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The Conceptualisation, Measurement, and Development of Mental Toughness in Military Training

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Pryfisgol Bangor University The Conceptualisation, Measurement, and Development of Mental Toughness in Military Training

Ph.D. Thesis

James P. J. Fitzwater September 2017

Thesis submitted to Bangor University in fulfilment of the requirements for the degree of Doctor of Philosophy at the School of Sport, Health and Exercise Sciences.

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Thesis Summary

This thesis examines some of the measurement, conceptual, predictive, and intervention issues surrounding mental toughness in military training. Chapter 1 briefly reviews the research literature on mental toughness as it relates to the above issues. This review identifies questions worthy of future investigation; specifically conceptualisation and measurement issues relating to mental toughness and issues relating to the development of mental toughness, particularly in the military environment.

In chapter 2, three studies were conducted to develop and validate a robust and psychometrically reliable informant-based measure of mental toughness for use in military training environments, utilizing a total of 645 infantry recruits from the Infantry Training Centre (ITC) at Catterick Garrison. Study 1 focused on item generation and identifying relevant key stressors from a range of different stressors experienced by recruits during infantry basic training to form the basis of the measure, followed by a test of the structural integrity of the resulting measure. Study 2 examined the concurrent validity, predictive validity, and test-retest reliability of the measure. A further study (Study 3) was conducted with a sample of more specialised infantry recruits to confirm the predictive validity of the measure. Overall, the Military Training Mental Toughness Inventory (MTMTI) was found to possess sound psychometric properties and structural validity, good test-retest reliability and concurrent validity, and predicted performance in two different training contexts with two separate samples.

Chapter 3 deals with the somewhat controversial topic of using punishment to develop mental toughness and enhance individual performance under pressure. Specifically, the study examined the interacting effects of contingent punishment and

1

three supportive transformational leadership behaviours on mental toughness and performance under pressure. The leadership transformational behaviours were: (1) individual consideration, (2) fosters an acceptance of group goals and, (3) inspirational motivation (c.f., Hardy & Arthur, 2010). A total of 808 recruits from ITC took part in two studies. Study 1 explored the interactive effects of contingent punishment with each of the aforementioned leader behaviours between weeks 15 and 26 of training. Results revealed that an interaction between contingent punishment and individual consideration (leader support) significantly predicted higher levels of mentally tough behaviour and individual recruit performance. In Study 2, the measure of contingent punishment was modified to reflect the recruits' perceived threat of punishment, rather than punishment received. A longitudinal design, with data gathered at weeks three, eight and twelve, was used to examine the interacting effects of the threat of punishment and individual consideration on mental toughness and performance during the first 12 weeks of training. The results revealed a significant interaction at weeks 8 and 12 and a significant correlation between mentally tough behaviour and performance. Significant differences in mental toughness were also evidenced between recruits who withdrew from training and recruits who completed training.

Chapter 4 describes a quasi-experimental study using a total of 173 Parachute Regiment recruits, divided into treatment and control conditions, to examine the efficacy of a three-week psychological skills intervention to develop mental toughness in elite military training. The intervention was delivered between weeks 16 and 20 of training, prior to the recruits attending a week-long physically and mentally demanding selection program. A contextually modified version of the Test of Performance Strategies-2 (TOPS-2) was used to measure the recruits' use of psychological skills during training and during the selection program, while the MTMTI was used to measure recruits' mentally tough behaviour at both pre and post intervention. Results revealed significantly greater use of goal-setting, relaxation techniques, self-talk strategies and imagery/mental rehearsal, and significantly higher levels of observer-rated mentally tough behaviour in the treatment group between pre and post intervention. However, during the selection program, significant differences were only evidenced with the use of relaxation and imagery. Individual recruit performance was shown to be significantly higher in the treatment group during the selection course.

The final chapter discusses the findings of the thesis and provides suggestions for future research.

CHAPTER 1

General Introduction

Mental toughness has become one of the most ubiquitous terms in sport and other high achievement contexts, used by coaches, athletes, psychologists, researchers and general commentators to describe the psychological attributes underpinning performance excellence, particularly in adversity (e.g., Connaughton, Hanton, & Jones, 2010; Connaughton, Wadey, Hanton, & Jones, 2008; Gucciardi & Hanton, 2016; Jones, Hanton, & Connaughton, 2002; Weinberg, Butt, & Culp, 2011). Indeed, in most contexts where effectively dealing with adversity and challenge is essential to success, mental toughness is commonly regarded as *the* most important attribute that enables an individual to achieve high levels of personal performance (e.g., Jones & Moorhouse, 2007; Weinberg, 2010). This may be due to mental toughness being associated with a variety of stressors in high performance environments such as, for example, endurance and pain tolerance (e.g., Crust & Clough, 2005; Crust, Nesti, & Bond, 2010), stress appraisal and coping effectiveness (e.g., Kaisler, Polman & Nichols, 2009; Polman, Levy, & Backhouse, 2008), and threat detection and goaldirected behavior (e.g., Bell, Hardy & Beattie, 2013; Hardy, Bell, & Beattie, 2014). Although the research literature on mental toughness has been dominated by research in the sports domain, which has significantly shaped the general understanding of mental toughness, the concept of mental toughness has great potential for application across a broad range of contexts, including business, health care, the performing arts, and the military (Clough & Strycharczyk, 2012; Gucciardi & Gordon, 2011).

Since the 1950s, when the term first came to prominence, various definitions have been posited, based on a range of other psychological attributes and skills deemed to be crucial to sporting success (e.g., self-confidence, arousal regulation) (Gucciardi & Hanton, 2016). This initially resulted in the first textbooks on the topic laying out how to train for mental toughness (i.e., Loehr, 1986; 1995). However, it was not until the promulgation of Jones, Hanton and Connaughton's (2002) seminal article entitled; "What is this thing called mental toughness," that a resurgence of research into mental toughness ensued. Jones and colleagues' study prompted a surge of further qualitative studies, largely based on perceptions of coaches and elite athletes (e.g., Bull, Shambrook, James, & Brooks, 2005; Butt, Weinberg, & Culp, 2010; Connaughton et al., 2008; Coulter, Mallet, & Gucciardi, 2010; Coulter et al., 2010; Gucciardi, Gordon, & Dimmock, 2008; 2009a; Jones, Hanton, & Connaughton, 2007; Thelwell, Such, Weston, Such, & Greenlees, 2010; Thelwell, Weston, & Greenlees, 2005). In these studies, researchers have identified myriad attributes, characteristics, constructs, cognitions, and emotions purported to be the basis of mental toughness, as well as a wide variety of conceptualisations (Andersen, 2011). For example, Jones and colleagues (2002) initially reported 12 attributes of mental toughness that were essential to being a mentally tough athlete, which were subsequently expanded to 30 (Jones et al., 2007).

However, Crust (2008) has argued that these are simply the characteristics of elite performers rather than mental toughness *per sé*. Moreover, Gucciardi et al. (2009a) have argued that the sampling of elite athletes and coaches is flawed due to the possibility that, being familiar with the topic of sport psychology, they are potentially influenced by the already widely held perceptions of mental toughness and its associated components. Fawcett (2011) adds to the general criticisms by suggesting that a key issue with these studies is that the term 'mental toughness' is widely open to individual interpretation. There does, however, appear to be a general consensus that mental toughness is a psychological response to a wide range of stressors (Middleton, Marsh, Martin, Richards, & Perry, 2004), complex and

multidimensional in nature, and containing an array of cognitive, affective and behavioural components (Gucciardi, 2012).

Despite the resurgence of research into mental toughness and the abundance of studies and measurement instruments it has yielded, little progress appears to have been made in agreeing a common conceptualisation and measurement strategy (e.g., Andersen, 2011; Gucciardi & Gordon, 2011; Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015; Hardy, Bell, & Beattie, 2014). It has been suggested that this is due, in part, to the parochial approach adopted by some scholars, leading to some researchers appearing to become overly protective of their research (Fawcett, 2011). For example, in response to a recent criticism of the Mental Toughness Questionnaire 48 (MTQ 48; Clough et al., 2002) by Gucciardi, Hanton, and Mallet (2012), Clough, Earle, Perry & Crust (2012) go as far to suggest that academic debate on the subject is seen by some as becoming 'increasingly toxic' (p. 283), presumably aimed at Gucciardi and colleagues (2012). On the other hand, there does appear to be a general consensus that mental toughness is a dispositional construct, that may nevertheless change across time, which allows individuals to deal with obstacles, distractions, pressure, and adversity from a wide range of stressors (e.g. Clough & Strycharczyk, 2012; Hardy et al., 2014; Gucciardi & Gordon, 2011; Jones et al., 2002).

Yet, despite the recent advancements being made in mental toughness research, Gucciardi, Hanton and colleagues (2015) have argued that certain methodological concerns have limited the usefulness of previous studies for the conceptual development of mental toughness. Firstly, the empirical focus on mental toughness has primarily been within sport contexts, which limits the extent to which the construct may generalize to other, non-sport, samples. Secondly, when mental toughness *has* been examined in non-sport contexts, researchers have applied sport models without an adequate explanation of the substantive or empirical evidence for doing so (Gucciardi, Jackson, Hanton, & Reid, 2015).

Conceptualisation

During the exploratory stage of a research program, it is not uncommon to use qualitative methods of research to identify key characteristics of a construct. However, an obvious limitation with the focus of early qualitative studies on mental toughness was the inability to differentiate between the causes, processes, outcomes, and other correlates of mental toughness (Hardy et al., 2014). Consequently, some researchers argued that qualitative methods were becoming overused and called for more quantitative methods to be employed (e.g., Andersen, 2011), along with the development of a reliable and psychometrically valid instrument with which to measure mental toughness (Sheard, Golby, & van Wersch, 2009). Although the majority of the initial resurgent research into mental toughness was qualitative, some notable quantitative studies were conducted (e.g., Crust & Azadi, 2010; Gucciardi, Gordon, & Dimmock, 2009b; Horsburgh, Schermer, Veselka, & Vernon, 2009; Kaisler, Polman, & Nicholls, 2009; Nicholls, Polman, Levy, & Backhouse, 2008). This research has produced a plethora of definitions and measurement tools. For example, one of the most commonly cited definitions in the mental toughness literature is that proposed by Jones and colleagues (2002), who conceptualised it as:

Having the psychological edge that enables you to generally cope better than your opponents with the many demands sport places on the performer and, specifically, be more consistent and better than your 8

opponent in remaining determined, focused, confident and in control under pressure (Jones et al., 2002, p. 209).

One of the problems with this definition is that stating mental toughness is being "better than one's opponent" places the degree of mental toughness an individual possesses in their opponent's control and, presumably on whether one wins or loses (Andersen, 2011). Andersen argues that, logically, one can still lose yet be mentally tough, indeed, two of the many characteristics associated with mental toughness is 'handling failure' and 'overcoming/dealing with adversity.' This point is more relevant in domains other than sport, where the criteria for success and achievement are not necessarily as clear cut as winning or losing (e.g., Andersen, 2011; Wagstaff & Leach, 2015).

Clough, Earle and Sewell (2002) suggest that Jones and colleagues' definition does not define what mental toughness is, more what individuals with mental toughness can do. Accordingly, Clough and colleagues (2002) propose that:

Mentally tough individuals tend to be sociable and outgoing; as they are able to remain calm and relaxed, they are competitive in many situations and have lower anxiety levels than others. With a high sense of self-belief and an unshakeable faith that they can control their own destiny, these individuals can remain relatively unaffected by competition or adversity (p. 38).

Clough and colleagues' conceptualisation originates from the construct of hardiness (Kobasa, 1979). They added a fourth dimension, confidence, to the existing three dimensions of hardiness (commitment, control, and challenge). This has become widely known as the 4Cs model, which, along with the measurement tool designed to assess the 4Cs, has been widely used by many researchers into mental toughness. Other researchers, however, suggest that Clough and associates' version of mental toughness is merely an old construct (i.e., hardiness) dressed up as something new (Andersen, 2011).

Yet another detailed, lengthy definition has been forwarded by Gucciardi, Gordon and Dimmock (2009), who propose that mental toughness is:

A collection of experientially developed and inherent sport-general and sport-specific values, attitudes, cognitions, and emotions that influence the way in which an individual approaches, responds to, and appraises both negatively and positively construed pressures, challenges, and adversities to consistently achieve his or her goals (p. 69).

However, apart from acknowledging a group of fundamental aspects to mental toughness that they argued would not vary significantly by sport, Gucciardi et al. (2009) did not provide any definitive information on the key values, attitudes, cognitions, and emotions related to the construct.

More succinct definitions of mental toughness have also been proposed. For example, Middleton and colleagues (2004) defined mental toughness as "an unshakeable perseverance and conviction towards some goal despite pressure or adversity" (p. 6), suggesting that it requires the presence of some or all of the identified mental toughness components. The strength of this definition, they argue, is that it does not limit itself to what may be considered merely the outcomes of mental toughness, but also includes the physical and psychological actions of mental toughness.

Despite the constant attempts to do so, the above state of affairs has left the concept of mental toughness inadequately defined and conceptualised (Middleton et

al., 2004), which only serves to "to confound the precise nature and make-up of mental toughness." (Gucciardi et al., 2011, p. 327). Consequently, in an effort to summarize and integrate the many conceptualizations forwarded, Gucciardi and colleagues proposed a relatively broad working definition of mental toughness as "a personal capacity to produce consistently high levels of subjective (e.g., personal goals or strivings) or objective performance (e.g., sales, race time, GPA) despite everyday challenges and stressors as well as significant adversities" (Gucciardi, Hanton et al., 2015, p. 28). This working definition, they suggest, may be refined and extended over time as a clearer understanding of the concept begins to emerge. On the other hand, in a critique of the mental toughness literature, Andersen (2011) suggests that, rather than attempting to conseptualize mental toughness with words or constructs, it should perhaps be viewed as "a variety of transient, fluctuating and mercurial states of being and seek ways to increase the probability of those states occurring (e.g., using mindfulness meditation)" (p. 71).

Measurement

Along with the plethora of definitions of mental toughness came almost as many instruments by which to measure it, for example, the Psychological Performance Inventory (PPI; Loehr, 1986); the Mental Toughness Inventory (MTI; Middleton et al., 2004); the Sport Mental Toughness Questionnaire (SMTQ; Sheard et al., 2009); the Mental Toughness Questionnaire-48 (MTQ-48; Clough et al., 2002).

The PPI was the first recognised measure of mental toughness and was developed as a means to assess an athlete's mental strengths and weaknesses. The measure consisted of 42-items which yielded seven distinct subscales (self-confidence, attention control, negative energy, motivation, attitude control, positive energy, visual and imagery control), which, through many years work with athletes and coaches, Loehr believed to be the most important elements of mental toughness, with little or no psychometric support offered to support the model (Golby, Sheard, & van Wersch, 2004; Middleton et al., 2004; Gucciardi, 2012). Golby and colleagues' attempts to utilise the PPI using a sample drawn from a variety of sports yielded a reduced, four factor, 14-item model which they referred to as the PPI-A. Using confirmatory factor analysis (CFA), they reported a good model fit, satisfactory psychometric properties and preliminary support for factorial validity. However, they suggest that a potential limitation of the scale is the exclusion of a subscale of control, a characteristic consistently highlighted in qualitative research into mental toughness (e.g., Jones et al., 2002) and encourage further investigation of the measurement's stability. While Gucciardi's (2012) examination PPI-A also revealed a more encouraging model fit, inadequate levels of consistency, as well as conceptual and methodological concerns were still identified.

The SMTQ was generated from data from previous qualitative studies on mental toughness. It is a 14-item measure with three sub-scales of confidence, constancy, and control, with a global measure of mental toughness. Sheard and colleagues (2009) conducted two studies involving 1142 participants of both genders (427 males, 206 females; $M_{age} = 21.5$ years, SD = 5.48), from a variety of sports, which supported the model and demonstrated satisfactory psychometric properties, adequate reliability, divergent validity and discriminant power. They do, however, recommend further testing of the measure over time.

Middleton *et al.* (2004; 2011) identified 13 characteristics that are purported to underpin mental toughness (self-efficacy, mental self-concept, potential, task specific attention, perseverance, task familiarity, personal bests, task value, goal commitment, positivity, stress minimisation, and positive comparisons). 65 original items were reduced, through a CFA process, to form a 36-item self-report measure comprising 12 sub-scales of three items each. Although the MTI appears to have produced reasonable indices of model fit using CFA, further testing is required to determine the robustness of the psychometric properties. Moreover, one of the main criticisms of this measure is that it only used *young elite* athletes ($M_{age} = 14.2$ years, SD = 1.54; range 12 to 19 years) (Sheard et al., 2009).

By far the most popular and most widely used measure of mental toughness to date is the MTQ-48 (Clough et al., 2002). Known more colloquially as the 4Cs model of mental toughness, the MTQ-48 is a 48-item, four factor model (challenge, commitment, control (emotional and life), and confidence (in abilities and interpersonal). Crust and Swann (2011) argue that, having been used in numerous studies to date (e.g., Crust & Clough, 2005; Nicholls et al., 2008; Horsburgh et al., 2009; Crust & Keegan, 2010), there is substantial evidence to support the validity and reliability of the measure. Yet despite the popularity and apparent validity of the measure, critics have highlighted the need for further psychometric testing, with doubts over the conceptualisation that underpins the measure and the lack of independent scrutiny of the factor structure (e.g., Gucciardi, Gordon, & Mallet, 2012). In a critique of the instrument, Gucciardi and colleagues have argued that the MTQ-48 lacks factorial validity and have questioned all of the studies that have utilised the MTQ-48.

While some researchers have approached the measurement of mental toughness from a sport-general viewpoint, others have more recently argued for a sport-specific approach. Due to the unique task demands of different sports/contexts, it has been suggested that some characteristics or attributes of mental toughness will have varying degrees of relevance, resulting in a degree of inter-sport/inter-context variance in mental toughness (Thelwell et al., 2005). That is, there is a difference between the emotional pain Jones et al. (2002) experienced by most athletes when confronted with failure, and the physical pain experienced by athletes in specific sports. For example, tolerating and coping with physical pain is a characteristic more likely to be associated with sports such as triathlon and rowing, but not in chess or snooker. Furthermore, other researchers have suggested that different type of mental toughness may exist (Bull et al., 2005).

For example, the mental toughness experienced by golfers is more likely to involve mind-set and coping skills, whereas the mental toughness experienced by an Olympic swimmer is more likely to involve the ability to endure high volumes of training and peaking in a one-off event. This approach to studying mental toughness has important implications from a both a conceptual and theoretical perspective, as well as the development of psychometric tools with which to measure it (Crust, 2007). Consequently, Gucciardi and colleagues (Gucciardi & Gordon, 2009; Gucciardi, Gordon, & Dimmock, 2009c) have sought to develop sport-specific measures of mental toughness for Australian football (the Australian football mental toughness inventory; AfMTI) and cricket (the cricket mental toughness inventory; CMTI). These attempts to develop sport specific measures of mental toughness have also yielded mixed, yet promising results.

The AfMTI is a 24-item scale that measures four components of mental toughness in Australian football (i.e., thrive through challenge, sport awareness, tough attitude, and desire success). The 24 items were designed to capture 11 key components of mental toughness in Australian football identified in a previous qualitative study (Gucciardi et al., 2008). Adequate internal reliability estimates across different raters (i.e., athletes, coaches and parents) was evidenced, while

moderate correlations with flow and resilience were also demonstrated. Although correlational data suggested a disagreement between raters, analysis of variance (ANOVA) suggested agreement between raters. Although preliminary data on factor structure, internal reliability and construct validity proved encouraging, they suggest this should be verified through further psychometric analysis before the measure can be considered a useful tool.

Gucciardi and Gordon (2009) developed a 15-item, five factor measure (affective intelligence, attentional control, resilience, self-belief and the desire to achieve) based the CMTI the perceptions of sixteen current and former cricketers of the key components of mental toughness in cricket. Psychometric analysis provided preliminary support for the measure's factor and internal structure, and internal reliability, while each of the five subscales were positively correlated with dispositional flow, hardiness, and resilience and negatively correlated with athlete burnout. However, further replication and extension of both measures is required. Although item brevity is considered a key strength and internal reliability and construct validity for both measures proved encouraging, further psychometric analysis is required before either measure can be considered a useful tool.

While the various measures of mental toughness have undoubtedly significantly contributed to the mental toughness literature, they are not, however, without their critics (e.g., Gucciardi, Hanton, & Mallett, 2012). For example, Gucciardi, Mallet, Hanrahan, and Gordon (2011) suggest that the utility of any proposed measure of mental toughness should be assessed on conceptual, statistical or empirical, and practical grounds. That is, any valid measure should, (1) be based on a theory or model which has empirical support, (2) employ the most appropriate procedures to examine its psychometric properties and, (3) provide practical utility, including item brevity and predictive validity. Gucciardi and colleagues (2015) suggest that the brevity of a short, single factor questionnaire may offer greater practical utility in field settings. Moreover, despite the general consensus regarding the multi-dimensional conceptualization of mental toughness (e.g., Clough et al., 2002; Coulter et al., 2010; Jones et al., 2002), more recent research by Gucciardi, Hanton et al. (2015) found that a uni-dimensional conceptualization may be empirically more appropriate. Furthermore, Hardy and colleagues (2014) argue that an observer-rated measure might be a more suitable means by which to measure mental toughness due to the social desirability and self-presentation limitations of selfreport measures.

A Behavioural Approach to Mental Toughness

As the research into mental toughness has advanced, it appears to have evolved through three distinct phases (see Gucciardi & Hanton, 2016). The first phase appears to have been aimed at identifying the positive qualities (e.g., confidence) and mental skills (e.g., goal-setting) believed to be associated with successful performance and coping with adversity, based primarily on researchers' experiences and observations of coaches and athletes (e.g., Loehr, 1985). The publication of Jones and colleagues' (2002) research started a wave of descriptive research aimed at providing a foundation for the theory, with the focus on mainly qualitative studies attempting to identify unobservable attributes thought to be unique to mentally tough individuals (e.g., Bull et al., 2005; Connaughton et al., 2008; Gucciardi et al., 2008; Jones et al., 2007; Thelwell et al, 2005).

While the first two phases of research and, in particular the second phase, have significantly advanced the mental toughness literature, some scholars have argued that, while unobservable psychological variables may influence mental toughness, or be correlates of it, the primary focus of mental toughness research should be on identifying whether mentally tough *behavior* has occurred (e.g., Andersen, 2011; Hardy et al., 2014). They further argue that while previous measures of mental toughness may capture a wide array of values, attitudes, cognitions, and affect, they do not explicitly capture mentally tough behavior. Moreover, Anderson (2011) recommends that the identification of context specific (e.g., sport, military) real world behaviours, calibrated against the various indices of mental toughness, may provide evidence of mentally tough behaviour.

Consequently, in an attempt to further advance the research into mental toughness, the current phase of research has seen researchers' attention being turned to examining mental toughness from a behavioural perspective. That is, examining the observable behaviors or actions that are typically demonstrated in challenging or demanding situations, with some notable studies yielding promising results (Bell et al., 2013; Gucciardi, Hanton et al., 2015; Gucciardi, Jackson et al., 2015; Gucciardi, Peeling, Ducker, & Dawson, 2016; Hardy et al., 2014).

For example, in a cross-sectional study with five separate samples (i.e., the workplace, education, and the military), Gucciardi and colleagues (Gucciardi, Hanton et al., 2015) found that a single factor self-reported measure was directly associated with higher levels of supervisor-rated performance and coping with stress, and completion of a rigorous military selection task. Moreover, there was evidence to support an inverse relationship between mental toughness and distress, and positive associations with goal progress, thriving, and psychological health, both in terms of variation within a person (e.g., over time) and between people. In another cross-sectional study, Gucciardi and colleagues (2016) examined the association between self-reported mental toughness and behavioural perseverance among a sample of male

Australian footballers, using a multistage 20m shuttle run test as a proxy for behavioral perseverance. Results revealed a strong association between mental toughness and behavioural perseverance, even when controlling for other factors known to influence MST performance (e.g., age, height, body mass, and experience). Gucciardi and colleagues suggest that their findings support the theoretical proposition that persistence, effort or perseverance represent a behavioural signature of mental toughness.

The emergence of mental toughness research from a behavioural perspective has also seen researchers utilizing context and sport specific informant-rated measures, rather than the traditional self-report instruments, some of which have yielded sound psychometric properties, strong factor loadings and internal reliability (e.g., Beattie et al., 2017; Hardy et al., 2014). Distinct advantages exist when using an informantrated measure. Firstly, they are able to directly capture mentally tough behaviour, rather than provide an assumption of the existence of an individual's mental toughness, based on achievement levels. Second, when compared with objective measures of achievement (e.g., race time), results yielded from an informant-rated measure are less likely to be confounded by other variables considered important to goal attainment (e.g., skill, talent, practice) (Gucciardi, Jackson et al., 2015). Third, an informant-rated measure negates the issue of social desirability and minimizes concerns associated with common method bias (Gucciardi, Jackson et al., 2015; Hardy et al., 2014). For example, Gucciardi, Jackson and colleagues conducted a study to examine the motivational correlates of mentally behaviours (e.g., fear of failure, inspiration, passion) among adolescent tennis players, with informants (parents) reporting on observed mentally tough behaviour and athletes self-reporting on motivational variables. Results revealed that harmonious passion and regular

inspiration were found to be associated with higher levels of mentally tough behaviour, whereas fear of failure and obsessive passion were found to be inversely related to mentally tough behaviour.

Hardy and colleagues (2014) developed and validated an 8-item informantrated measure for use in a study with young elite cricketers (see Bell et al., 2013) designed to assess personal performance under pressure. The eight items described stressful situations that cricketers performing at a high level that have been shown to experience (e.g., Woodman & Hardy, 2001). The measure demonstrated good structural integrity and discriminated between professional and university level cricketers in terms of mental toughness (Hardy et al., 2014). Hardy and colleagues' measure has been subsequently contextualized in a study with young competitive swimmers (Beattie et al., 2017), with seven original items being retained and others describing stressors specific to the sport added (e.g., s/he has to achieve a National qualifying time), resulting in a 11-item questionnaire. Good psychometric properties were also evidenced in this study.

Theoretical Underpinning

Despite the requirement to base any measure or conceptualization of a construct on a framework of underpinning theory, some researchers have failed to base their conceptualization on a sound theoretical rationale. For example, Loehr's (1985) promulgation of what he thought to be the most important elements of mental toughness was based on previous interactions with athletes and coaches and lacked any form of rigorous research. This resulted in a weak conceptual and theoretical underpinning of his conceptualization and measurement of mental toughness (Golby, Sheard, & van Wersch, 2004; Middleton et al., 2004). Similarly, Bull and colleagues (2005) based their own conceptualization of mental toughness on their findings,

without employing established theory or discussing as a means by which to facilitate a deeper understanding of the key characteristics of mental toughness (Gucciardi, Hanton & Mallett, 2011).

Many researchers have, however, attempted to provide a logical theoretical framework to underpin their conceptualization and measurement of mental toughness. For example, Golby and colleagues (2004) claimed to offer a dispositional perspective towards the measurement of mental toughness, with a theoretical framework based on what Seligman and Csikszentmihalyi (2000) termed "positive psychology." The 13 characteristics identified and purported by Middleton and colleagues (2004) to underpin mental toughness provided a link to existing theories related to some of those characteristics (e.g., self-efficacy theory; Bandura, 1996; 2009; goal-setting theory; Locke & Latham, 1984; 1990).

Gucciardi and Gordon (2008) examined personal construct psychology (PCP; Kelly, 1955) as a theoretical framework for their conceptualization of mental toughness in Australian football and Cricket. PCP explains how an individual's own interpretation of events dictate his or her subsequent behavior by taking different components of human behavior and incorporating them into one psychology. Kelly (1955) posits that the various motivations, emotions, values, cognitions stem from one underlying process of anticipation and construction, none of which can be studied individually without any consideration of the other features.

Crust et al. (2002) utilized the theoretical foundations of hardiness theory for their conceptualization of mental toughness and the MTQ-48. Hardiness is a related but subtly distinct construct that previously emerged from research examining stress reactions. Hardiness is viewed as a relatively stable personality characteristic, involving courage, adaptability, and the ability to maintain optimal performance under exposure to stress. It has been conceptualized as a combination of three attitudes, commitment, control, and challenge, all of which provide an individual with existential courage and motivation to appraise stressful situations as opportunities for growth (Kobasa, 1979; Maddi, 2006, 2007). Crust and colleagues posit that, while the concepts of mental toughness and hardiness share some common ground, in that they both help to buffer against the deleterious affects of stress, the three hardiness do not fully encapsulate the construct of mental toughness. Clough and colleagues argue that it is the added attribute of confidence (in one's abilities and inter-personal confidence) that distinguishes mental toughness from hardiness. Despite being one of the most popular instruments used by researchers to examine mental toughness, this line of thinking is not without its critics. Andersen (2011), for example, suggests that, with 75% of the underlying model being hardiness theory, the MTQ-48 appears to be merely the constructs of hardiness and resilience 'repackaged' into something new (i.e., mental toughness).

It is worth noting at this point that other similar, yet subtly different constructs associated with ameliorating the potential harmful effects of exposure to stress, have been proposed, defined, and operationalized. For example, resilience is characterized by the ability to recover from negative emotional experiences and the ability to adapt to stressful situations. Further, grit is a psychological construct proposed by Duckworth, Peterson, Mathews, & Kelly (2007), which involves striving toward challenges and maintaining effort and persistence despite adversity, setbacks, and failure. Duckworth and colleagues define grit as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087), with the emphasis on long-term stamina, rather than short-term intensity (Kelly, Mathews, & Bartone, 2024).

With regard to examining mental toughness from a behavioural perspective,

Hardy and colleagues (2014) proposed that existing personality theories might offer some promise in furthering an understanding of mentally tough behavior. Specifically, they drew on the revised Reinforcement Sensitivity Theory (rRST; Gray & McNaughton, 2000) as a theoretical framework, which they hypothesized would explain between-person differences in mentally tough behavior. In rRST, Gray and McNaughton (2000) postulate three neuropsychological systems that are responsible for reward and punishment sensitivities of the organism, namely the behavioral activation system (BAS), behavioural inhibition system (BIS), and the fight, flight, freeze system (FFFS) (Gray & McNaughton, 2000). Importantly, Hardy and colleagues argue that rRST offers a neuropsychological explanation of the maintenance of goal-focused behavior in the face of stressful stimuli in the context of mental toughness.

Reward sensitivity is influenced by the BAS, which mediates reactions to all conditioned and unconditioned appetitive (rewarding) stimuli, generating the emotion of 'anticipatory pleasure.' The personality traits associated with the BAS and reward sensitivity comprise optimism, reward-orientation and impulsiveness, which clinically map onto addictive behaviors and high-risk, impulsive behavior. The BAS is a positive feedback system, designed to move away from the existing appetitive goal-state towards the biological reinforcer (Corr, 2004). On the other hand, punishment sensitivity is underpinned by a combination of the FFFS and the BIS.

The FFFS is responsible for mediating reactions to all conditioned and unconditioned aversive (punishing) stimuli and mediates the emotion of fear. A hierarchical array of modules comprises the FFFS, responsible for avoidance and escape behaviors. The FFFS is an example of a negative feedback system, designed to reduce the discrepancy between the immediate threat and the desired state of safety. The associated personality factor comprises fear-proneness and avoidance, which clinically mapped onto such disorders as phobia and panic.

The BIS is responsible for resolving goal conflict between BAS (approach) and the FFFS (avoidance), which generates the state of anxiety. The BIS inhibits prepotent conflicting behaviours, and it scans the long-term memory to try and identify a resolution to the current approach-avoid goal conflict. Subjectively, this state is experienced as anxiety, and a sense of impending danger (Corr, 2004). Both FFFS and BIS functioning are linked to the amygdala, which is a key brain region involved in threat detection and fear regulation (Davis & Whalen, 2001).

It has been posited that this combination of behavioral and affective responses may go some way to explain why individuals in high-pressure performance environments find it difficult to perform to an optimal level (Bell et al., 2013). While moderate levels of anxiety and physiological activation have been shown to facilitate optimal performance (e.g., Woodman & Hardy, 2001), Bell and colleagues argue that persistent inhibited behavior is unlikely to facilitate optimal performance under pressure (Bell et al., 2014). Indeed, to provide support for this line of reasoning, Hardy and colleagues point to research into rRST, which has shown reward sensitivity to be associated with mild reactions to highly threatening situations and punishment sensitivity to be associated with orientation away from threatening situations and negative evaluations of the capacity to deal with pain (Perkins & Corr, 2006). Moreover, in the context of this thesis, research into rRST relating to a military combat task has suggested that reward sensitivity is associated with high levels of performance and punishment sensitivity is associated with poor performance (Perkins, Kemp, & Corr, 2007). The aforementioned research, they argue, provides evidence that "reward sensitivity is related to various cognitions and behaviors that one might
associate with mental toughness, whereas punishment sensitivity is related to cognitions and behaviors that appear to imply a lack of mental toughness" (Hardy et al, 2014, p. 73).

Hardy and colleagues (2014) conducted a study with university and high-level athletes to examine the interactive nature of reward and punishment sensitivity in a sporting context. Corr (2001) suggests, interactive effects are most likely to occur in environments containing a combination of strong appetitive and aversive stimuli (e.g., sport training and competition) which Hardy and colleagues posit is an appropriate environment in which to examine the presence or absence of mentally tough behavior (Bell et al., 2013). It was hypothesized that high reward sensitivity and low punishment sensitivity would be associated with high levels of mentally tough behaviour, while an interaction between the two would show any associated negative effects of punishment sensitivity to be mitigated by high levels of reward sensitivity.

However, the results from two separate studies revealed the opposite to what was hypothesized. That is, the interaction between reward and punishment sensitivity revealed that punishment sensitivity was found to be significantly and positively related to mental toughness when reward sensitivity was low, while significantly and negatively related to mentally tough behaviour when reward sensitivity was high.

A later study conducted by Beattie et al., 2017 in an alternative sporting context (swimming) provided support for Hardy and colleagues' findings. The results revealed that athletes who were sensitive to punishment and insensitive to reward demonstrated greater levels of mentally tough behaviour and, consequently, were able to consistently perform at a high level under competitive pressure. Taken together, the results from this batch of studies suggests that athletes who are sensitive to punishment are predisposed to pick up threat early, thereby providing them with the time to plan effective responses to high pressure situations (e.g., competition).

Mental Toughness Development

With mental toughness being regarded as so crucial to coping with pressure, overcoming adversity, and maintaining high levels of performance and functioning (Gucciardi, Jackson et al., 2015), it is unsurprising that the last decade and a half has spawned a plethora of research examining ways in which to understand and develop the construct. Much of the research into mental toughness development has been conducted within the sports domain and been informed by qualitative designs (e.g., Bull et al., 2005; Connaughton et al., 2008; Gucciardi, Gordon, Dimmock, & Mallett, 2009d; Thelwell, Such, Weston, Such, & Greenlees, 2010; Weinberg et al., 2011), although some notable quantitative research has started to be conducted (e.g., Beattie et al., 2017; Bell et al., 2013; Mahoney, Ntoumanis, Gucciardi, Mallett, & Stebbings, 2016). While the research to date has shown that attempts to develop mental toughness are a complex undertaking involving multiple mechanisms and sources of influence (Anthony, Gucciardi, & Gordon, 2017), some common themes have begun to emerge. Specifically, mechanisms such as challenging training environments, sources of influence such as social support networks (e.g., coach, family, friends), and psychological skills/coping strategies appear to play an important role in mental toughness development (Harmison, 2011).

Several researchers have suggested that exposure to tough and challenging environments (e.g., competition) are crucial to the development of mental toughness (e.g., Clough & Crust, 2011; Bull et al., 2005; Connaughton et al., 2008). Crust and Clough (2011) suggest training should include some form of psychological pressure, and argue that "to develop mental toughness, young athletes must be gradually exposed to, rather than shielded from, demanding situations in training and competition in order to learn how to cope" (Crust & Clough, 2011, p. 21). On this basis, it might be reasonable to suggest that a performance-based training climate that is both sufficiently challenging, and accurately representative of the typical stressors likely to be encountered in the relevant context may be appropriate (Crust, 2008). Bell and colleagues (2013) suggest that in order to develop mental toughness, training sessions that expose athletes to negative consequences that occur due to poor performance in competition would provide them with them with the opportunity to face and deal with stressors that threaten personal goal achievement. Indeed, they argue that exposure to punishment conditioned stimuli is an important element of any mental toughness development program

However, a potential limitation with this is that the BIS (see prior discussion on rRST) fails to identify previous experiences to draw upon, leading to avoidance behaviour and possible negative impact on performance and skill development. One solution to this could be the application of stress inoculation training, whereby stress tolerance can be increased by gradual and intermittent exposure to stress and the stressors associated with the training context (cf. Dienstbier, 1989). Moreover, Bell and colleagues (2013) propose that systematic desensitization Deffenbacher & Suinn, 1988) may be useful in helping athletes with performance enhancement techniques in highly pressurized situations by gradual exposure to punishment-conditioned stimuli. Indeed, recent research has found that practicing perceptual motor tasks under mild conditions of anxiety inducing stress may prevent choking when performing under higher levels of anxiety (e.g., Oudejans & Pijpers, 2010).

In line with rRST, high-pressure, challenging performance environments (e.g., elite sport, military operations and training) contain a high prevalence of punishment conditioned stimuli in the form of physical or ego threats (Gray and McNaughton, 2000). In a sporting environment, such punishment-conditioned stimuli may come in the form of fear of mistakes or poor performances where the punishment is the negative emotions that are experienced as a result (Bell et al., 2013). Hardy and colleagues (Bell et al, 2013; Hardy et al., 2014) posit that the appropriate use of punishment per sé, or the threat of punishment may be a useful means by which to induce exposure to stress and anxiety as part of a challenging environment. Importantly, in order for the perceived threat to be appropriately attended to, the negative consequences (e.g., punishment) need to be perceived as genuine. Unfortunately this is widely discouraged by sports practitioners for fear of the negative emotional and motivational consequences (Hardy et al., 2014).

Consequently, the intelligent use of punishment remains largely unexplored, which is unfortunate, as it only serves to limit further academic understanding of the construct and prevents the use of a valuable tool in behaviour modification (Arvey & Ivancevich, 1980; Bare, 1970). Arvey and Ivancevich, 1980 suggest that "only rigorous research and an open dialogue will provide the insight needed to understand the effectiveness of punishment in organizational settings" (Arvey & Ivancevich, 1980, p. 131), particularly in the development of stress tolerance in a military training environment (e.g., Attwater, Cambreco, Dionne, Avolio, & Lau, 1997). This is somewhat surprising, as leader reward *and* punishment behaviour are both central to transactional leadership (Bass, 1985) both of which are critical in forming the foundation upon which transformational leadership is built (Avolio, 1999). Indeed, there is evidence to suggest that punishment and the threat of punishment can lead to higher levels of performance under pressure, providing they are administered *appropriately* and augmented by transformational leadership behaviours (e.g., Bass, 1998; Arthur et al., 2014). Further, in order to prevent the adverse effects associated with punishing training environments, it is essential that athletes be taught effective strategies with which to cope (Gould, Eklund, & Jackson, 1993).

One psychosocial resource that has been recognized for its ability to buffer the adverse effects of stress, aid recovery from injury and positively impact of performance is social support (e.g., Cohen & Wills, 1985; Gruber, Kilcullen, & Iso-Ahola, 2009; Harlow & Cantor, 1995; Moldjord, Laberg, & Rundmo, 2015). Social support can be defined as, "an exchange of resources between at least two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient" (Shumaker & Brownell, 1984, p. 13), which involves a network of personal ties that serve to meet an individual's need to provide reassurance, and improve communication skills. Importantly, social support also serves to reduce uncertainty during stressful experiences, provide resources and companionship, and facilitate mental and physical recovery (Albrecht & Adelman, 1984).

Social support is believed to be a particularly important personal resource because it helps provide access to further resources beyond those already possessed by the individual (Hobfoll et al., 1990). In an attempt to explain the way in which social support mitigates stress, Cohen and Wills (1985) proposed the buffering hypothesis. Evidence for a buffering model is found when the social support measure assesses the perceived availability of interpersonal resources that are responsive to the needs elicited by stressful events (Cohen & Wills, 1985).

A number of qualitative studies have highlighted the importance of support from significant others (e.g., coaches, peers, parents, etc.) in the development and maintenance of mental toughness (e.g., Butt et al., 2010; Connaughton et al., 2010; Connaughton et al, 2008; Thelwell et al., 2010). For example, Connaughton and colleagues (2008) found that coaches' leadership had an impact on attributes such as an unshakable belief in an athlete's ability to achieve practice and competition goals, perform better than his/her opponent, and possessing the desire to succeed. Thelwell and colleagues (2010) found that athletes perceived coach support in the form of emotional support, positive feedback, motivation and encouragement, instilling determination, and being made to feel special.

In support of previous investigations regarding the development of mental toughness, Butt and colleagues (2010) found that the most important person appeared to be the coach. Coaches were perceived by athletes to provide support and encouragement both in and out of the practice and competition environments. Moreover, coaches were seen as displaying certain characteristics, such as confidence and good leadership skills, perceived to facilitate mental toughness development in athletes. In a study from the sport psychologists' perspective, Weinberg, Freysinger, Mellano, & Brookhouse (2016) found that one of the important ways for coaches to develop mental toughness is by creating aversive situations (e.g., punishment conditioned stimuli) similar to those the athletes might face in actual competition. However, it is important that the coach also displays nurturing and supportive behaviour towards the athlete by providing the athletes with, for example, mental skills and coping strategies with which to deal with stressful situations. In a nonsporting context, leader-provided social support was found to attenuate the negative impact of job demands on employee stress. Furthermore, the highest levels of burnout and lowest levels of job satisfaction were found under conditions of high demands, low perceived control and low leader-provided social support (Melamed, Kushnir & Meir, 1991).

Leader social support has also been found to be important in a military training context. Overdale and Gardener (2012) examined the impact of various sources of

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social support (i.e., friends, family, peer, instructor) on coping adaptability in military training. Their results revealed that instructor support was the only source of support directly associated with better coping and higher performance in training. Overdale and Gardener (2012) suggest that, due to their status, proximity, and expertise, instructors are in a better position to provide material support, performance feedback, and specific information relevant to the training environment.

This may be because recruits' previous support networks (e.g., friends, parents) will not be as readily available as the new networks established during the early stages of training (e.g., peers, instructors). The instructor's leadership style and/or behaviours will determine effectiveness of social support. Specifically, behaviours on the part of the instructor that fulfil these functions include; expressing emotional support (e.g., affection), appraisal support (e.g., performance feedback), giving information (e.g., advice and role clarification), offering emotionally sustaining behaviours (e.g., empathy), and listening to the concerns and feelings of the other person (Albrecht & Adelman, 1984; House, 1981). One of the most effective ways to provide supportive leadership and positively influence the training environment and performance in a variety of settings, including; education (Koh, Steers, & Terborg, 1995), finance (e.g., Barling, Weber, & Kelloway, 1996) business organizations (Podsakoff, MacKenzie, Moorman, & Fetter, 1990), sport (Callow, Smith, Hardy, Arthur, & Hardy, 2009), and the military (e.g., Arthur & Hardy, 2013; Bass, Avolio, Jung, & Berson, 2003; Dvir, Eden, Avolio, & Shamir, 2002; Hardy, et al, 2010) is through the application of transformational leadership behaviors. Transformational leadership theory (Bass, 1985) posits a range of leader behaviors that inspire followers to transcend self-interest for the greater good of the organization or team, resulting in an increase in positive attitudinal outcomes.

A subsequent differentiated model of transformational leadership posits six behaviours: (i) appropriate role modelling (ii) intellectual stimulation, (iii) fosters an acceptance of group goals, (iv) individual consideration, (v) intellectual stimulation, and (vi) high performance expectations (e.g., Arthur & Hardy, 2014; Hardy et al., 2010). These behaviours augment traditional operant leadership behaviours of contingent reward and contingent punishment (Rubin, Bommer, & Bachrach, 2010). Each behaviour is posited to serve one, or a combination of three specific functions; (i) articulating a positive vision of the future (vision; appropriate role modeling, inspirational motivation), (ii) providing appropriate challenging (challenge; high performance expectations, intellectual stimulation, contingent punishment), and (iii) providing leader support (support; individual consideration, inspirational motivation, contingent reward) (Arthur, Hardy, & Woodman, 2014).

Research in both elite and regular military training environments have shown transformational leadership behaviours to positively impact on a number of performance-related outcome variables (e.g., resilience, confidence, training satisfaction, group cohesion) and discriminate between recruits' success and failure in training (Arthur & Hardy, 2014; Hardy et al., 2010). It would be logical to assume that supportive transformational leadership behaviours may have a positive impact on the development of mental toughness.

Some researchers have found that the use of psychological skills may play an important role in mental toughness development (e.g., Bell et al., 2013; Gucciardi et al., 2009b; Thellwell et al., 2010). Psychological skills training research in the sport domain has generated a wealth of evidence demonstrating the positive effect of psychological skills usage in relation to performance (e.g., Cumming & Ramsey, 2010; Fournier, Calmels, Durand-Bush, & Salmela, 2005; Hanton, Mellalieu & Hall,

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2004; Kress & Statler, 2007; Patrick & Hrycaiko, 1998; Sheard & Golby, 2006; Thelwell et al., 2001; 2003; Wadey & Hanton, 2008). For example, in two studies, Thelwell and Greenless (2003) showed that indoor triathlon performance was enhanced when implementing a PST package involving goal-setting, relaxation, imagery and self-talk, while Patrick & Hrycaiko (1998) demonstrated the utility selftalk, relaxation and imagery enhanced performance for a 1600m run. In a study examining the nature and effects of cognitive strategies used by former Olympic cyclists to cope with exertion pain during performance, Kress and Statler (2003) found that cognitive skills such as goal setting, imagery, and positive self-talk were routinely used to cope with endurance pain while training *and* competing and that all of them attended to the pain rather than attempting to ignore it.

Whilst a wide variety of such strategies, and skills have been included in intervention programs, the four key basic psychological skills are considered to be imagery, goal setting, self-talk and relaxation (Hardy, Jones, & Gould, 1996; Vealey, 2007). The coping literature in sport suggests that coping is a complex and multidimensional process, therefore, it is highly unlikely that any single psychological skill will be effective in all situations (Hardy et al., 1996). Consequently, Gould et al. (1993) recommend developing a number of skills or coping strategies, which can be individualized, learned, refined and practiced to the point that they can be executed automatically. Used appropriately, the research literature has shown that the use of a combination of the four basic psychological skills can positively influence performance by: (1) eliciting positive changes in anxiety, confidence and motivation (e.g., Hardy et al., 1996; Krane & Williams, 2011), (2) enhancing focus, stress management and reduction (e.g., Krane & Williams, 2011; Short, Ross-Stewart, & Monsma, 2006), and (3) increasing pain tolerance (e.g., Kress & Statler, 2003; Thelwell & Greenlees, 2003).

The use of psychological skills has also shown to enhance performance in the military training environment. For example, Hammermeister et al. (2010) measured soldiers' physical performance on a standard soldiers' fitness test designed to test cardiovascular respiratory fitness in three events (a 2-mile run, push-ups and sit-ups). Results revealed that soldiers' high in the use of psychological skills performed significantly better on the test than did their peers in low use of psychological skills. However, one notable weakness in this study was that the recruits' past performances were not adequately controlled for, that is, the strong psychological skills cluster may have exhibited higher levels of fitness prior to being measured (Arthur, Fitzwater, Roberts, Hardy, & Arthur, 2017).

In a randomized control study, Adler, Bliese, Pickering et al., (2015) found that soldiers in the mental skills training condition reported greater use of a range of cognitive skills and increased confidence and performed significantly better on a variety of military tasks, including fitness related tasks, compared to those in the control condition. Unfortunately, despite demonstrating the utility in PST in performance enhancement, no attempt was made to measure mental toughness or its relationship with mental skills. In a study with elite British Army recruits undergoing an arduous physical selection program, the use of goal setting, imagery, and relaxation was indirectly related to endurance performance via perceived levels of activation. Furthermore, the use of goal setting was also positively related to endurance via a perceived improved ability to reduce negative thinking (Arthur et al., 2017).

Several qualitative studies suggest that the use of psychological skills and effective coping strategies also have a pertinent role to play in the development of mental toughness (e.g., Bull et al., 2005; Connaughton et al., 2008; Connaughton et al., 2008; Jones et al., 2002; 2007; Sheard & Golby, 2006; Thelwell et al., 2010). Indeed, Thelwell et al. (2010) suggest that "there is a clear role for psychological skills training (PST) within mental toughness development" (p. 185), while Jones et al's. (2007) mental toughness framework suggests the use of strategies by mentally tough athletes may provide important clues regarding the potential role of mental skills training in facilitating the development of mental toughness. The role of PST in the development of mental toughness has received mixed support through a number of studies (e.g., Crust & Azadi, 2010; Gucciardi et al., 2009b; Sheard & Golby, 2006).

For example, in a study with young swimmers, Sheard and Golby (2006) found that the use of psychological skills led to significant increases in both the performance and self-rated mental toughness (i.e., PPI; Loehr, 1986). However, due to its inadequate psychometric properties, the PPI as a measure of mental toughness is questionable (Middleton et al., 2004). Moreover, the study did not include an active control group, therefore, the improved performance may have been due to general improvements through training. Crust and Azadi (2010) showed that mental toughness was significantly related to the use of a number of psychological skills in both practice and competition, using the MTQ-48 (Clough et al., 2002) and the TOPS (Hardy, Roberts, Thomas, & Murphey, 2010). With regard to practice, the significant positive correlations were with, relaxation, self-talk. While in competition, low to moderate positive correlations were revealed with relaxation, self- talk, and goalsetting.

Despite mental toughness being regarded as one of the most important psychological characteristics in determining competitive success, there remains a paucity of examples of effective mental toughness interventions in the literature (Bell, et al., 2013). However, some examples can be found. For example, Gucciardi, Gordon and Dimmock (2009) evaluated the effectiveness of a traditional PST program targeting self-regulation, arousal regulation, mental rehearsal, attentional control, selfefficacy, and ideal performance state, and a program targeting the keys to mental toughness (Gucciardi, Gordon, & Dimmock, 2008). They reported more positive changes in subjective ratings of mental toughness, resilience, and flow than the control group, with both programs demonstrating equal effectiveness in enhancing mental toughness. Indeed, similar ratings for mental toughness were reported by the parents and coaches. However, by the authors' own admission, a large majority of the material delivered in the mental skills program was also delivered in the mental toughness program (e.g., self-efficacy, arousal regulation, and mental rehearsal), which probably accounted for the similar observed effects.

In an effort to test the efficacy of an intervention designed to develop mental toughness, Bell and colleagues (2013) examined elite young cricketers' ability to achieve a high level of personal performance in a pressurized performance environment characterized by a high prevalence of punishment-conditioned stimuli. The study addressed many of the issues discussed above regarding conceptualization, measurement and the development of mental toughness. Mental toughness was conceptualized within the neuropsychological theoretically driven framework of rRST (Gray & McNaughton, 2000) as "the ability to achieve personal goals in the face of pressure from a wide range of different stressors" (Hardy et al., 2014, p. 5). The 8-item, observer-rated mental toughness inventory (MTI; Hardy et al., 2014) was completed by the athletes' coaches to evaluate the effectiveness of the intervention and the presence of mentally tough behaviour. A range of performance data were also collected pre and post intervention to demonstrate the proposed link between mental toughness and performance (i.e., batting and fitness assessments).

The challenging training environment was augmented by exposing participants to pre-determined punishments for failure to meet strict disciplinary standards during training (e.g., punctuality, tidiness, correct kit) or specific performance standards (e.g., during testing). To avoid ambiguity, or any perception of unfairness or bullying, all athletes were informed of this prior to the start of the intervention. In line with recommendations by Gould, et al. (1993), athletes were taught an array of effective coping strategies to manage threat and prevent the adverse effects associated with punishment. The coping strategies included goal setting, imagery techniques, self-talk, arousal regulation, refocusing strategies, and cognitive re-structuring, all of which have been found to enhance athletic performance (e.g., Greenspan & Feltz, 1989).

Further, in order ensure that the punishment conditioned stimuli had the intended effect and to provide an appropriately supportive training climate, Bell and colleagues ensured that the delivery of the intervention was underpinned by transformational leadership behaviours. The transformational leadership behaviors posited by Bell and colleagues to be particularly pertinent in a mental toughness intervention were inspirational motivation, intellectual stimulation, and appropriate role modeling.

The results of the study revealed significant increases in observed mentally tough behaviour in the treatment group between pre and post intervention, while significant interactions were evidenced between mental toughness and four of the five performance variables measured. Bell and colleagues suggest that these results suggest that the appropriate use of punishment, but more specifically the threat of punishment, can lead to higher levels of mentally tough behaviour mental toughness and performance under pressure. Consequently, they encourage further investigation along this line in other training contexts.

Unfortunately, however, Bell et al. (2013) were unable to clearly identify which aspects of the intervention contributed most to the observed changes in mental toughness, that is, the punishment-conditioned stimuli, the efficacy of the coping skills, or the transformational delivery. Therefore, it would seem prudent for future research to isolate and examine the separate effects of punishment-conditioned stimuli, the coaches' use of transformational leadership behaviours and coping skills in developing mental toughness in a training environment.

The Military Context

Although the research literature on mental toughness has been dominated by research in the sports domain, which has significantly shaped the general understanding of mental toughness, the concept of mental toughness has great potential for application across a broad range of contexts, including business, health care, the performing arts, and the military (Clough & Strycharczyk, 2012; Gucciardi & Gordon, 2011). A number of researchers have contributed to the discussion regarding the ways in which the theoretical, empirical, and applied concepts from sport psychology might be applied to current and future military initiatives. Indeed, many sports have evolved from basic military tasks and are exemplified in a variety of individual disciplines, including marksmanship (e.g., rifle), overcoming physical defenses and obstacles (e.g., steeplechase), navigation (e.g., orienteering), and handto-hand combat (e.g., wrestling) (Goodwin, 2008). Similarities have also been highlighted between team sports, such as rugby, and small unit military combat operations, both requiring individuals to perform in a complex and dynamic environment under stressful circumstances (Ward, Farrow, Harris, Williams, Eccles, & Ericsson, 2008).

While several studies have been conducted demonstrating the utility of the application of sports science (e.g., Adler et al., 2015; Arthur and Hardy, 2014; Gold and Friedman, 2000; Hammermeister et al., 2010; Overdale and Gardener, 2012; Moldjord et al., 2015) to date, there appears to have been little or no empirical research conducted on mental toughness in the military domain, although there is evidence to suggest that it has recently started to be explored (e.g., Hammermeister, Pickering, & Lennox, 2011). This is surprising, as exposure to highly stressful environmental demands is a natural consequence of the military environment. Indeed, "combat, with its very real threat of death or mutilation might represent the ultimate in naturally occurring events of stress" (Bourne, 1970, p. 22), requiring soldiers to perform under intense pressure in extremely hostile environments characterised by chaos, danger, exhaustion, fear, loneliness and deprivation (Wagstaff & Leach, 2015). Typical combat stressors include, for example, violent close quarter fighting and coming under fire, a high risk of injury or even death, seeing seriously injured comrades or witnessing others suffering and dying, and the application of disciplined restraint due to strict rules of engagement (Moldjord et al, 2015).

Conditions of stress and the problems of coping and adaption in the military go beyond combat situations and are also highly relevant in recruit training. During training, recruits undergoing basic training are exposed to stress in the form of rigorous mental and physical training. Typical stressors include, for example; a far stricter discipline regime than that with which they are familiar, intense physical demands, time pressures, isolation from familiar social support networks, threats to personal feelings of safety, loss of independence and freedom, and a general lack of privacy (Gold & Friedman, 2000; Johnsen, Laberg & Eid, 1998). Moreover, an inability to cope with the stresses associated with the training environment can contribute to non-completion of training through voluntary withdrawal or even involuntary discharge (Clemons, 1996).

Infantry basic training, in particular, elicits high attrition rates, resulting in high personal cost to the individual and significant financial cost to the organization (Blacker, Wilkinson, Bilzon, & Rayson, 2008). Indeed, a recent study examining the factors associated with failure to complete infantry training in British Army recruits revealed a 36.2% attrition rate (Kiernan, 2011). Although attrition is mainly caused by injury, a significant number of recruits are also lost to training because they are unable to meet the required standard, or voluntarily withdraw from training. This is in spite of a screening process involving cognitive, physical and medical tests, designed to identify and reject individuals who have a low probability of successfully completing training (Jackson, Agius, Bridger, & Richards, 2011). Moreover, recent statistics regarding training for elite military units (e.g., Parachute Regiment, Royal Marines) have revealed training attrition to be approximately 60-70% (Cockroft, 2014; Copper, 2014).

Professional competence is achieved by skill acquisition, and the development of technical proficiency, discipline, teamwork, and physical fitness. However, other cross-functional competencies necessary to succeed in a complex and stressful environment (e.g., adaptability, stress tolerances, perseverance, and attention control) (Robson & Manacapilli, 2014) are not generally taught or explicitly incorporated into the training curriculum. They tend to be developed by various other means. For example, military training organizations create rigorous training standards to test the mental fortitude of trainees, which often involve trainees executing tasks while exposed to a variety of physical and psychological stressors (Robson & Manacapilli, 2014). However, these important psychological lessons are, at best, implicit, with the recruit having to rely on his own cognitive functioning and coping strategies to control thoughts and emotions. Therefore, while many individuals learn these vital mental lessons over time, the remainder will have varying degrees of difficulty acquiring them (Thompson & McCreary, 2006).

Summary

Having reviewed the mental toughness literature, it is evident that further research is warranted regarding the development of mental toughness, particularly in contexts other than sport, where research is scant. Of particular interest are the results of Bell et al's. (2013) study indicating that a coping skills intervention, delivered in an environment characterized by punishment conditioned stimuli, was successful in developing mental toughness. However, by the authors' own admission, their study made no attempt to measure the separate effects of the punishment conditioned stimuli, the transformational delivery, or the efficacy of the coping skills. Thus, no conclusions could be inferred regarding which aspects of the intervention contributed most to the observed change in mental toughness or, indeed, whether these aspects interacted to impact the observed change in mental toughness. Consequently, further investigation along these lines is warranted. However, the absence of a well-validated measure of mental toughness in military training is a serious obstacle to conducting such research.

While dealing with adversity and difficult challenges are commonplace in most stressful achievement contexts, it is clear from the discussion above that the military training environment, replete with opportunities to examine the presence or absence of mentally tough behaviour, is an ideal context in which to examine mental toughness. That is, it provides a highly challenging environment for young recruits. Importantly, the military training environment also provides objective measures of performance with real consequences for failure.

Thesis Objectives

Consequently, the primary objectives of this thesis were to: (1) develop and validate a psychometrically robust informant-rated instrument with which to measure mentally tough behaviour in military training, (2) examine the interactive effects of contingent punishment and supportive leadership behaviour on the development of mentally tough behaviour and performance and, (3) examine the effects of a psychological skills intervention on the development of mental toughness during training and subsequent recruit performance on an arduous military task.

Throughout the thesis, Hardy and colleagues' (Hardy et al., 2014) conceptualization of mental toughness is used within the neuropsychological theoretically driven framework of rRST (Gray & McNaughton, 2000). That is, "the ability to achieve personal goals in the face of pressure from a wide range of different stressors" (Hardy et al., 2014, p. 5). It should be noted that while the theoretical framework of rRST underpins mentally tough behaviour, rRST and reward and punishment sensitivity was not measured directly. Therefore, no inferences can be made with regard to individual reward and punishment sensitivities in relation to the results of the following studies.

Thesis Structure

The thesis consists of five chapters; the present introduction, three empirical chapters, and a general discussion, with the main part of the thesis focusing on production of three research papers. As a consequence of this structure, inevitable overlap and repetition does occur. The first research chapter (Chapter 2) describes the

development and validation of a contextually relevant measure of observer-rated mental toughness for use in a military training environment.

The second research chapter (Chapter 3) is a two-study paper utilising the recently developed measure of mental toughness. The first study examined the interactive effects of contingent punishment and supportive leadership behaviour on the development of mentally tough behaviour and performance. It describes a longitudinal study that included objective performance data. A total of 362 British Army Infantry recruits undergoing basic training took part in the study. Study 2 then used the findings from Study 1, along with a modified punishment measure (i.e., to denote the *threat* of punishment rather than *actual* punishment) to examined the interacting effect of leader support (individual consideration) and the threat of punishment to identify the point in the training cycle that mental toughness starts to occur. Objective performance data was also used.

Chapter 4 explored the effects of a psychological skills intervention on the development of mental toughness during training and subsequent recruit performance on an arduous military task. The study reports a study that used a quasi-experimental design to examine the efficacy of a mental skills intervention in facilitating the development of mental toughness in a sample of elite infantry recruits. Objective performance data was also used to examine the impact of the intervention on individual performance on the Parachute Regiment's 'test week,' which recruits are required to successfully negotiate before earning the coveted maroon beret. A total of 273 Parachute Regiment recruits, divided into treatment and control groups took part in the study.

Chapter 5 discusses the main findings of the research chapters, identifies limitations of the thesis, and presents suggestions for future research.

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CHAPTER 2

Development and Validation of the Military Training Mental

Toughness Inventory (MTMTI)¹

¹ This chapter has been published as (accepted on 26 February, 2016); Arthur, C. A., Fitzwater, J., Hardy, L., Beattie, S. & Bell, J. J. (2015). Development and validation of the military training mental toughness inventory. Military Psychology, 27, 232-241. http://dx.doi.org/10.1037/mil0000074

Abstract

The aim of this research chapter was to develop and validate a reliable measure of mentally tough behaviour for use in a military training environment. Three studies were conducted in order to achieve this. Study 1a (n = 435) focused on item generation and testing the structural integrity of the Military Training Mental Toughness Inventory (MTMTI). The measure assessed ability to maintain optimal performance under pressure from a range of different stressors experienced by recruits during infantry basic training. Study 1b (n = 104) examined the concurrent validity, predictive validity, and test-retest reliability of the measure. Study 1c (n = 106) confirmed the predictive validity of the measure with a sample of more specialized infantry recruits. Overall, the military training mental toughness inventory demonstrated sound psychometric properties and structural validity. Furthermore, it was found to possess good test-retest reliability, concurrent validity, and predicted performance in two different training contexts with two separate samples.

Key Words

Mental toughness, military, measure

Introduction

Mental toughness has been identified by coaches and athletes as one of the most crucial attributes underpinning performance excellence (e.g., Connaughton et al., 2008; Coulter et al., 2010; Jones et al., 2002). The research literature on mental toughness has been dominated by qualitative approaches, which have significantly shaped our understanding of mental toughness (e.g., Bull et al., 2005; Connaughton et al., 2008; Coulter et al., 2010; Gucciardi et al., 2009a; Jones, et al., 2002;). However, some researchers have argued that qualitative methods have become overused (e.g., Andersen, 2011), while others have urged researchers to develop reliable and valid measures of mental toughness (e.g., Sheard et al., 2009). Further, Hardy et al. (2014) argue that one of the limitations of adopting qualitative methods is that researchers are unable to differentiate between the causes of mental toughness, processes, outcomes, and other behaviours that are more likely to be correlates associated with mental toughness.

There are, however, some notable exceptions to the qualitative approaches, with several quantitatively derived mental toughness measures having been developed, for example: the Mental Toughness Inventory (MTI; Middleton et al., 2004; 2005); the Sport Mental Toughness Questionnaire (SMTQ; Sheard et al., 2009); the Mental Toughness Questionnaire -48 (MTQ-48; Clough et al., 2002); and the Cricket Mental Toughness Inventory (CMTI; Gucciardi & Gordon, 2009). Whilst these various measures of mental toughness have significantly contributed to the mental toughness literature and have gone some way to alleviating the over reliance on qualitative approaches, they are not without their critics. For example, Hardy et al. (2014) argue that while the above measures capture a wide array of values, attitudes, cognitions and affect, they do not explicitly capture mentally tough behavior. They further argue that psychological variables may influence mental toughness, or be correlates of it, but that the primary focus of such measures should be on *assessing* the presence or absence of mentally tough behavior. Hardy and colleagues also argue that the use of self-report measures in assessing behaviors may be questionable due to social desirability and self-presentation confounds. To this end, Hardy et al. (2014) developed an informant rated behavior-based mental toughness inventory in an elite sport context that was underpinned by the following definition; "the ability to achieve personal goals in the face of pressure from a wide range of different stressors" (p. 5).

Hardy et al.'s (2014) Mental Toughness Inventory (MTI) has been shown to have good psychometric properties, strong test-retest reliability and successfully discriminate between professional and non-professional athletes. A particular strength of the MTI, which sets it apart from other conceptualizations of mental toughness, is that it was conceptualized within a neuropsychological theoretically driven framework, namely Gray & McNaughton's (2000) revised Reward Sensitivity Theory (rRST). rRST was used as it has the potential to offer a neuropsychological explanation of the maintenance of goal directed behavior in the face of stressful stimuli. Hardy et al., were successful in examining the prediction of mental toughness from rRST personality traits. In a further study, the MTI was used to evaluate the efficacy of a successful mental toughness training intervention (Bell et al., 2013) that was underpinned by Hardy et al.'s findings.

The MTI and the use of rRST (Gray & McNaughton, 2000) appear to offer some promise in furthering our understanding of mentally tough behaviour in elite sport. Consequently, based on Hardy et al.'s findings, there is a need to develop contextually relevant measures of mentally tough behaviours for other settings. One particular context where mental toughness is undoubtedly important is within the military. However, to date, there appears to have been little or no empirical research conducted on mental toughness in the military domain, although there is evidence to suggest that it has recently started to be explored (e.g., Hammermeister, Pickering, & Lennox, 2011).

Military action requires soldiers to perform under intense pressure in highly stressful environments, characterized by fear, fatigue, and anxiety largely caused by risk to one's life. Typical combat stressors include, for example: exposure to enemy fire and improvised explosive devices, armed combat, and seeing colleagues killed or seriously injured. To demonstrate this, one soldier recently defined mental toughness as, "...gearing yourself up to go on a patrol in Afghanistan, outside the wire, the day after you lost a member of your squad to a sniper, and you know the sniper is still out there" (Lt Col. Burbelo; cited in Hammermeister *et al.*, 2011, p. 4). The purpose of the present study was to develop a behaviorally based measure of mental toughness in a military training environment based upon Hardy et al.'s (2014) definition and measure. Four independent samples, drawn from general and specialized infantry training platoons from a UK-based Army training establishment were employed in the study.

Study 1a: Developing the Measure

Method

Stage I: Item Development. Item development was underpinned by rRST and the behaviorally-based approach adopted by Hardy et al. (2014). Small group discussions were conducted with training teams (an officer, a sergeant, four corporals and a physical training instructor) responsible for training the recruits to identify typical environmental stressors experienced by recruits in training (e.g., feeling fatigued, being reprimanded, pressure to perform well, etc.). Discussion participants

had all spent between four and 24 months training recruits ($M_{months} = 13.95$, SD = 5.89) and had served in the army for an average of eight years. Furthermore, all of the sergeants and corporals had been through the training establishment as recruits, some as recently as five years prior to their tenure as an instructor.

Ten group discussions were held, with each discussion consisting of three training teams present (21 training staff) and lasting approximately 40 to 60 minutes. The training teams separately annotated what they thought to be typical stressors experienced by recruits onto a flip chart. The teams then came together to compare their results. Common themes were recorded, while discrepancies or items that overlapped were discussed and either agreed upon or discarded. This process resulted in an initial, agreed upon, list of 22 stressors typically experienced by recruits in training. The candidate, an experienced recruit and NCO trainer (and having been through the training process as a recruit), refined the list into 15 items for potential inclusion in the measure. The items were presented back to the same training teams for confirmation or further refinement. After further discussion, the pool of 15 items was agreed upon for inclusion in the initial measure. The items were presented to five different training teams for subsequent approval. The final agreed upon 15 items, with means, SDs and factor loadings are presented in Table 2.1

Participants and Procedure. A total of 279 infantry recruits ($M_{age} = 21.45$, SD = 3.16) who were between 5 and 24 weeks of training (M = 14.18 weeks, SD = 7.11) were reported on by 41 male infantry recruit instructors who had served for an average of 9.03 years in the Army (SD = 2.35) and had spent an average of 11.78 months as an instructor (SD = 5.89). In order for the instructors to accurately assess the recruits, a minimum of 5 weeks supervision was set for inclusion criteria (M = 11.73 weeks, SD = 6.84 weeks). The inclusion criteria was set for all of the studies in the thesis.

Table 2.1.

15-Item Model 6-Item Model [The recruit] is able to maintain a high level of personal performance, even when: FL FL Μ (SD) Μ (SD) His recent performances have been 1 0.75 4.20 (1.53)0.72 4.23 (1.50)poor*. He is in pain (e.g., associated with high 2 0.80 (1.78)4.06 0.77 4.06 (1.78)levels of physical effort)*. The conditions are difficult (e.g., on 3 0.81 4.22 (1.55)0.8 4.22 (1.55)exercise)*. 4 He has been reprimanded/punished*. 0.79 4.06 (1.68)0.81 4.06 (1.68)5 He has not had much sleep*. 0.72 4.04 (1.51)0.74 4.04 (1.51)He is under pressure to perform well 6 0.73 4.41(1.62)0.73 4.41 (1.62)(e.g., assessments, test conditions)*. 7 He is lacking in confidence. 0.71 4.32 (1.42)He is dealing with a number of personal 8 issues away from training (e.g., at 0.76 4.23 (1.50)home). He is not getting on with the training 9 0.68 4.28 (1.53)team staff. 10 He has been training hard all week. 0.79 4.13 (1.57)Other people are relying on him to 11 0.79 3.89 (1.63)perform well. 12 He is fatigued. 0.78 4.46 (1.53)He has to perform at a high level for a 13 0.66 4.76 (1.62) few hours. He is not getting on with other section 14 0.70 4.29 (1.62)members 15 He is hungry and/or dehydrated 0.73 4.10 (1.56)**Total Mental Toughness** 4.23 (1.21) 4.17 (1.32)

Original Item Pool for MTMTI Development with Factor Loadings, Means and SDs

* Items retained for subsequent six-item measure.

FL = Factor Loading

Infantry recruit instructors are responsible for training infantry recruits through a 26 week Combat Infantryman's Course (CIC). They are all experienced section corporals who are selected to serve a 24-month tenure at a training establishment before returning to their parent unit. The aim of the CIC is to train infantry recruits to the standards required of an infantry soldier to operate as an effective member of a platoon in extremely hostile environments. Infantry training is, therefore, designed to be both physically and mentally demanding with the majority of instruction and training taking place outdoors and on field exercises. The consequence of failing to meet the required standards at any point in training results in being reallocated to an earlier point in training with another training platoon.

After receiving institutional ethical approval, instructors and recruits were verbally solicited to take part in the study and informed of the nature of the study and the inclusion criteria. They were informed that participation in the study was not mandatory and were free to withdraw should they choose to participate. Confidentiality was assured and, once the inclusion criteria were satisfied, informed consent was obtained (no recruits declined to participate in any of the following studies). The same conditions for recruitment, participation and assurance of confidentiality were applied to all of the studies in this research program.

The instructors were asked to complete the 15 items that were retained from stage I for each recruit in their section and asked to rate how well they were able to maintain a high level of personal performance when confronted with different stressful situations in training. Responses were based on a 7-point Likert scale that ranged from 1 (never) to 7 (always), with a midpoint anchor of 4 (sometimes).

While the disadvantages of using self-report measures have been discussed in the general introduction, observer-rated measures are not without limitation. For example, observers can be influenced by a variety of biases that can potentially render the data questionable (Khang, Ingvarson, Ouigg, Seckinger, & Teichman, 2011). For example, 'observer drift' occurs when there is erosion in the defined parameters of the observed behaviour over time, which can be caused by boredom, fatigue or illness. Furthermore, it is important that every instructor is rating the recruits under his tutelage based on the same criteria. Consequently, each item was carefully explained to the instructors prior to completing the questionnaires to avoid ambiguity and varying perceptions. Typical day-to-day examples were provided to aid clarity and avoid misinterpretation. For example, 'when he is in pain (associated with high levels of physical effort)' refers to the somatic symptoms (tightening of the body and shortness of breath) that makes physical effort less effective and more painful" (Birrer & Morgan, 2010). To further ensure the reliability and efficacy of the data, it was important that the instructors were taking into account the individual ability of each recruit and not rating on a desired 'generic standard. Consequently, 'a high level of personal performance' was defined as each recruit's personal capacity. That is, each recruit was being rated against his own optimal (or sub-optimal) performance².

Data Analysis. First, the data were screened for missing values, violations against assumptions of normality, and outliers using IBM SPSS 20. Second, structural equation modeling (SEM) was carried out in LISREL 8.80 (Jöreskog & Sörbom, 2006) using robust maximum likelihood estimator (MLR). When developing a new instrument, it is recommended that exploratory factor analysis (EFA) be conducted to examine factor structure, while confirmatory factor analysis (CFA) is typically used to confirm factor structure using data from a new sample (e.g., Brown, 2006). However,

 $^{^2}$ Note: this process was employed for the administration of the MTMTI for all of the studies conducted in the thesis. Where mental toughness data was collected at more than one time point, the process was repeated.

an alternative approach, is to perform CFA to confirm a theoretically driven item set without the prior use of EFA (Worthington & Whittaker, 2006). While EFA is used when there no a priori hypothesis of the number of factors or which items load onto those factors has been specified, CFA is conducted when the number of factors, and the items loading onto each factor are known. Consequently, with the number of factors known (i.e., one) and underpinned by the guiding theoretical framework of rRST (Gray & McNaughton, 2000), and related research (e.g., Bell et al., 2013; Hardy et al., 2014), confirmatory factor analysis (CFA) using was used in an exploratory way to refine the item pool.

To assess model fit, Chi-squared (χ^2) was used to measure the divergence of the sample from the fitted covariance matrices (Hu & Bentler, 1999). While a low chisquare is desired, generating a non-significant result and indicating a good fit, it is accepted that the result is sensitive to sample size (i.e., large sample sizes produce larger χ^2 and, therefore, more likely to produce a type I error; while smaller sample sizes may be likely to produce a type II error), and model size (more variables produce higher χ^2) (Brown, 2006). This appears somewhat paradoxical, for although a minimum sample size of 200 observations is recommended to obtain stable results, models with sample sizes larger than 200 observations will generally reveal significant differences, therefore, the chi-square statistic should be used with caution (Marsh, Balla, & McDonald, 1988). However, general rules of thumb have been suggested, for example, a person-to item-ration of 10:1 (Worthington & Whittaker, 2006), while others recommend obtaining the largest sample available due to it not being possible to determine the adequacy of the sample size until *after* the data have been analyzed (Henson & Roberts, 2006). Therefore, data collected from an initial sample size of 279 allowed analysis of almost 300, 250 and 150 (in line with a person-to-item ratio of

10:1) to be conducted.

Based on recommendations from Hu and Bentler (1999), goodness of fit indices were used in conjunction with chi-square to minimize problems associated with sample size and other misspecifications associated with chi-square and examine goodness of fit (Bentler, 1990). The model was considered a good fit if the χ^2 / df ratio was less than 2.0, the Comparative Fit Index (CFI) approached .95, the Root Mean Square of the Approximation (RMSEA) was less than .07, and the Standardized Root Mean Square Residual (SRMR) was less than 0.7.

Where a poor fit was evidenced, modification indices and residual variances were examined to diagnose the source of the lack of adequate fit. A good fitting model should produce modification indices that are small in magnitude, with indices of 3.84 or greater indicating that the error term between two items are highly correlated (Brown, 2006; Jackson, Gillaspy, & Purc-Stephenson, 2009). Consequently, where a poor model fit resulted, modification indices greater than 4.00 were considered for deletion. Negative residual variances can indicate model misspecification, too small a sample size, sampling error, or extreme outliers (Geiser, 2010).

Strong factor loadings indicate acceptable convergent validity, with the generally accepted rule of thumb being factor loadings < .40 are considered weak, while factor loadings \geq .60 are considered strong (Garson, 2010). Moreover, it has also been argued that, depending on the requirements of the model, it may be more appropriate to have fewer items with higher factor loadings (Garson, 2010). Therefore, a minimum value of .60 was set for standardized factor loadings. Taking into account that the instructors would be required to report on up to 12 recruits, a model of six to 10 items was deemed desirable.

Results. Preliminary data screening revealed an absence of outliers. The Shapiro-Wilk statistic indicated non-normal distributions for all items (p < .01), however, the test is notoriously affected by large sample sizes in which even small deviations from normality can yield significant results (Field, 2013). A manual examination of the data demonstrated that the distribution of all of the items appeared to be relatively normal, which was supported by the indices for skewness and kurtosis, ranging from -0.05 (SE = 0.15) to -0.48 (SE = 0.15) and -0.59 (SE = 0.29) to -1.09 (SE = 0.29) respectively. Nevertheless, a robust maximum likelihood estimator was used to test the model. Based on the aforementioned criteria, the fit statistics for the 15-item model were considered a poor fit to the model and, therefore, unacceptable (χ^2 (90) = 511.23, p < 0.01; RMSEA = .10, CFI = .97, NFI = .96, SRMR = .06). Taking into account the issues with sample size (Brown, 2006), the analysis was re-run with 200,150, and 100 randomly selected participants, however, the model fit did not improve.

Post-hoc item refinement was conducted by examining the standardized residuals, modification indices for theta delta and theoretical rationale. This process identified a number of items that had considerable conceptual overlap with other items, were ambiguously worded, or referred to environmental conditions that may not be a universal stressor (i.e., not all recruits may have experienced the stressor).

Specifically, items 8 (issues at home), 9 (not getting on with training staff), and 14 (not getting on with section members) were identified as not being universal stressors. That is, it is likely that not every recruit would have experienced that stressor. Consequently, the rater would be required to provide his 'best guess' or the researcher would be required to deal with missing data. Item 10 (training hard all week) appeared to be ambiguously worded, while the modification indices for items

12 (he is fatigued) and 13 (perform at a high level for a few hours) indicated considerable overlap with other items. Items 7 (lacking confidence) and 15 (hungry/dehydrated) revealed high modification indices and closer examination of the items suggested that they would be difficult to observe and assess, once again leaving the rater to provide a 'best guess.' While item 11 (others relying on him) revealed satisfactory residual variance and modification indices, retaining the item revealed an unacceptable RMSEA (> 1.0). In order to denote good internal consistency of the measure, a Cronbach's α of > .80 was desired (Nunnally & Bernstein, 1994).

Removal of these items resulted in a six-item scale that demonstrated a good fit to the data ($\chi^2(9) = 17.95$, p = .04; CFI = .99, RMSEA = .03, SRMR = .02, NFI = .99, NNFI = .99, GFI = .98). The mean mental toughness score was 4.17 (SD = 1.30) with an internal consistency (Cronbach's alpha) of .89. Factor loadings ranged from .72 to .81. The factor loadings, means and standard deviations for each item are presented in Table 2.2.

Stage II: Structural Validity. The purpose of stage II was to confirm the factor structure of the MTMTI on a separate sample.

Participants and Procedure. A total of 156 recruits ($M_{age} = 21.33$, SD = 2.90) between weeks 7 and 23 of training (M = 14.77 weeks, SD=6.49) were reported on by 23 instructors ($M_{age} = 26.87$, SD = 2.09) who had served for an average of 8.48 years in the Army (SD = 2.27) and had spent an average of 13.30 months as an instructor (SD = 5.46) training recruits. The same inclusion criteria was set as for stage I, with the recruits having been under their respective instructors' tutelage between 6 and 13 weeks ($M_{weeks} = 13.27$, SD=6.45) Instructors completed the 6-item MTMTI developed in stage 1.

Table 2.2.

Standardized Factor Loadings, Means and SDs for Retained Items

Item		Study 1(stage I)		Study 1(stage II)		Study 1b (wk 20)		(Study 1b wk 23)		Study 1c	
		(n = 279)		(n = 156)		(n = 104)				(n = 134)	
		FL	M (SD)	FL	M (SD)	FL	M (SD)	FL	M (SD)	FL	M (SD)
1	His recent performances have been poor.	0.72	4.23(1.50)	0.82	4.08(1.52)	0.64	4.57(1.82)	0.86	4.95(1.40)	0.63	4.81(1.26)
2	He is in pain (e.g., associated with high levels of physical effort).	0.77	4.06(1.78)	0.74	3.98(1.59)	0.75	4.86(1.76)	0.87	4.89(1.60)	0.66	4.78(1.48)
3	The conditions are difficult (e.g., on exercise).	0.80	4.22(1.55)	0.88	4.12(1.49)	0.82	5.05(1.55)	0.90	4.91(1.58)	0.87	5.00(1.22)
4	He has been reprimanded/punished	0.81	4.06(1.68)	0.75	4.41(1.61)	0.82	5.11(1.56)	0.83	4.90(1.51)	0.69	5.06(1.19)
5	He has not had much sleep	0.74	4.04(1.51)	0.82	3.87(1.36)	0.85	4.95(1.50)	0.85	4.79(1.52)	0.80	4.78(1.24)
6	He is under pressure to perform well (e.g., assessments, test conditions)	0.73	4.41(1.62)	0.72	4.22(1.53)	0.79	5.23(1.65)	0.84	4.88(1.58)	0.75	4.92(1.36)
	Total Mental Toughness		4.17(1.30)		4.11(1.25)		4.95(1.34)		4.89(1.36)		4.89(1.01)

Note. FL = standardized factor loading

Data Analysis. Data were screened for missing values, violations against assumptions of normality, and outliers using IBM SPSS 20. The factorial validity of the six-item measure was confirmed by CFA using estimator MLR in LISREL 8.80 (Jöreskog & Sörbom, 2006).

Results. Preliminary data screening revealed an absence of outliers. The Shapiro-Wilk statistic indicated non-normal distributions for most items (p < .01). A manual examination of the data demonstrated that the distribution of all of the items appeared to be normal, which was supported by the indices for skewness and kurtosis, ranging from -0.03 (SE = 0.19) to -0.48 (SE = 0.19) and -0.27 (SE = 0.39) to -0.89 (SE = 0.39) respectively. CFA revealed that the fit statistics for the six-item model demonstrated a good fit to the data (χ^2 (9) = 21.89: p < .01; CFI = .99, RMSEA = .07, SRMR = .03, NNFI = .98, NFI = .98). The mean mental toughness score was 4.11 (SD = 1.25) with an internal consistency (Cronbach's alpha) of .91. Factor loadings ranged from .72 to .88.

Study 1b: Test-retest Reliability, Concurrent and Predictive Validity

Study 1b sought to examine the test-retest reliability, concurrent and predictive validity of the MTMTI. Test-retest reliability provides an estimate of the stability of the responses on the same measure over time. That is, it assesses the amount of measurement errors (e.g., maturation, memory) that occur during a period of elapsed time (Crocker & Algina, 1986). An acceptable estimate will be influenced by the nature of the construct being tested (e,g., transitory or stable) and the time between administrations of the measure. Consequently, higher test-retest reliability estimates would be appropriate for more stable constructs such as personality measures, compared to attitudinal measures. Moreover, individual responses or observed scores on a measure may fluctuate due to temporary changes in the respondent's states.

Consequently, no unequivocal minimum value exists that indicates an acceptable level of retest reliability, however, a generally accepted value for acceptable reliability is 0.7 or above (Crocker & Algina, 1986). Although it has been suggested that mental toughness is a relatively stable trait-like construct (Clough & Crust, 2005), others have argued that it can be developed and, therefore, increased over time under the appropriate environmental conditions (Hardy et al., 2014). Indeed the aim of this thesis is to provide support for that argument. Test-retest reliability was examined to confirm the stability of the MTMTI in Chapters 3 and 4, where the measure would be administered at different time points (e.g., pre and posttest).

Concurrent validity is the degree to which the test of a measure corresponds with a previously validated instrument that measures the same construct (e.g., mental toughness), with both measures being administered at the same time. The concurrent validity of a measure may also be tested against different but related constructs (e.g., resilience, confidence) (McIntire & Miller, 2005). A significant correlation between the two measures demonstrates concurrent validity. Concurrent validity was examined to draw comparison with an alternative measure of mental toughness in a different context and instruments measuring similar or related constructs.

Predictive validity is the degree to which an instrument accurately predicts future behaviour or performance, with a significant correlation between the measure and the future criterion demonstrating predictive validity (McIntire & Miller, 2005). Predictive validity was tested to confirm whether the MTMTI would predict different performance criteria in Chapters 3 and 4.

Method

Participants. One hundred and four recruits ($M_{age} = 22.07$, SD = 3.92) took part in Study 1b. They were reported on by 15 different instructors ($M_{age} = 26.61$, SD = 2.12) who had served for an average of 8.70 years in the Army (SD = 2.08) and had spent an average of 12.17 months as an instructor (SD = 5.93). The recruits had been under the supervision of the reporting instructors for an average of 17.95 weeks (SD =5.83).

Instruments.

MTMTI. The MTMTI developed and validated in Study 1a was used. Concurrent validity of the MTMTI was tested by selecting variables that are theorized to correlate with mentally tough behaviour (e.g., self-report mental toughness, self-confidence, and resilience measures). Predictive validity was tested by assessing the extent to which the MTMTI predicted performance.

SMTQ. The sport mental toughness questionnaire (Sheard et al., 2009) is a 14item measure that consists of three subscales; confidence, constancy and control. These subscales can be combined to create a global measure of mental toughness. The scale is measured on a 4-point Likert scale anchored at 1 (not at all true) to 4 (very true). Example items include, "*I have what it takes to perform well under pressure*" (confidence); "*I am committed to completing the tasks I have to do*" (constancy); and, "*I worry about performing poorly*" (control; reverse scored). CFA has been shown to provide good support for the 3-factor model (Sheard et al., 2009). As a previously validated measure of mental toughness (via EFA/CFA), the SMTQ was selected to examine the concurrent validity of the MTMTI against an instrument measuring the same construct.

Self-Confidence. Self-confidence was measured using a 5-item scale that was developed and validated by Hardy et al. (2010) in a military training context by asking, "*compared to the most confident recruit you know, how would you rate your confidence in your ability to....*(e.g., "*...meet the challenges of training*)". The
response format is rated on a 5-point Likert scale anchored at 1 (low) to 5 (high). This scale has been shown to have good psychometric and predictive validity in a military training context (Hardy et al., 2010). The self-confidence scale was included to examine the concurrent validity of the current measure against a construct thought to be associated with mental toughness (e.g., Crust et al., 2002; Sheard et al., 2009)

Resilience Scale. Resilience was measured using a 4-item resilience scale developed specifically for use in a military training context. (Hardy et al., 2010). The stem and response format used was the same as the self-confidence scale. Example items include, "...adapt to different situations in training and be successful" This scale has been shown to have good psychometric and predictive validity in a military training context (Hardy et al., 2010). The resilience scale was included to examine the concurrent validity of the current measure against a similar construct.

Performance. Performance was determined by the recruits' end of course final grades, based on their weekly reports and grades throughout the CIC. This grade is awarded by the platoon commander (Lieutenant or Captain) and ranges from 0 (fail) to 6 (excellent).

Procedure.

To assess test-retest validity, the MTMTI was administered to the recruits' instructors at weeks 20 and 23 of training. The self-report SMTQ (Sheard et al., 2009), resilience, and confidence scales (Hardy et al., 2010) were administered during week 23 of training at the same time as the MTMTI, and the performance data was collected at the end of training (week 26).

Data Analysis.

A paired sample t-test was conducted to confirm the test-retest reliability. Due to the malleable nature of mental toughness, the time frame chosen for administrations of the measure for test-retest reliability was three weeks, with 0.7 as the estimate for acceptable reliability. Bivariate correlation analysis was conducted to examine the concurrent validity between the MTMTI and SMTQ, and the MTMTI and confidence and resilience. Regression analysis was conducted to examine the predictive validity of the MTMTI against recruits' performance. Hierarchical regression analysis was then conducted to examine the variance in recruit performance against the SMTQ, resilience and confidence scales.

Results.

Descriptive statistics, correlations and alpha coefficients for all study 1b variables are displayed in Table 2.3. The MTMTI demonstrated a good fit to the data $(\chi^2(9) = 6.81, p = .66; \text{RMSEA} = .00, \text{NNFI} = 1.00, \text{CFI} = 1.00, \text{SRMR} = .01)$, although this result should be interpreted with caution due to the small sample size. Factor loadings ranged from .71 to .83.

Test-Retest Reliability. The mean mental toughness score at week 20 was 4.95 (SD = 1.34), with factor loadings between .60 and .85, and the mean score at week 23 was 4.89 (SD = 1.36), with factor loadings between .85 and .91. A paired sample t-test revealed that these means were not significantly different (t (103) = 0.63, p > .05). The test-retest reliability for the MTMTI was .72.

Concurrent Validity. Significant moderate correlations were revealed between the MTMTI and the global SMTQ (r = .43) and subscales confidence (r = .37) and constancy (r = .40), while a significant but small correlation was evidenced with control (r = .24). Significant moderate correlations were revealed between the MTMTI and Hardy et al.'s (2010) subscales of resilience (r = .35), and confidence (r = .33). Results are presented in Table 2.3.

Table 2.3.

		Mean	SD	1	2	3	4	5	6	7	8	9
<u>Study 1b (<i>n</i> = 104)</u>												
1	Mental Toughness (wk 20)	4.95	1.34	(.90)								
2	Mental Toughness (wk 23)	4.89	1.36	.72**	(.94)							
3	SMTQ	2.98	0.40	.33**	.43**	(.78)						
4	SMTQ-Confidence	3.08	0.48	.27**	.37**	.83**	(.66)					
5	SMTQ-Constancy	3.38	0.45	.31**	.40**	.75**	.51**	(.45)				
6	SMTQ-Control	2.42	0.61	$.20^{*}$.24*	.74**	.33**	.40**	(.62)			
7	Resilience	3.94	0.70	.32**	.35**	.68**	.62**	.52**	.46**	(.81)		
8	Self-confidence	4.12	0.63	.25**	.33**	.71**	.72**	.52**	.38**	.75**	(.85)	
9	Final Course Grade	4.05	1.57	.33**	.56**	.39**	.33**	.39**	.23*	.33**	.35**	
<u>Study 1c (<i>n</i> = 134)</u>		Mean	SD	1	2	3						
1	Mental Toughness	4.89	1.01	(.87)								
2	P Company Score	47.25	17.63	.36**								
3	Fitness Score	0.03	0.74	.43**	.42**							

Means, SDs, and Inter-correlations Between Variables in Studies 1b and 1c (Alpha Coefficients in Parentheses)

***p* < .01

**p* < .05

Predictive Validity. Regression analysis revealed that mental toughness significantly predicted individual course performance ($R^2 = .31$; $\beta = .56$, p < .01). Furthermore, hierarchical regression analyses revealed that the MTMTI accounted for a significant proportion of variance in course performance (Block 2: $R\Delta^2 = .19$; $\beta = .48$, p < .01) over and above that accounted for by the SMTQ (Block 1: $R^2 = .15$; $\beta =$

.19, p < .01). The MTMTI was also tested as to whether it accounted for variance in performance after controlling for all the self-report variables used in the current study. The results revealed that the MTMTI accounted for a significant proportion of variance in performance (Block 2: $R\Delta^2 = .18$; $\beta = .48$, p < .01) over and above that accounted for by all the self-report measures (Block 1: $R^2 = .17$, p < .05).

Study 1c: Further Test of Predictive Validity

Study 1b demonstrated the test re-test reliability, concurrent and predictive validity of the MTMTI. Furthermore the MTMTI was shown to predict performance after controlling for self-reported mental toughness. The aim of Study 1c was to further test the predictive validity of the MTMTI in a specialized infantry context, namely the Parachute Regiment (Para).

Although initial training for the infantry is necessarily arduous and demanding, initial training for Para recruits is widely regarded by the British Army as being the most physically and mentally demanding of all Infantry regiments in the British Armed Forces (Wilkinson, Rayson, & Bilzon, 2008). Their specialist role requires them to operate at a higher intensity than the regular infantry, carrying heavy loads for longer distances, at a faster pace as well as withstanding the hardships of operating independently in the field for long periods under harsh environmental conditions (Wilkinson et al., 2008). To determine their suitability for this role, at week 20 of the CIC Para recruits are required to undergo a pre-Para selection test-week (PPS), known colloquially as P-Company. P-Company consists of a series of physically demanding team and individual events that involve carrying personal equipment weighing 20kg or more for distances of up to 32km over severe terrain with time constraints, a steeplechase assault course and aerial confidence course. Two team events require

the participants to run with a 60kg log and 80kg stretcher for 2.5km and 8km respectively. Pass rates typically range between ~40-70%.

Furthermore, the nature of the military performance indicators is such that they tend to be very physical in nature. However, whilst a specific level of fitness is required for military service, the various tests are designed to assess recruits abilities to perform under stressful and arduous conditions. That is, it is not just fitness that determines the quality of a Para recruit but the ability to maintain a high level of performance in stressful and arduous conditions. Success on P-Company entitles a recruit to wear the coveted maroon beret and pass out of training into a Parachute Regiment unit. Conversely, failure results in the recruit being reallocated to a platoon earlier in the training cycle or transfer to another infantry regiment. The recruits have been training for this test week for the preceding 20 weeks.

It was hypothesized that fitness will predict performance on P-Company but, more importantly, mental toughness will predict variance in performance on P-Company after controlling for fitness.

Method

Participants. Participants for Study 1c were 134 Para recruits ($M_{age} = 19.95$, SD = 4.14) who were reported on by 20 different Para recruit instructors ($M_{age} = 28.71$ years, SD = 2.92) who had served for an average of 10.65 years in the Army (SD = 2.63) and had spent an average of 10.95 months as an instructor (SD = 4.87). The recruits had been under the supervision of their respective instructors for between 7 and 20 weeks (M = 15.31 weeks, SD = 4.06).

Instruments.

Mental Toughness. The MTMTI was used to measure mental toughness.

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Performance. During P-Company, participants can achieve a maximum of 70 points, determined by their performance on each event (i.e., up to 10 points for each of the 7 events; the aerial confidence course is a pass or fail test). Most of the points are awarded objectively based on time to complete or completion of an event and are awarded by P-Company staff who are independent of the recruits' regular training team. Performance scores ranged from 10-70 out of a maximum possible score of 70 points (M = 49.95, SD = 15.07).

Fitness. An objective measure of fitness was used to control for individual fitness. During training, recruits are required to complete physical assessments to measure progression in individual fitness. One of these assessments is a two-mile loaded run in less than 18 minutes, carrying a 16 kg pack and rifle. Another assessment is a timed run, over a steeplechase assault course consisting of several dry and water obstacles. Each event generates an individual time. Two-mile loaded times for this cohort ranged from 15 minutes and 30 seconds to 22 minutes and 47 seconds (M = 18:39, SD = 1:37). The steeplechase times ranged from 18 minutes 30 seconds to 22 minutes 26 seconds (M = 20:19, SD = 1:08). In order to create an overall indication of fitness these times were standardized within event and were then combined to create an overall score. We then multiplied the overall score by -1 so that a higher score was indicative of better performance.

Procedure. Instructors were approached and asked to take part in the study. Once the inclusion criteria (the instructor to have known and instructed the recruit for a minimum of five weeks) were satisfied, those who agreed to participate were informed of the nature of the study and assured of confidentiality. Instructors were then asked to complete a MTMTI for each recruit under their instruction at week 19 of training, one week prior to the commencement of P-Company. The fitness tests were conducted during week 18 of training and the MTMTI was administered at the end of week 19 of training. P-Company was conducted at week 20 of training.

Data Analysis. CFA was conducted to confirm the factor structure of the measure. This was followed by regression analysis to determine whether the MTMTI predicted performance within a higher stress and more demanding training context than general infantry basic training (i.e., P-Company). As fitness is an important variable contributing to, and significantly correlated with, performance on P-Company (r = .42, p < .01), hierarchical regression analysis was conducted to determine the variance of mental toughness associated with P-Company performance (Block 2) after accounting for individual fitness (Block 1).

Results

Descriptive statistics and correlations for all study variables are displayed in Table 2.2. Consistent with Studies 1a and 1b, the MTMTI demonstrated a good fit to the data ($\chi^2(9) = 14.07$, p = 0.12; RMSEA = .06, NNFI = .99, CFI = 1.00, SRMR = .03). The mean mental toughness score was 4.94 (SD = 1.02) with an internal consistency (Cronbach's alpha) of .87. Factor loadings were between .63 and .87.

Regression analysis revealed that mental toughness significantly predicted individual P Company performance ($\mathbb{R}^2 = .14$; $\beta = .36$, p < .01). Moreover, hierarchical regression analysis revealed that the MTMTI predicted variance in performance (Block 2: $\mathbb{R}\Delta^2 = .06$, $\beta = .26$, p < .01) over and above that accounted for by the fitness measure (Block 1: $\mathbb{R}^2 = .15$, $\beta = .30$, p < .01).

Discussion

The purpose of the series of studies in Chapter 2 was to develop and validate a measure of mentally tough behaviour in a military training environment. Initial items contained in the MTMTI were generated through a series of workshops consisting of

experienced recruit trainers, with an innate understanding of the types of stressors experienced by recruits undergoing basic infantry training. This was followed by CFA, used in an exploratory manner to refine the item pool into a final six-item measure.

Study 1a found good support for the structural validity of the six-item MTMTI $(\gamma^2 (9) = 21.89; p < .01; CFI = .99, RMSEA = .07, SRMR = .03, NNFI = .98, NFI = .98,$.98), while Study 1b found support for the concurrent and predictive validity, and test retest reliability. Concurrent validity was demonstrated by a weak to moderate, significant positive correlation (r = .43) being evidenced when comparing results of the MTMTI to the SMTQ (a previously validated self-report measure of mental toughness), while weak significant positive correlations of (r = .33 to .32) were evidenced when comparing results from the MTMTI with similar or associated constructs. The MTMTI was shown to predict objective performance ($R^2 = .31$; $\beta =$.56, p < .01), accounting for a significant proportion of variance in performance (Block 2: $R\Delta^2 = .19$; $\beta = .48$, p < .01) over and above that accounted for by the SMTQ (Block 1: $\mathbb{R}^2 = .15$; $\beta = .19$, p < .01), and similar and associated constructs (Block 2: $R\Delta^2 = .18; \beta = .48, p < .01;$ Block 1: $R^2 = .17, p < .05$). The test reliability was .72. The predictive validity of the MTMTI was further supported in a specialized infantry sample, where it was shown to significantly predict objective performance on a series of physically and mentally demanding military tasks ($R^2 = .14$; $\beta = .36$, p < .14) .01), and the variance in performance over and above that accounted for by individual fitness (Block 2: $R\Delta^2 = .06$, $\beta = .26$, p < .01; Block 1: $R^2 = .15$, $\beta = .30$, p < .01).

Overall, the MTMTI demonstrated good psychometric properties across 3 separate samples and the predictive validity was supported in two separate samples.

Consequently, these results provide further support for Hardy et al.'s (2014) proposal that mental toughness should be assessed via observer rather than self-report ratings. As a result, the current research is an important first step in developing a valid measure of mental toughness in a military context. Having a valid scale that stands up well to both psychometric and predictive testing will allow an examination of mental toughness both from applied and theoretical perspectives that will help to provide a further understanding of mentally tough behaviour in a military training context.

Bell et al. (2013) developed a successful multimodal intervention that was designed to impact mental toughness in elite level cricketers. Consequently, the MTMTI could potentially be used to conduct similar interventions to evaluate mental toughness in a military training environment. The intervention contained three main components; exposure to punishment conditioned stimuli, coping skills training, and was delivered in a transformational manner. Whilst the results of the intervention indicated that it was successful in developing mental toughness no attempt was made to measure the separate effects of the punishment conditioned stimuli, the transformational delivery, or the efficacy of the coping skills. Thus, no conclusions can be inferred regarding which aspects of the intervention contributed most to the observed change in mental toughness, or indeed, whether these aspects interacted to impact the observed change in mental toughness. Consequently, further research is needed to delineate more precisely the effects that punishment conditioned stimuli, transformational delivery, and coping skills has on the development of mental toughness.

As a result, the measure will allow an examination of the interactive effects of punishment (as part of a challenging environment) and supportive leadership

behaviours on mental toughness development in a standard infantry training environment. It was also allow an examination of the effect of a psychological skills intervention on mental toughness development and performance in an elite infantry context.

Whilst the current measure has been demonstrated to perform well in the standard tests of measurement efficacy it is noted that the scale is one-dimensional, that is, all the stressors fall under one global aspect. It is suggested that it might be possible to delineate the stressors into clusters. For example, some of the stressors identified in the MTMTI may fall under physical stress (e.g., tiredness) whilst others about threats to ego (e.g., punishments). Further investigation of this would seem warranted. For example, all of the social pressure items (e.g., "he is not getting on with other section members") were deleted at stage 1 due to inadequate fit. One reason is that some of the items may have been inadequately worded. For example, item 11 (other people are relying on him to perform well) could potentially be re-worded as, "…… when it is a team event," to better reflect the nature of the stressor.

In order for the instructors to accurately report on each recruit, it was important for them to have observed the recruit experiencing all of the stressors. Consequently, some items were deleted due to not being universal stressors and, therefore, not having been experienced by the recruit and observed by the instructor. For example, not all recruits may have experienced problems at home, or experienced problems with team integration. Therefore, the criteria set for participant inclusion in the study was important. The requirement for instructors to have instructed the recruit for a minimum of five weeks ensured that the instructor would have experienced the recruit under all conditions. This would greatly limit the need to provide a 'best guess' for some items if the recruit had not been observed in a specific situation. The nature of infantry recruit training makes it highly probable that all stressors will have been experienced by recruits at some point over a five-week period.

One of the limitations of only using one instructor to rate recruits is that participants may be lost due to not having met the five-week inclusion criteria. For example, as training progresses, and section sizes decrease due to wastage, recruits are often reallocated to another section. Another reason that recruits may experience a change in instructors is due to instructor turnover. That is, instructors returning to their units and being replaced by a new instructor part way through the training cycle. To counter this this limitation, it would be prudent to examine the inter-rater reliability of the measure. Inter-rater reliability is used to assess the degree of consistency multiple observers provide in their assessment of a participant. This would allow more than one instructor to rate each recruit.

While SEM has become an important statistical technique for researchers to determine how the model best reflects adequate model fit, there remains a great deal of debate on cut-off values and what goodness of fit indices to be used. Indeed, it has been argued that most multi-dimensional assessment instruments are unlikely to meet the minimal standards of goodness of fit based on the aforementioned recommendations (e.g., Marsh, 2007). Consequently, the appropriateness of following rough guidelines for goodness of fit and how rigorously the results of CFA should be applied to multidimensional models has been called into question (e.g., Marsh, Hau, and Wen, 2004). Consequently, some researchers argue that, while the internal structure of a measure is important, the wider, meaningful context of the measure should be considered when deciding on item retention or rejection based on recommended cut-off criteria (e.g., Hopwood & Donnellan, 2010). Therefore, it could be argued that the cut-off values set for the initial steps of item refinement may have

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been overly parsimonious.

However, others argue that rigorous and statistically valid procedures should be employed when developing and examining the psychometric properties of the measure (e.g., Gucciardi & Gordon, 2011; Gucciardi, Hanton & Mallet, 2012). They suggest that the view that fit indices are only to be used as a rough guide/rule of thumb leaves the criteria open to abuse, with researchers free to choose whatever criteria suit their needs, with future research questioning the validity of the measure (e.g., Gucciardi et al., 2012; Gucciardi, Hanton & Mallet, 2013). Consequently, the decision was made to adopt stricter cut-offs of fit-indices to determine a good fit to the model.

Clearly, this has greatly influenced the number of items for deletion. However, Gucciardi et al. (2011) also argue that a measure should have the ability to encapsulate the key attributes of mental toughness in a 'user-friendly' manner. It was important to develop a measure that could be accurately completed by an observer on up to 12 participants. Therefore, a measure consisting of 6 to 10 items was considered desirable to fulfill these criteria. This is an advantage with an observer-rated measure when time is a key consideration. For example, if the instructors were required to complete a measure on 12 recruits, there is a danger that the process would be rushed and render the data inaccurate. This allowed for greater parsimony to be applied when determining items for deletion.

To sum, up the current series of studies have gone some way toward developing and validating a measure of mental toughness in a military training environment that will hopefully stimulate further theoretical and applied research in this area.

CHAPTER 3

The Moderating Effect of Supportive Leadership Behaviours on Punishment in

Facilitating Mental Toughness Development in Infantry Basic Training

Abstract

The aim of this research chapter was to examine the moderating effects of supportive leader behaviours, provided by recruit instructors, on contingent punishment in facilitating the development of mental toughness in a military training environment. Study 2a (n = 362) revealed a significant interaction between individual consideration, and contingent punishment on instructor-rated recruits' mental toughness in the later stages of recruit basic training. Study 2b (n = 446) revealed significant interactions individual consideration, and the threat of punishment in the early stages of basic training. Significant differences in mental toughness were also evidenced between those who completed training and those who did not, while high levels of mental toughness were shown to be significantly positively correlated with high levels of personal performance.

Key words

mental toughness, multilevel analysis, punishment, leader support

Introduction

Combat operations places enormous psychological stress on the service personnel involved, with an intensity and relentlessness difficult to imagine in any other setting (Castro & Adler, 2011; Litz, 2007). Indeed, "combat, with its very real threat of death or mutilation might represent the ultimate in naturally occurring events of stress" (Bourne, 1970, p. 22). Repeated exposure to the stress of combat has been shown to result in significant debilitations in performance and a wide range of long lasting emotional and behavioural problems (e.g., heightened risk of suicide, posttraumatic stress disorder, substance abuse, and family violence; Driskell, Salas, Johnston, & Wollart, 2008; Eidelson, 2012; Kok, Herrell, Thomas, & Hodge, 2015; Kuehn, 2009). Importantly, research has shown these effects to be significantly clustered in the cohort of personnel who start out less psychologically robust prior to deployment (LeardMann, Smith, Smith, Wells, & Ryan, 2009). In response, attention has begun to shift from treatment to prevention, with researchers investigating ways in which to the develop and implement effective pre-deployment training programs with the goal of inoculating soldiers against the negative impact of psychological distress on the battlefield (Driskell & Johnston, 1998). To facilitate this, it has been suggested that mental toughness may provide a useful framework from which to address some of the current mental health issues confronting the military (Hammermeister et al., 2011).

Mental toughness has been shown to be associated with the ability to deal with a variety of stressors in high performance environments such as, for example, endurance and pain tolerance (e.g., Crust & Clough, 2005; Crust et al., 2010), stress appraisal and coping effectiveness (e.g., Kaisler et al., 2009; Nicholls et al., 2008), and threat detection and goal-directed behavior (e.g., Bell et al., 2013; Hardy et al., 2014). Indeed, some researchers regard it as *the* defining attribute that enables individuals to deal effectively with adversity and challenge and achieve high levels of personal performance (e.g., Jones & Moorhouse, 2007; Weinberg, 2010). While several different definitions of mental toughness have been forwarded in the literature, for the purpose of the current investigation, mental toughness is defined as, "the ability to achieve personal goals in the face of pressure from a wide range of different stressors" (Arthur et al., 2015; Bell et al., 2013; Hardy et al., 2014).

While the vast majority of research on mental toughness has been conducted in the sport context, a number of studies have demonstrated its utility in a military environment. For example, Chapter 2 (Arthur et al., 2015) revealed that mental toughness significantly predicted higher levels of performance over and above that accounted for by individual fitness levels. Further, Gucciardi, Hanton et al. (2015) provided evidence that mental toughness was important for sustaining high levels of performance and success when faced with the stress and adversity of a physically and mentally demanding military special forces selection course, even when controlling for hardiness and self-efficacy. Whilst these studies have provided correlational evidence that mental toughness is related to performance outcomes in a military context, Chapter 4 also provides preliminary evidence that mental toughness can be developed within a military context, along with concomitant effects on performance.

Mental Toughness Development

With mental toughness being regarded as so crucial to coping with pressure, overcoming adversity, and maintaining high levels of performance and functioning (Gucciardi, Jackson et al., 2015), it is unsurprising, therefore, that the last decade and a half has spawned a plethora of research examining ways in which to understand and develop this important construct. Much of the research into mental toughness development has been conducted within the sports domain and been informed by qualitative designs (e.g., Bull et al, 2005; Connaughton et al., 2008; Gucciardi et al., 2009d; Thelwell et al., 2010; Weinberg et al., 2011), although some notable quantitative research has started to be conducted (e.g., Beattie et al., 2017; Bell et al., 2013; Gucciardi et al., 2009b; Mahoney et al., 2016). While the research to date has shown that attempts to develop mental toughness are a complex undertaking involving multiple mechanisms and sources of influence (Anthony et al., 2017), some common themes have begun to emerge. Specifically, mechanisms such as challenging training environments and sources of influence such as social support networks appear to play an important role in mental toughness development and the ability to maintain high levels of performance, despite exposure to high levels of stress, pressure and adversity (Harmison, 2011).

Some researchers have suggested that exposure to tough and challenging environments (e.g., competition) are crucial to the development of mental toughness (e.g., Clough & Crust, 2011; Bull et al., 2005; Connaughton et al., 2008), while others suggest training should include some form of psychological pressure (Crust & Clough, 2011), punishment-conditioned stimuli (e.g., Bell et al., 2013), or exposure to other aversive situations (Weinberg et al., 2016). However, it is important that while creating challenging and aversive situations in training, coaches provide the requisite support to help athletes deal with those situations (e.g., Weinberg et al., 2016). This is supported by studies that have identified the coach support as a fundamental source of support in the development of athletes' mental toughness (Butt et al., 2010; Connaughton et al., 2010; Clough & Strycharczyk, 2012; Thelwell et al. 2010; Weinberg et al., 2010). Support could come from coaches (e.g., recruit instructors), parents, peers, and senior athletes who can share stressful experiences, and foster reappraisal of the meaning and relevance of experiences.

Military Discipline and the use of Punishment

The military environment is, by necessity, one of strict discipline. Soldiers are often disciplined for minor offences that their civilian counterparts would not. In the military context, punishment is historically an integral part of the development and maintenance of military discipline, the purpose of which is to ensure compliance to orders among individuals and groups and to create and maintain cohesion in military units (Houghton & Holmes, 2001). It should be noted that any form of bullying, victimisation, or brutality is not condoned in modern western armies and is closely monitored by the organisational chain of command. In the modern British Army, the use of punishment is underpinned by the Armed Forces Act, 2006 (AFA 2006) and the Army General and Administrative Instructions, Chapter 67 (AGAI-67), which serve the purpose of providing "the maintenance of good order and discipline among members of the Army and, in certain circumstances, among others who live or work in a military environment." AFA (2006) supplements the ordinary criminal law of England and the ordinary judicial system with a special code of discipline with acts or omissions, which, in the context of army life become punishable offences. In military training establishments, instructors are also governed by the guidelines of conduct mandated in the particular training establishment's code of practice for instructors, as well as the aforementioned legal documentation. This leaves instructors with a number of possible interventions for motivating and reprimanding recruits who fall below the required standards of behaviour, performance and achievement. It could reasonably be argued that the stricter discipline regime than with which new recruits are familiar (including the frequent use of punishment), coupled with the pressure to learn new skills in an unfamiliar environment away from friends and family, epitomizes a tough and challenging environment.

Given its emphasis on transactional sanction in Queen's Regulations for the army, it is important to understand what is meant by the term 'punishment' and its influence in determining performance outcomes. Firstly, to provide a definition and, secondly, to establish the differences between punishment and discipline; terms that are filled with confusion and uncertainty, because researchers fail to articulate their distinctive meanings (Seifried, 2008). For example, in the organizational literature there are occasions where the terms punishment and discipline have been used synonymously (e.g., Arvey, Davis, & Nelson, 1984; Ball, Trevino, & Simms, Jr., 1992; Butterfield, Trevino & Ball, 1996).

The Oxford English dictionary defines discipline as "the practice of training people to obey rules or a code of behaviour, using punishment to correct disobedience," or as "the controlled behaviour resulting from such training." Punishment, on the other hand, is defined as "the infliction or imposition of a penalty as retribution for an offence" (Oxford English Dictionary, 2018). In a military context, military discipline can be defined as "a form of behaviour that is the consequence of training and indoctrination, designed to ensure compliance with orders among individuals and groups that creates and maintains cohesion in military units." (Houghton & Holmes, 2001, p. 261). The use of and threat of punishment facilitates the creation of, and underpins, military discipline and serves the purpose of reinforcing the implication of failure that results from attitudinal problems, and where severe operational penalties would result. Importantly, the recipient of punishment should understand why the punishment has been administered and the purpose of it.

Within the contemporary organizational literature, the terms contingent punishment and non-contingent punishment have come into prominence and refer to the *appropriate* and *inappropriate* administration of punishment on employees (e.g., Podsakoff, Podsakoff, & Kuscova, 2010; Podsakoff, Toder, Grover, & Huber, 1984; Podsakoff, Bommer, Podsakoff, & MacKenzie, 2006; Podsakoff, Todor, & Skov, 1982; Rubin et al., 2010). *Non-contingent* punishment reflects the degree to which a leader administers punitive events regardless of or despite the subordinate's efforts or performance (Podsakoff et al., 1984). On the other hand, *contingent* punishment "reflects a leader's disapproval, displeasure, and use of reprimands contingent upon poor performance" (Podsakoff et al., 1984, p. 40) and is defined as "the leader's administration of negative feedback in the form of reprimands, criticism, or disapproval to employees who exhibit poor or declining performance, or undesirable behaviors" (Podsakoff et al., 2010, p. 293). This is in line with the understanding and purpose of punishment used in a military context where the punishment should be contingent on lack of effort, poor performance, or undesirable behaviour.

Consequently, the term contingent (i.e., appropriate) punishment is used in the context of this study and reflects the instructor's disapproval, displeasure and use of reprimands and minor sanctions to reinforce the implication of undesirable behaviour, effort and performance. This is consistent with terms punishment and punishment-conditioned stimuli used by Hardy et al (2014) and Bell et al., (2013), whereby athletes were exposed to punishments for failure to meet strict disciplinary standards during training (e.g., punctuality, tidiness, correct kit) or specific performance standards.

The use of punishment, however, is not restricted to the military environment. Despite the unpleasant connotations associated with its use, punishment has been, and remains, commonplace in organizational and industrial settings. Leader reward and punishment appear in various forms in almost every major leadership theory (Podsakoff et al., 2006). For example, leader reward and punishment behavior are both central to transactional leadership (Bass, 1985) and are critical in forming the foundation upon which transformational leadership is built (Avolio, 1999). Yet, there remains a mixed attitude towards the rationale for the use of punishment in the research literature. While some researchers view it as a fundamental aspect of leadership and daily life (e.g., Bandura, 1969; Carlsmith, 2006; Greer & Chalmer, 1987; Podsakoff et al., 2006; Podsakoff et al., 2010; Seifried, 2008; 2010) and an important determinant of subordinate attitudes and behaviour (Podsakoff, et al., 2006), others view it as an ineffective way to change subordinate behaviour without incurring detrimental long term behavioural, attitudinal, and emotional side effects (e.g., Albrecht, 2009; Ball, Trevino, & Simms, Jr., 1992; Parke, 1972; Skinner, 1938; 1948). Consequently, the intelligent use of punishment remains largely unexplored. This is unfortunate, as continuing to ignore or deny its existence prevents the use of a valuable tool in behaviour modification (Arvey & Ivancevich, 1980; Bare, 1970) and will impede further academic understanding of the construct. Indeed, "only rigorous research and an open dialogue will provide the insight needed to understand the effectiveness of punishment in organizational settings" (Arvey & Ivancevich, 1980, p. 131), particularly in the development of stress tolerance in a military training environment (e.g., Attwater, Cambreco, Dionne, Avolio, & Lau, 1997).

Seifried (2008) argues that these concerns about the use of punishment are based on the misconception that punishment will often be administered inappropriately. However, the evidence from Bell et al. (2013) suggests that punishments and the threat of punishment can lead to higher levels of performance under pressure, providing they are administered appropriately and underpinned by supportive transformational leadership behaviour. This view is supported by Arthur, Hardy, and Wagstaff (2010), who have provided preliminary evidence that the use of contingent punishment is significantly and positively related to improvements to a variety of attitudinal variables in military training, including self-esteem and satisfaction. Rubin et al. (2010) found that the contingent (appropriate) use of punishment mitigated many of the negative harmful effects of punishment compared to non-contingent (inappropriate) punishment, while Attwater, et al. (1997) suggest that punishment may be regarded as a useful tool for building stress and frustration tolerance in a military environment.

Gray & McNaughton's revised Reinforcement Sensitivity Theory (rRST; 2000) appears to offer some promise in furthering an understanding of mentally tough behavior and its relationship with punishment. Gray and McNaughton (2000) argue that high-pressure environments contain high degrees of punishing stimuli in the form of physical or ego threats. Using rRST, Bell et al. (2013) examined athlete's ability to achieve a high level of personal performance in a pressurized performance environment characterized by repeated exposure to punishment-conditioned stimuli in a training environment. Athletes were taught a variety of coping strategies to deal with the threatening environment to avoid the potentially harmful effects of punishment, while the coping strategies and training were delivered in a transformational manner. The results of the study suggest that the appropriate use of punishment, but more specifically the threat of punishment, can lead to enhanced mental toughness and performance under pressure. Based on these results, further investigation along this line in other training contexts is warranted. It is also important to note, however, that the use of (the threat of) punishment was augmented by transformational leadership behaviour.

Transformational Leadership and Instructor Support

Transformational leadership is one of the most widely used leadership theories

in the organizational psychology literature (Arthur & Hardy, 2013) and has been shown to positively impact a wide range of individual and organizational outcomes in a variety of settings, including finance (e.g., Barling et al., 1996), sport (Charbonneau etv al., 2001), education (Koh et al., 1995), organizations (Podsakoff et al., 1990), and the military (e.g., Arthur & Hardy, 2013; Bass et al., 2003; Dvir et al., 2002; Hardy et al., 2010).

The Multifactor Leadership Questionnaire (MLQ) (Bass & Avolio, 1995) is the most widely used leadership scale to date. However, due to mixed empirical support regarding its discriminant validity and factor structure, alternative approaches to the conceptualization and measurement of transformational leadership have been explored, including differentiated models that allow for a more detailed examination of the specific sub-components of transformational leadership behaviors. Hardy et al. (2010) utilized a differentiated transformational leadership inventory (DTLI) consisting of six sub-dimensions: (1) appropriate role modeling; (2) inspirational motivation; (3) fosters an acceptance of group goals; (4) individual consideration; (5) intellectual stimulation and; (6) high performance expectations. A differentiated model of transformational leadership allows the effects of separate sub-dimensions to be examined, depending on the nature, outcome and context (e.g., Antonakis, Avolio & Sivasubramaniam, 2003; Hardy et al., 2010). Moreover, Arthur and Hardy (2008), proposed a meta-cognitive model of transformational leadership for use in a military context, whereby the leadership behaviours could be categorized into three basic components; vision (e.g., appropriate role modeling, inspirational motivation), support (e.g., individual consideration, fosters an acceptance of group goals,), and *challenge* (e.g., intellectual stimulation, high performance expectations) (see Arthur, et al., 2014 for a more detailed discussion).

It is the supportive behaviours of the differentiated transformational leadership model that are of interest to this particular study. Arthur and colleagues (2014) posit that leader support provides a belief in the follower that the vision is attainable, and contributes to feeling valued and important. Support can be defined as "the extent to which emotional, esteem, informational, and tangible support is provided or is perceived as being available when needed" (Arthur et al., 2014, p. 76). Inspirational motivation, fosters an acceptance of group goals and individual consideration represent leader support.

A number of qualitative studies investigating mental toughness development in athletes have highlighted the importance of coach support (e.g., Butt, Weinberg, & Culp, 2010; Connaughton, Hanton, & Jones, 2010; Connaughton, Wadey, Hanton, & Jones, 2008; Thelwell et al., 2010). Connaughton and colleagues (2008) found that coaches' leadership had an impact on athletes' attributes such as, for example, an unshakable belief in an athlete's ability to achieve their goals, performing better than his/her opponent, and the desire to succeed. Thelwell and colleagues (2010) found that athletes perceived coach support in the form of emotional support, positive feedback, motivation and encouragement, instilling determination, and being made to feel special. Butt and colleagues (2010) found that the most important person in the development of athletes' mental toughness appeared to be the coach. Coaches of mentally tough athletes were perceived by athletes to provide support and encouragement both in and out of the practice and competition environments and seen as displaying certain characteristics, such as confidence and good leadership skills, perceived to facilitate mental toughness development in athletes.

Weinberg, Freysinger, Mellano, & Brookhouse (2016) found that an important way for coaches to develop mental toughness is to creating aversive situations in training, similar to those that might be faced in competition. However, it is important that the coach also displays nurturing and supportive behaviour towards the athlete by providing the athletes with, for example, mental skills and coping strategies with which to deal with stressful situations. Nash, Steenkamp, Conoscenti, & Litz (2011) posit that one of the primary roles of instructors in initial military basic training is to develop the recruits' physical and mental strength and the recruit's confidence in his ability to cope with the challenges of combat operations During initial military basic training, instructor support has been shown to be the only source of support (when compared to family friends and fellow recruits) directly associated with better coping and higher performance in training (Overdale & Gardener, 2012). The authors suggest that this is because the instructors are in a better position to provide material support, performance feedback, and specific information relevant to the training environment.

The collective evidence suggests that high levels of supportive leadership and creating a challenging environment help to provide the conditions to facilitate the development of mental toughness. Further, drawing on the work of Bell et al. (2013) and Beattie et al. (2017) that applies rRST to mental toughness, it could be argued that an interaction between aversive situations (e.g., punishment) and the supportive transformational leader behaviours of inspirational motivation, fosters an acceptance of group goals, individual consideration may help to predict mental toughness.

Hypothesis

The purpose of study 2 is to examine the role of punishment, when combined with supportive leadership behaviours in facilitating the presence of mentally tough behaviour in a military recruit training environment. It is proposed that significant interactive effects would be evidenced between the supportive leader behaviors of inspirational motivation, fosters an acceptance of group goals, individual consideration, and contingent punishment. That is, when high levels of contingent punishment were accompanied by high levels of either inspirational motivation, fosters an acceptance of group goals and teamwork, individual consideration, observer rated mental toughness would be high. It is further hypothesized that higher levels of mental toughness will significantly and positively correlate with higher levels of individual recruit performance, measured by mid and end of course grades.

Study 2a

Method

Participants. A total of 362 male British Army infantry recruits ($M_{age} = 21.01$, SD = 3.22) undergoing a 26-weeks initial basic training were reported on by 61 male infantry recruit instructors ($M_{age} = 28.44$, SD = 2.74). The instructors were all experienced combat veterans and instructors who had served between five and a half and 13 years in the Army (M = 9.30, SD = 2.09) and had spent between six and 24 months of a 24-month tenure as a recruit instructor (M = 14.84, SD = 7.74). The British Army consists of soldiers from a wide variety of British Commonwealth countries, which is reflected in the sample. 86.7% were British nationals, while the remaining 13.3% were from Foreign and Commonwealth countries (e.g., African, Polynesian, Antipodean, etc.). 10 Foreign and Commonwealth recruits (2.8%) recorded English as being their second language.

Of 531 recruits from whom data were initially obtained, 169 (31.8%) failed to reach week 20 of training due to discharge, injury or failing to achieve a periodic critical training objective and, therefore, sent back to an earlier point in training. The final sample consisted of 362 recruits (68.2%). Multilevel analysis requires a minimum of 3 participants at level-1 within each group being analysed (Hox, 2010). Consequently, four of the 65 recruit instructors reported on by the recruits at week 15 of training were removed from the analysis due to having less than three remaining members of their sections at week 20 of training. Therefore, 61 section corporals were involved in the final analysis. At week 20 of training, the recruits had been with their section corporals for an average 16.5 weeks (SD = 5.1).

Study Context. The aim of initial basic training for infantry soldiers is to provide soldiers with the requisite skills of war fighting in extremely hostile environments. While undergoing basic training, recruits are exposed to stress in the form of rigorous mental and physical training (Gold & Friedman, 2000). Typical stressors include; a far stricter discipline regime form that which they are familiar with, intense physical demands, time pressures, isolation from familiar social support networks, threats to personal feelings of safety, loss of independence and freedom, a lack of privacy, sleep deprivation (Johnsen et al., 1998). The consequences of failing to meet the required standards at any point in training, result in the recruit being reallocated to an earlier point in training with another training platoon.

The majority of instruction and training takes place outdoors and on field exercises. While general instruction involves the development of technical proficiency (e.g., skill-at-arms, field craft), discipline, teamwork, and fitness, the competencies necessary to succeed in a stressful environment (e.g., adaptability, stress tolerances) are not explicitly taught or incorporated into the training curriculum. Rather, they are developed by rigorous training standards that test the mental fortitude of recruits, which often involve executing tasks while exposed to a variety of physical and psychological stressors, (Robson & Manapilli, 2014). Consequently, while many recruits will develop mental fortitude over time, others will have difficulty developing the coping mechanisms required to deal with extreme stress (Thompson & McCreary, 2006). As a result, high attrition rates are elicited, resulting in high personal cost to the individual and significant financial cost to the organization (Blacker et al., 2008). Indeed, a recent study examining the factors associated with failure to complete infantry training among British Army recruits revealed a 36.2% attrition rate (Kiernan, 2011). Although attrition is mainly caused by injury, a significant number of recruits are also lost to training due to voluntarily withdrawal (Jackson, et al., 2011).

Study Design. A prospective longitudinal design was adopted for the study, with perceptions of recruits' leader support and punishment (week-15) and instructor-rated perceptions of recruits' mental toughness (week-20) being measured five weeks apart. Six weeks after that, on completion of basic training, performance data were gathered (week-26).

Measures.

Leader support. The Differentiated Transformational Leadership Inventory (DTLI; Arthur & Hardy, 2014; Hardy, et al., 2010) was used to assess the corporal instructors' leadership behaviours. The DTLI is a 22-item inventory used to identify six transformational leadership behaviours: (1) Appropriate role modeling (*e.g.*, "*My section commander is a good role model for me to follow*"); (2) inspirational motivation (*e.g.*, "*My section commander talks enthusiastically about what needs to be accomplished in training*"); (3) fosters an acceptance of group goals (*e.g.*, "*My section commander recognises that I have different needs to others*"); (5) Intellectual stimulation (*e.g.*, "*My section commander encourages me to think for myself*") and; (6) high performance expectations (*e.g.*, "*My section commander pushes me until I achieve the best performance I can*"). Each item is scored on a 5-point Likert scale anchored from 1 (*not at all*) and 5 (*all of the time*).

In an earlier study in the same training establishment (i.e., Arthur& Hardy, 2014), the DTLI demonstrated good factor structure $(S-B\chi^2 (329) = 612.03, p = .01;$ RMSEA = .04; SRMR = 0.04; CFI = 0.99; NNFI = 0.98), with the alpha coefficients for each scale were < .70. As discussed previously, only the leader behaviours of inspirational motivation, fosters an acceptance of group goals and individual consideration were considered supportive and were, therefore, retained for analysis. Recruits were asked to complete the questionnaire in relation to their instructor.

Contingent Punishment. A contextually modified version of the Leadership Reward and Punishment Questionnaire (LRPQ; Podsakoff et al, 1984; Podsakoff et al., 1982) was used to measure the corporals' use of reward and punishment behaviour. To modify the measure to the context, the wording 'my supervisor' was changed to 'my section commander' (i.e., the recruit's instructor. The LRPQ is a 23 item questionnaire used to measure: (1) contingent reward (10 items; e.g., "My section commander gives me positive feedback when I perform well"); (2) contingent punishment (5 items; e.g., "If I performed at a level below that of which I was capable, my section commander would show his disapproval"); (3) non-contingent reward (4 items; e.g., "Even when I perform poorly, my section commander praises me"); and; (4) non-contingent punishment (4 items; e.g., "I am often reprimanded by my section commander without knowing why"). Each item is scored on a 5-point Likert scale anchored from 1 (not at all) and 5 (all of the time). In two studies, Podsakoff and colleagues (Podsakoff et al., 1982; 1984), factor analysis for the 23-item measure revealed a 4-factor solution, which means each scale can be analyzed independently. Although the full factor analysis results were not reported, in the latter study they reported that, taken together, the four factors accounted for over 60% of the variance explained in each of six separate samples (ranging from N = 198 to N = 421).

Moreover, in both studies, the internal consistency (alpha coefficient) for the contingent punishment scale was > .80. For the purpose of this study, only the contingent punishment scale was used. Recruits were asked to complete the questionnaire in relation to their instructor.

Mental toughness. The Military Training Mental Toughness Inventory (MTMTI; Arthur et al., 2015) is a six item behavioural measure of mental toughness designed and validated to measure the ability to maintain optimal performance under pressure from a range of different stressors experienced by recruits during infantry basic training. Responses are based on how much each recruit is able to maintain a high level of personal performance when confronted with different stressful situations in training (e.g., when the conditions are difficult; when he has been reprimanded or punished). Responses are based on a 7-point Likert scale ranging from 1 (never) to 7 (always), with a midpoint anchor of 4 (sometimes). Chapter 2 provided evidence that the MTMTI possesses good psychometric properties and structural validity, with good test-retest reliability, concurrent validity. Moreover, it predicted performance in two different training contexts with three separate samples. Instructors were asked to complete the questionnaires in relation to each recruit under their tutelage.

Performance. Performance was measured by the recruits' end of course final grades, based on their weekly reports and grades throughout the CIC. This grade is awarded after discussion between the platoon commander (Lieutenant or Captain) and the platoon sergeant, and based on the recruits' bi-weekly progress/performance reports throughout the CIC. Grades ranged from 0 (fail) to 6 (excellent).

Procedure. Institutional ethical approval was obtained prior to the commencement of the study. In addition, the commandant and commanding officers were approached and permission requested to approach the recruits from the two

Infantry Training Battalions from which the participants were drawn. At week 15, the recruits were approached by the experimenter, who explained the purpose of the study. They were informed that participation was not mandatory and assured of complete confidentiality for those agreeing to participate. A total of five recruits declined to take part and were free to leave the room. Thereafter, those agreeing to participate completed informed consent forms. The DTLI and LRPQ were administered in a training lecture room without the presence of any military training staff. Once the questionnaires were completed, they were placed in an envelope and sealed. The recruits were assured that only members of the research team would have access to their questionnaires. The week 15 point was chosen because it is beyond the mid-way milestone of training and the recruits have progressed from the basic to more advanced training activities.

At week 20, the candidate approached the section corporals of the participating recruits. The purpose of the study was explained and complete anonymity and confidentiality assured, after which, informed consent forms were completed by those agreeing to participate. The corporals were then issued with a MTMTI questionnaire pack consisting of one questionnaire for each recruit under their instruction, which they were asked to read and complete. Once the questionnaires were completed, they were placed in an envelope and sealed. The corporals were assured that only members of the research team would have access to the questionnaires. At week 26, on completion of basic training, recruit performance data were collected.

Analytic strategy. The current data consist of two hierarchical levels, the recruit (level 1) and the section corporal (Level 2). Multilevel modelling provides a means by which to examine the relationships between level 1 and level 2 simultaneously and provides individual level error terms. MLwiN (V 2.10; Rasbash,

Charlton, Browne, Healy, & Cameron, 2009) was used in this study to examine the relationships between the section corporals' use of punishment and perceived support, and the recruits' mental toughness. In order to determine whether it is appropriate to analyse the data using a multilevel framework, the variance components of mental toughness were examined by calculating the intraclass correlation coefficient (ICC). This is the ratio of group level variability to individual level variability and is calculated by dividing the between groups variability by the sum of the between groups variability and within groups variability. It is proposed that anything over 5% variance, multilevel analysis is warranted, while for anything less than 5%, normal regression analysis using SPSS can be conducted. The ICC for mental toughness was 0.183, therefore, the total variance of mental toughness accounted for by group membership is 18.3%. Consequently, a multilevel framework was adopted to examine the hypotheses. Prior to conducting the analysis, all variables were standardized, ensuring that the coefficients would be interpreted as β coefficients. The centering method used was group mean centering where the ith case is centred around its jcluster, that is, the individual scores were centred around the group mean.

When conducting multilevel analysis, it has been suggested that the Level 1 predictors should be tested to determine whether they should be fixed or set random at Level 2 (Kreft & Leeuw, 1998). If fixed, it is assumed that the effect of the predictor (e.g., contingent punishment) on the outcome variable (mental toughness) does not vary across the Level 2 units (section corporals), whereas a random effect implies the opposite. Possible random effects of the predictors were tested by examining the significance of the variance term at Level 2. In this case, the variance terms were not significant and were, therefore, treated as fixed factors. The predictor variable was subsequently entered into the multilevel equation. The nature and form of significant interactions were followed up by plotting the interactions at one standard deviation above and below the mean (Aiken & West, 1991). Analyses of simple slopes were conducted using software developed by Preacher, Curran and Bauer (2006).

Results

Preliminary data analysis.

Confirmatory factor analysis. This is the first time the LRPQ (Podsakoff et al., 1984) has been used in a military context. Both the MTMTI (Arthur et al., 2015) and the DTLI (Hardy et al., 2010) have been used in studies with similar sample populations and been found to possess sound psychometric properties (e.g., Arthur et al., 2015; Arthur et al., 2017; Arthur & Hardy, 2013; Fitzwater et al, 2017). Nevertheless, confirmatory factor analysis (CFA), using LISREL 8.80 (Jöreskog & Sörbom, 2006), was conducted to test the factor structure of all measures.

The following fit indices were used: Satorra-Bentler scaled chi square (S-B χ^2 : Satorra & Bentler, 1994); Root Mean Square Error of Approximation (RMSEA: Steiger & Lind, 1980); Standardized Root Mean Square Residual (SRMR: Bentler, 1995); Comparative Fit Index (CFI: Bentler & Bonett, 1980); and Non-Normative Fit Index (NNFI: Tucker & Lewis, 1973), with the recommended values of \leq .06 for RMSEA; \leq .08 for SRMR; \geq .95 for CFI; and \geq .95 for NNFI being adopted, in line with recommendations by Hu and Bentler (1999).

LRPQ. The scale demonstrated an acceptable fit with all 5 items retained, (S- $B\chi^2(5) = 16.71$, p = .01; RMSEA = .07; SRMR = 0.03; CFI = 0.99; NNFI = 0.98). The mean contingent punishment score was 4.71 (*SD* = .70) with an internal consistency (Cronbach's alpha) of .77. Standardized factor loadings were all above .54. Scale items with standardized factor loadings are presented in Table 3.1.

MTMTI. The fit statistics for the MTMTI were considered acceptable (S-B χ^2

(9) = 27.75, p=0.00, RMSEA = .07, CFI = .99, TLI = .98, SRMR = .02). The mean mental toughness score was 4.87 (SD = 1.18) with an internal consistency (Cronbach's alpha) of .90. Standardized factor loadings were all above .73.

DTLI. As only three specific leadership behaviours were being measured for this study, CFA was conducted for those individual scales only. The fit statistics for the scales were considered adequate to good fits: inspirational motivation (S-B χ^2 (2) = 0.26, *p* = .88; RMSEA = 0.00; SRMR = 0.00; CFI = 1.0; NNFI = 1.0) with factor loadings >.45 and cronbach's alpha of .77; fosters an acceptance of group goals (S-B χ^2 (2) = 7.46, *p* = .02; RMSEA = .07; SRMR = 0.03; CFI = .98; NNFI = .99) with factor loadings >.56 and cronbach's alpha of .81; and individual consideration (4-item) (S-B χ^2 (2) = 1.83, *p* = .40; RMSEA = 0.00; SRMR = 0.02; CFI = 1.0; NNFI = 1.0) with factor loadings >.41 and cronbach's alpha of .67.

Table 3.1.

Contingent Punishment Items with Factor Loadings.

Item				
1	If I performed at a level below that which I was capable of, my Section Commander would show his disapproval.	.66		
2	My Section Commander shows his displeasure when my performance is below an acceptable standard.	.74		
3	My Section Commander lets me know about it when I perform poorly.	.70		
4	My Section Commander would punish me if my performance was below standard.	.54		
5	When my performance is not good, my Section Commander points it out to me.	.56		

Main data analysis. Descriptive statistics, correlations and alpha coefficients for all Study-2a variables are displayed in Table 3.2. The results for the multilevel analysis for Study-2a are displayed in Table 3.3. Model 1 displays the results for the moderator (e.g., individual consideration). Model 2 displays the results for the moderator and the predictor variable, and Model 3 displays the results for the moderator, predictor variable and the interaction term predicting the dependent variable (mental toughness).

Table 3.2.

Means, Standard Deviations and Zero-order Correlations for all Study 2a Variables

	Mean	SD	MT	СР	IM	FGG	IC
Mental Toughness	4.87	1.18					
Contingent Punish.	4.71	0.70	-0.03				
Insp. Motivation	4.10	0.73	.11*	.12*			
Foster Group Goals	4.30	0.71	0.08	0.09	.81**		
Individual Consider.	3.85	0.82	.11*	0.08	.77**	.73**	
Performance	3.22	1.72	.38**	15**	.13*	.16**	.12*

* Correlation is significant at the 0.05 level.

** Correlation is significant at the 0.01 level.

Contingent punishment X individual consideration. The results of the

analyses revealed no main effect for contingent punishment ($\beta_1 = 0.005$ (*SE* = 0.065), p > .05), while a main effect was evidenced for individual consideration ($\beta_2 = 0.191$ (*SE* = 0.062), p < .01). After controlling for the main effects, the interaction term between contingent punishment and individual consideration was significant ($\beta_3 = 0.175$ (*SE* = 0.068), p = .01). Both group and individual-level variance associated with contingent punishment and individual consideration was significant ($\Omega_u = 0.137$ (*SE* =

0.054), p < .01; $\Omega_e = 0.085$ (SE = .68), p < .01). Using the Preacher *et al.* (2006) software, further analysis was conducted in order to explore the slopes for high and low individual consideration. The analysis revealed that the slope for low individual consideration was non-significant and negative (t(361) = 0.119, p > .05), while the slope for high individual consideration was non-significant and positive, t(361) = 0.573, p > .05. The interaction is presented in Figure 3.1.

Contingent punishment X inspirational motivation. The analysis revealed no main effect for contingent punishment ($\beta_1 = -0.040$ (SE = 0.061), p > .05), while a main effect was evidenced for inspirational motivation ($\beta_2 = 0.195$ (SE = 0.066), p < .05). After controlling for the main effects, the interaction term for contingent punishment and inspirational motivation was not significant ($\beta_3 = 0.122$ (SE = 0.07), p > .05). Both group and individual-level variance associated with contingent punishment and inspirational motivation was significant ($\Omega_u = 0.133$ (SE = 0.054), p < .01; $\Omega_e = .818$ (SE = .069), p < .001).

Contingent punishment X fosters an acceptance of group goals. The analysis revealed no main effect for contingent punishment ($\beta_1 = -0.030$ (SE = 0.058), p > .05), while a main effect was evidenced for fosters an acceptance of group goals ($\beta_2 = 0.140$ (SE = 0.069), p < .05). After controlling for the main effects, the interaction term was non-significant) $\beta_3 = 0.087$ (SE = 0.069), p > .05). Both group and individual-level variance associated with contingent punishment and fosters an acceptance of group goals was significant ($\Omega_u = .141$ (SE = .05), p < .01; $\Omega_e = .828$ (SE = .07), p < .01).

Bivariate correlational analysis revealed that mental toughness was significantly and positively correlated to overall course performance (N = 362, r = .38, p < .001).
Table 3.3.

Results for Study 2a Predictor and Moderating Variables

	β	SD	р
Intercept β0ij	-0.009	0.064	.887
Contingent Punishment, β_1	-0.040	0.058	.472
Inspirational Motivation, β_2	0.195	0.066	.002
Interaction Term, β_3	0.122	0.070	.081
Individual-Level Variability	0.818	0.069	.000
Group-Level variability	0.133	0.054	.014
Intercept β0ij	-0.003	0.065	.963
Contingent Punishment, β_1	-0.03	0.058	.605
Fosters an Acceptance of Group Goals, β_2	0.140	0.069	.043
Interaction Term, β_3	0.087	0.069	.207
Individual-Level Variability	0.828	0.070	.000
Group-Level variability	0.141	0.050	.004
Intercept, β 0ij	-0.008	0.065	.902
Contingent Punishment, β_1	-0.025	0.057	.330
Individual Consideration, β_2	0.208	0.063	.000
Interaction Term, β_3	0.175	0.068	.005
Individual-Level Variability	0.834	0.070	.000
Group-Level variability	0.154	0.058	.008



Figure 3.1. Interaction between contingent punishment and individual consideration in Study 2a.

Discussion

The purpose of this study was to examine the interactive effects of supportive leadership behaviors and contingent punishment on mental toughness in military recruits. As hypothesized, the results revealed an interaction between contingent punishment and individual consideration. However, while main effects were observed for inspirational motivation and fosters an acceptance of group goals, no interactions resulted from contingent punishment and inspirational motivation, or contingent punishment and fosters an acceptance of group goals. Therefore, contingent punishment would seem to have a positive effect on mental toughness, but only in the presence of leader support in the form of individual consideration.

Whilst the results offer initial support for the hypothesis, it is important to note that only one of the supportive leader behaviors, namely individual consideration, interacted with contingent punishment. However, the results showed that inspirational motivation approached significance. Fosters an acceptance of group goals, on the other hand, appeared to have no effect. However, it is still acknowledged that the other supportive behaviours were expected to positively interact with contingent punishment.

The results lend support to the mental toughness literature and, in particular, Bell and colleagues' (2013) research by demonstrating that punishment conditioned stimuli (i.e., contingent punishment), as part of a challenging training environment, and support from significant others (i.e., in this case, the recruit's instructor) is associated with higher levels of mentally tough behaviour. Furthermore, the results from the secondary analysis suggest that mentally tough individuals are better able to deal with challenging and stressful environments and maintain higher levels of individual performance. One potential explanation for this result may be the time in training when the study was tested. That is, the effects may have taken place earlier in the training cycle. By week 15, the recruits are over half way through basic training and most of the recruits who are likely to drop out will have done so at this stage. Therefore: (1) the modelled behaviour by the instructors may have already had the desired effect; (2) at this stage the recruits are working as a cohesive unit (fosters group goals) and: (3) the motivation to perform has become more internalized without the need for externally regulated stimuli from instructor (i.e., the behaviour has become more autonomous (see Deci & Ryan, 2002).

Arguably, it is the early stages of military basic training which are the most stressful and demanding for the recruits, particularly the first five or six weeks. This is because of the initial culture shock of the stricter discipline regime, more intense physical demands, initial isolation from familiar social support networks (e.g., friends and family), loss of independence and freedom, and general a lack of privacy (Johnsen et al., 1998). Moreover, during the initial stages of training, recruits are required to adapt a more disciplined way of life, which, for many, involves radical behavioral change reinforced by the threat of contingent punishment.

By the later stages of training, those recruits who have made it thus far will have adapted to the new regime. Therefore, it is possible that an enhanced likelihood exists for the supportive leader behaviours to create a buffering effect. That is, the contingent punishment may be more stressful in the earlier stages of training of training because receiving such contingent punishment might be a new experience for recruits. As a consequence, contingent punishment might be perceived as more intense in the earlier stages of training. As training progresses, recruits might become more conditioned to contingent punishment and, therefore, desensitized to its effect, thus the induced stress may be reduced.

In an attempt to identify the point at which the interaction between individual consideration (leader support) and punishment (as part of a challenging environment) begins to emerge, Study 2b focused on the first phase of basic training. That is, the first 12 weeks, at which point there is a natural break when the recruits go on leave for two weeks. The first 12 weeks focus on 'basic' soldiering skills, (e.g., basic marksmanship, developing physical fitness, foot drill, personal administration, etc.). Furthermore, in an attempt to more accurately assess the threat of punishment, it was decided to amend the contingent punishment scale to reflect the recruits' perceived *threat* of punishment, rather than punishment *per sé*. The reason for this is that some of the recruits may not actually be punished, due to consistently behaving in the manner stated by the corporals (e.g., never being late or poorly turned out, weapon always clean, demonstrating maximum effort at all times). However, the *threat* of punishment remains, regardless, whether because it is clearly stated by the training staff or whether it is observed vicariously.

Based on the rationale provided earlier in the discussion regarding fosters an acceptance of group goals as a supportive leader behaviour, only inspirational motivation and individual consideration were retained for Study 2b.

Study 2b

Method

Participants. Data were collected from a total of 446 male British Army infantry recruits ($M_{age} = 20.85$, SD = 3.35) and 49 male infantry recruit instructors ($M_{age} = 27.31$, SD = 2.34). The recruits were in the first 12 weeks of 26 weeks of basic training (as described in Study 2a). 89.9% of the recruits were British nationals,

with 94.4% recording English as their first language. The corporal instructors were all experienced soldiers who had served between 5 and 13 years in the Army ($M_{years} = 8.78$, SD = 1.98) and were in the process of serving a 24-month tour of duty at the Infantry Training Centre ($M_{months} = 8.32$, SD = 5.51).

A total of 93 recruits failed to reach week-12 due to: discharge as of right (DAOR³; 11.7%, n = 52); inadequate performance (4%, n = 18); injury and moved to rehabilitation platoon (3.4%, n = 15) and; injury followed by medical discharge from training (2.2%, n = 10). As a result, at week-12, three sections contained less than three recruits who had submitted data at weeks-3 and 8. Consequently, the data for 351 recruits ($M_{age} = 20.83$, SD = 3.34) and 46 instructors ($M_{age} = 27.28$, SD = 2.32) were retained for analysis.

Measures.

Leader support. The DTLI (Hardy, et al., 2010) was used to assess the corporal instructors' leadership behaviour.

Mental toughness. MTMTI (Arthur et al., 2015) was used to measure mentally tough behaviour.

Threat of punishment. The punishment items from the LRPQ (Podsakoff et al., 1984) were slightly adapted to reflect the recruits' perceived *threat* of punishment, rather than punishment per se. That is, the tense of the item wording was altered to read. For example, the original wording from the contextually modified LRPQ item, "My section commander shows his displeasure when my performance is below an

³ Recruits have a statutory right to leave the army within a certain window. This is between 28 days and 12 weeks of training. Recruits over 18 must give the Commanding Officer 14 days notice of their intention to leave once they have completed 28 working days. The window to submit their notice closes at the 12-week point. Recruits under 18, however, can effectively give notice to leave at any point up until their 18th birthday. The right to DAOR is separate to other administrative discharges, such as those required medical or disciplinary reasons.

acceptable standard," was amended to read, "my section commander *would* show his displeasure if my performance was below an acceptable standard." 6 more items, which reflected the behaviours likely to be punished in the training environment, were also added. For example, "if I failed to turn up on time, I *would* be punished by my section commander." Each item was scored on a 5-point Likert scale anchored from 1 (not at all) and 5 (all of the time).

Performance. Two performance indices were used. The first was the recruits mid-course grades, based on their performance at the halfway point in training. The second was measured by the recruits' end of course final grades, as in Study 2a. Both grades are based on discussion between the platoon commander and the platoon sergeant, based on the recruits' bi-weekly performance reports and performance in specific skills (e.g., shooting, fitness, personal administration) throughout the course. Grades ranged from 0 (fail) to 6 (excellent).

Procedure. After receiving institutional and organizational ethical approval, instructors and recruits were verbally solicited to take part in the study. At week 3, the recruits were approached by the candidate who explained the purpose of the study. They were informed that participation was not mandatory and assured of complete confidentiality for those agreeing to participate. A total of seven recruits declined to take part and were free to leave the room. Those agreeing to take part in the study completed informed consent forms. Week three was determined as the start point for data collection as it allowed the recruits to get a feel for their instructors' behaviour prior to completing the questionnaires. It also gave the instructors time to observe and accurately report on the recruits. The DTLI and Threat of Punishment measure were administered in a training lecture room without the presence of any military training staff. Once the questionnaires were completed, they were placed in an envelope and

sealed. The recruits were assured that only members of the research team would have access to their questionnaires. The DTLI and Threat of Punishment measure were administered under the same conditions during weeks 8 and 12.

At a different point during week three, the candidate approached the section corporals of the participating recruits. The purpose of the study was explained and complete anonymity and confidentiality assured, after which, informed consent forms were completed by those agreeing to participate. The corporals were then issued with a MTMTI questionnaire pack consisting of one questionnaire for each recruit under their instruction, which they were asked to read and complete. Once the questionnaires were completed, they were placed in an envelope and sealed. The corporals were assured that only members of the research team would have access to the questionnaires. The section corporals were given follow-up MTMTI packs during weeks 8 and 12.

Performance grades were collected from the collected from the platoon commander on completion of week 12 and on completion of basic training.

Data analysis.

Confirmatory factor analysis. As the threat of punishment measure had not been used before, CFA was conducted, using Mplus (7.3) (Muthen & Muthen, 2012), to test the factor structure. Initially, the scale demonstrated a poor fit with all 11 items retained ((S-B χ^2 (44) = 273.539, *p* = .00; RMSEA = .13; CFI = .82; TLI = .78; SRMR = .07), with standardized factor loadings ranging between .40 and .74. However, a good fit was obtained with 5 of the 11 items, two of which were from the original LRPQ contingent punishment scale ((S-B χ^2 (5) = 5.99, *p* = .31; RMSEA = .024; CFI = 1.0; TLI = 1.0; SRMR = 0.02). Standardized factor loadings were between .52 and .75 with a composite reliability of .82. All retained items for the threat of punishment

measure are displayed in Table 3.4.

Main data analysis. MLwiN (V 2.1; Rasbash et al., 2009) was used in this study to examine the relationships between the section recruits' perceived threat of punishment and perceived instructor support, and the recruits' mental toughness. The variance components of mental toughness were examined by calculating the ICC to determine the appropriateness of using a multi-level framework. The ICC for mental toughness was 0.2784, therefore, the total variance of mental toughness accounted for by group membership is 27.84%. Consequently, a multilevel framework was adopted to examine the hypotheses. Prior to conducting the analysis, all variables were standardized, ensuring that the coefficients would be interpreted as β coefficients.

As for Study 2a, the centering method used was group mean centering where the *i*th case is centred around its *j* cluster, that is, the individual scores were centred around the group mean. Possible random effects of the predictors were tested by examining the significance of the variance term at Level-2. These were not significant and were, therefore, treated as fixed factors (i.e., a random intercept fixed slope model was adopted). The main analysis consisted of the moderator (e.g., individual consideration), predictor variable (threat of punishment) and the interaction term predicting the dependent variable (mental toughness) being entered into the equation.

First, two main analyses were conducted: (1) the moderator (e.g., individual consideration) and predictor variable (threat of punishment) at week-3, and the interaction term predicting the dependent variable (mental toughness) at week-8; (2) the moderator (e.g., individual consideration) and predictor variable (threat of punishment) at week-3, and the interaction term predicting the dependent variable (mental toughness) at week-12. These analyses were conducted for each of the supportive leadership behaviours. The nature and form of significant interactions

were followed up by plotting the interactions at one standard deviation above and

below the mean (Aiken & West, 1991). Analyses of simple slopes were conducted

using software developed by Preacher, Curran and Bauer (2006).

Table 3.4.

Retained Threat of	f Punishment Measure	Items for Study 2b.
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Item					
1	If I performed at a level below that which I was capable of, my Section Commander would show his disapproval.*	.75			
2	If my performance was poor, my Section Commander would point it out to me.*	.66			
3	If I did not put in enough effort, my section commander would reprimand me.	.55			
4	If I was poorly turned out, my section commander would put me on show parade ⁴	.52			
5	If I failed to turn up on time, I would be punished.	.69			

* Original modified LRPQ items

Second, independent t-tests were conducted to examine differences in mental toughness between recruits who completed the first 12 weeks of basic training, completed basic training, and those who did not. This was done for recruits who had DAOR only, followed by all discharged recruits (e.g., medical discharge, disciplinary discharge). Finally, correlational analyses were conducted to examine the relationship between mental toughness at weeks 3, 8, and 12, and performance at weeks 12 and 26.

Results

Descriptive statistics, correlations, and alpha coefficients for all Study 2b

⁴ Show parade is a military punishment that involves parading at the guardroom at 22:00 hours to be inspected by the Duty Officer. It is a common punishment used in recruit basic training and is normally awarded for minor infractions such as tardiness, poor turnout or equipment in bad order.

variables are displayed in Table 3.5. The results for all Study 2b multilevel analyses are displayed in Tables 3.6 and 3.7.

Means, SDs and Zero-order Correlations for all Study 2b Variables

	Mean	SD	MT 3	TP	IM	FGG	IC	MT8	TP8	IM8	FGG8	IC8	MT12	Perf1	Perf2
Week-3															
Mental Toughness	4.17	1.26													
Threat of Punish	4.09	0.65	08												
Insp. Motivation	4.16	0.64	.19**	.09											
Fosters Group Goals	4.32	0.62	.13**	.04	.67**										
Individual Consider.	3.85	0.78	.14**	.09	.64**	.59**									
Week-8															
Mental Toughness	4.41	1.27	.44**	13*	.09	.12*	.12*								
Threat of Punish	4.06	0.68	01	.63**	.20**	.14**	.16**	.01							
Insp. Motivation	4.12	0.69	.10	.12*	.44**	.37**	.43**	.22**	.16**						
Fosters Group Goals	4.29	0.69	.01	.03	.29**	.39**	.38**	.17**	.05	.72**					
Individual Consider.	3.83	0.80	.13*	.11	.31**	.34**	.50**	.26**	.15**	.72**	.64**				
Week-12															
Mental Toughness	4.55	1.12	.36**	07	.11*	.04	.10	.56**	.04	.13*	.09	.16**			
Performance-1	2.60	1.76	.35**	06	.12**	.06	.11*	.45**	.10*	.21**	.11*	.20**	.60**		
Performance-2	2.41	1.88	.32**	07	.11*	.06	.09	.32**	01	0.09	.03	.08	.40**	.69**	

* p < .05** p < .01

Performance-1 is mid course grade (week-12) Performance-2 is final grade (week-26)

Predictor and Moderator Variables at Week-3 on Mental Toughness at Week-8.

Threat of punishment X individual consideration. The analysis revealed no main effect for threat of punishment ($\beta_1 = 0.011$ (SE = 0.074), p > .05) or individual consideration ($\beta_2 = 0.065$ (SE = 0.076), p > .05), while the interaction term was significant ($\beta_3 = 0.145$ (SE = 0.065), p < .05). Both group and individual-level variance associated with contingent punishment and individual consideration was significant ($\Omega_u = 0.348$ (SE = 0.200), p < .01; $\Omega_e = 0.628$ (SE = 0.196), p < .01).

Using the Preacher *et al.* (2006) software, further analysis was conducted in order to explore the slopes for high and low individual consideration. The analysis revealed that while the slope for high individual consideration was positive (t(349) = 0.04, p > .05) and the slope for low individual consideration negative (t(349) = 0.42, p > .05), neither slope was significant. The interaction is presented in Figure 3.2.



Figure 3.2. Interaction between threat of punishment and individual consideration at week-3 on mental toughness at week-8.

Threat of punishment X inspirational motivation. The analysis revealed no main effect for threat of punishment ($\beta_1 = 0.020$ (SE = 0.063), p > .05) or inspirational motivation ($\beta_2 = -0.001$ (SE = 0.068), p > .05) and the interaction term was not significant ($\beta_3 = 0.010$ (SE = 0.066), p > .05). Both group and individual- level variance associated with contingent punishment and inspirational motivation of group goals was significant ($\Omega_u = 0.354$ (SE = 0.203), p < .01; $\Omega_e = 0.638$ (SE = 0.198), p < .01).

Table 3.6.

Results for Study 2b Predictor and Moderating Variables at Week-3 on Mental Toughness at Week-8

	β	SD	р
Intercept, β0ij	0.006	0.057	0.916
Threat of Punishment, β_1	0.020	0.063	0.750
Inspirational Motivation, β_2	-0.001	0.068	0.988
Interaction Term, β_3	0.010	0.066	0.879
Individual-Level Variability	0.638	0.198	0.001
Group-Level variability	0.354	0.203	0.081
Intercept, β0ij	-0.005	0.055	0.928
Threat of Punishment, β_1	0.009	0.060	0.880
Individual Consideration, β_2	0.053	0.062	0.392
Interaction Term, β_3	0.145	0.065	0.025
Individual-Level Variability	0.628	0.196	0.001
Group-Level variability	0.348	0.200	0.081
Intercept, β0ij	0.004	0.056	0.943
Threat of Punishment, $\beta 1$	0.007	0.061	0.990
Fosters Group Goals, $\beta 2$	0.072	0.062	0.246
Interaction Term, β3	0.046	0.066	0.486
Individual-Level Variability	0.628	0.196	0.001
Group-Level variability	0.359	0.201	0.074

Threat of punishment X fosters an acceptance of group goals. The analysis revealed no main effect for contingent punishment ($\beta_1 = 0.007$ (SE = 0.061), p > .05) or for fosters an acceptance of group goals ($\beta_2 = 0.072$ (SE = 0.062), p > .05). After controlling for the main effects, the interaction term was not significant ($\beta_3 = 0.046$ (SE = 0.066), p > .05). The individual-level variance associated with contingent punishment and fosters an acceptance of group goals was significant ($\Omega_e = .628$ (SE = .196), p < .01), however, the group level variance was not ($\Omega_u = .359$ (SE = .201), p < .01).

Predictor and Moderator Variables at Week-3 on Mental Toughness at Week-12.

Threat of punishment X individual consideration. The analysis revealed no main effect for threat of punishment ($\beta_1 = 0.080$ (SE = 0.060), p > .05) or individual consideration ($\beta_2 = 0.063$ (SE = 0.059), p > .05) at week-3 on mental toughness at week-8, however, the interaction term was significant ($\beta_3 = 0.155$ (SE = 0.064), p < .05). Both group and individual-level variance associated with contingent punishment and individual consideration was significant, $\Omega_u = 0.354$ (SE = 0.188), p < .01; $\Omega_e = 0.619$ (SE = 0.183), p < .01.

Using the Preacher *et al.* (2006) software, further analysis was conducted in order to explore the slopes for high and low individual consideration. The analysis revealed that while the slope for high individual consideration was positive (t(349) = 0.68, p > .05) and the slope for low individual consideration negative (t(349) = 0.21, p > .05), neither slop was significant. The interaction is presented in Figure 3.

Threat of punishment X inspirational motivation. The analysis revealed no main effect for threat of punishment ($\beta_1 = 0.071$ (*SE* = 0.062), *p* > .05) or inspirational motivation ($\beta_2 = 0.082$ (*SE* = 0.067), *p* < .05) and the interaction term was not

significant ($\beta_3 = 0.006$ (*SE* = 0.066), *p* > .05). Both group and individual-level variance associated with contingent punishment and inspirational motivation was significant, $\Omega_u = 0.345$ (*SE* = 0.193), *p* < .01; $\Omega_e = 0.641$ (*SE* = 0.189), *p* < .01.

Table 3.7.

Results for Study 2b Predictor and Moderating Variables at Week-3 on Mental Toughness at Week-12

	β	SD	р
Intercept, β0ij	-0.002	0.055	0.971
Threat of Punishment, β_1	0.071	0.062	0.252
Inspirational Motivation, β_2	0.082	0.067	0.221
Interaction Term, β_3	0.006	0.066	0.927
Individual-Level Variability	0.641	0.189	0.000
Group-Level variability	0.345	0.193	0.073
Intercept, β 0ij	-0.014	0.054	0.795
Threat of Punishment, β_1	0.080	0.060	0.182
Individual Consideration, β_2	0.063	0.059	0.285
Interaction Term, β_3	0.155	0.064	0.015
Individual-Level Variability	0.619	0.183	0.000
Group-Level variability	0.345	0.188	0.066
Intercept, β0ij	-0.007	0.054	0.9897
Threat of Punishment, $\beta 1$	0.087	0.061	0.154
Fosters Group Goals , $\beta 2$	0.019	0.060	0.752
Interaction Term, β3	0.061	0.066	0.355
Individual-Level Variability	0.625	0.186	0.000
Group-Level variability	0.361	0.191	0.059

Threat of punishment X fosters an acceptance of group goals. The analysis revealed no main effect for contingent punishment ($\beta_1 = 0.087$ (*SE* = 0.061), *p* > .05) or for fosters an acceptance of group goals ($\beta_2 = 0.019$ (*SE* = 0.060), *p* > .05). After controlling for the main effects, the interaction term was not significant) $\beta_3 = 0.061$

(*SE* = 0.066), p > .05). The individual-level variance associated with contingent punishment and fosters an acceptance of group goals was significant ($\Omega_e = .625$ (*SE* = .186), p < .01), however, the group level variance was not ($\Omega_u = .361$ (*SE* = .191), p < .01).



Figure 3.3. Interaction between threat of punishment and individual consideration at week-3 on mental toughness at week-12.

Mental toughness. An independent sample t-test revealed that there were significant differences in mental toughness at week-3 between recruits who completed the first 12 weeks of training (M = 4.34, SD = 1.23) and those who did not (M = 3.53, SD = 1.19) (t(152) = 5.82, p < .001). When recruits who were injured and medically discharged were removed from the analysis, leaving those who had DAOR only (n = 52; M = 3.48, SD = 1.11), the results were unchanged (t(71) = 5.15, p < .001). There was no significant difference between those who completed the first 12 weeks of training and those who were injured or medically discharged (M = 4.16, SD = 1.52) (t(28) = 1.76, p > .05). Further analysis revealed that there were also significant differences in mental toughness at week-3 between recruits who completed the full 26 weeks of basic training (M = 4.17, SD = 1.26) and those who did not (M = 4.17, SD = 1.26)

1.26) (t(299) = 5.86, p < .001). When recruits who were injured and medically discharged were removed from the analysis, the results were marginally stronger (t(237) = 5.87, p < .001).

Bivariate correlations revealed that there was a significant positive relationship between: (1) mental toughness at week-3 (M = 4.17, SD = 1.26) and performance at both week 12 (r = .35, p < .001) and on completion of basic training (week 26) (r =.32, p < .01), (2) mental toughness at week-8 (M = 4.41, SD = 1.27) and performance at both week 12 (r = .45, p < .001) and on completion of basic training (r = .32, p <.001), and (3) mental toughness at week-12 (M = 4.55, SD = 1.12) and performance at both week 12 (r = .60, p < .001) and on completion of basic training (r = .40, p <.001).

Discussion

The purpose of Study 2b was to determine at which point during basic training the interaction between individual consideration and the threat of punishment began to emerge to predict mental toughness in recruits in training. A secondary aim was to determine whether any of the other supportive leader behaviours interacted with punishment threat earlier in the training cycle.⁵

The result revealed significant interactions between individual consideration and threat of punishment on mental toughness at both weeks 8 and 12, with no

⁵ While contingent reward behaviour can reasonably be argued to be a supportive behaviour, it is a transactional, rather than transformational behaviour. In other words, as part of the transaction between the leader and follower, the follower must do something to earn contingent reward from the leader (in much the same way as the leader's displeasure is incurred for undesirable actions or behaviour (contingent punishment) (Bass, 1985). On the other hand, transformational behaviours are displayed by the leader regardless of follower endeavour. For the sake of transparency and clarity, the main and interactive effects of punishment threat X contingent reward were examined, although, for the reasons explained, not as part of the study. The results revealed no main effects for contingent reward at either week 3 ($\beta 1 = .007$ (SE = 0.050) p > .05) or week 8 ($\beta 1 = .075$ (SE = 0.045, p > .05). Moreover, the interaction terms between punishment threat and contingent reward were not significant at either week 3 ($\beta 1 = .032$ (SE = 0.050) p > .05) or week 8 ($\beta 1 = .031$ (SE = 0.037, p > .05) on mental toughness at week 12.

Interactions being evidenced for punishment threat and inspirational motivation, or punishment threat and fosters an acceptance of group goals. This supports the findings in Study 2a and suggests that the effect of leader support and the use of/threat of contingent punishment start to have an effect early in the training cycle.

General Discussion

The purpose of the study was to identify whether the use of/threat of contingent punishment played an important role in predicting mental toughness in infantry training when coupled with supportive leadership behaviours in both early and later stages of basic recruit training. Given that punishment, in various forms, is an ever-present part of military training, it is logical to suggest that it should serve some other useful purpose than to expedite rapid behavioural change in young soldiers who are required to adapt quickly to a new regime. Based on the mental toughness and transformational leadership literature and theory, it was hypothesized that punishment and leader support would interact to positively impact on observed mentally tough behaviour in infantry recruits. Specifically, the transformational leadership behaviours of inspirational motivation, fosters an acceptance of group goals, and individual consideration were examined. The results yielded partial support for the hypothesis in that the only significant interaction occurred between individual consideration and punishment. However, this interaction was consistent throughout the training cycle.

One reason for this is that, arguably, individual consideration is indicative of true, explicit supportive behaviour, whereas inspirational motivation provides support more implicitly. Theoretically, it could be argued that individual consideration and inspirational motivation reflect more the support of the leader because there is a direct interaction between the leader and the follower. Fosters an acceptance of group goals,

on the other hand, once established, is more about the interaction between team members and, therefore, more associated with peer support. While the leader in any other context is considered part of the team, the military training environment is a slight anomaly in that the section commander is situated outside the team, unlike in a regular unit.

While the leader provides the inspiration for teamwork and generates a sense of belonging, by engaging in effective teamwork it is the recruits who provide the support for each other. In other words, it is peer social support, rather than leaders social support. This is consistent with other studies in military training environments whereby trainees perceived strong social support, friendship, and 'mattering' throughout training to be an important coping strategy (e.g., Gold & Friedman, 2000; Joplin, Quick, Nelson, & Turner, 1995; Myers & Bechtel, 2004). Indeed, Joplin and colleagues found that that recruits who were unable to form social networks during training were less likely to succeed.

Interestingly, main effects were observed for all supportive behaviours in Study 2a, but none of the supportive behaviours from week-3 to week-12 in Study 2b. A possible explanation for this is that while individual consideration is important in moderating (the threat of) punishment throughout the training cycle, the other supportive behaviours are also important contributors to performance in training (e.g., Arthur & Hardy, 2014; Dvir et al., 2002; Hardy et al., 2010), without having a moderating effect on punishment. Surprisingly, it would also appear that these specific behaviours, unlike individual consideration, have more impact later in the training cycle. One could logically assume that inspiring the recruits with a vision of positive future states and expressing a confidence in the recruits' ability to

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successfully complete basic training (inspirational motivation) would be important aspects of leader support early on in basic training.

An interesting, but not altogether unsurprising result was the difference in mental toughness between those who drop out of training and those who go on to complete training. While previous research has shown the maladaptive effects of the stress of combat deployment impact on soldiers who start out less psychologically robust prior to deployment (LeardMann et al., 2009), the results for this study suggest that some degree of mental fortitude is required prior to embarking on 26 weeks of infantry basic training. Furthermore, the results from across both studies provide support for previous research examining mentally tough behaviour in relation to performance (e.g., Beattie et al., 2017; Bell et al., 2013). That is, observed mentally tough behaviour at weeks 3, 8, and 12 was significantly correlated with recruit performance at weeks 12 and 26.

There are several notable strengths to this study. Firstly, it has been conducted in a real-life military training, with the use and threat of punishment an integral part of the context, along with other myriad stressors, all of which have an accumulative effect of creating a stressful and challenging training environment. Moreover, the performance data is realistic, with real consequences for failing to perform to the required standard. The findings lend support to previous studies demonstrating instructor support as an important aspect of training and development, particularly in a military context where recruit instructors have been shown to be a fundamental source of social support in coping and performance in basic training (e.g., Overdale & Gardener, 2012).

The results also provide empirical support for previous qualitative studies that advocate a challenging training environment and coach support as important factors in

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the development of mental toughness (e.g., Butt, Weinberg, & Culp, 2010; Connaughton, Hanton, & Jones, 2010; Connaughton, Wadey, Hanton, & Jones, 2008; Thelwell et al., 2010). In particular, the contention of Clough & Crust (2011) that individuals should be put under some form of physiological pressure as part of a challenging training environment. The study also considerably extends the limited research on the use of punishment, providing support for Bell and colleagues' (2013) study showing that punishment and the threat of punishment, far from having no place in the high performance domain, serves to facilitate the development of mental toughness, when accompanied by leader (e.g., coach, instructor) supportive behaviour, specifically, individual consideration.

Despite the notable strengths of the study, a number of limitations are acknowledged. Field studies are renowned for the difficulty in controlling the compounding variables that can affect the data. Due to the arduous nature of infantry training, attrition is high and many trainees fail to complete training. Consequently, as recruits are lost to training, others returning from rehabilitation replace them. Furthermore, there is a degree of instructor turnover, with some returning to their parent units, others going on leave or courses, and others being between sections.

Another potential limitation is that two variables were adapted between study 2a and study 2b. The period of training during Study 1a was from weeks 15 to 26, while Study 2b was conducted during the initial stage of training, from weeks 1 to 12. This was necessary in order to examine at what point in training the effects started to occur. However, the punishment measure was also changed to reflect the threat of punishment rather than the receipt of punishment, the reasons for which has already been discussed in the discussion for Study 2a. While a variable may be changed during the course of an experiment, it is not common practice to alter more than one as it limits the ability to interpret observed changes in results (Vincent, 2005). Despite this risk, the candidate feels that the change in punishment measure provided a clearer reflection of the variable being measured. In view of the overall results, it is unlikely that the modifications to the measurement influenced the results significantly. That is, the same variables interacted to impact on observed mental toughness.

This study is with military recruits in a military training environment, with its unique approach to the use of punishment. That is, the use and threat of punishment are an accepted part of the training process, with some consequences and forms of punishment not employed in other contexts. Consequently, the findings in this study may not generalise to other domains, for example, education and sport. Moreover, due to the nature of infantry soldiering, the study was conducted with male participants only. Therefore, it is unclear whether the same results would be replicated in a female population, even in the military environment.

Combat stress differs from most types of stress in that it constitutes a combination of aversive stressors (Orasnu & Backer, 1996). Consequently, The constant harassment, shouting and time pressure, isolation from friends and family, threats to personal feelings of safety, loss of independence and freedom, and endless assessments all endured whilst tired and exhausted from the demanding physical training regimen are designed to put recruits under the type of pressure that they may have to experience on combat operations (Crabtree, 2006; Gold & Friedman, 2000; Johnsen, Laberg, & Eid, 1998). All this, coupled with a strict discipline regime with the threat of punishment for poor behaviour or performance, goes to make up an extremely challenging environment. Historically, military discipline, underpinned by the threat and use of contingent punishment, has been a fundamental aspect in maintaining good order and discipline among military personnel. At a general level, it

serves the purpose of ensuring compliance to orders among individuals and groups and creating and maintaining cohesion in military units (Houghton & Holmes, 2001). However, it is of particular importance in the 'teeth' arms (e.g., infantry) whose job it is to close with the enemy, often at close quarters (i.e., face to face), and destroy him. Indeed, as long ago as the first century the Romano-Jewish scholar, Titus Flavius Josephus, commented that austere discipline, obedience, and constant vigorous training was what made the Roman army superior to its enemies, and that they never broke or panicked in battle (cited in Williamson, 1970).

This is an important step forward in military research seeking to identify methods by which to develop mental toughness in soldiers prior to deployment on combat operations. While effective pre-deployment training programs are developed and implemented to inoculate soldiers against the maladaptive effects of psychological distress on the battlefield, this study provides alternative methods to enhance resilience. For example, the selection and training of suitable training staff in military training establishments may help to facilitate mental toughness development in the early stages of soldiers' careers. In particular, specific training in the use of appropriate punishment and instructor support with the aim of developing mental toughness in soldiers in training.

Future research should seek to replicate the findings from this study in other domains (e.g., sport) and in mixed military training establishments to determine the effect on female recruits.

CHAPTER 4

The effect of a psychological skills training intervention on

the development of mental toughness in elite infantry

training⁶

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Abstract

The aim of this research chapter was to examine the impact of a psychological skills intervention on observer-rated mental toughness and performance on an arduous military selection course with elite recruits. Study 3 utilized a quasi-experimental design, with treatment (PST) and control conditions. Data were collected from 173 (experimental n = 83; control n = 90) male British Army Parachute Regiment recruits $(M_{age} = 21.03, SD 3.34)$ and their training instructors $(N = 32; M_{age} = 28.38, SD 2.73)$ between weeks 16 and 21 of training. A contextually modified version of the Test of Performance Strategies-2 (TOPS-2) measured the recruits' use of psychological skills pre and post intervention, while the Military Training Mental Toughness Inventory (MTMTI) measured recruits' mental toughness pre and post intervention. Significant differences in the use of psychological skills and observer-rated mental toughness were evidenced by the treatment group between pre and post intervention. During the selection course, significant differences were evidenced between the treatment and control groups in psychological skills usage and performance. The results provided support for the implementation of psychological skills interventions in elite military training.

Keywords

Psychological skills, mental toughness, military, Bayesian analysis

Introduction

Mental toughness has been described as one of the most important variables in determining success in high stress environments (e.g., Gucciardi, Hanton et al., 2015; Jones et al., 2002), with results from the mental toughness literature supporting the contention that it is important in predicting performance outcomes across various performance contexts (e.g., Beattie et al., 2017; Bell et al., 2013; Gucciardi et al., 2016). Yet there are limited field based interventions that have been specifically designed to impact mental toughness and examine the concomitant effects on performance, especially in military contexts. For exceptions within sport please see Bell et al. (2013) and Gucciardi et al., (2009). Indeed, Gucciardi and colleagues have called for further research to identify the most effective content and method of delivery for psychological skills interventions aimed at developing mental toughness. To this end the current research is a field based intervention study that utilises objective performance data to examine whether a psychological skills intervention facilitates an increase in mentally tough behaviour.

Despite the resurgence of research into mental toughness over the last 15 years, spawning a plethora of definitions of mental toughness and a variety of tools by which to measure it (e.g., Arthur et al., 2015; Clough et al., 2002; Gucciardi, Jackson et al., 2015; Hardy et al., 2014; Middleton et al., 2004; 2005; Sheard et al., 2009), little progress has been made on the agreement of a common conceptualisation and measurement tool (Gucciardi & Gordon, 2011). While mental toughness has generally been regarded as a multidimensional, relatively stable, trait-like construct (e.g., Clough & Crust, 2005; Clough et al., 2002; Gucciardi, Hanton et al., 2015; Jones et al, 2002), a collection of recent studies have provided evidence that it may be appropriate to operationalize it as a unidimensional construct (e.g., Arthur et al., 2015; Hardy, et

al., 2014; Gucciardi, Jackson, et al., 2015; Gucciardi et al., 2016). Further, recent research by Gucciardi, Hanton, et al. (2015) suggested that mental toughness may be "a contextualized expression of dispositional traits that are activated or shaped by contextual or social factors" (p. 41).

In an attempt to further explore the underlying mechanisms of mental toughness, recent attention has turned to observable behavior. (e.g., Beattie et al., 2017; Bell et al., 2013; Gucciardi, Jackson et al., 2015; Gucciardi et al., 2016). Hardy et al. (2014) argue that while several qualitative studies have shown that mental toughness may be related to a collection of unobservable values, attitudes, emotions, and cognitions (e.g., determination, focus, confidence, perceived control, thriving through challenge, sport awareness, tough attitude, and desire for success) (e.g., Gucciardi & Gordon, 2011; Jones et al., 2002), mentally tough *behavior* is just that, a behavior. Therefore, the presence or absence of mentally tough behavior (e.g., persistence, effort, perseverance) should be determined before claims are made about the importance of unobservable predictors and key correlates (Gucciardi, Jackson et al., 2015; Gucciardi et al., 2016; Hardy et al., 2014). To this end, in line with Hardy and colleagues' conceptualization, mental toughness is defined from a behavioral perspective as "the ability to achieve personal goals in the face of pressure from a wide range of different stressors" (Hardy et al., 2014, p. 5).

Although no common agreement exists on the precise definition of mental toughness, researchers are in agreement that mental toughness is an important construct within performance domains. Moreover, in most contexts where the ability to deal with adversity and challenge is essential to success, mental toughness is commonly regarded as *the* most important attribute that enables an individual to achieve high levels of personal performance (e.g., Jones et al., 2002). Indeed, studies

in a variety of achievement contexts have demonstrated the importance of mental toughness. For example, when measured using the MTQ-48, Kaiseler, Poleman, & Nicholls (2009) showed that mental toughness predicted coping and coping effectiveness and to be associated with less stress and more control experienced by athletes. Further, Crust and Clough (2005) demonstrated that mental toughness was significantly positively correlated to an endurance task. In the military context, mental toughness has been shown to significantly predict higher levels of performance over and above that accounted for by individual fitness levels (Arthur et al., 2015) and normative commitment, affective commitment, and recruit adjustment in training (Godlewski & Kline, 2012). Furthermore, Gucciardi, et al. (2015) provided evidence that mental toughness was important for sustaining high levels of performance and success when faced with the stress and adversity of a physically and mentally demanding military task while controlling for hardiness and self-efficacy.

Despite the theoretical advances being made in mental toughness research, Gucciardi, Hanton et al. (2015) argue that certain conceptual and methodological concerns have limited the usefulness of previous studies for the conceptual development of mental toughness. Firstly, the empirical focus on mental toughness has primarily been within sport contexts, which limits the extent to which the construct may generalize to other, non-sport samples. Secondly, when mental toughness *has* been examined in non-sport contexts, researchers have applied sport models without an adequate explanation of the substantive or empirical evidence for doing so (Gucciardi, Hanton, et al., 2015).

A number of researchers have contributed to the discussion regarding the theoretical, empirical, and applied concepts in sport psychology and how they might be applied to current and future military initiatives (e.g., DeWiggins, Hite, & Alston, 2010; Fiore and Salas, 2008, Goodwin, 2008; Gucciardi et al., 2015; Hammermeister, et al., 2011; Janelle & Hatfield, 2008). Indeed, there are many similarities between the performance-related psychological challenges that soldiers and athletes are required to deal with (Janelle & Hatfield, 2008). Both lack predictability, with a real and perceived cost of winning and losing, and the associated risk of participation impacting the psychological responses that affect performance (DeWiggins et al., 2010). However, one could reasonably argue that the degree of risk and objective magnitude of stressors experienced by combat soldiers is far greater than that of any athlete or team, where terms such as "fighting for one's life," is often a realistic scenario rather than a mere metaphorical descriptor (Janelle & Hatfield, 2008, p. S40). In many cases, this repeated exposure to extreme stress often leads to adverse long-term emotional and behavioural problems (Kok, Herrell, Thomas, & Hodge, 2012), with research showing these effects to be significantly clustered in the cohort of personnel who start out less psychologically robust (LeardMann et al., 2009).

Stress and anxiety in the military environment are not, however, limited to the combat context. Problems of stress, coping and adaption are highly relevant in military training, where distractions, anxiety and fear are common challenges experienced by recruits throughout the training period, all of which require a degree of mental fortitude and/or various coping strategies. Unfortunately, these important psychological competencies are, at best, implicit, with recruits having to rely on their own cognitive functioning and coping strategies to control thoughts, emotions, and behavior. Consequently, while many recruits learn these vital mental lessons over time, the remainder will have varying degrees of difficulty acquiring these skills (Thompson & McCreary, 2006). It is, therefore, logical to presume that the variety of applied concepts in sport psychology, deemed so critical to high-level performance in

sports (i.e., mental toughness, psychological skills), could be utilized in military training to enhance performance and facilitate coping in stressful situations (DeWiggins et al., 2010; Fiore & Salas, 2008, Goodwin, 2008; Hammermeister et al., 2011; Janelle & Hatfield, 2008). In particular, elite military training and selection, which subjects potential candidates to far more extreme physical and psychological demands in comparison to regular army units (Sundin et al., 2010) may benefit from performance enhancing concepts from the sport domain.

While the aforementioned research has only provided correlational evidence that mental toughness is related to performance outcomes in the military, there is a dearth of intervention research and thus there is as yet no evidence to suggest that mental toughness can be developed within a military context. Furthermore, no intervention evidence exists that increasing levels of mental toughness will have concomitant effects on performance. Therefore, in light of the environmental stresses experienced by servicemen and women, along with the potential emotional and behavioral problems, the next logical step would be to explore the possibility of developing mental toughness in military personnel through targeted interventions. The current research utilised a field based intervention design to examine the development of mental toughness in a high performance military training context.

The United States military has already acknowledged the potential value of theoretical, empirical, and applied concepts from sport psychology. In an effort to increase the psychological strength and positive performance of its service personnel, and reduce the high incidence of maladaptive responses of combat-related stress disorders, the U.S Army has established the comprehensive soldier fitness (CSF) program and the mental resilience trainer (MRT) course as a means of delivery. CSF is an integrated, proactive approach to increasing resilience and enabling mental toughness in soldiers, their families, and the civilian workforce. Personnel are taught a variety of performance enhancing psychological and physical skills to be employed when facing a the wide variety of challenges they may be required to face in their personal and professional lives, including combat (see Reivich, Seligman, & McBride, 2011 for a review). The MRT course is one of the foundational pillars of comprehensive soldier fitness and provides instruction to low-level unit leaders on how to teach the resilience and mental toughness enabling skills to their soldiers (see Cornum, Mathews, & Seligman, 2011 for a review). Furthermore, PST has been integrated into elite U.S. Special Forces training and selection to facilitate the development of mental toughness. In the early stages of U.S. Navy SEAL Basic Underwater Demolition/Seals program, potential candidates receive training in a variety of psychological skills and cognitive strategies including goal-setting, mental rehearsal, arousal regulation, and self-talk strategies to help monitor their psychological performance and develop mental toughness. The skills and strategies are reinforced throughout BUD/S selection, with special emphasis before difficult parts of the training, such as "Hellweek⁷." Hellweek is regarded as an ideal environment to assess the suitability of candidates under extreme physical and mental pressure testing phase to screen out unsuitable SEAL candidates. Consequently, it is an ideal opportunity for candidates to practice the skills and strategies they have been taught. Because it is an assessment, no encouragement or coaching is provided by the training staff. (e.g., Robson & Manacapilli, 2014). Unfortunately, however, no empirical evidence exists to suggest that this develops mental toughness or resilience in SEAL

⁷ Hell Week is considered to be the toughest training in the U.S. Military with an average of 25% of candidates achieving success. It consists of 5 days of extreme physical and mental stress which tests the candidate in physical endurance, mental toughness, pain and cold tolerance, teamwork, attitude, and the ability to perform work, and sleep deprivation (Navy SEALs.com, 2018).

candidates.

Several decades of research in the sport domain has generated a wealth of evidence demonstrating the positive effect of psychological skills usage in relation to performance (e.g., Hanton, Mellalieu & Hall, 2004; Kress & Statler, 2007; Patrick & Hrycaiko, 1998; Sheard & Golby, 2006; Thelwell & Greenlees, 2001; 2003).

For example, in two studies, Thelwell and Greenless (2001; 2003) showed that indoor triathlon performance was enhanced when implementing a PST package involving goal-setting, relaxation, imagery and self-talk, while Patrick and Hrycaiko (1998) demonstrated the utility self-talk, relaxation and imagery enhanced performance for a 1600m run. In a study examining the nature and effects of cognitive strategies used by former Olympic cyclists to cope with exertion pain during performance, Kress and Statler (2003) found that cognitive skills such as goal setting, imagery, and positive self-talk were routinely used to cope with endurance pain while training *and* competing and that all of them attended to the pain rather than attempting to ignore it. While more recently, Sheard and Golby (2006) found that significant improvements in performance were observed in youth-level elite swimmers after a 7week PST program consisting of goal-setting, imagery, relaxation, concentration and thought stopping techniques. The primary limitation of this study, however, was the lack of a control group.

Whitmarsh & Alderman (1993) examined the role of stress inoculation training and psychological skill acquisition (including relaxation and controlled breathing, attention diversion, and self-instructional techniques) in increasing athletic pain tolerance on an isometric quadriceps task. They found that subjects in both treatment groups had developed a significantly higher degree of pain tolerance than the control group from pre-treatment to post-treatment. In a similar study, examining the use of

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dissociative and positive self-talk strategies on during a muscular endurance task, (Weinberg, Smith, Jackson, & Gould, 1984) found that treatment group demonstrated significantly greater persistence than the control condition. However, it could be argued that wall-sit and the leg-lift tasks are both tests of muscular capacity rather than endurance (Patrick & Hyrackio, 1998).

However, only in the past decade have there been attempts in sport to enhance mental toughness via PST interventions in sport (e.g., Bell et al., 2013; Gucciardi et al., 2009b), therefore, it would seem prudent to adopt a PST perspective within a military context. This is surprising, considering that many of the factors associated with mental toughness (e.g., Connaughton et al., 2010; Jones et al., 2002) have been shown to be associated with psychological skills (e.g., confidence, emotional control, visualization motivation, positive energy, commitment, thrive through challenge, etc.; Beattie et al., 2017). While no attempt has been made to conduct PST intervention studies to facilitate the development of mental toughness in the military, there have been recent PST studies aimed at enhancing performance, with the initial results being widely supportive of the benefits of psychological skills (e.g., Adler et al., 2015; Arthur et al., 2017; Hammermeister et al., 2010).

For example, Adler and colleagues examined the effect of a psychological skills intervention with a sample of soldiers in basic combat training. Results revealed that soldiers using a variety of task-related psychological skills (including goal-setting, relaxation techniques, self-talk and mental rehearsal) performed significantly better on a variety of military tasks (including fitness related tasks), compared to those in an active control condition. Hammermeister and colleagues (2010) examined soldier's use of psychological skills in three psychological skills profile groups (i.e., strong skills, weak skills, and fearful focus). Results revealed that soldiers in the strong

psychological skill profile group performed significantly better than those in the other profile groups on an army physical fitness assessment. More recently, Arthur and colleagues (2017) examined the indirect effects of basic psychological skills (i.e., goal-setting, relaxation, self-talk, & imagery/mental rehearsal) on military endurance through enhanced advanced psychological skills. While controlling for fitness as a covariate, their results revealed that goal-setting, imagery and relaxation all had positive indirect effects on endurance via activation, with goal setting also impacting on endurance via negative thinking. This provides further support for the use of basic psychological skills for enhancing performance in a military context.

Unfortunately, no attempt was made to measure mental toughness in any of these studies, thus the role of PST in developing mental toughness and the concomitant effects on performance remains untested. This is unfortunate, as the military training environment is replete with opportunities for the recruits to demonstrate mentally tough behavior. Consequently, the current study aims to extend the work of these studies by examining the potential impact of a psychological skills intervention on the development of mental toughness in an elite military training setting towards the end of the training period. A secondary aim is to examine the impact of the intervention on performance on a series of extremely physically and mentally demanding elite military tasks. This is an appropriate environment in which to examine the presence or absence of mentally tough behaviour (Bell et al., 2013) and it is typical of the environmental conditions where interactive effects are most likely to occur (e.g., sport training and competition) (Corr, 2001)

While individual talent (including physical fitness) is an important variable in performance achievement, it is not uncommon for talented individuals with exceptional physical attributes to fail to perform to their full potential. Indeed, it is recognized that psychological factors are just as important in determining athletic performance, with mental toughness being acknowledged one of *the* most important attributes in achieving performance excellence, particularly in contexts where the ability to deal with adversity and challenge is essential to success (Gucciardi et al., 2008; Jones et al., 2002). Furthermore, previous research in both elite and regular military training environments have shown transformational leadership to positively impact on a number of performance-related outcome variables (e.g., resilience, confidence, training satisfaction, group cohesion) and discriminate between recruits' success and failure in training (Arthur & Hardy, 2014; Hardy et al., 2010). Consequently, the current research controlled for leadership and physical fitness.

The current study used a quasi-experimental trial with experimental (PST) and control conditions to examine the impact of a psychological skills intervention on observer-rated mental toughness and performance on an arduous military selection course. The psychological skills intervention targeted the four basic psychological skills of goal-setting, relaxation and arousal regulation, self-talk strategies and imagery/mental rehearsal, based on their previously demonstrated efficacy with respect to performance enhancement in competitive sport and military contexts (e.g., Arthur, et al., 2015; Kress & Statler, 2003; Patrick & Hryaiko, 1998; Sheard & Golby, 2006; Thelwell & Greenlees, 2001). The environment in which the study was conducted provided all participants with the same opportunity to demonstrate mentally tough behavior under pressure, with prior individual fitness and the recruits' leadership climate being isolated as covariates. In this way the current research addresses the potential impact on the recruits' performance by the previously mentioned extraneous variables. It is hypothesized that: (a) PST will result in an increased use of psychological skills during training resulting in, (b) greater use of psychological skills use by recruits during an arduous physical selection course and, (c) greater use of psychological skills will result in higher levels of mental toughness with concomitant effects on performance.

Method

Participants

Data was collected from 222 male British Army Para recruits, aged between 17 and 33 ($M_{age} = 21.13$, SD 3.36) and 32 Parachute Regiment corporals ($M_{age} = 28.44$, SD 2.74) from a UK-based infantry training establishment. At the start of the study, the recruits were at week 16 of basic training, having had no previous military experience, while the corporals were part way through a 24-month instructional tour of duty (M = 12.80 months, SD = 6.51 months) and had served between 7 and 18 years in the Parachute Regiment (M = 9.78 years, SD = 1.90 years).

Para Training and Selection

Para basic training is a 28-week course, widely regarded by the British Army as being the most physically and mentally demanding of all infantry regiments in the British Armed Forces (Wilkinson, Rayson, & Bilzon, 2008). It is designed to produce physically and mentally robust soldiers able to deal with the physical and mental demands placed on soldiers in combat. Due to the highly attritional nature of Para basic training, platoon sizes can decrease by up to 60% before completion (Wilkinson et al., 2008). Failure to complete the course is attributable to a variety of reasons, including injury, poor performance, or voluntary discharge.

At week 20 of the course, Para recruits are required to undergo Pre-Para Selection, more colloquially known as P-Company. The purpose of P-Company is to test physical fitness, determination and mental robustness, under conditions of stress, to determine a recruit's suitability for service in the Parachute Regiment. Although a
high level of fitness is required to successfully complete P-Company, the various tests are also designed to assess a recruit's ability to maintain a high level of performance under pressure. Failure results in the unsuccessful recruits being reallocated to a platoon earlier in the training cycle or transfer to another infantry regiment. P-Company consists of a series of physically demanding team and individual events that involve carrying personal equipment weighing 20kg or more for distances of up to 32km over severe terrain with time constraints, a steeplechase assault course, and an aerial confidence course. Two team events require the participants to run with a 60kg log and 80kg stretcher for 2.5km and 8km respectively. P-Company pass rates typically range between ~40-70%.

Statistical Power

Statistical power for the current study was estimated using G*Power3 (Faul, Erdfelder, Lang, & Buchner, 2007) using the generally accepted criteria of .80 or above to detect an effect (Cohen, 1988). The G*Power analysis revealed that a power of .80 would be achieved with a sample size of between 28 and 237, depending on the analysis (i.e., mixed model MANOVA, N = 237; 1-way MANOVA, N = 86; mixed model ANOVA, N = 28; ANCOVA, N = 128).

Study Design

A random block experimental design was implemented to evaluate the efficacy of the intervention. While completely random allocation of participants is preferred, this was not feasible at the recruit level in the present study because it would have meant delivering the PST to some recruits in each platoon and not others. This was not possible because the structure of training precluded this. Furthermore, this design would likely compromise the integrity of the groups, as cross contamination would be highly possible. When random assignment is not possible, Grant and Wall (2009) suggest a quasi-experimental design to be appropriate. Quasi-experimental designs have distinct advantages in that they can serve to strengthen causal inferences, minimize ethical dilemmas and inequity, and help the researcher to take advantage of the effect of un-controllable environmental events.

Data were gathered at 2 time points, 3 weeks (22 days) apart. The first platoon was assigned to the control condition, the second to the experimental, and so on for a total of 10 platoons (five in each condition). By the later stages of training, a typical Para platoon consists of, not only those remaining of the original intake, but also those returning from injury and rehabilitation, those who have failed an earlier P-Company or stage of training and transferees from other regiments. Consequently, some control recruits had already been exposed to some form of coping skills training by the candidate, while others who had transferred would have already completed basic training with their own regiments. Therefore, in order to avoid any influence from recruits previously exposed to PST or other confounding variables, the inclusion criteria for the study was that only original entrants in each platoon were eligible to participate. Thus, questionnaires were only administered to, and data collected from, recruits who had started with the original intake of each platoon and had completed 16 weeks of training at the start of the study. Of the 222 recruits from whom initial data were collected, 83.8% (n = 186) completed P-Company and, therefore, were retained for analysis ($n_{control} = 92$; $M_{age} = 20.96$, SD 3.54; $n_{experimental} = 94$; $M_{age} = 21.14$, SD 3.20). The remainder were either: (1) not loaded onto P-Company due to injury $(13.9\%, n_{control} = 16, n_{experimental} = 4)$ or being back-termed to a previous platoon (9.7%, $n_{control} = 7$, $n_{experimental} = 4$; (2) withdrawn during P-Company due to injury (7%, $n_{control}$) = 6, $n_{experimental}$ = 2); or (3) withdrawn from P-Company due to failure to complete the

aerial assault course (0.8%, $n_{control} = 1$, $n_{experimental} = 1$). The aerial assault course is the second event of P-Company and is a pass or fail test with no points allocated. Failure to successfully complete this test results in withdrawal from P-Company.

Instruments

Military Training Mental Toughness Inventory. The MTMTI developed in Chapter 2 (Arthur et al., 2015) was used to assess mentally tough behaviour. The MTMTI was found to possess sound psychometric properties and structural validity as well as good test-retest reliability, concurrent validity, and predicted performance in two different training contexts with two separate samples, including a sample of Para recruits. The composite reliability for the scale was .93, with standardized factor loadings ranging from .76 to .97.

Test of Performance Strategies. The Test of Performance Strategies (TOPS-2; Hardy, Roberts, Thomas, & Murphy, 2010) is a 36-item instrument designed to measure a range of basic and advanced psychological skills and techniques used by athletes in both practice and competition. Specifically, the instrument measures the quantity of use rather than the quality of use (i.e., how much one uses the skills/techniques, rather than how good or effective one is at implementing them). A previously contextually modified version of the TOPS-2, which was shown to demonstrate good psychometric properties with a similar sample population (Arthur et al., 2017), was used to assess recruits' use of psychological skills in training (i.e., pre and post-intervention) and during P-Company. In the current research we only used the four basic psychological skills. Example items included; "I set realistic but challenging goals for practice" (goal-setting), "I use relaxation techniques as a coping strategy during P-Company" (relaxation), "I say things to myself to help my practice

performance" (self-talk) and, "I rehearse my performance in my mind before practice" (imagery). The composite reliability for the practice scale was .97, with standardized factor loadings ranging from .76 to .97. The practice scale was used to measure psychological skill usage during training, while the competition scale was used to measure psychological skill usage during P-Company. The composite reliability of the competition scale was .95, with standardized factor loadings ranging from .45 to .94. Only four were below .70, one in each subscale.

Transformational Leadership Inventory. A modified version of the Differentiated Transformational Leadership Inventory (e.g., DTLI; Hardy, Arthur, Jones et al., 2010) was used to measure and control for leadership climate within each group. The DTLI has 22-items that measure the following 6 transformational leadership behaviors: (a) appropriate role modeling (e.g., "my section corporal always leads by example"); (b) inspirational motivation (e.g., "..... sets high standards for me to achieve"); (c) fostering acceptance of group goals (e.g., "...... always encourages us to be team players"); (d) individual consideration (e.g., ".....spends time teaching and coaching me"); (e) intellectual stimulation (e.g.,encourages me to think for myself"); and (f) high performance expectations (e.g., ".....always emphasizes trying your best"). Responses were made on a 5-point Likert scale anchored by 1 (not a tall), 2 (not very often), 3 (sometimes), 4 (fairly often) and 5 (all of the time). The purpose of measuring transformational leadership in the current study was simply to control for the effects of transformational leadership. Consequently, it was decided to form a composite transformational leadership scale by using one item from each subscale. This procedure has been used in other research on transformational leadership where a composite reduced item scale has been used (e.g., Barling, Loughlin and Kelloway, 2002). Individual items were selected based on

those we considered most representative of the sub-scale. The items selected are those provided as example items above. The composite reliability for the composite leadership scale was .87, with standardized factor loadings ranging from .64 to .78.

Performance. During P-Company, recruits can achieve a maximum of 70 points, determined by their performance on each event (i.e., up to 10 points for each of the 7 events; the aerial confidence course is a pass or fail test). Most of the points are awarded objectively based on time to complete or completion of an event and are awarded by P-Company staff, who are independent of the recruits' regular training team. Performance scores during the present study ranged from 10-70 out of a maximum possible score of 70 points (M = 55.53, SD = 11.01), which is within the normal range for P-Company.

Fitness. An objective measure of fitness was used to control for individual fitness. At week 16, recruits are required to complete two contextually relevant, timed physical assessments to measure progression in individual fitness. One of these assessments is a two-mile loaded run, carrying a 16 kg pack and 4kg rifle, with the other being the negotiation of a steeplechase assault course consisting of several dry and water obstacles. The two-mile loaded run times ranged from 15min, 4s to 25min, 3s (M = 18min, 31s, SD = 1min, 51s), while the steeplechase times ranged from 17m:16s to 29 min, 28s (M = 20m:50s, SD = 1m:42s). In order to create an overall indication of individual fitness prior to the delivery of the intervention, the times were standardized for each event and were then combined to create an overall score. The overall score was then multiplied by -1 (so that a higher score was indicative of better performance).

Procedure

Following institutional ethical approval, at week 16 of training, the recruits and

instructors were informed of the nature of the study and asked if they would participate, having been told that participation was not mandatory. All recruits opted to take part in the study. They were given standardized verbal instructions regarding the completion of the initial questionnaires, including social-desirability instructions which encouraged participants to respond honestly at all times. All participants were also informed that the data provided would be held in confidence and not shared with any third party (e.g., their instructors, PPS staff) and that they were free to withdraw from the study at any time.

The TOPS-2 (practice) and DTLI were both administered to recruits in week 16 prior to the intervention being delivered (T1), and at the beginning of week 20, two days prior to the start of P-Company (T2), and by which time the intervention had been completed. The TOPS-2 (competition) was administered to the recruits with a retrospective instructional set within one hour of completing the final P-Company event and before they had been informed of the results. The recruit questionnaires were administered in a large recreation room by the experimenter, with no other military staff present. The MTMTI were administered at weeks 16 and 20 in the instructors' rest room. Fitness data were collected at weeks 16 and 19 and P-Company performance data were obtained on completion of P-Company from the official P-Company scorecard.

Intervention

The experimental group was exposed to a psychological skills program targeting goal-setting, relaxation and arousal regulation, self-talk strategies and imagery/mental rehearsal. Following general guidelines recommended by Weinberg and Williams (2010) (e.g., emphasizing the importance of PST, establishing a good rapport with the recruits, analyzing the demands of the sport, providing encouragement and opportunities to practice, etc.), the intervention was developed and administered by the candidate (a former warrant officer in the Parachute Regiment), under the supervision of his primary supervisor. The intervention consisted of a total of 520 minutes of interaction with the candidate, split into two 80 minute and seven 40 minute sessions between the start of week 17 and the end of week 19. All of the sessions were classroom based, with the exception of one outdoor practical session. After consultation with the organizational hierarchy and training staff, the training sessions were integrated into the platoon's training schedule where they would cause minimum disruption to the training program.

Intervention Procedure

After an initial introductory and administrative session, the first skill session involved the recruits being educated in the use of progressive muscle relaxation (Hardy, Jones, & Gould 1996; Williams, 2010) and a simple breathing exercise (rhythmic breathing; Williams, 2010) to modify their arousal levels prior to, and during P-Company events. During the second skills session, goal-setting and the use of effective goal-setting strategies were taught, with recruits being encouraged to identify personal outcome, performance and process goals (e.g., complete 10 miler, score more than 50 points on P-Company, regulate breathing and relax during the log race). Having been previously encouraged to identify negative self-talk statements during PT sessions, the third skills session involved educating the recruits in techniques for controlling personal self-talk dialogues, including, thought-stopping, reframing and countering. Examples from the recruits' own experiences were discussed and how they could be changed to a positive valence. The fourth skills session involved recruits being educated in imagery use. An imagery exercise was conducted during which they were encouraged to incorporate all their senses into the experience. It was also explained to them how to conduct mental rehearsal utilizing the other three skills. Sessions were highly interactive and during each session, the potential utility of each skill, before and during P-Company events, was discussed. The recruits were also encouraged to practice each skill during their scheduled physical training sessions. Once taught the four basic skills, a practical psychological skills session was conducted to provide the recruits with opportunity to practice the skills under supervision on a simulated P-Company event (i.e., the log race). This event was chosen as, administratively and time-wise, it had no disruptive effect on the recruits' training. It is also perceived to be one of the hardest P-Company events, involving many aspects of fitness (i.e., endurance, strength, stamina). This provided the recruits with the opportunity to practice the skills they had been taught under conditions of physical and mental pressure, particularly with regards to pain tolerance. (i.e., a great degree of physical discomfort). As each skill was taught, the recruits were encouraged to practice them during their scheduled physical training events, so that they could be reviewed and discussed in subsequent sessions. A summary of the intervention content is displayed in Table 4.1.

Comparison Control Group

The control group was not exposed to any form of PST, while both groups experienced the same training regimen throughout the course. The only contact by the research team with the control condition was by the candidate, which was solely for the administration of questionnaires. Participants were not informed of the study hypotheses.

Analytic Strategy

The aim of the analysis was fourfold; (1) to determine whether Para recruits' use of psychological skills was greater in training after receiving a PST program, (2) to examine whether there were any differences between the two groups in the recruits' use of psychological skills during P-Company (i.e., "competition"), (3) to examine whether there was a significant increase in mentally tough behavior in the experimental group as a result of receiving a PST program and, (4) to identify whether there was any significant differences in individual performance between groups during P-Company. The primary data analysis was conducted using IBM SPSS Statistics for Macintosh, Version 22.0 (IBM Corp, 2013).

Four analyses were conducted: (1) With the four basic psychological skills entered as the dependent variables, a 2 (Group) x 2 (Time) mixed model MANOVA was conducted to examine the effect of the PST program on psychological skills usage during training (i.e., practice); (2) With the four basic psychological skills entered as the dependent variables, a one-way MANOVA was conducted to determine group differences in psychological skills usage during P-Company test week (competition); (3) A 2 (Group) x 2 (Time) mixed model ANOVA was conducted to determine whether there were significant changes in instructor-rated mental toughness between the two conditions between pre- and post-intervention with mental toughness as the dependent variable; and (4) With the individual P-Company scores of the recruits entered as the dependent variable and individual fitness rating and the composite transformational leadership scale at week 16 entered as covariates a one-way ANCOVA was conducted to examine the difference in individual performance between groups on P-Company. Finally, a Chi square analysis was conducted to determine any significant difference in pass rates between the groups.

Results

Preliminary Data Testing

Confirmatory factor analysis.⁸ Confirmatory factor analysis (CFA) using

⁸ The BCFA was not included in the published edition of the manuscript for this study. Due to word count constraints, it was included as supplemental material.

Table 4.1.

Summary of PST Invention Content

Session	Content	Week/Day/Time	Activities
1	Introduction to study	Week 17/Mon/80 min	Questionnaire packs administered and completed. Introduction to the program and methods. Brief background of sport psychology and relevance to the military setting, particularly P-Company. Brief summary of skills to be taught and the beneficial effect on physical performance.
2	Relaxation & Arousal Regulation	Week 17/Wed/40 min	Introduction to progressive Muscle Relaxation (PMR) and simple breathing technique.
3	Goal-setting	Week17/Fri/40 min	Introduction and discussion about long-term (e.g., pass P-Company) and short-term goals (e.g., complete 10 miler), including outcome, performance and process goals.
4	Review	Week 18/Mon/40 min	Discuss successful use of goal-setting on previous PT activity and any discernible effect of PMR. Intro to self-talk. Encourage identification of individual self-talk cues on next PT activities.
5	Self-talk	Week 18/Wed/40 min	Discussion and identification of personal negative self-talk statements. Teach techniques for controlling personal self-talk dialogues (e.g., thought-stopping, reframing and countering.
6	Imagery	Week 18/Fri/40 min	Introduce imagery. Practical exercise utilizing external, internal, and kinaesthetic imagery. Explanation and discussion of pre-performance routines and mental rehearsal.
7	Review	Week 19/Mon/40 min	Review of self-talk and imagery use so far.
8	Practical Consolidation	Week 19/Wed/80 min	Practical exercise simulating the log race utilizing all of the psychological skills taught.
9	Review & Discussion	Week 20/Fri/40 min	Fine-tuning. Pre-performance routine.

maximum-likelihood chi-square testing can apply unnecessarily strict models et al., 2009). Bayesian analysis is an approach to CFA and structural equation modeling (SEM) that replaces the parameter specification of exact zeros with approximate zeros with a view to producing an analysis that better reflects substantive theory. This is achieved using posterior predictive checking, which is less conservative than traditional likelihood-ratio chi-square testing commonly used to conduct this type of analysis.

The MTMTI and a contextually modified version of the TOPS-2 (Hardy, Roberts et al., 2010) have been found to possess sound psychometric properties in previous studies with similar sample populations, that is, Parachute Regiment recruits undergoing basic training (Arthur et al., 2017; Chapter 2). Nevertheless, confirmatory factor analysis was conducted to confirm the factorial validity of all measures for this study using Mplus (7.3) (Muthen & Muthen, 2012).

Model-testing strategy. To assess the factorial validity of the MTMTI and the composite transformational leadership scale a series of two Bayesian structural equation models were estimated (BSEM; Muthén & Asparouhov, 2012). The estimation of model 1 incorporated non-informative priors for the major loadings, exact zero cross-loadings and exact zero residual correlations. The estimation of model 2 incorporated the addition of informative approximate zero cross-loadings. For the TOPS-2 training and P-Company measures, a series of three BSEM models were estimated. The estimation of models 1 and 2 were the same as the models for the previous two measures, while the estimation of model 3 incorporated the addition of both informative approximate zero cross-loadings and residual correlations.

All analyses specified small prior variances for cross loadings and residual correlations at \pm .01 and estimated with Markov Chain Monte Carlo (MCMC)

simulation procedure with a Gibbs sampler and a fixed number of 100,000 iterations for two MCMC chains, which allowed for the examination of model convergence. Model convergence was assessed by the potential scale reduction factor (PSR), where evidence for convergence is shown when the PSR value lies between 1.0 and 1.1 for all parameters (Gelman, Carlin, Stern & Rubin, 2004). The Gelman and Rubin (1992) convergence diagnostic was implemented, as described in the M*plus* manual, but with a stricter convergence criterion than the default setting of 0.01 instead of 0.05. Modeldata fit was assessed according to the posterior predictive *p* value (PPP) where a goodfitting model is indicated when values are around .50, whereas values of < .05 indicate an unacceptable model-data fit (Muthén & Asparouhov, 2012). Finally, model-data fit was also assessed with the symmetric 95% confidence interval for the difference of the observed and replicated χ^2 values. A good fitting model is indicated when the values centre on zero (Muthén & Asparouhov, 2012). BSEM fit and convergence for all measures are displayed in Table 4.2.

MTMTI. For the MTMTI, Model 1 was a poor fit to the data (PPP = 0.00, observed and replicated $\chi 2$ 95% CI [177.89, 222.66], DIC = 2794.42, BIC = 2873.04). Model 2, however, was an excellent fit to the data (PPP = .406, observed and replicated $\chi 2$ 95% CI [-24.17, 31.26], DIC = 2617.23, BIC = 2804.77). The PSR value reached and remained below 1.01 at 8,000 iterations. To ensure that convergence was obtained, the model was estimated again but with the number of iterations doubled (16,000 iterations).

TOPS-2 (training). For the TOPS-2 training measure, Model 1 was a poor fit to the data (PPP = .001, observed and replicated $\chi 2$ 95% CI [19.34, 103.64], DIC = 6327.76, BIC = 6496.94). Model 2 was also a poor fit to the data (PPP = .005, observed and replicated $\chi 2$ 95% CI [10.93, 99.05], DIC = 6327.76, BIC = 6711.67).

Model 3, however, proved to be an excellent fit to the data (PPP = .688, observed and replicated $\chi 2$ 95% CI [-60.71, 37.36], DIC = 6337.04, BIC = 7201.69). The PSR value reached and remained below 1.01 at 49,800 iterations. To ensure that convergence was obtained, the model was estimated again but with the number of iterations doubled (100,000 iterations).

TOPS-2 (P-Company). For the TOPS-2 P-Company measure, Model 1 was a poor fit to the data (PPP = .000, observed and replicated χ 2 95% CI [36.28, 120.44], DIC = 6716.84, BIC = 6883.54). Model 2 was also a poor fit to the data (PPP = .183, observed and replicated χ 2 95% CI [-24.31, 65.16], DIC = 6678.46, BIC = 7048.30). Model 3, however, proved to be an excellent fit to the data (PPP = .599, observed and replicated χ 2 95% CI [-55.85, 42.89], DIC = 6717.76, BIC = 7568.10). The PSR value reached and remained below 1.01 at 73,900 iterations. To ensure that convergence was obtained, the model was estimated again but with the number of iterations doubled (174,000 iterations).

Composite transformational leadership scale. For the composite transformational leadership scale, Model 1 was a poor fit to the data (PPP = .50, observed and replicated $\chi 2$ 95% CI [-3.72, 35.23], DIC = 2740.24, BIC = 2796.93). Model 2, however, was an excellent fit to the data (PPP = .514, observed and replicated $\chi 2$ 95% CI [-20.80, 20.43], DIC = 2621.03, BIC = 2737.24). The PSR value reached and remained below 1.00 at 8,000 iterations. To ensure that convergence was obtained, the model was estimated again but with the number of iterations doubled (16,000 iterations).

Outliers. MANOVA is known to be extremely sensitive to outliers, which may produce either a Type I, or Type II error with no indication as to which has been committed (Tabachnick & Fidell, 2013). Consequently, preliminary testing revealed

13 univariate outliers which were subsequently removed prior to further analyses, thereby reducing *N* from 186 to 173 ($M_{age} = 21.03$, *SD* 3.34 ($n_{control} = 90$; $M_{age} = 21.07$, *SD* 3.20; $n_{experimental} = 83$; $M_{age} = 21.00$, *SD* 3.51). However, while there is no unequivocal procedure for dealing with outliers, in the interests of transparency, the results for all analyses with the outliers retained can be viewed in the supplementary material. All other assumptions were met, with the exception of Box's M statistic revealed a violation in the assumption of variance-covariance matrices for the psychological skills variables (p < 001) and Levene's test, which demonstrated a violation in homogeneity of variance for some of the psychological skills (p < .05). However, Box's M test is known to be over sensitive with large and relatively equal group sizes and that MANOVA is robust enough to deal with this violation (Tabachnick & Fidell, 2013), therefore, a manual scan of the SPSS output was conducted which revealed satisfactory QQ plots. Moreover, in line with recommendations by Tabachnick and Fidell (2013), a more conservative alpha level of .025 was set in order to avoid the possibility of a Type 1 error.

Independent sample *t*-tests were conducted to determine any differences in leadership climate (composite transformational leadership score) and individual fitness levels. While there were no significant differences in leadership climate at week 16 (t(166) = .105, p > .05), mean fitness in the experimental group was significantly higher than in the control group at week 16 (t(166) = -4.84, p < .01). Individual fitness and the composite transformational leadership scores were treated as a covariates when analysing P-Company performance.

Table 4.2.

BSEM Fit and Convergence

	Difference be	etween ob	served and repli	[
Model	No free parameters	PPP	Lower 2.5%	Upper 2.5%	DIC	BIC	Iteration	PSR
TOPS Training Scale								
No specified priors	54	0.001	19.337	103.638	6327.759	6496.937	2500	1.00
Informative priors (crossloadings of items on the factors)	102	0.005	10.928	99.046	6327.759	6711.669		
Informative priors (crossloadings & residual correlations)	222	0.688	-60.705	37.363	6337.044	7201.694	49800	1.01
TOPS P-Company Scale								
Non informative priors	54	0.000	36.278	120.435	6716.842	6883.543	5000	1.00
Informative priors (crossloadings)	102	0.183	-24.318	65.164	6678.456	7048.293	8000	1.00
Informative priors (crossloadings & residual correlations)	222	0.599	-55.852	42.894	6717.763	7568.095	73900	1.01
Mental Toughness								
No specified priors	24	0.000	177.886	222.661	2794.423	2873.035	21000	1.01
Informative priors(crossloadings of items on the factors)	52	0.406	-24.172	31.257	2617.234	2804.774	8000	1.01
Composite Transformational Leadership Scale								
No specified priors	18	0.050	-3.723	35.229	2740.236	2796.932	4400	1.00
Informative priors (crossloadings)	33	0.514	-20.799	20.425	2621.026	2737.235	8000	1.01

Note: PPP = posterior predictive p value; PSR = potential scale reduction.

Attrition bias analyses were conducted to determine any differences between participants who completed P-Company ($n_{complete} = 173$) and those who did not ($n_{non-complete} = 36$). The results revealed no significant differences between the groups for any of the study variables: (a) psychological skills (F(4,195) = 2.34, p > .05); (b) mental Toughness (t(198) = 1.64, p > .05); (c) individual fitness (t(194) = .689, p > .05); (d) composite leadership: (t(200) = .744, p > .05).

Main Data Analysis

Descriptive data for study outcome variables and covariates are displayed in Table 4.3.

Psychological skills during training. A 2 (group) x 2 (time) mixed model MANOVA revealed a significant group x time interaction (F(4, 168) = 10.56, p < .01, $\eta_p^2 = .20$). Univariate follow up tests revealed a significant group x time interactions in the use of goal-setting ($F(1, 171 = 17.50, p < .01, \eta^2_p = .09)$), relaxation ($F(1, 171) = 25.38, p < .01, \eta^2_p = .13$), self-talk (F(1, 171) = 16.02, p < .02, p < ..01, $\eta_p^2 = .09$), and imagery (*F*(1, 171) = 5.14, *p* < .02, $\eta_p^2 = .03$). Eight Bonferroni corrected paired sample *t*-tests (.05/8 = .006) revealed that goalsetting (t(89) = -.83, p > .05), relaxation (t(89) = .74, p > .05), self-talk (t(89) = -.63, p = .05)> .05), and imagery (t(89) = -.89, p > .05) in the control group did not differ from pretest to post-test, while significant differences were evidenced in the scores for goalsetting (t(82) = -6.53, p < .001), relaxation (t(82) = -5.90, p < .001), self-talk (t(82)= -4.63, p < .001), and imagery (t(82) = -3.94, p < .001) in the experimental group. This indicates that the interactions were likely caused by an increase in the use of all four psychological skills during training by the experimental group between pre and post-test, while no differences were evidenced in the control group (see figures 4.1a. to 4.1d.).

Table 4.3.

	Experimental Group						Control Group						
	Week 16		Week 20		P-Company		Week 16		Week 20		P-Company		
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Instructor-rated Mental Toughness	4.89	-1.15	5.10	-1.09			4.68	-1.06	4.58	-1.11			
Goal-setting	3.45	-0.70	4.00	-0.5	3.86	-0.59	3.38	-0.78	3.44	-0.74	3.68	-0.87	
Relaxation	1.82	-0.92	2.6	-1.01	2.77	-0.95	1.58	-0.76	1.65	-0.7	2.26	-0.95	
Self-talk	3.74	-0.70	4.11	-0.70	3.75	-0.64	3.70	0.75	3.66	-0.88	3.57	-0.73	
Imagery	3.00	-0.79	3.30	-0.73	3.50	-0.61	2.89	-0.68	3.00	-0.85	3.25	-0.84	
Mean Fitness score (min/s)	19.06	-1.17	18:49	01:10			20:13	01:46	19:20	01:11			
Standardized Fitness score	0.35	-0.78	0.224	-0.97			-3.23	-1.07	-2.07	-0.99			
Composite Transformational Leadership Scale	4.13	-0.64	4.06	-0.63			4.09	-0.64	4.02	-0.70			
P-Company Performance					56.07	-9.6					55.02	12.21	

Descriptive Data for Outcome Variables and Covariates for Both Study Conditions (N=173)



Figure 4.1a. Group x Time interaction for goal-setting during training.



Figure 4.1b. Group x Time interaction for relaxation during training.



Figure 4.1c. Group x Time interaction for self-talk during training.



Figure 4.1d. Group x Time interaction for imagery during training.

Psychological skills during P-Company. A one-way MANOVA revealed a significant multivariate effect for group in the use of psychological skills during P-Company (*F* (4, 168) = 3.55, p < .01, $\eta_p^2 = .08$). Univariate follow-up tests revealed significant group effects in the use of relaxation (*F* (1, 171) = 12.59, p < .01, $\eta_p^2 = .07$) and imagery (*F* (1, 171) = 4.85, p < .05, $\eta_p^2 = .03$), while no main effect was observed

with goal-setting (*F* (1, 171) = 2.77, p > .05, $\eta_p^2 = .02$) and self-talk (*F* (1, 171) = 2.88, p > .05, $\eta_p^2 = .02$). Examination of the cell means indicated that all these effects were due to the experimental group making more use of psychological skills during P-Company than the control group.

Mental Toughness. A 2 (group) x 2 (time) mixed-model ANOVA revealed a significant group x time interaction (*F* (1, 171) = 5.30, p < .05, $\eta_p^2 = .03$).

Four Bonferroni corrected paired sample *t*-tests (.05/4 = .0125) revealed that mental toughness scores for the control group (t(89) = 1.08, p > .05) and the experimental group (t(82) = -2.11, p = .038) did not differ from pre-test to post-test.

An independent sample *t*-test revealed no significant difference between the two groups at pretest (t(171) = -1.25, p > .05) and a significant difference at post-test (t(171) = -3.16, p < .01), indicating that the interaction was caused by an increase in mental toughness in the experimental group between pre and posttest, with no change having occurred in the control group (see figure 4.2).



Figure 4.2. Group x Time interaction for instructor-rated mental toughness.

P-Company Performance. A one-way ANCOVA, with individual fitness prior to P-Company and leadership climate entered as covariates, revealed that individual performance on P-Company was significantly higher in the experimental group than the control group (F(1, 172) = 5.93, p < .05, $\eta^2_p = .03$). Although there was a difference of 4.8% in pass P-Company rates (Exp = 91.6%; Cont = 85.6%), a Chi squared test indicated that this was non-significant ($\chi^2(1) = .11$, p > .05).

Discussion

The purpose of this study was to examine whether a PST intervention would facilitate the development of mental toughness, thereby, enhancing the performance of elite British Army recruits undergoing a physically and mentally demanding infantry regiment selection course. We hypothesized that basic psychological skills usage in the experimental group would significantly increase during training and during a week-long physically and mentally demanding selection course (i.e., P-Company) with concomitant effects observed in informant rated mental toughness and performance when compared to the control group. Importantly, the current study examined the relationships whilst controlling for fitness and leadership climate. This is first study to have examined such effects using an informant-rated measure of mental toughness along with an objective measure of performance in a military context.

Results revealed general support for the hypotheses. As a consequence of the 3-week intervention, the experimental group engaged in a significantly greater use of goal-setting, relaxation techniques, self-talk strategies and imagery/mental rehearsal in training than the control group, there was a significant increase in observer-rated mental toughness in the experimental group between pre and post-test, whilst there was no change in mental toughness in the control group. Moreover, individual

performance was significantly higher in the experimental group during P-Company when controlling for fitness and leadership climate in training. It is worth noting that the means and standard deviations of the performance data do suggest that a nonsignificant result would not have been surprising. That being said, with the alpha level set at .05, there is a 95% probability that the results were not by chance alone.

However, significant differences in psychological skills usage during P-Company were only evidenced with relaxation and imagery, whereas no differences were evidenced in the use of goal-setting and self-talk. Lastly, whilst the experiential group had higher overall pass rates during P-Company, the difference was not significant. It is possible that given more time to practice the skills to the point where they were being executed automatically, the results may have been more pronounced because (i.e., having started PST earlier in training). However, a number of factors prevented this. For example, in the early stages of training, the recruits are focused on learning fundamental skills and may be overwhelmed in terms of the number of concepts they are being taught (Adler et al., 2015). It is also a matter of the training program. Between the recruits' mid-course leave at week 12 and the start of the intervention, several field exercises take place for several days duration where basic skills are being honed. This would not only be impractical, but unfair to burden the recruits with information overload in their fatigued state.

An interesting and unanticipated result that emerged from the current research was the difference for the intervention effects on psychological skill usage during training and during P-Company. Specifically, use of all the psychological skills was impacted during training whilst only relaxation and imagery were impacted during P-Company, albeit with a medium effect size for relaxation ($\eta^2_p = .07$) and small effect size for imagery ($\eta^2_p = .03$). It is unclear why exactly this was the case, however, a closer examination of the nature of the psychological skills, the nature of the P-Company assessment, and the environment in which the research was conducted may provide some possible explanations.

On P-Company, the recruits from each condition reported using the same levels of self-talk and goal setting, yet the control recruits had not received any training in the use of these skills. A possible explanation is that goal setting and selftalk may be more naturally occurring psychological strategies than relaxation and imagery. Due to the consequences of failing P-Company, optimal performance on every event is arguably more important and, therefore, stressful than training. Indeed, previous research has shown athletes to engage in greater use of psychological skills during competition than in practice because athletes view competition as more important than practice (e.g., Frey, Laguna, & Ravizza, 2003; Thomas, Murphey, & Hardy, 1999). Consequently, the control group may have naturally employed goal setting and self-talk strategies during P-Company and not in training, but without having been taught how to successfully make use of relaxation and imagery strategies and given the opportunity to practice them, were unable to employ them as effectively during P-Company. Indeed, one of the major limitations of the TOPS-2 is that it only measures use of psychological skills, not ability or effectiveness.

Therefore, the effectiveness of imagery use between the groups during competition may be due to the quality of imagery and/or type of imagery employed. Researchers have identified different types of imagery, all of which serve a different purpose during a performance task (Cumming & Ramsey, 2009). The use of two types of imagery in particular may have influenced the results in the current study. Cognitive general imagery refers to the imagery of strategies, routines, and game plans (e.g., mental rehearsal), while motivational general- arousal imagery is related to the arousal and anxiety associated with competition and has been used by athletes to remain calm and relaxed prior to competition (Munroe, Giacobbi, Hall, & Weinberg, 2000). The experimental group were educated in the different types of imagery and their purpose and, therefore, may have employed the appropriate types of imagery more than the control group. However, the TOPS-2 imagery scale measures only the use of imagery and does not assess the functions of imagery. Consequently, it is unclear which types of imagery were employed.

Although it is unclear how each of these skills directly impacted on the recruits' performance during P-Company, as a consequence of the PST, the recruits' ability to recognize and regulate arousal levels and reduce the debilitating effects of anxiety is likely to have been a key factor in achieving optimal performance (e.g., Hardy et al., 1996; Krane & Williams, 2011). It is also likely that the recruits in the experimental group were able to use relaxation techniques to reduce pre-performance anxiety prior to each event and regulate arousal levels in order to cope with the extreme physical effort experienced on P-Company (Kress & Statler, 2003; Thelwell & Greenlees, 2001). Anxiety or arousal levels were not measure in the recruits, therefore, this cannot be conformed, however, future research may be warranted to explore this intriguing possibility. The current intervention included all the psychological skills in one package but the results from the reported use of psychological skills during competition may point towards the notion that imagery and relaxation may be more important skills in this context. However, the data only tentatively suggest this and future research exploring which specific psychological skills impact performance and mental toughness in this context is warranted.

Another possible explanation for the similar use of psychological skills during P-Company can be found in the stress and coping literature. According to Lazarus and

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Folkman (1984), coping is a continuous, dynamic, and situation specific process of the interaction between the person-environment, which fluctuates over time in response to changing demands and one's own appraisal of the situation. That is, cognitively, each recruit will cope with the demands of P-Company in a different way. Further, they may cope with each event differently, depending on the specific demands of that event, or how they have performed on previous events. For example, if they have performed poorly on a particular event/day, they may approach the following event/day with either less self-confidence or increased anxiety. Therefore, the intervention may not have radically changed the way in which the recruits employ goal-setting and self-talk strategies but encouraged more frequent and persistent use of those skills.

Several limitations are acknowledged in this study, the first of which was the necessity to adopt a random block design. While complete random allocation of participants is preferred, for the reasons explained in the study design section, this was not possible. Potentially, the study could also have been influenced by Hawthorne effects (Gillespie, 1991). Whilst having a control group is a major strength of the current research providing a placebo condition as well would have been an additional strength. This, however, was not possible within the constraints of training program of the organization. While steps were taken to minimize any such effects or leakage from the intervention group, Hawthorne effects cannot be ruled out entirely. Whilst the most parsimonious explanation of the results remains that the psychological skills intervention significantly increased psychological usage, mental toughness and performance, we cannot completely rule out any such Hawthorne effects. Furthermore, cross contamination between groups cannot be completely ruled out. However, the training was delivered to in tact training platoons that start training

approximately five weeks apart. Therefore, it is thought that the minimal interaction recruits from each group would have had with each other would have minimal impact on the results.

It is evident that some of the effect sizes are small. One possible explanation for this is that observational field studies tend to yield deflated effect sizes due to the interaction test relying on observations in the corners of the design. However, these observations tend to be uncommon in field studies, particularly with correlated variables (e.g., goal-setting, relaxation, self-talk and imagery) (McClelland & Judd, 1993).

The TOPS-2 as an instrument which to measure psychological skills usage in a military context has its limitations. The TOPS-2 was developed specifically for the sport setting, thus whilst the measure does appear to possess adequate utility in a military context, further validation work may be required to adapt the TOPS to the military. Indeed, given the recent interest in psychological skill usage in the military, the development of a new military specific measure may even be warranted. Although the short-term effects of the intervention were promising, the long-term effects remain unknown. Future research should seek to measure the continued effects on performance, perhaps even in the operational context, for soldiers who have been exposed to psychological skills training early in the training cycle. Further, future research should seek to identify whether the increased levels of mental toughness derived from the PST are maintained over time.

Despite the limitations of this study, we believe that it has a number of key strengths. The primary strength of the study is that it was conducted within a live elite military training setting in which performance under pressure held real consequences for success and failure, using an informant rating of mentally tough behaviour and an ecologically valid measure of performance. Furthermore, the study considerably extends the literature by being the first study to control for individual fitness and leadership climate in the context of a psychological skills training intervention. The findings lend support to previous studies advocating the use of traditional psychological skills training packages in facilitating the development of mental toughness (e.g., Bell et al., 2013; Crust & Azadi, 2010; Gucciardi et al, 2009b; Kaiseler et al., 2009) and previous studies that have shown PST to be a useful performance enhancing strategy in a military training setting (e.g., Adler et al., 2015; DeWiggins et al., 2010; Hammermeister, et al., 2010). At a more general level, the findings reinforce the general consensus that theoretical, empirical and applied concepts in sport psychology can be successfully applied in a military context (e.g., Fiore & Salas, 2008, Goodwin, 2008; Hammermeister, et al., 2010).

Summary, General Discussion, and Future Directions

Thesis Objectives

The primary objectives of this thesis were to: (1) develop and validate a psychometrically robust informant-rated instrument with which to measure mentally tough behaviour in military training, (2) examine the interactive effects of contingent punishment and supportive leadership behaviour on the development of mentally tough behaviour and performance and, (3) examine the effects of a psychological skills intervention on the development of mentally tough behaviour of elite military recruits during training and subsequent performance on an arduous military task.

Gray and McNaughton's (2000) rRST was used as the underpinning theoretically framework, while mental toughness was conceptualized as "the ability to achieve personal goals in the face of pressure from a wide range of different stressors" (Hardy et al., 2014, p. 5).

Chapter 1 discussed a brief history of mental toughness research and the issues surrounding its conceptualisation, measurement and development. In particular, some of the common themes emerging from previous qualitative studies on mental toughness development were discussed and how this may relate to a military environment. Chapter 2 utilised a series of studies to develop, refine and validate a single factor, observer-rated behavioural measure of mental toughness for use in studies 3 and 4. Based on the findings of Bell and colleagues (2013), Chapters 3 and 4 focused on examining the effects that punishment conditioned stimuli, transformational leadership behaviours, and coping skills all have on the development of mental toughness. Specifically, Chapter 3 utilised two longitudinal designs to examine the role of punishment in mental toughness development, particularly when augmented by leader support (in the form of individual consideration), while Chapter 4 utilised a quasi-experimental design to examine the effect of a psychological skills intervention on mental toughness development and performance. Thus, the three main components of Bell and colleagues' (2013) study were measured in isolation allowing clearer conclusions to be inferred regarding the impact of each component on the development of mental toughness.

Main Findings

The first main finding of the thesis, in line with the first primary objective, was that the use of a contextually relevant, observer-rated measure is an appropriate method by which to measure the presence of mentally tough behaviour. This supports Bell and colleagues' (2013) and Beattie and colleagues' (2017) research using similar measures for cricketers (mental toughness inventory; MTI) and swimmers respectively (swimming mental toughness inventory; SMTI). After being validated in the series of studies in Chapter 1, the MTMTI maintained satisfactory psychometric properties across a further series of studies with similar cohorts. Moreover, the thesis supports the contention of Gucciardi and colleagues (Gucciardi, Jackson et al., 2015) that it may be more appropriate to conceptualise mental toughness as a unidemensional rather than multi-dimensional construct, as espoused by some of the earlier researchers (e.g., Clough et al., 2002; Coulter et al., 2010; Jones et al., 2002). Indeed, Study 2 in Chapter 1 revealed that the single factor MTMTI accounted for a significant variance in performance over and above that accounted for by a multi-factor self-report measure (i.e., SMTQ; Sheard et al., 2009). This is consistent with the findings of Gucciardi, Jackson et al. (2015).

While some scholars have argued that punishment could potentially serve a useful purpose in performance enhancement (e.g., Seifried, 2008), others vehemently denounce any such suggestions (e.g., Albrecht, 2009). The fact remains that, punishment, in its many forms, is a natural part of daily life (e.g., Carlsmith, 2006) and

occupational settings (e.g., Greer, Chalmer, & Labig, 1987). Moreover, it remains an integral aspect of the military environment, particularly in the development and maintenance of military discipline (Houghton & Holmes, 2001). Therefore, it would appear logical to explore the impact of punishment on various outcome related variables, such as mental toughness, particularly given that military personnel are trained to perform in what is arguably the ultimate in stress inducing environments (Bourne, 1970, p. 22), where mental toughness is arguably a fundamental prerequisite.

Consequently, the second main finding, in line with the second main objective, was that the appropriate use punishment in a military training context, coupled with the application of individual consideration from the instructor, demonstrates an important connection with recruit mentally tough behaviour and concomitant effects on performance. This adds to previous research by Bell and colleagues (Bell et al., 2013) demonstrating that the threat of punishment conditioned stimuli (i.e., punishment) serves to enhance mental toughness in a sporting context (when augmented by transformational leadership behaviours displayed by the coaching staff). It also adds credence to Arthur et al.'s (2010) findings that provided preliminary evidence that the use of contingent punishment is significantly and positively related to improvements in a variety of attitudinal variables (e.g., self-esteem, satisfaction) in a military training environment. Interestingly, however, of the three behaviours analyzed two supportive behaviours analyzed, only individual consideration appeared to show the interactive effect with contingent punishment. Chapter 3 also provides support for the existing mental toughness literature, specifically, providing evidence for the positive impact of instructor support in developing mental toughness in a military training environment (e.g., Overdale & Gardener, 2012).

The third main finding, in line with the third main study objective,

demonstrated that, despite being a relatively stable construct, mental toughness might be malleable. That is, it appears that given the appropriate environmental conditions (Chapter 3) and provision of training (Chapter 4), mental toughness can be developed. These results provide support for Bell and colleagues' (Bell et al., 2013) finding that mental toughness can be enhanced by the threat of punishment-conditioned stimuli when supportive leadership is present. Both Chapter 3 and Bell et al.'s research provide support for Gucciardi and colleagues' interpretation of mental toughness as "a contextualised expression of dispositional traits that are activated or shaped by contextual or social factors" (Gucciardi, Jackson et al., 2015, p. 41), and their contention that it may be more appropriate to view mental toughness as a state-like, rather than trait-like construct. It was interesting to note, however, that while mental toughness appeared to be enhanced by a significant increase in all of the four psychological skills included in he intervention, it was only relaxation and imagery that appeared to have a significant impact on P-Company performance.

Theoretical Points of Interest

Measurement. The first theoretical point of interest is the nature of the measure used to assess mental toughness in recruits. While some researchers have suggested that it may be better to conceptualize mental toughness as a uni-dimensional construct (e.g., Gucciardi, Hanton et al, 2015; Hardy et al., 2014), others believe it is far too complex to capture with one scale and, therefore, should be viewed as multi-dimensional (e.g., Connaughton et al., 2011; Crust and Clough, 2011; Crust et al., 2002; Kaisiler et al., 2009). This thesis has provided support for the uni-dimensional view across five separate studies in Chapters 2, 3 and 4. However, as a 6-item

measure, some researchers may question its ability to tap into the full depth of mental toughness.

During the refining process, items that had considerable conceptual overlap with other items (e.g., "he is fatigued/he has not had much sleep"), were ambiguously worded (e.g., "other people are relying on him to perform well"), or referred to environmental conditions that were not necessarily a universal stressor to all recruits (e.g., He is dealing with a number of personal issues away from training, for example, at home) were deleted. However, it was interesting to note that all of the items that could be considered 'social' stressors (e.g., "he is not getting on with other section members") proved to be an inadequate fit and were deleted at stage 1. The idea that stressors might be clustered into 'types' of stressor may be worthy of future exploration. For example, physical stressor items (e.g., "he has not had much sleep"), ego threats items (e.g., "he has been punished or reprimanded"), and cognitive stressor items (e.g., "pressure to perform on assessments").

The second point regarding the measurement of mentally tough behaviour relates to demonstrable and observable behaviour. While researchers have engaged in a sport specific approach (e.g., Bull et al., 2005 - Cricket; Gucciardi et al., 2008 -Australian football), or an all-encompassing sports approach to measure mental toughness (Gucciardi, Hanton et al., 2015), Gucciardi et al. (2016) suggest that persistence, effort and perseverance are behavioural signatures of mentally tough behaviour. If this is indeed that case, one could reasonably argue that individual behaviour that demonstrates effort, perseverance and persistence manifests itself in the same way, regardless of sport or context. However, Gucciardi and colleagues (2016) suggest that further exploration is required to determine whether or not mental toughness provides incremental validity over and above other relevant variables relating to individual differences (e.g., emotion regulation) (Guciardi et al. 2016).

The third point regarding the MTMTI is to do with the cut-off values and fit indices which resulted in only a 6-item measure. However, rather than have the future validity of the measure called into question, it was decided to adopt the relatively strict recommended guidelines (e.g., Hu & Bentler, 1999), rather than use them as a rule of thumb. Although an 8 to 10 item measure was desired, which would have captured a wider scope of potential environmental stressors, the psychometric properties of the resulting 6-item measure were sound.

Instructor Support. An interesting result from Chapter 3 was that only one of the three supportive leadership behaviours buffered the contingent punishment – leader support relationship, namely individual consideration. While, it is acknowledged that the other two supportive behaviours were expected to buffer this relationship, if any of the behaviours were to do so, it is not altogether surprising that it was shown to be individual consideration. One of the reasons for this is that it could be argued that individual consideration is the most supportive of leader behaviours that were measured.

Based on a model for use in a military context by Arthur and Hardy (2008), Arthur, Hardy and Woodman (2014) proposed a meta-cognitive model of transformational leadership, whereby the leadership behaviours where categorized into three basic components: (1) vision; (2) support and; (3) challenge (VSC). The underlying proposition of the VSC model is that the leader (e.g., instructor) inspires the follower (e.g., recruit) by: (a) creating an inspirational *vision* of the future; (b) providing the necessary *support* to achieve the vision; and (c) providing the *challenge* to achieve the vision (Arthur et al., 2014).

To briefly summarize, vision provides meaning and direction to the follower

and is facilitated by the transformational leader behaviours of appropriate role modelling, inspirational motivation and fostering acceptance of group goals. Vision can be defined as "the extent to which athletes have an inspirational and meaningful future image of themselves" (Arthur et al., 2014, p. 76). Support is provided to help the follower to achieve the vision, provide belief that the vision is attainable, and contribute to feeling valued and important and can be defined as "the extent to which emotional, esteem, informational, and tangible support is provided or is perceived as being available when needed" (Arthur et al., 2014, p. 76). Support is facilitated by the leader behaviours of individual consideration, inspirational motivation, and fosters an acceptance of group goals. Raising the follower's awareness between his current and ideal future state provides the challenge component of the model and is facilitated by the leader behaviours of high performance expectations and intellectual stimulation. Challenge can be defined as "an understanding of what needs to be done in order to achieve goals and the gap between current state and a future desired state, with the implicit assumption that the larger the discrepancy the more challenged followers are" (Arthur et al., 2014, p 76). Although it is posited that support is facilitated by inspirational motivation, fosters an acceptance of group goals and individual consideration, only individual consideration sits solely in the support aspect of the VSC model. Both inspirational motivation and fosters an acceptance of group goals have some crossover with vision and support. A closer inspection of the items underpinning each of those behaviours may provide some explanation for the findings.

Individual consideration. Items for individual consideration were: (1) "... treats everyone as an individual;" (2) ".... considers that I have different strengths and abilities from others;" (3) "... helps me to develop my strengths" and; (4) "... spends time teaching and coaching me." These items are consistent with Rafferty and
Griffin's (2004; 2006) proposal of personal support. Rafferty and Griffin's (2004; 2006) posited that individual consideration consists of two sub-components; developmental leadership and supportive leadership, defining supportive leadership as primarily emotional support, "which involves the provision of sympathy, evidence of liking, caring and listening" (p. 39). Moreover, this definition is not inconsistent with Cobb's (1976) definition of social support, which suggests that it is information from the leader leading followers to believe that they are cared for and loved, esteemed and valued, within a network of communication and mutual obligation. The items that underpinned Rafferty and Griffin's (2004; 2006) definition of supportive leadership were: (1) "considers my personal feelings when implementing actions that will affect me;" (2) "takes into account my personal needs;" (3) "ensures the interests of employees are considered when making decisions" (Rafferty & Griffin, 2006, p. 45).

Inspirational motivation. The inspirational motivation items are less explicit in their obvious relationship which supportive leadership as discussed above. Items for individual consideration were: (1) ".... talks optimistically about the future;" (2) "... talks enthusiastically about what needs to be accomplished in training;" (3) "... sets high standards for me to achieve" and; (4) "... expresses confidence that standards will be achieved." However, when taking into account the behaviour that constitutes inspirational motivation, that is, inspiring followers with a vision of an exciting future state and expressing a belief that it can be achieved, it is understandable that this behaviour can potentially provide support by instilling self-belief in followers. Interestingly, while the interaction term for inspirational motivation in the first study in Chapter 3 was non-significant, it could be considered to be approaching significance (p = .08). Moreover, Figure 5.1 shows that, while non-significant, the results suggest that when high contingent punishment is accompanied by high

inspirational motivation, observed mental toughness is higher than when high contingent punishment is not accompanied by high inspirational motivation.

A possible explanation for the results for inspirational motivation could be due to a 'washout' effect. Despite being employed in similar roles, the infantry regiments of the British Army have distinctly different characters, cultures and ethoses, based on their different histories. In a study examining the impact of coaching and transformational leadership behaviours on recruit performance and attitudinal outcomes, Hardy and Arthur (2006) discovered that the importance and effect of different behaviours varied between regiments. For example, inspirational motivation was perceived to more important to Para recruits than other regiments, while appropriate role modelling was deemed more important to Guards recruits.

While Arthur and colleagues' (2014) VSC model includes inspirational motivation, fosters an acceptance of group goals and individual consideration as supportive behaviours, the results in Chapter 4 appear to suggest that fosters an acceptance of group goals does not provide support in the same way as individual consideration and inspirational motivation.

Fosters an acceptance of group goals. There is a plausible explanation for the lack of main effect or interaction for fosters an acceptance of group goals in Study 2b. The section commander/soldier relationship in training is different from the relationship in a typical army unit. During recruit training, the instructor is situated outside the recruit section as a team. Rather, he is part of the permanent staff training team, comprising the other instructors, platoon sergeant, and platoon commander. The instructor will, however, provide the inspiration that generates team cohesion in the recruits that provides another type of instrumental support, that is, social support from peers. This premise is supported by other research in the military domain whereby

trainees who form strong social networks are more likely to succeed in training (e.g., Joplin et al., 1995). This may help to explain the main effect in study 2a. After 15 weeks together, living, eating, socializing, and training together, strong team bonds have formed between the recruits. Along this line of reasoning, it is no surprise to have found a main effect between fosters an acceptance of group goals and completion of training.

Psychological skills. An unexpected, albeit interesting result that emerged from Chapter 3 was the difference for the intervention effects on psychological skill usage during training and during P-Company, between the treatment and control groups. That is, significant differences emerged between the groups in the use of psychological skills during training, however, during P-Company, the only significant differences evidenced were for relaxation and imagery use, while recruits from both conditions appeared to employ the same amount of goal-setting and self-talk strategies. One possible explanation for this is that recruits see P-Company as more important than general training sessions. If a recruit performs poorly on a physical training lesson during normal training, he has the opportunity to perform better on the next session. However, during P-Company, there are no second chances; poor performance leads to fewer points, which means the recruit has to work harder on subsequent events. If one is already exerting maximum effort, this becomes somewhat problematic. Therefore, it is possible that the potentially more naturally occurring psychological skills (e.g., goal-setting and self-talk) are utilized to help them achieve maximum effort.

During the intervention training sessions, most of the recruits reported having heard of, been exposed to, or even used goal-setting techniques in the past, particularly those who played sport at a high level (Parachute Regiment recruits tend to have engaged in more regular and arduous physical activity than recruits joining regular infantry regiments). Moreover, most reported using some form of self-talk strategy as a motivational tool when things became difficult. Conversely, very few reported using any form of relaxation or imagery technique. This suggests that goal-setting and self-talk, while maybe not utilized to an optimal degree, was used nonetheless, at least to the degree of revealing no significant differences in the data analysis. On the other hand, relaxation and imagery techniques had to be taught, practiced and applied to reveal any differences in the data analysis. Moreover, the difference in the use of relaxation, in particular, appears to have had a significant difference on the recruits' individual performance on P-Company.

The ability to relax has been identified as crucial to dealing with pressure in a high performance environment (e.g., Hardy et al., 1996; Krane & Williams, 2011). Moreover, the ability to deal with pressure and pre-performance anxiety has been posited as a key attribute linked to mental toughness. The use of relaxation techniques is considered to be an appropriate way in which to regulate activation and arousal levels before and during competition and to be a useful technique for performance enhancement and pain management (Kress & Statler, 2003). Indeed, relaxation strategies have been employed before competition to regulate arousal and to enable enhanced focus on goals rather than an inappropriate focus on pain (Thelwell & Greenlees, 2003). Consequently, recruits would be able to remain goal focused even when the environmental demands and physical pain increase because they will be better able to regulate their arousal levels and thus be less susceptible to the performance-debilitating effects of pain and elevated anxiety levels. It is unsurprising, therefore, that the use of relaxation techniques prior to performing on each event had the effect that it did.

The use of imagery during P-Company may also have impacted on the recruits' anxiety, albeit more indirectly. Indeed, the relationship between confidence, anxiety and imagery use is well established (Williams & Cumming, 2016) and has been shown to positively impact on anxiety symptoms by reducing the intensity of the symptoms, or reappraising the symptoms as facilitative to performance (Cumming et al., 2007). Imagery involves a combination of sensory modalities to mimic real life experiences (Cumming & Ramsey, 2010), which can serve a number of functions (e.g., stress management and reduction of tension; Short, Ross-Stewart, & Monsma, 2006). Imagery use has also been found to be a strong and significant predictor of mental toughness (Mattie & Munroe-Chandler, 2012), while mental preparation in the form of imagery has been reported as a viable resource for managing the pain (Kress & Statler, 2003).

However, imagery also requires education and practice to be applied appropriately and an individual's imaging ability will determine the effectiveness of its use (Cumming & Williams, 2012). Used appropriately, the recruits would have used imagery to mentally rehearse each task and their responses to the feelings they are likely to experience (e.g., fatigue and pain). Thereby strategizing further skills, such as goal setting to maintain motivation and persistence (under difficult conditions). Imagery may also have been employed by the recruits to visualize successfully completing each task, thereby enhancing self-belief and confidence. Considering these differences in performance with regard to relaxation and imagery use, it would have been prudent to have obtained some form of performance data from the recruits in training to determine if any significant differences emerged there.

Applied Issues

Measurement. The first applied issue also relates to measurement. Gucciardi, Hanton et al. (2015) suggest that the brevity of a short, single factor questionnaire may provide greater practical utility in field settings than a multi-faceted measure with many items (e.g., MTQ-48; Crust et al., 2002). Further, several researchers have argued for, and examined the utility of an observer-rated measure that reduces the risk of social desirability issues (e.g., Beattie et al., 2017; Bell et al., 2013; Gucciardi, Hanton et al., 2015; Hardy et al., 2014). From an applied perspective, it would be impractical for an instructor to complete a 48-item measure for up to 12 recruits. Despite its potential limitations, arguably, one of its key strengths of the MTMTI is its ease of use for raters.

Use of Punishment. The use of punishment remains a contentious issue among scholars and researchers, however, it has been, and remains, an integral part of the development and maintenance of military discipline, with the purpose of ensuring compliance with orders and to create and maintain units cohesion (Houghton & Holmes, 2001). Unlike many other contexts, inappropriate behaviour and ill discipline in the military environment, particularly on combat operations, can result in the loss of life or serious injury. Thus, the appropriate use of punishment (i.e., contingent punishment) should be used strategically by the instructor to communicate to the recruit that the action, behavior, or performance exhibited was inappropriate and to deter future such behaviour or actions that may cause loss of life or serious injury (Seifried, 2010). Further, there should be a clear rationale as to the purpose of the punishment, that is, "to restore order and reaffirm the team's core values when they are threatened" (Seifried, 2008, p. 373).

Seifried (2008) suggests that this general antipathy towards the use of

punishment is based on the misconception that punishment will always be administered inappropriately. However, there is evidence to suggest that punishment and the threat of punishment can lead to higher levels of performance under pressure, providing they are administered *appropriately* and augmented by transformational leadership behaviours (e.g., Bass, 1998; Bell et al. (2013). Further, Arthur et al. (2010) have provided preliminary evidence that the use of contingent punishment is significantly and positively related to improvements in a variety of attitudinal variables, including self-esteem and satisfaction, in military training recruits. The results from Chapter 3 provide support for this but specify that the augmentation be in the form of specific transformational leadership behaviours (i.e., individual consideration) rather than transformational leadership per sé.

In military training establishments, instructors are governed by the guidelines of conduct mandated in the particular training establishment's code of practice for instructors, underpinned by military and civil law. This leaves instructors with a variety of potential options for reprimanding recruits who fall below the required standards of performance and behaviour. While leadership and coaching training exist to enhance recruit instructors' impact on training and recruit performance, an oftneglected area of instructor training is in the appropriate use of punishment. Induction courses for instructors prior to commencing a tour of duty at a training establishment tend to focus on what instructors cannot do and the consequences of what happens if they fall foul of the punishment system. As discussed, punishment serves an important function in the military environment, therefore, more could be done to educate instructors on the psychological and performance related effects of both appropriate and inappropriate punishment.

Psychological skills training. While the PST intervention appeared have an

impact on promoting mentally tough behaviour during training, the results for the employment of psychological skills and subsequent performance during P-Company were somewhat equivocal. The initial results clearly demonstrate a place for PST in recruit training to help cope with the many demands that the recruits have to face. Indeed, all four psychological skills appeared to have an effect and, one could logically assume that more time to practice the skills to the point of employing them automatically would potentially have a greater effect on P-Company. However, military training is a constant stream of learning, both in barracks and on exercise. Attempting to start PST too early in training may well be a wasted endeavour, particularly in the first five to seven weeks of training where a 12 to 14 hour working day is not uncommon, therefore, it would have to be started after the initial stages of training. For PST training to be effective, it would have to be formally integrated into the training program, in the same way as it has been done with the U.S. Navy SEAL Basic Underwater Demolition/Seals program.

Mental toughness development. Despite the contention by some researchers that mental toughness is a relatively stable construct, a study conducted by Gucciardi et al. (2016) found that 63% of responders believed mental toughness is malleable (i.e., developable). Chapter 4 lends support to previous studies advocating the use of traditional psychological skills training packages in facilitating the development of mental toughness (Bell et al., 2013; Crust & Azadi, 2010; Gucciardi et al., 2009b; Kaiseler et al., 2009) and studies that have shown psychological skills training to be a useful performance-enhancing strategy in a military training setting (e.g., Adler et al., 2015; DeWiggins et al., 2010; Hammermeister et al., 2010). The findings in Chapters 3 and 4 also reinforce the general consensus that theoretical, empirical, and applied concepts in sport psychology can be successfully applied to military contexts (e.g., Fiore & Salas, 2008; Goodwin, 2008; Hammermeister et al., 2010). With this empirical evidence at their disposal, British Army training establishments should seek to integrate similar context specific training packages into the training schedule. Apart from the obvious performance-enhancing benefits, such training may serve to reduce and reduce the high incidence of maladaptive responses of combat-related stress disorders in service personnel. Indeed, in an effort to increase the psychological strength and positive performance of its own service personnel, the U.S. Army has already established the comprehensive soldier fitness (CSF) program and the mental resilience trainer (MRT) course.

Limitations of the Thesis

One of the main limitations of the thesis is that all of the studies were conducted in a male only environment, which limits generalisation to other populations. Although this is unfortunate, the purpose of the thesis was to explore mental toughness in an infantry training environment. While research in the sports context has provided a wealth of evidence demonstrating the positive effect of psychological skills usage in relation to performance with different genders and age groups (Hanton, Mellalieu, & Hall, 2004; Kress & Statler, 2007; Patrick & Hrycaiko, 1998; Sheard & Golby, 2006; Thelwell & Greenlees, 2001), the same cannot be said for the findings relating to punishment and/or the threat of punishment. While earlier research has been conducted into discipline and punishment in organizations in the 1980s, the most recent example in recent years was Bell et al.'s (2013) study in a sporting context. However, even that study was conducted with male athletes; interestingly, of a similar age to the participants used in the current thesis. Future research should seek to re-examine the findings from this study in other domains and contexts relating to the use of punishment in relation to mental toughness development (e.g., sport, mixed gender military training establishments, junior soldier training establishments).

Another limitation, which in some respects is also a strength (discussed in next section), is that the thesis utilized only field studies. While the key strength of field research is that it is carried out in the real world with real world demands, there are some key limitations that should be considered (Burgess, 1984). Unlike laboratory experiments there is no control over some of the extraneous variables that may influence the results of the study (e.g., Rosenthal & Jacobson, 1968). Secondly, field studies are difficult to replicate because it is unlikely that exactly the same conditions will be in place when the experiment is repeated (e.g., weather, key personnel). In field research, it is also more likely that the Hawthorne effect may be present, where participants behave differently when they know they are being observed (Gillespie, 1991), thereby potentially undermining the validity of the results

No qualitative studies were included in the thesis. It could be reasonably argued that by not conducting some sort of qualitative study, all available research techniques have not been used. Qualitative research methods can provide a richer, more in depth, picture whilst providing a better understanding of complex phenomena (e.g., Conger, 1998). That having been said, the initial stages of Chapter 2 included focus groups with context experts (i.e., recruit trainers, senior military personnel) to identify an item pool of stressors typically experienced by recruits in training (e.g., pressure to perform well, fatigue, punishment). While not qualifying as qualitative research per sé, it did require discussion with subject matter experts in the field of military training.

Main Strengths of the Research Programme

Despite the limitations of the thesis, there are a number of notable strengths.

Although as discussed above, the use of field studies could be considered a weakness, research in field settings may also be considered one of the main strengths of the thesis. The participants in this thesis faced an array of real-life stressors associated with a mentally and physically challenging military training environment. In particular, personal performance was measured by ecologically valid measures of performance and failure to perform to the required standard held real consequences for the participants. For example, punishment and the threat of punishment was not manufactured or manipulated for the study but a natural occurrence in the environment. One could argue that mental toughness is not developed under the sterile environment of laboratory conditions, but in the real world with the array of emotion inducing stressors that cannot realistically be created in the laboratory.

A further strength of the current research programme was that it involved a variety of different study designs, including; measurement, experimental, and longitudinal studies. In all, the studies used a variety of different analytic techniques including; bivariate correlation, regression, mixed-model analysis of variance and multivariate analysis of variance, and multilevel modelling. Confirmatory factor analysis techniques were also utilised to assess model fit. Indeed two different approaches to CFA were used; in Chapter 3, maximum-likelihood chi-square testing using both Lisrel (Jöreskog & Sörbom, 2006) was used, while for the intervention study in Chapter 4, Bayesian analysis using Mplus. (Muthen & Muthen, 2012) was used. This has given the candidate a broader understanding of research design and applied statistics.

Another strength to the study is from a pragmatic perspective. The researcher's personal experience in this particular area of study allowed an understanding of the unique context of the study, including the nuances of the social and historical context of the organization and the recruits' personal exeriences (Giacobbi, Poczwardowski, & Hager, 2005). Having served for 25 years in the army (at the start of the project), the candidate had considerable knowledge of the participant population and the environment. Indeed, a significant amount of the candidate's service was spent in the training environment, from transitioning through basic training himself (including attending P-Company), to training recruits, noncommissioned officers and officers. This provided a valuable existing knowledge of the organisation within which the research was conducted. This knowledge was particularly useful when conducting the intervention with the Para recruits, having walked in their boots, so to speak. Furthermore, as far as conducting the intervention went, this also gave the candidate a great deal more credibility with the recruits than a civilian researcher/consultant would have had. In the candidate's experience, external consultants can be viewed with scepticism and suspicion, particularly when introducing new ideas and having not experienced what they are going through.

Summary of Future Directions

The thesis has gone some way toward furthering Bell and colleagues' (Bell et al., 2013) research by helping to identify which components of their intervention had the most impact on promoting mentally tough behaviour in young athletes. It is clear from the results that, when isolated and measured separately, all of the components appeared to have an important role to play. Study 2 confirmed the important role of the use of appropriate punishment and transformational leadership behaviours. It is possible that in Bell et al.'s study, it was individual consideration and inspirational motivation that played the biggest role. Further, Study 3 confirmed that the delivery of a PST package promotes the development of mentally tough behaviour and has an impact on performance in a high-pressure training environment. Results from Bell et al.

al.'s (2013) study, supported by the work of Beattie et al. (2017) also showed that reward and punishment sensitivities predicted something different than posited by rRST (Gray & McNorton, 2000). That is, punishment sensitivity was associated with higher levels of performance when reward sensitivity was low. Hardy et al. (2014) posit that this is because punishment sensitive individuals are predisposed to pick up threat early, thereby providing them with the time to plan effective responses to highpressure situations (e.g., competition). Measuring reward and punishment sensitivity in recruits in basic training would be a worthwhile endeavor to examine whether those results were replicated in a non-sport context. Indeed, this would be particularly pertinent in combat situations where the threat is potentially a threat to one's life

The thesis has highlighted some issues where other future research would be warranted. Firstly, in line with one of the limitations of the thesis, in that the studies were all conducted in an all male military training environment. While at the time of data collection, the British Army precluded females from serving in infantry units, other training establishments contain mixed cohorts of recruits. Therefore, it would be prudent to conduct similar research with mixed gender cohorts to determine whether the effects remain the same, or moderated by gender. When the opportunity arises, it would also be a worthwhile endeavour to try and replicate the findings in mixed gender infantry training cohorts.

Secondly, while some research has demonstrated that mental toughness may indeed be unidimensional in nature, more research on the potential multidimensional nature of the construct in a military context is warranted. For example, it may be possible to delineate the types of stressor into clusters such as physical pressure, social pressure, or ego threats and so on. Indeed, this would also allow an examination of whether individuals respond differently to different types of stressor. While some promising short-term effects were evidenced as a consequence of the intervention in Chapter 4, the long-term effects remain unknown. Future research should seek to measure the continued effects on performance, perhaps even in the operational context, for soldiers who have been exposed to psychological future research should seek to identify whether the increased levels of mental toughness derived from the psychological skills training are maintained over time.

Conclusion

This thesis has addressed some of the issues surrounding mental toughness research. Firstly, while the attempts to develop mental toughness remain a complex undertaking involving multiple mechanisms and sources of influence (Anthony et al., 2017), further evidence has been provided for the utility of a context specific, single factor measure of mentally tough behaviour. Moreover, support was provided for Gucciardi and colleagues' (Gucciardi, Jackson et al., 2015) contention that the brevity of a short, single-factor measure would prove to have practical utility in research conducted in field settings.

Secondly, support has been provided for the potential benefits of the threat of punishment already existing in many organizations but, in particular, in the military, providing it is used in the correct manner and is augmented with the appropriate supporting behaviour on behalf of the instructor.

Finally, quantitative evidence has been provided for the association between psychological skill usage and mentally tough behaviour. Moreover, Study 3 has provided evidence for the potential benefits in teaching military recruits how to use specific psychological skills to cope with the physical and mental demands of high performance achievement.

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APPENDIX A Chapters 2, 3 & 4: Study Informed Consent Form

Bangor University SCHOOL OF SPORT, HEALTH AND EXERCISE SCIENCES FORM 2 – Informed Consent to Participate in a Research Project or Experiment

1		i de la constante de	
	1	Title of project	A Study into Mental Toughness in Military Training
	2	Name and e-mail address(es) of all researcher(s)	Prof Lew Hardy: <u>pes002@bangor.ac.uk</u> Dr Calum Arthur: <u>c.arthur@bangor.ac.uk</u> James Fitzwater: <u>pepc1f@bangor.ac.uk</u>

Please tick boxes

- I confirm that I have read and understand the Information Sheet dated **Day Month, Year** for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
- I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason, without my medical care or legal rights being affected.
- I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. If I do decide to withdraw I understand that it will have no influence on me as a recruit at ITC.
- I understand that I may register any complaint I might have about this experiment with the Head of the School of Sport, Health and Exercise Sciences, and that I will be offered the opportunity of providing feedback on the experiment using the standard report forms.

I agree to take part in the above study.

Name of Participant		
Signature	Date	
Name of Person taking consent	James Fitzwater	
Signature	Date	

APPENDIX B Military Training Mental Toughness Inventory

	Military Training Mental Toughness Inventory								
Inst Pla	Instructor Age: <u>N</u> Time in Army: <u>yrs</u> Time at ITC:mths Platoon: Section: <u>m</u>								
Stu	Student Army Number:Weeks under your instruction:								
Ple The leve dur thir	Please think about each recruit and how he GENERALLY performs during training. The following questions ask you to rate how often the recruit is able to maintain a high level of personal performance , even when he is faced with demanding situations during training. Please consider each scenario individually and circle the number you think is most appropriate.								
<u>HE </u>	IS ABLE TO MAINTAIN A HIGH LEVEL OF PERSONAL PERFOR	RMANCE		EV	EN WH	IEN:			
		Neve	r	S	ometi	mes		Always	
1	His recent performances have been poor.	1	2	3	4	5	6	7	
2	He is in pain (e.g., associated with high levels of physical effort).	1	2	3	4	5	6	7	
3	The conditions are difficult (e.g., on exercise).	1	2	3	4	5	6	7	
4	He has been reprimanded/punished	1	2	3	4	5	6	7	
5	He has not had much sleep	1	2	3	4	5	6	7	

Ŭ		1	2	5	•	5	0	,
6	He is under pressure to perform well (e.g., critical assessments/ being observed)	1	2	3	4	5	6	7

APPENDIX C

Chapter 2: Sport Mental Toughness Questionnaire

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

APPENDIX D Chapter 2: Confidence & Resilience Scales

Recruit Self-report Questionnaire-2								
Co wo	Compared to the most confident recruit you know, how would you rate your confidence in your ability to…					High		
1	Meet the challenges of training	1	2	3	4	5		
2	Perform the technical tasks necessary to be successful (e.g., weapons handling, map reading)	1	2	3	4	5		
3	Perform the field tasks necessary to be successful (e.g., field admin, section attacks)	1	2	3	4	5		
4	To concentrate well enough to be successful	1	2	3	4	5		
5	Perform under pressure	1	2	3	4	5		

Recruit Self-report Questionnaire-3

Com woul	pared to the most confident recruit you know, how d you rate your confidence in your ability to…	Low			High	
1	Bounce back from performing poorly and succeed	1	2	3	4	5
2	Bounce back from a major injury and succeed	1	2	3	4	5
3	To adapt to different training situations and be successful	1	2	3	4	5
4	Be consistently successful week-on-week	1	2	3	4	5

APPENDIX E

Chapters 3 & 4: Differentiated Transformational Leadership Inventory

	Recruit Self-report Questionnaire-1							
Му	section commander	Never	Rarely	Sometimes	Mostly	Always		
1	Is a good role model for me to follow	1	2	3	4	5		
2	Talks optimistically about the future	1	2	3	4	5		
3	Gets the section to work together for the same goal	1	2	3	4	5		
4	Gets me to rethink the way I do things	1	2	3	4	5		
5	Treats everyone as an individual	1	2	3	4	5		
6	Insists on only the best performance	1	2	3	4	5		
7	Leads by example	1	2	3	4	5		
8	Talks enthusiastically about what needs to be accomplished in training	1	2	3	4	5		
9	Believes each individual is important to the success of the section	1	2	3	4	5		
10	Challenges me to think about problems in new ways.	1	2	3	4	5		
11	Considers that I have different strengths and abilities from others	1	2	3	4	5		
12	Sets high standards for me to achieve	1	2	3	4	5		
13	Will not settle for second best	1	2	3	4	5		
14	Leads by "doing" rather than simply "telling"	1	2	3	4	5		
15	Encourages us to be team players	1	2	3	4	5		
16	Asks questions that make me think	1	2	3	4	5		
17	Helps me to develop my strengths	1	2	3	4	5		
18	Shows us that he expects a lot from us	1	2	3	4	5		

19	Develops a team attitude and spirit among the recruits	1	2	3	4	5
20	Spends time teaching and coaching me	1	2	3	4	5
21	Always emphasizes trying your best	1	2	3	4	5
22	Expresses confidence that standards will be achieved	1	2	3	4	5

	Leadership Reward & Punishment Questionnaire										
Ple	ase respond to the following statements	Never	Hardly ever	Sometimes	Mostly	Always					
1	My section commander gives me positive feedback when I perform well.	1	2	3	4	5					
2	My Section Commander gives me special recognition when I perform really well.	1	2	3	4	5					
3	If I performed at a level below that which I was capable of, my Section Commander would show his disapproval*.	1	2	3	4	5					
4	My Section Commander often blames me for things that I have no control over.	1	2	3	4	5					
5	Even when I perform poorly, my Section Commander often praises me.	1	2	3	4	5					
6	My Section Commander would quickly acknowledge an improvement in my performance	1	2	3	4	5					
7	My Section Commander is often displeased with my performance for no apparent reason.	1	2	3	4	5					
8	My Section Commander is just as likely to praise me when I do poorly as when I do well.	1	2	3	4	5					
9	My Section Commander shows his displeasure when my performance is below an acceptable standard*.	1	2	3	4	5					
10	My Section Commander praises me when my performance is above average.	1	2	3	4	5					
11	I often perform well in training and still receive no praise from my Section Commander. (R)	1	2	3	4	5					
12	My Section Commander is often critical of my performance even when I perform well.	1	2	3	4	5					
13	My Section Commander lets me know about it when I perform poorly*.	1	2	3	4	5					
14	My Section Commander personally compliments me when I do something outstanding.	1	2	3	4	5					

APPENDIX F Chapter 3: Leadership Reward & Punishment Questionnaire

15	Even when I perform poorly, my Section Commander does not get upset with me.	1	2	3	4	5
16	My Section Commander informs the PI Comd/PI Sgt or OC/CSM when I do something outstanding.	1	2	3	4	5
17	If I do well, I know my Section Commander will praise me.	1	2	3	4	5
18	My Section Commander would punish me if my performance was below standard*.	1	2	3	4	5
19	My Section Commander would do all that he could to help me pass training if my performance was consistently above average.	1	2	3	4	5
20	My good performance is often ignored by my Section Commander. (R)	1	2	3	4	5
21	When my performance is not good, my Section Commander points it out to me*.	1	2	3	4	5
22	I am often reprimanded by my Section Commander without knowing why.	1	2	3	4	5
23	My Section Commander often praises me, even when I don't deserve it.	1	2	3	4	5

* Contingent punishment items retained for analysis.

	Recruit Self-report Questi	onn	aire	-2		
Ple	ease respond to the following statements	Not at all	Probably not	Occasionally	More than likely	Most Definitely
1	If I performed at a level below that which I was capable of, my Section Commander would show his disapproval.	1	2	3	4	5
2	My Section Commander would show his displeasure if my performance was below an acceptable standard.	1	2	3	4	5
3	My Section Commander would let me know about it if I performed poorly.	1	2	3	4	5
4	My Section Commander would punish me if my performance was below standard.	1	2	3	4	5
5	If my performance was poor, my Section Commander would point it out to me.	1	2	3	4	5

APPENDIX G Chapter 3: Threat of Punishment Questionnaire

Items not retained for analysis after CFA.

If I did not put in enough effort, my section commander would reprimand me.
If I was poorly turned out, my section commander would put me on show parade
If my locker layout was not of a high standard, my section commander would
If I perform poorly in training, I might be backsquadded
If I perform poorly, my section commander would threaten to back-squad me.
If I failed to turn up on time, I would be punished.

APPENDIX H

Chapter 4: Test of Performance Strategies Questionnaires

IDENTIFICATION OF PERFORMANCE STRATEGIES⁹ (Training)

Rat	e how often you used the following strategies during training	Never	Rarely	Sometimes	Often	Always
1	I set realistic but challenging goals for myself in training.	1	2	3	4	5
2	I set goals to help me achieve more in training.	1	2	3	4	5
3	I say things to myself to help my performance in training.	1	2	3	4	5
4	During training, I visualize successful past performances.	1	2	3	4	5
5	My attention wanders during tasks in training.	1	2	3	4	5
6	I practise using relaxation techniques during training.	1	2	3	4	5
7	During training, I have thoughts of failing some of the training objectives.	1	2	3	4	5
8	Before doing something, I rehearse my performance in my mind during training	1	2	3	4	5
9	I use some of my training time to work on relaxation techniques.	1	2	3	4	5

⁹ To avoid recruits' perceptions that this questionnaire was just another of many formative and summative tests conducted during training, the name of the TOPS questionnaire was amended to identification of Performance Strategies.

10	I use self-talk effectively during training.	1	2	3	4	5
11	I am able to control distracting thoughts during training.	1	2	3	4	5
12	I get frustrated and emotionally upset when I don't perform well during training.	1	2	3	4	5
13	During training, I can allow the whole skill or movement to happen naturally without concentrating on each part (e.g., weapon handling, shooting, drill).	1	2	3	4	5
14	During training, when I visualize my performance, I imagine what it will feel like.	1	2	3	4	5
15	During training, I focus my attention effectively.	1	2	3	4	5
16	I motivate myself to work hard during training by using positive self-talk.	1	2	3	4	5
17	I have trouble maintaining my concentration during long tasks/events during training.	1	2	3	4	5
18	I talk positively to myself to get the most out of training activities	1	2	3	4	5
19	I have very specific goals for training.	1	2	3	4	5
20	I don't set goals during training; I just go out and do it.	1	2	3	4	5
21	I can control my emotions when things are not going well during training.	1	2	3	4	5
22	During training, when I visualize my performance, I imagine watching myself as if on a video replay.	1	2	3	4	5

23	I keep my thoughts positive during training.	1	2	3	4	5
24	I imagine failing basic training.	1	2	3	4	5
25	I can psych myself to perform well during training.	1	2	3	4	5
26	I am able to perform skills during training without having to consciously think about them.	1	2	3	4	5
27	During training I use relaxation techniques to improve my performance.	1	2	3	4	5
28	I need to think about each move in detail in order to successfully execute skills (e.g., skill at arms, drill).	1	2	3	4	5
29	My emotions keep me from performing my best during training.	1	2	3	4	5
30	I have difficulty getting into an ideal performance state during training.	1	2	3	4	5
31	My self-talk during training is negative.	1	2	3	4	5
32	I can get myself "up" if I feel physically and mentally flat during training?	1	2	3	4	5
33	During training I can perform automatically without having to consciously control each movement of a particular skill.	1	2	3	4	5
34	My training suffers if something upsets me during training?	1	2	3	4	5
35	I practice relaxation techniques in my spare time	1	2	3	4	5

36	I can get my intensity levels just right during training.	1	2	3	4	5

IDENTIFICATION OF PERFORMANCE STRATEGIES (P-Company)

Rat duri	e how often you used the following strategies ing P-Company	Never	Rarely	Sometimes	Often	Always
1	During P-Company I set specific goals for each event.	1	2	3	4	5
2	My self-talk during P-Company was negative.	1	2	3	4	5
3	During P-Company, I had thoughts of failure.	1	2	3	4	5
4	I visualized each event on P-Company going exactly the way I wanted it to go.	1	2	3	4	5
5	I had specific cue words or phrases that I said to myself to help my performance during P- Company.	1	2	3	4	5
6	After each event, I evaluated whether I achieved my goals.	1	2	3	4	5
7	I set very specific goals for P-Company.	1	2	3	4	5
8	I kept my thoughts positive during P-Company.	1	2	3	4	5
9	I said things to myself during P-Company to help my performance.	1	2	3	4	5
10	Before each event on P-Company, I rehearsed how it would feel in my mind.	1	2	3	4	5
11	I used self-talk effectively during P-Company.	1	2	3	4	5
12	I set personal performance goals for each event on P-Company.	1	2	3	4	5
13	I imagined what I needed to do before each event on P-Company.	1	2	3	4	5
14	I imagined failing some events during P- Company.	1	2	3	4	5
15	I said things to myself during events to help me to keep going during P-Company.	1	2	3	4	5
16	I rehearsed my performance for each event in my mind during P-Company.	1	2	3	4	5

17	My emotions kept me from performing my best on P-Company.	1	2	3	4	5
18	My emotions got out of control under the pressure of P-Company.	1	2	3	4	5
19	During P-Company I was able to let each of the events happen without having to concentrate on them.	1	2	3	4	5
20	I used relaxation techniques to cope with the nerves/tension of P-Company	1	2	3	4	5
21	I was able to get myself physically and mentally ready to perform each event on P-Company.	1	2	3	4	5
22	I had difficulty with my emotions during P- Company.	1	2	3	4	5
23	I had difficulty controlling my emotions if I had a poor event on P-Company.	1	2	3	4	5
24	My attention wandered on events during P- Company.	1	2	3	4	5
25	I was able to control distracting thoughts during P-Company.	1	2	3	4	5
26	I was able to 'psych' myself to perform well during P-Company.	1	2	3	4	5
27	I used relaxation techniques during P-Company to improve my performance.	1	2	3	4	5
28	I was able to perform on P-Company without having to consciously think about it.	1	2	3	4	5
29	If I started to struggle during P-Company, I used a relaxation technique.	1	2	3	4	5
30	I was able to get my intensity levels just right for P-Company.	1	2	3	4	5
31	I was able to trust my body to perform effectively during P-Company.	1	2	3	4	5
32	I relaxed myself before each event to prepare myself.	1	2	3	4	5
33	During P-Company, I was sufficiently prepared to be able to perform on automatic pilot.	1	2	3	4	5
34	I was able to get myself "up" if I was feeling flat during P-Company.	1	2	3	4	5
35	I focused my attention only on the event I was on during P-Company	1	2	3	4	5

36	I had trouble maintaining concentration during P- Company.	1	2	3	4	5	
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APPENDIX I Summary of P-Company Events

Table H.1.Description of P-Company Events

P-Company Event	Event Description
10-miler	A 16 km loaded march conducted as a squad over undulating terrain, carrying a16 kg back-pack and a rifle weighing 4. 8kg, to be completed in under 1 hr: 50 min.
Trainaisium	A unique aerial assault course set 20 m above the ground, designed to test a recruit's ability to overcome fear and follow simple orders at considerable height. This is the only event that is a straight pass or fail. Failure to complete the trainaisium means a recruit is withdrawn from P-Company.
Log race	Teams of 8 men carry a log 60 kg log over 3.1 km of undulating terrain, wearing helmets and webbing. Commonly regarded as one of the hardest events on P-Company, where the ability to overcome pain and fatigue is paramount. 6 points are awarded for completing the course, while up to 4 points are subjectively awarded for determination, aggression and teamwork.
Steeplechase	A 2.9 km cross-country run, culminating with an assault course, to be completed in 19 min or less, for 10 points, after which candidates lose one point for every 30 sec over 19 min.
2-miler	A 3.2 km run over undulating terrain, carrying a 16 kg back-pack, rifle, combat jacket, and helmet. To be completed in 18 min or less for 10 points, after which recruits lose one point for every 30 sec over 18 min.
Milling	Recruits are given 60 seconds to demonstrate determination and controlled aggression against an opponent of similar weight and build, wearing head protection, gum shields and boxing gloves. Blocking and dodging punches result in points deduction. Neither winning or losing are pre-requisites of scoring high points, rather recruits ability to keep moving forward and punching regardless of what the opponent is doing to him.
20-miler	A 32 km loaded march conducted as a squad over undulating terrain, carrying a16 kg back-pack and a rifle weighing 4. 8kg, to be completed in under 4 hrs: 20 min.
Stretcher race	Teams of 14-16 recruits carry an 80kg steel 'stretcher' over 8.0 km of undulating terrain, wearing a helmet, webbing and a slung rifle. No more than four recruits carry the stretcher at any given time, changing round at regular intervals. 6 points are awarded for completing the course, while up to 4 points are subjectively awarded for determination, aggression and teamwork. With the log race, commonly one of the hardest events on P-Company

APPENDIX I Chapter 4 – Supplementary Analysis; Results with Outliers Retained

Results

Main Data Analysis

With the outliers (13) retained, 186 recruits were analysed ($M_{age} = 21.05$, SD 3.37($n_{control} = 94$; $M_{age} = 21.32$, SD 3.21; $n_{experimental} = 92$; $M_{age} = 21.91$, SD 3.53). Attrition bias analyses were conducted to confirm that there were no differences between participants who completed P-Company ($n_{complete} = 186$) and those who did not ($n_{non-complete} = 36$). The results revealed no significant differences between the groups for any of the study variables: (a) psychological skills (F(4,208) = 1.90, p > .05); (b) mental Toughness (t(211) = 1.48, p > .05); (c) individual fitness (t(204) = ...37, p > .05); (d) composite leadership: (t(213) = .75, p > .05).

Psychological skills during training. A 2 (group) x 2 (time) mixed model MANOVA revealed a significant group x time interaction ($F(4, 181) = 8.32, p < .01, \eta_p^2$ = .18, observed power = 1.0). Univariate follow up tests revealed significant group x time interactions in the use of goal-setting ($F(1, 184 = 17.14, p < .01, \eta_p^2 = .09$, observed power = .99), relaxation ($F(1, 184) = 15.55, p < .01, \eta_p^2 = .01$, observed power = .98), self-talk ($F(1, 184) = 14.36, p < .01, \eta_p^2 = .07$, observed power = .97), and imagery ($F(1, 184) = 4.26, p < .05, \eta_p^2 = .02$, observed power = .54).

Eight Bonferroni corrected paired sample t-tests (.05/8 = .006) revealed that in the control group, goal-setting (t(93) = -.87, p > .05), relaxation (t(93) = .96, p > .05), self-talk (t(93) = -.94, p > .05), and imagery (t(93) = -.99, p > .05) did not differ from pre-test to post-test, while significant differences were evidenced in the experimental group for goal-setting (t(91) = -6.48, p < .01), relaxation (t(91) = -4.87, p < .01), self-talk (t(91) = -4.10, p < .01), and imagery (t(91) = -3.85, p < .01). This indicates that the interactions were likely caused by an increase in the use of all four psychological skills during training by

the experimental group between pre and post-test, while no differences were evidenced in the control group. Post-hoc power analysis revealed medium to large ES (dz = .41 - .67) and strong statistical power (1- error prob = .99 - 1.0) for the experimental group, but small ES (.09 - .10) and weak statistical power (.25 - .29) for goal-setting, self-talk, and imagery for the experimental group. Consequently, a visual inspection of the central and non-central distribution plots was conducted, which confirmed non-significant differences between pre and posttest.

Psychological skills during P-Company. A one-way MANOVA revealed a significant multivariate effect for group in the use of psychological skills during P-Company ($F(4, 181) = 3.21, p < .05, \eta^2_p = .07$, observed power = .82). Univariate follow-up tests revealed significant group effects in the use of relaxation ($F(1, 184) = 10.36, p < .01, \eta^2_p = .06$, observed power = .90), while no main effect was observed with goal-setting ($F(1, 184) = .89, p > .05, \eta^2_p = .01$, observed power = .16), self-talk ($F(1, 184) = 1.75, p > .05, \eta^2_p = .01$, observed power = .26) or imagery ($F(1, 184) = 3.60, p > .05, \eta^2_p = .02$, observed power = .47). Examination of the cell means indicated that all these effects were due to the experimental group making more use of relaxation during P-Company than the control group.

Mental Toughness. A 2 (group) x 2 (time) mixed-model ANOVA revealed a significant group x time interaction (*F* (1, 184) = 4.44, p < .05, $\eta^2_p = .02$, observed power = .55). Four Bonferroni corrected paired sample t-tests (.05/4 = .0125) revealed that mental toughness scores for the control group (t(93) = .77, p > .05) and the experimental group (t(91) = -2.16, p = .033) did not differ from pre-test to post-test (given the more conservatively corrected p value). Post-hoc statistical power analyses yielded satisfactory statistical power for the experimental group (1- β error prob = .87) with a small ES (dz = .23), but weak statistical power (1- β error prob = .19) and a small ES (dz = .08) for the control group. To avoid the risk of a Type-1 error, a visual inspection of the plot of central

and non-central distributions was conducted, which confirmed the non-significant difference between pre and post-test for the control group with an alpha of .05.

An independent sample t-test revealed no significant difference between the two groups at pretest (t(184) = -1.82, p > .05) and a significant difference at post-test (t(184) = -3.45, p < .01), indicating that the interaction was caused by an increase in mental toughness in the experimental group between pre and posttest, with no change having occurred in the control group. Post-hoc statistical power analyses yielded satisfactory statistical power (1- β error prob = .94) and a medium ES (dz = .52) for differences between the groups at week 20, but weak statistical power (1- β error prob = .43) and a small ES (dz = .26) for the difference between groups at week 16. To avoid the risk of a Type-1 error, a visual inspection of the plot of central and non-central distributions was conducted, which confirmed the non-significant difference between pre and post-test for the control group with an alpha of .05.

P-Company Performance. A one-way ANCOVA, with individual fitness prior to P-Company and leadership climate entered as covariates, revealed that individual performance on P-Company was significantly higher in the experimental group than the control group (F(1, 183) = 6.85, p = .01, $\eta^2_p = .04$, observed power = .74). However, was less of a difference in P-Company pass rates was evidenced than in the original analysis with the outliers removed (2.9%: Exp = 81.1%; Cont = 86.2%).

Discussion

While the results remained broadly the same as the analyses with the outliers removed (see Chapter 4), retaining the outliers had an impact on the results of the use of psychological skills during P-Company. Specifically, the univariate results for imagery became non-significant (F(1, 184) = 3.60, p > .05. Importantly, the significant differences

for the other main findings remained unchanged, although effect sizes and power were reduced in some cases.