner, & Deci, 1991; Vansteenkiste et al., 2004). Further, individuals who are exposed to autonomy-supportive social contexts are more likely to evidence deeper levels of processing, whereas those exposed to controlling environments are more likely to report only surface level processing (Vansteenkiste et al., 2004).

Taken together, the aforementioned findings illustrate that individuals' perceived satisfaction of psychological needs, enhanced through the provision of autonomy-supportive environments, predicts thriving. Further, thriving is likely to be inhibited when individuals' psychological needs are thwarted as a result of being exposed to controlling environments. As such, components central to SDT are useful for understanding how the thriving concept consistent with my mental toughness reconceptualisation is developed.

## Conclusions

Unique to my review is my tripartite mental toughness reconceptualisation (i.e., striving, surviving, and thriving). My reconceptualisation represents a theory-based attempt to address disagreements evident in previous research by directing the focus away from the collection of personal characteristics that comprise mental toughness and instead focusing on what the personal characteristics individuals possess allow them to do. In so doing I have argued that mental toughness is indicative of how athletes strive, survive, and thrive in their ongoing pursuits of performance standards. Despite this novel contribution to the literature, there is a need to empirically substantiate my contention that striving, surviving, and thriving serve as a useful unifying reconceptualisation for mental toughness. One approach would be to identify if established measures of striving, surviving, and thriving load meaningfully onto a general factor of mental toughness and explore the shared variance between these factors. Beyond factorial analysis of these concepts, researchers could experimentally manipulate variables such as pressure to examine if my tripartite reconceptualisation distinguishes those individuals who sustain performance standards across low- and high-pressure conditions, with individuals who succumb to the pressure manipulation and perform worse.

Also unique to my review is the consideration of the motivational antecedents of mental toughness using a SDT lens. Specifically, I contested that striving, surviving, and thriving – as representative of qualities reported in previous mental toughness research – are predicted by the degree to which individuals' psychological needs are satisfied through the provision of particular social contextual factors. Specifically, I argued that autonomy-supportive environments facilitate mental toughness development through the provision of needs satisfaction and autonomous goal striving, whereas controlling environments thwart mental toughness development through the undermining of individuals' psychological needs and the promotion of controlled goal striving. It is necessary to acknowledge that SDT is only one lens through which to consider mental toughness development. In the future, the consideration of other theoretical frameworks outside the motivation

literature (e.g., the bioecological model of human development, Bronfenbrenner & Morris, 2006) would be fruitful for composing a comprehensive understanding of mental toughness development.

My contentions also hold practical value for individuals invested in the development of athletes. For example, coaches could attempt to provide autonomy-supportive training environments, whilst avoiding the use of controlling sanctions, to nurture psychological needs and encourage striving, surviving, and thriving in their athletes. I believe that the ideas I have presented offer researchers and individuals such as coaches new insights into mental toughness and its development, as well as promote future research along these lines.

# CHAPTER VI. GENERAL CONCLUSION.

My intentions for this thesis were to explore the factors that contribute to mental toughness development by considering the perspectives of individuals during critical stages of growth (i.e., adolescence), and to embed such understandings within established theories from broader fields of psychological enquiry. My intentions were underscored by four specific objectives. First, I aimed to explore the innate and environmental factors that contributed to mental toughness development. Second, I attempted to embed understandings of mental toughness development within established theories. Third, I attempted to identify and evaluate a mental toughness intervention. Finally, I attended to the issue of participant recruitment in previous studies by considering the perspectives of individuals during critical stages of development (i.e., adolescence). In this concluding chapter, I will summarise the findings from the investigations within this thesis, and offer conclusions about the substantive contributions of my work to the research field, as well as recommendations for future research.

## How do Individuals in Critical Stages of Life, in Particular Adolescence, Understand Mental Toughness Development?

The above question was empirically addressed in Chapter II. Employing qualitative methodologies, I garnered the perspectives of mentally tough adolescents. Based on my findings, I proposed that mental toughness develops over time, predominantly as a result of exposure to particular environmental factors, but that innate factors also play a central role. I also suggested that these innate factors are relatively dormant during childhood and begin to surface during adolescence. My findings were largely complementary of previous research (i.e., significant others, social processes, critical incidents, Connaughton et al., 2010; Thelwell et al., 2010), but several unique factors emerged (e.g., *curiosity*), providing support for the contention that the development of mental toughness is conceptualized differently across life stages. That is, being open to new experiences and exploring one's environments with interest may promote learning in adolescence and foster mental toughness, but may become less central to mental toughness development over time as individuals become more familiar with their surroundings and competent on tasks. Taken

together, adolescents offer new perspectives about mental toughness and its development that both complement and advance the literature. This said, due to the narrow sampling of participants (i.e., only one culture was explored), these conclusions should be extended to other groups with care.

**What Theory or Theories are Useful for Understanding Mental Toughness Development in Adolescents?**

I directly addressed this question across each chapter of my thesis. My initial intentions were to propose a framework for understandings mental toughness development (Chapter II). After considering numerous theories, I selected Brofenbrenner's bioecological model of human development (Bronfenbrenner & Morris, 2006). I chose this framework primarily because of the consistencies it shared with my findings and those of other mental toughness researchers, but also because it was a robust framework that encapsulated central principles of other prominent developmental theories (Bronfenbrenner & Morris, 2006). The bioecological model is useful for explaining the development of mental toughness because of the value it places on both innate and environmental factors. Further, these factors are detailed in substantial depth through the PPCT interactions detailed by Bronfenbrenner in his model (Bronfenbrenner & Morris, 2006).

Beyond simply identifying a robust framework, I also wanted to embed understandings of mental toughness development within a theory that could be used to inform a mental toughness intervention (Chapters III and IV). However, the bioecological model only describes developmental activities and offers little specificity in the way of informing applied research. As such, I returned to the literature in search for a theory that had both consistencies with the bioecological model and also had applied implications. Additionally, although not dismissing the importance of innate factors, I deemed it appropriate to select a theory that focused primarily on the environmental factors that influence development. I believed that this was a reasonable approach considering the breadth of evidence pertaining to the environmental factors that influence mental toughness development and because this would more likely lead to the identification of a theory that could be

used to inform a mental toughness intervention. To service these ends, I selected Deci and Ryan's theory of self-determination (Deci & Ryan, 1985b, 2000).

A preliminary investigation revealed meaningful associations between key principles of SDT and mental toughness (Chapter III). In light of these findings, I attempted to evaluate an intervention, informed by SDT, for the development of mental toughness (Chapter IV). Results garnered from this investigation indicated that contextual pressures may have hindered the implementation of the intervention and, as a result, no changes in mental toughness were recorded. My findings highlighted the applicability of SDT principles to understanding mental toughness development, but also the barriers to implementing such principles in sport contexts. I also composed a conceptual essay to more thoroughly elucidate the mechanisms that underscore the role SDT principles play in mental toughness development (Chapter V). This essay offered further conceptual insights into the value of SDT for understanding mental toughness development and reflected the opinions I had formulated over the course of my doctoral candidature. In so doing, my conceptual proposals offer useful directions for future research, especially regarding the behavioural components of mental toughness and the theoretical underpinnings of this concept.

## Are Interventions Informed by Self-Determination Theory Principles Effective in Developing Mental Toughness in Adolescents?

As noted above, the intervention evaluated in Chapter IV was not effective in developing mental toughness in adolescents. I argued that contextual pressures hindered the adoption of autonomy-supportive behaviours. I propose that, based on cross-sectional findings reported in Chapter III and the conceptual arguments outlined in Chapter V, as well as evidence from other studies that have employed similar approaches (Su & Reeve, 2011), an intervention informed by SDT principles is still of value to the development of mental toughness. However, there is a need for researchers to evaluate such interventions while also taking into consideration and addressing the barriers I outlined (e.g., managing feelings of responsibility for athletes' achievements).

## Substantive Contribution to the Research Field

Through this doctoral thesis, I have offered several substantive theoretical, methodological, and applied contributions to the research field of mental toughness.

### Theoretical

Although most researchers have previously contested that mental toughness develops as a result of exposure to particular environmental factors, a small group have also argued that mental toughness is innate (Golby & Sheard, 2006). Even fewer researchers have suggested that mental toughness might originate from both environmental and innate factors (Connaughton et al., 2011). In addressing the uncertainties present in the literature, I considered the innate and environmental origins of mental toughness together and, provided a framework for understanding the interplay between them. To these ends, I utilised Brofenbrenner's (Bronfenbrenner & Morris, 2006) bioecological model of development. Not only did this model provide a meaningful foundation upon which to understand the innate and environmental origins of mental toughness, it also provided further theoretical insights about development that had not previously been considered in mental toughen literature. For example, the bioecological model identifies the role of contexts that promote, enforce, and limit broader societal ideologies in development. In line with the bioecological model, a community that values hard work and commitment may be more likely to contain the conditions that foster mental toughness than a community that values other virtues, such as participation alone. Although these suggestions are preliminary, they highlight a unique contribution of my thesis to research on mental toughness development.

I have also made substantive contributions to the field by grounding an understanding of mental toughness development within SDT (Deci & Ryan, 1985b, 2000). This theory details the motivational processes that underscore human growth and development and, as such, aligns with definitions and conceptualisations of mental toughness (this point is elucidated in greater detail in Chapters III and V). In line with SDT, I argued and demonstrated that individuals whose

psychological needs were satisfied were more likely to report higher levels of mental toughness compared to those who had their psychological needs thwarted. My findings provided preliminary support for the connection between SDT principles and mental toughness development, but also the adaptive nature of mental toughness (i.e., Chapter III). Some researchers (Andersen, 2011) have contested that mental toughness may be both adaptive and maladaptive, yet I found that higher levels of mental toughness were not only associated with better performances, but also higher levels of positive affect and lower levels of negative affect (consistent with the definition of mental health from the World Health Organization, see Grad, 2002). These findings provide initial evidence that counters previous speculations about the maladaptive nature of mental toughness and support the perspective that this concept reflects positive human functioning. However, further research is required in order to test similar associations under more challenging circumstances such as injury or sickness.

The evidence I garnered to support the utility of both the bioecological model and SDT provides scholars with a central knowledgebase that gives impetus and theoretical grounding to future research on mental toughness development. Additionally, until recently, researchers have rarely progressed past exploring the definitional and conceptual properties of mental toughness. By embedding understanding of mental toughness development within established theories, I have also added to the small body of literature that has attempted to explore topics outside the definitional and conceptual properties of mental toughness. Progress beyond these topics may help resolve issues with defining and conceptualising mental toughness, as well as substantiate the value of continued research on this concept.

A final substantive theoretical contribution of my thesis was the rigor I brought to understandings of mental toughness development by considering the perspectives of individuals during critical years of psychological growth. Previously, researchers (Connaughton et al., 2010) contested that mental toughness was subject to greatest change during adolescence, yet none had not garnered the perspectives of such individuals. By researching the perspectives of adolescents I

supported past findings, identified unique concepts (e.g., *curiosity*) not previously identified by researchers, and provided this group with a voice regarding understandings and the development of mental toughness.

**Methodological**

With the exception of attending to issues with participant recruitment, it was not my intention to address specific methodological shortcomings from previous mental toughness research. Nevertheless, as a by-product of my research questions, I attended to two limitations in the extant literature. First, in an attempt to progress beyond exploratory, qualitative methodologies employed in the majority of past mental toughness research (e.g., Connaughton et al., 2008; Thelwell et al., 2010; Weinberg et al., 2011), I investigated my research questions using cross-sectional, experimental, and mixed-methods designs. The use of such methodologies returned findings consistent with qualitative research designs and, as such, gives impetus to the conclusions derived from these works.

Secondly, I implemented contemporary statistical protocols in my thesis that enables scholars to integrate prior knowledge with new data. Bayesian estimation has begun to garner the interests of researchers in the social sciences as a meaningful alternative to traditional methods (van de Schoot et al., 2014). By employing Bayesian estimation protocols in my thesis, I have contributed to the handful of other studies in sport psychology that have used these methods (e.g., Doron & Gaudreau, 2014; Jackson et al., 2014), and promoted the continued use of such approaches in the future. I share the opinion of some statisticians who believe that Bayesian estimation protocols will become the dominant statistical approach in the future (van de Schoot et al., 2014), as it services social science research better than traditional methods (e.g., null-hypothesis testing). As such, the use of Bayesian estimation protocols highlights a substantive contribution that my thesis has made to not only sport psychology and the topic of mental toughness, but also broader fields of psychological enquiry.

**Applied**

Through my thesis I made several meaningful contributions to the field of applied psychology. I supported the notion that adolescence is a key period during which mental toughness develops. Although it is reasonable to contest that the development of mental toughness begins during childhood (i.e., 7-10 years of age, Graber & Brooks-Gunn, 1996), the perspectives of some researchers (Connaughton et al., 2008), supported by evidence from my thesis, indicates that the greatest changes occur during adolescence. As such, a concerted effort to develop mental toughness is arguably best delivered during this period of growth. Mental toughness interventions that are directed at children or adults may also be effective, but are unlikely to match the increases possible during adolescence. Elucidating this point further, SDT principles lend further impetus to the association between mental toughness development and adolescence. Adolescence is a time of physical, psychological, and social change (Graber & Brooks-Gunn, 1996). As such, individuals are discovering their physical competencies, actively seeking opportunities to be self-determined, and assuming valued social roles and forming meaningful relationships. In other words, the experiences characteristic of adolescence are consistent with SDT principles and, as such, highlight why the nourishment of individuals' psychological needs during adolescence may lead to meaningful improvements in mental toughness.

In line with the associations between adolescence and mental toughness development, as well as the utility of SDT principles to explain the underlying mechanisms of this association, I evaluated a mental toughness intervention that was informed by SDT principles. The intervention made two substantive contributions to the extant literature. First, it offered alternatives to previous mental toughness interventions, which had not previously considered self-determination theory perspectives. Second, this thesis was one of the first attempts to implement an intervention informed by SDT principles in sport. Previously, scholars have discussed the appropriateness of such an interventions in sport (Mageau & Vallerand, 2003) and others have evaluated similar interventions in related contexts (Su & Reeve, 2011). My results indicated that the autonomy-

supportive behaviours were not adopted by coaches following the intervention. Although this finding was disappointing, it led to other meaningful insights and recommendations. In particular, I provided evidence for how an intervention informed by SDT principles might be better introduced in a sport context, taking into consideration the contextual complexities of such environments. That is, I suggested that, in the future, researchers need to have a better understanding of the pressures felt by coaches from extraneous sources such as society, parents, and athletes. Having said this, my results may also indicate that greater attention needs to be paid to constructing interventions that support individuals through behaviour change protocols.

## Future Research

Recommendations for future research pertaining to the individual empirical and conceptual manuscripts of my thesis are included within each chapter. To avoid reiterating these points in this concluding chapter, I instead propose future research that addresses more general topics pertinent to the field.

Throughout my thesis, I have illustrated the utility of established theories for explaining mental toughness and its development. However, other theories are worthy of consideration in the future. One theory that is worth considering in future investigations is achievement goal theory (AGT, Elliot, Murayama, & Pekrun, 2011). In line with AGT, goal pursuits are predicated on by how individuals define and valance competence. Individuals can define competence compared to a self- (e.g., beat a personal best), task- (e.g., reach a time trial benchmark for selection), or other-referenced (e.g., outperform an opponent) standard (Elliot et al., 2011). Competence can also be valanced in terms of positive, desirable outcomes (e.g., success) or negative undesirable outcomes (e.g., failure). These dimensions form a 3 X 2 (Definition X Valance) framework (see Figure 5). In line with this framework, researchers have found that individuals who are orientated toward self- and task-approach goals, compared to other goal orientations, are more effortful, persistent, knowledgeable, and engaged, as well as perform better over time (Elliot, McGregor, & Gable, 1999; Elliot et al., 2011; Gucciardi, 2010; Harackiewicz, Barron, Tauer, & Elliot, 2002; Puente-

Diaz, 2012). In other words, individuals who are orientated toward these types of achievement goals demonstrate behaviours consistent with understandings of mental toughness.

| | | Definition | | |
|---|---|---|---|---|
| | | Self | Criterion | Other |
| Valance | Positive | Self-approach goals | Task-approach goals | Other-approach goals |
| | Negative | Self-avoidance goals | Task-avoidance goals | Other-avoidance goals |

Figure 5. The 3 X 2 achievement goal model.

In the future, researchers could explore alternative theories such as AGT in order to form robust understandings of the motivational processes that underscore mental toughness and its development. To achieve these ends, researchers might combine theories where appropriate. For example, one group of researchers have recently combined the theoretical components of SDT and AGT (Duda, 2013; Duda et al., 2013). These researchers have developed an intervention underscored by these established theories of motivation that may reflect a more comprehensive approach to mental toughness development than utilizing a single body of theoretical knowledge. For example, approaches aligned with AGT (e.g., the promotion of task/self-referenced standards) may more directly address the factors central to mental toughness development (e.g., critical incidents; see Chapter II) compared to those consistent with SDT. Researchers could evaluate the effectiveness of different interventions by comparing, for example, an SDT, an AGT, and a combined SDT and AGT intervention. Such an approach would allow researchers to determine the key motivational antecedents to mental toughness development.

Throughout my thesis I primarily considered the opinions and perspectives of endurance athletes (i.e., middle distance runners, rowers). Such contexts are intuitively appealing to the topic of mental toughness because they place high demands on individuals' physical and psychological capacities. However, other performance contexts are of equal interest to the topic of mental

toughness and should be investigated to enhance the generalisability of my conclusions. For example, some scholars (e.g., Bull et al., 2005) have distinguished between sports that require acute (i.e., the ability to regularly perform to the best of one's abilities in isolated tasks and often pressure-filled environments) and chronic (i.e., the ability to regularly perform to the best of one's abilities over a long period of time during occasions of varying pressure) mental toughness. The development of acute mental toughness may be enhanced best through stress-inoculation training (Bell et al., 2013), as a key predictor of regularly performing to the best of one's abilities in such situations requires the ability to manage high levels of anxiety. In comparison, chronic mental toughness may be enhanced best through protocols consistent with motivational theories (e.g., SDT, AGT). Such theories may be beneficial in developing chronic mental toughness as athletes who encounter situations of varying pressure over their performances need to be able to not only manage anxieties, but also sustain their attentions, regulate their performances, and persist through times of little or no activity.

Along similar lines, scholars have begun to investigate mental toughness in individuals from performance settings outside of sport (e.g., surgery, Colbert et al., 2012; military, Gucciardi et al., in press). Although an appealing line of enquiry, there is a need to substantiate previous research on mental toughness and its development within these settings. Military settings, for example, strongly value controlling instructional strategies and are characterised by power differentials (Reivich, Seligman, & McBride, 2011). As such, researchers are likely to face considerable resistance when attempting to implement principles consistent with SDT in such setting (Reeve, 2009). In these settings, instead of promoting autonomy-supportive behaviours, researchers might attempt to discourage the use of controlling behaviours, while also promoting the provision of other contextual factors central to the nourishment of individuals' psychological needs, namely structure and involvement. In line with Mageau and Vallerand's (2003) contentions, individuals' psychological needs for competence and relatedness can still be nurtured through the provision of structured and involvement, which may be notions more readily adopted in settings such as the military. However,

it should be noted that, despite attending to two of the three psychological needs, little attention to nurturing individuals' needs for autonomy may restrict the growth and development of individuals in such settings. In a similar vein, researchers could explore psychological needs thwarting environments as obstacles that require individuals to demonstrate mental toughness in order to overcome such challenges. That is, mental toughness may buffer against the deleterious effects of environments that would typically undermine functioning and growth.

A third recommendation for future research concerns the consideration of the psychosocial contexts and factors that indirectly influence development. The bioecological model and SDT literatures reference the role of indirect psychosocial contexts and factors on the processes that underscore development and, as such, identify this topic as worthy of consideration in the future. Within the bioecological model, it is postulated that the interactions between two or more third parties, cultural attitudes and ideologies, policies, laws, and societal norms surround and influence the proximal processes that drive development (Bronfenbrenner, 2001). Similarly, scholars within SDT have argued that the greater the pressures from above (e.g., social norms and expectations, responsibilities and expectations) the less likely individuals are to adopt autonomy-supportive behaviours (Reeve, 2009). Although mental toughness development might be the result of direct interactions between the environment and the individual (the focus of my thesis), in line with prominent theories such as the bioecological theory of development, the psychosocial factors that surround these interactions (e.g., social/community norms) are also likely to significantly influence such outcomes.

In future, researchers could first map a particular performance context before implementing interventions similar to the one described in Chapter IV. This approach could be achieved by employing traditional phenomenological methodologies for understanding a context such as integrating narratives from key stakeholders (e.g., coaches, athletes, parents, administrators), observing physical environments, and interpreting jargon and rituals (Sarason, 1982). Such investigations could, in line with the bioecological model, provide researchers with rich data about

the factors that indirectly affect development. To deepen and broaden this knowledge, as well as leverage off SDT literature, researchers could also investigate the extraneous pressures coaches experience (Reeve, 2009). Again, this could be achieved through phenomenological methods. This information could then be employed to inform the implementation of an autonomy-supportive intervention. In light of this recommendation, researchers might conduct a series of case studies whereby they identify the unique characteristics of a context, and address or prepare contingencies for overcoming these before implementing an autonomy-supportive intervention.

A final recommendation for research pertaining to mental toughness and its development concerns the use of behavioural measures. Although questionnaires are the most common method for measuring mental toughness, some scholars have argued that mental toughness describes individuals' behaviours and, as such, should be measured using behavioural scales (Andersen, 2011). Some researchers have measured mental toughness using behavioural scales (Davis & Zaichkowsky, 1998). However, these measures are typically sport-specific, meaning that a general behavioural measure of mental toughness is absent in the literature. Based on discussions in Chapter V, researchers might address the need for a general behavioural measure of mental toughness by consider *striving*, *surviving*, and *thriving* indices.

In the case of striving, researchers could employ methodological paradigms from SDT to objectively measure task persistence. For example, researchers could employ free-choice paradigms as objective measures of persistence (Ryan et al., 1991). These paradigms measure participants' engagement on target tasks during allocated "free-choice periods". In this paradigm, persistence is represented by the time spent on the target task during the free-choice period. As a measure of *striving,* athletes could be afforded free-choice periods at intervals throughout trainings with time spent on predetermined target tasks serving as measures of persistence.

Similarly, protocols from other research fields could be employed to objectively measure the *surviving* component of mental toughness. Seligman and colleagues (Seligman et al., 1990), in their work on attribution theory, devised a protocol that may service these ends. In their studies, these

researchers falsely informed athletes that they had underperformed on a target task and then measured subsequent performances. Using this protocol, the *surviving* component of mental toughness could be behaviourally measured as the degree to which athletes performances change following perceived underperformance (i.e., performances that are equal to or better than initial performances could be used to represent surviving). Although protocols such as the two suggested above could be used as sports-general measures of mental toughness behaviours, it is necessary to note that traditional approaches (e.g., mental toughness questionnaires) offer an alternative yet complementary perspective (Gucciardi et al., in press). This is particularly true when one considers that, while possible for *striving* and *surviving*, it is difficult to behaviourally measure the *thriving* components of mental toughness (although the learning component of thriving could be measured using performance outcomes). In the future, researcher could calibrate subjective and objective measures of mental toughness and, in particular, explore the utility of the aforementioned behavioural measures.

## Summary of Thesis

Throughout my thesis I explored and evaluated the appropriateness of established psychological theories for understanding mental toughness development in adolescents. I attended to these intentions initially by garnering the perspectives of adolescent performers and grounding such understandings within Bronfenbrenner's (2001) bioecological model of development (Chapter II). I then focused on the value of SDT (Deci & Ryan, 1985b, 2000) for understanding mental toughness development using a cross-sectional survey with adolescent performers. I selected this theory because of its consistencies with the bioecological model and my initial findings, as well as its potential to inform applied protocols. I identified significant theoretically-expected associations between SDT principles and mental toughness, as well as mental toughness and other meaningful outcomes, such as performance and psychological health (Chapter III). I then attempted to extend on these findings by evaluating the effectiveness of an autonomy-supportive intervention (Chapter IV). Although I did not garner support for my hypotheses in this investigation, I identified several

barriers and obstacles to adopting autonomy-supportive behaviours in sport. Based on meta-analytic evidence from other contexts (Su & Reeve, 2011), I proposed that researchers should continue to explore the value of autonomy-supportive interventions in sport. To emphasise these beliefs, I composed a conceptual essay (Chapter V) that detailed the value of SDT for understanding mental toughness, which I conceptualised as comprising notions of *striving*, *surviving*, and *thriving*. It is my hope that researchers will continue to investigate the development of mental toughness along the lines pursued in my thesis and, at the same time, attend to my proposed recommendations. I also hope that practitioners interested in the development of mental toughness will contemplate the applied aspects of my research and implement protocols based on my findings, recommendations, and conclusions.

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# Appendix A – Psychometric Instruments

**Sport Climate Questionnaire – Short Form (SCQ-SF)**

INSTRUCTIONS: The statements below relate your experiences with your teachers. Teachers have different styles in working with students, and we would like to know more about your experiences with your teachers. Your responses are confidential, so please be as honest as possible.

| 1 *Strongly Disagree* | 2 | 3 | 4 *Neutral* | 5 | 6 | 7 *Strongly Agree* |
|---|---|---|---|---|---|---|
| I feel that my coach provides me with choices and options | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel understood by my teachers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| My teachers conveys confidence in my ability to do well in my studies | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| My teachers encourage me to ask questions | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| My teachers listen to how I would like to do things | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| My teachers try to understand how I see things before suggesting a new way to do things | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Basic Needs Satisfaction in Sport Scale (BNSSS).**

INSTRUCTIONS: Below are statements that describe how you may think about your sport/studies right now. Use the scale below to indicate your level of agreement or disagreement with each statement as it relates to you.

| 1 *Not at all true* | 2 | 3 | 4 | 5 | 6 | 7 *Very true* |
|---|---|---|---|---|---|---|
| I can overcome challenges in my sport/school work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am skilled at my sport/school work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel I am good at my sport/studies. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I get opportunities to feel that I am good at my sport/school work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I have the ability to perform well in my sport/studies. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school work, I get opportunities to make choices. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school work, I have a say in how things are done. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school work, I can take part in the decision-making process. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school work, I get opportunities to make decisions. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| In my sport/studies, I feel I am pursuing goals that are my own. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school classes, I really have a sense of wanting to be there. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school work, I feel I am doing what I want to be doing. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel I participate in my sport/studies willingly. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school work, I feel that I am being forced to do things that I don't want to do. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I choose to participate in my sport/school work according to my own free will. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/studies, I feel close to other people. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I show concern for others in my sport/school. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| There are people in my sport/school who care about me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In my sport/school, there are people who I can trust. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I have close relationships with people in my sport/school. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Psychological Needs Thwarting Scale (PNTS).**

INSTRUCTIONS: Below are statements that describe how you may think about your sport/studies right now. Use the scale below to indicate your level of agreement or disagreement with each statement as it relates to you.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| *Strongly disagree* | | | | | | *Strongly agree* |

**In my sport/school work**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| I feel prevented from making choices with regard to the way I train/study | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel pushed to behave in certain ways | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel forced to follow training/classroom decisions made for me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel under pressure to agree with the training/study regimen I am provided | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Situations occur in which I am made to feel incapable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| There are times when I am told things that make me feel incompetent | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| There are situations where I am made to feel inadequate | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel inadequate because I am not given opportunities to fulfil my potential | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel I am rejected by those around me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel others can be dismissive of me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel other people dislike me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I feel other people are envious when I achieve success | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Controlling Coach Behaviours Scale (CCBS).**

INSTRUCTIONS: The statements below relate your experiences with your coach(es). Use the scale below to indicate your level of agreement or disagreement with each statement as it relates to you.

| | 1 *Strongly disagree* 2 3 4 5 6 7 *Strongly agree* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | My coach tries to motivate me by promising to reward me if I do well | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | My coach only rewards/praises me to make me train harder | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | My coach only uses rewards/praise so that I stay focused on tasks during training | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | My coach only uses rewards/praise so that I complete all the tasks he/she sets in training | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | My coach is less friendly with me if I don't make the effort to see things his/her way | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6 | My coach is less supportive of me when I am not training and competing well | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7 | My coach pays me less attention if I have displeased him/her | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | My coach is less accepting of me if I have disappointed him/her | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | My coach shouts at me in front of others to make me do certain things | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10 | My coach threatens to punish me to keep me in line during training | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11 | My coach intimidates me into doing the things that he/she wants me to do | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | My coach embarrasses me in front of others if I do not do the things he/she wants me to do | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13 | My coach expects my whole life to centre on my sport participation | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14 | My coach tries to control what I do during my free time | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15 | My coach tries to interfere in aspects of my life outside of my sport | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Mental Health Continuum Short Form (MHC-SF).**

INSTRUCTIONS: The following questions are about how you have been feeling during the past month. Place a check mark in the box that best represents how often you have experienced or felt the following:

| 1 *Never* | 2 *Once or twice* | 3 *About once a week* | 4 *2 or 3 times a week* | 5 *Almost every day* | 6 *Every day* |
|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Happy | 1 | 2 | 3 | 4 | 5 | 6 |
| Interested in life | 1 | 2 | 3 | 4 | 5 | 6 |
| Satisfied | 1 | 2 | 3 | 4 | 5 | 6 |
| That you had something important to contribute to society | 1 | 2 | 3 | 4 | 5 | 6 |
| That you belonged to a community (like a social group, your school, or your neighbourhood) | 1 | 2 | 3 | 4 | 5 | 6 |
| That our society is becoming a better place for people like you | 1 | 2 | 3 | 4 | 5 | 6 |
| That people are basically good | 1 | 2 | 3 | 4 | 5 | 6 |
| That the way our society works made sense to you | 1 | 2 | 3 | 4 | 5 | 6 |
| That you liked most parts of your personality | 1 | 2 | 3 | 4 | 5 | 6 |
| Good at managing the responsibilities of your daily life | 1 | 2 | 3 | 4 | 5 | 6 |
| That you had warm and trusting relationships with other children | 1 | 2 | 3 | 4 | 5 | 6 |
| That you had experiences that challenged you to grow and become a better person | 1 | 2 | 3 | 4 | 5 | 6 |
| Confident to think or express your own ideas and opinions | 1 | 2 | 3 | 4 | 5 | 6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| That your life has a sense of direction or meaning to it | 1 | 2 | 3 | 4 | 5 | 6 |

**Depression Anxiety Stress Scale (DASS)**

INSTRUCTIONS: Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past month*. There are no right or wrong answers. Do not spend too much time on any statement

| 0<br>*Did not apply to me* | 1<br>*Applied to me to some degree, or some of the time* | 2<br>*Applied to me a considerable degree, or a good part of time* | 3<br>*Applied to me very much, or most of the time* |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| I found it hard to wind down | 0 | 1 | 2 | 3 |
| I was aware of dryness of my mouth | 0 | 1 | 2 | 3 |
| I couldn't seem to experience any positive feeling at all | 0 | 1 | 2 | 3 |
| I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion) | 0 | 1 | 2 | 3 |
| I found it difficult to work up the initiative to do things | 0 | 1 | 2 | 3 |
| I tended to over-react to situations | 0 | 1 | 2 | 3 |
| I experienced trembling (eg, in the hands) | 0 | 1 | 2 | 3 |
| I felt that I was using a lot of nervous energy | 0 | 1 | 2 | 3 |
| I was worried about situations in which I might panic and make a fool of myself | 0 | 1 | 2 | 3 |
| I felt that I had nothing to look forward to | 0 | 1 | 2 | 3 |
| I found myself getting agitated | 0 | 1 | 2 | 3 |
| I found it difficult to relax | 0 | 1 | 2 | 3 |
| I felt down-hearted and blue | 0 | 1 | 2 | 3 |
| I was intolerant of anything that kept me from getting on with what I was doing | 0 | 1 | 2 | 3 |
| I felt I was close to panic | 0 | 1 | 2 | 3 |
| I was unable to become enthusiastic about anything | 0 | 1 | 2 | 3 |

| | | | | |
|---|---|---|---|---|
| I felt I wasn't worth much as a person | 0 | 1 | 2 | 3 |
| I felt that I was rather touchy | 0 | 1 | 2 | 3 |
| I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat) | 0 | 1 | 2 | 3 |
| I felt scared without any good reason | 0 | 1 | 2 | 3 |
| I felt that life was meaningless | 0 | 1 | 2 | 3 |

**Athlete Burnout Questionnaire (ABQ).**

INSTRUCTIONS: Please respond to each of the following statements by indicating the degree to which the statement is true for you. Use the following scale:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Not at all true* | | | | *Very true* |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | I feel so tired from my training that I have trouble finding energy to do other things | 1 | 2 | 3 | 4 | 5 |
| 2 | I feel overly tired from my golf participation | 1 | 2 | 3 | 4 | 5 |
| 3 | I feel wiped out from golf | 1 | 2 | 3 | 4 | 5 |
| 4 | I feel physically worn out from golf | 1 | 2 | 3 | 4 | 5 |
| 5 | I am exhausted by the mental and physical demands of golf | 1 | 2 | 3 | 4 | 5 |

**Subjective Vitality Scale (SVS).**

INSTRUCTIONS: Please respond to each of the following statements by indicating the degree to which the statement is true for you. Use the following scale:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| *Not at all true* | | | | | | *Very true* |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | I feel alive an vital | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | Sometimes I feel so alive I just want to burst | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | I have energy and spirit | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | I look forward to each new day | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | I nearly always feel alert and awake | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Coach Behaviour Observations Checklist.**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Thwarts needs satisfaction<br>Disaffected behaviours | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Nurtures the basic psychological needs<br>High level of engagement |

Organisational instructions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Uses commands and directives, imposes everything | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Gives choices and options (e.g., tasks) |

Rationales

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Imposes rules and limits<br>Doesn't give rationales | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Explains rules and limits<br>Gives rationales |

Coach guidance

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Controlling feedback | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Gives feedback in an informal way<br>Asks golfers' point of view about learning |

Coach-athlete interactions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cold, distant, strict, sarcastic, rigid, inflexible, limits time | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Sympathetic, warm, uses humour with golfer, listens, understands golfer, invests time and energy |

Structure of the golfer's activity

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No feedback, vague goals, confusing, unclear | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Contingent feedback, short term goals |

Encouragement

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No encouragement | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Encourages golfer's efforts and progress |

Cognitive engagement

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Practise to let "steam off"<br>Doesn't try to understand | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Listens carefully to coach<br>Asks questions |

Behavioural engagement

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Passive, minimal effort | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Active, intense effort<br>Perseveres when faced with difficulties |

Affective engagement

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bored, disinterested, lethargic | 1 | 2 | 3 | **4** | 5 | 6 | 7 | Joyful, interested, energetic, full of fun |

# Appendix B – Generic Consent Form

# [Insert Study Title]

## Consent Form

I have read the information provided concerning this study. I agree to participate in this activity, realising that I may withdraw at any time without reason and without consequence.

I understand that all information provided will be treated as strictly confidential, and will not be released by the researchers unless required by law. I have been advised as to what data are being collected, what the purpose is, and what will be done with the data upon completion of the research.

I agree that research data gathered for the study may be published provided that neither my name, nor other identifying information, is used beyond data collection procedures.

Name: _____

Signed: _____

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# Appendix C – Information Sheets

# An exploration of the characteristics important for achievement in adolescents and how they are developed.

## Student Information Sheet

**Purpose of the Study:** We are interested in identifying and understanding what characteristics are important for adolescents to consistently achieve to the upper limit of their abilities regardless of the circumstances they face, as well as the role significant others play in the development of these characteristics

**Procedure:** You are invited to take part in a discussion group with fellow students on various issues relating to achieving and performing above expectations at a time and place most convenient to you. The discussion group will be run by a researcher, who is also a registered psychologist, from The University of Queensland and take roughly one hour. Broadly speaking, in the discussion group we will ask you about your perspectives on (a) what characteristics are required to consistently achieve to the upper limit of your abilities regardless of the circumstances you face and (b) how significant others (e.g., your parents, coaches, teachers) contribute to the development of these characteristics. What you discuss with the research team will be audio-recorded and copied word-for-word in a document. We will provide you with a copy of this document containing your discussion (word-for-word) to ensure that we have captured what you were trying to say and provide you with the opportunity to amend, clarify, and/or withdraw your discussion.

**Confidentiality:** Any information about you that is obtained in connection with this study will remain confidential and will be disclosed only with your written permission. However, the results of the study may be published or revealed to other people in a way that will not identify you. Completed interviews will be used for data analysis then safely and securely stored at the School of Human Movement Studies in a locked office and password only accessible computer. Identifiable information will be substituted with codes during data entry so that your responses and personal information cannot be linked.

**Risks and Benefits:** Although there are no known physical, psychological, economic, or social risks associated with participation in this study, appropriate support (e.g., counselling) will be offered should any unusual discomforts arise. All participants will be provided with a summary of the study's results upon request as well as the option to attend an information session based on the findings of the study.

**Consent:** You are free to withdraw your consent at any time for any reason, and you do not need to justify your decision. Your participation in the study is voluntary and does not prejudice any right to compensation.

**Further Information:** This study has been cleared in accordance with the ethical review guidelines and processes of the University of Queensland. These guidelines are endorsed by the University's principal human ethics committee, the Human Experimentation Ethical Review Committee, and registered with the Australian Health Ethics Committee as complying with the National Statement. You are free to discuss your participation in this study with project staff (contactable on 33656240). If you would like to speak to an officer of the University not involved in the study, you may contact the School of Human Movement Studies Ethics Officer on 3365 6380.

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# Performance Psychology in Achievement Contexts

## Information Sheet

**Purpose of the Study:** The purpose of this study is to examine how coaches influence your motivations as well as your sporting achievement and general well-being.

**Procedure:** We are asking you to complete a series of questionnaires about your experiences in sport. The questionnaires should take approximately 20 – 30 minutes to complete. Additionally, as part of our project, the principal researcher (John Mahoney), with the assistance of the School's sport director, is intending to access sporting results. It is important to note that, due to the sensitive nature of the data we are collecting, exceptional lengths will be taken to ensure that all information (questionnaires and sporting results) is kept confidential at all times.

**Confidentiality:** Your responses will be stored in a locked office on a password-locked computer accessible only by the principal research. Additionally, any identifying information collected during our study will be destroyed, blacked out, or removed once entered into the secure computer to ensure complete secrecy. The results of the study may be published in academic journals and presented at conferences, but no identifying information about you or your school will be revealed.

**Risks and Benefits:** The physical, psychological, economic, or social risks associated with participation in this study are small (e.g., some questions way make you feel uncomfortable). Nevertheless, please contact the principal researcher should any discomfort arise and he will arrange appropriate support (e.g., counselling) as necessary. We believe that our study could spell far-reaching benefits for adolescents and the individuals who support their development. Specifically, we expect to uncover results that could be used to inform coaches about how to effectively contribute to the success and well-being of our younger generations. Further, findings could indicate the factors necessary for promoting qualities such as persistence, high concentration, resilience, and self-belief (to name a few) in adolescents. If you would like a summary of the results of the study, please inform the principal researcher.

**Consent:** You are free to withdraw from the study at any time for any reason without justification. Your participation in the study is voluntary and does not prejudice any right to compensation.

**Further Information:** This study has been cleared in accordance with the ethical review guidelines and processes of The University of Queensland. These guidelines are endorsed by the University's principal human ethics committee, the Human Experimentation Ethical Review Committee, and registered with the Australian Health Ethics Committee as complying with the National Statement. You are free to discuss your participation in this study with project staff (contactable on 33656240). If you would like to speak to an officer of the University not involved in the study, you may contact the School of Human Movement Studies Ethics Officer on 3365 6380.

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# Understanding Mental Toughness and its Development

## Information Sheet

**Purpose of the Study:** The purpose of this study is to enhance coachers' understandings of mental toughness and its development and to monitor changes in their adolescent athletes.

**Procedure:** The procedure for this project is separated into three stages:

***Stage 1.*** During stage one, coaches will be asked to complete two questionnaires (one demographic questionnaire and one questionnaire pertaining to their belief about coaching). The lead researcher, John Mahoney, will also collect observational data and *may* conduct 1-1 interviews with coaches during this initial stage. Observational data collection will involve videotaping coach-athlete training sessions, whilst 1-1 interviews will involve voice-recording coaches' responses to a set of questions. In both cases the *upmost care* will be taken to ensure the security of this data. Video and voice data will be coded (i.e., transferred into text with all identifying information removed) and deleted from devices at the earliest convenience.

***Stage 2.*** The second stage requires coaches to attend a half-day (approx. 3 hours) workshop. The workshop will involve a series of knowledge-based and skill-based activities aimed at enhancing coaches' understandings about how to enhance their athletes' mental toughness. A second, shorter (approx. 1 hour) workshop will be offered 1 week afterwards to consolidate learning.

***Stage 3.*** The third and final stage will commence 5 weeks after the second workshop and will involve data collection similar to that conducted in the first stage (i.e., observational data and 1-1 interview data will be collected).

**Confidentiality:** Obtained data – including questionnaire responses, observational data, and interview transcripts – will be stored in a locked office on a password-locked computer only accessible to the lead researcher. Additionally, any identifying information collected during the study will be destroyed, blacked out, or removed following data inputting to ensure confidentiality. The results of the study may be published in academic journals and presented at conferences, but no identifying information about coaches or golfers will be disclosed.

**Risks and Benefits:** Although there are no known physical, psychological, economic, or social risks associated with participation in this study, appropriate support (e.g., counselling) will be offered should any unusual discomforts arise. We believe that our study could spell far-reaching benefits for adolescents and the individuals who support their development. Specifically, we expect to uncover results that could be used to inform invested parties about how to effectively contribute to the success and well-being of our younger generations. All participants will be provided with a summary of the results of the study upon request and a complementary presentation of the findings will be offered upon finalisation of the study's results.

**Withdrawal:** You are free to withdraw from the study at any time for any reason without consequence. If data has been collected and the withdrawing participant would like it destroyed, they need only inform the lead researcher. Participation in the study is voluntary and does not prejudice any right to compensation.

**Further Information:** Participation in this study requires a basic level of literacy. This study has been cleared in accordance with the ethical review guidelines and processes of the University of Birmingham. These guidelines are endorsed by the University's Research Governance and Ethics Committee. You are free to discuss your participation in this study with project staff (contactable on 0121 414 8736). If you would like to speak to an officer of the University not involved in the study, you may contact the university's Ethics Officer on 0121 414 8825.

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# Understanding Mental Toughness and its Development

## Information Sheet

**Purpose of the Study:** The purpose of this study is to enhance coachers' understandings of mental toughness and its development and to monitor changes in their adolescent athletes.

**Procedure:** Athletes will be asked to complete a set of questionnaires during four training session separated by 2 - 4 months each. The questionnaires will be the same each time and ask athletes about their sport, their coach, and their mental toughness. The lead researcher, John Mahoney, will also collect observational data and *may* conduct 1-1 interviews with athletes during the first and last time points. Observational data collection will involve videotaping a coach-athlete training session, whilst 1-1 interviews will involve voice-recording athletes' comments. In both cases the *upmost care* will be taken to ensure the security of this data. Video and voice data will be coded (i.e., transferred into text with all identifying information removed) and deleted from devices at the earliest convenience.

**Confidentiality:** Obtained data – including questionnaire responses, observational data, and interview transcripts – will be stored in a locked office on a password-locked computer only accessible to the lead researcher. Additionally, any identifying information collected during the study will be destroyed, blacked out, or removed following data inputting to ensure confidentiality. The results of the study may be published in academic journals and presented at conferences, but no identifying information about athletes will be disclosed.

**Risks and Benefits:** Although there are no known physical, psychological, economic, or social risks associated with participation in this study, appropriate support (e.g., counselling) will be offered should any unusual discomforts arise. We believe that our study could spell far-reaching benefits for adolescents and the individuals who support their development. Specifically, we expect to uncover results that could be used to inform invested parties about how to effectively contribute to the success and well-being of our younger generations. All participants will be provided with a summary of the results of the study upon request and a complementary presentation of the findings will be offered upon finalisation of the study's results.

**Withdrawal:** Athletes are free to withdraw from the study at any time for any reason without consequence. If data has been collected and the withdrawing participant would like it destroyed, they need only inform the lead researcher. Participation in the study is voluntary and does not prejudice any right to compensation.

**Further Information:** Participation in this study requires a basic level of literacy. This study has been cleared in accordance with the ethical review guidelines and processes of the University of Birmingham. These guidelines are endorsed by the University's Research Governance and Ethics Committee. You are free to discuss your (son/daughter's) participation in this study with project staff (contactable on 0121 414 8736). If you would like to speak to an officer of the University not involved in the study, you may contact the University's Ethics Officer on 0121 414 8825.

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