Title: A review and conceptual re-examination of mental toughness: Implications for future researchers

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Abstract

This paper provides a review of mental toughness research and examines the major conceptual concerns that are evident in current mental toughness literature. Despite more rigorous scientific approaches to the study of mental toughness, a number of limitations are apparent: These include the assumption that elite or super elite performers are mentally tough (failure to provide objective measures), focusing research solely on elite or super elite performers, appearing to conceptualise mental toughness in absolute rather than relative terms, and ignoring contextual differences. Comparisons are made with research developments in the related concept of hardiness. It is argued that more innovative approaches to research are required to further develop knowledge. This should include more experimental studies, longitudinal research, psychophysiological approaches, and testing the influence of mental toughness in contexts outside sport performance. Further efforts to understand how mental toughness develops are encouraged. With recent advances in instruments to measure mental toughness, further quantitative research is deemed appropriate. The efficacy of proposed methods of enhancing mental toughness such as environmental manipulations, and mental skills training approaches need to be evaluated if the gap between theoretical research and practice is to be bridged.
Introduction

Although the concept of mental toughness in sport is not new, and applied texts devoted to the development of mental toughness have existed for some time (i.e. Bull, Albinson, & Shambrook, 1996; Goldberg, 1998; Loehr, 1986, 1995), it was not until relatively recently that more rigorous scientific approaches to the study of this important construct have been evident (Jones, Hanton, & Connaughton, 2002, 2007). The surge in research interest clearly indicates the importance which sport psychologists, coaches and athletes attach to the concept of mental toughness because of the potential relationship with successful performance (cf. Crust, 2007).

In the past decade, scientific evidence has ostensibly led to a greater understanding of mental toughness, although agreement concerning the conceptualisation, definition, and development of mental toughness has been slow to emerge. Bull, Shambrook, James, and Brooks (2005, p211) take a pragmatic stance by accepting the conceptual ambiguities which are, ‘bound to exist when trying to establish all encompassing definitions of mental toughness in sport’. As research interest appears to be increasing there is a need to evaluate progress and to focus research efforts to enable efficient acquisition of new knowledge.

This paper aims to review mental toughness research, re-examine some of the underlying conceptual and methodological issues, identify gaps in the knowledge domain and provide appropriate direction for future researchers. With apparent increased knowledge of what mental toughness is (Clough, Earle, & Sewell, 2002; Jones et al., 2007), the associated attributes of mentally tough performers (Fourie & Potgieter, 2001; Jones et al., 2002) and emerging evidence of how mental toughness is developed and maintained (Bull et al., 2005; Connaughton, Wadey, Hanton, & Jones, 2008), there is a need to carefully consider how research should proceed.
Replication or Innovation?

In relation to the study of anxiety in sport, Nesti (2004) suggested future researchers faced an important decision: to continue using the same methods and asking the same questions, thereby essentially replicating past research; or choose new approaches in an attempt to advance knowledge. With a plethora of research studies using qualitative methods and elite athletes from either generic athletic samples or mainstream sports to identify the attributes of mentally tough athletes (Bull et al., 2005; Fawcett, 2005; Fourie & Potgieter, 2001; Gordon, Gucciardi, & Chambers, 2007; Jones et al., 2002, 2007; Thelwell, Weston, & Greenlees, 2005) it is reasonable to consider the value of pursuing this particular line of enquiry. It will be presently argued that researchers need to adopt more innovative approaches to the study of mental toughness. Just as mentally tough athletes seek challenges and are focused on personal growth, mental toughness researchers need to embrace the challenge to be innovative, rather than continue to replicate past research; or as Maddi (2004) might suggest, have the courage to choose the future rather than the past.

Dominant Perspectives

The work of Jones et al. (2002; 2007) has undoubtedly made a significant contribution to the current understanding of mental toughness in sport. In contrast to previous investigations, these studies demonstrated a more rigorous, scientific approach. Jones et al. (2002, 2007) studied mental toughness within the guiding framework of personal construct theory (Kelly, 1955) and employed qualitative methods using elite, and super elite performers (Olympic gold medallists and world champions) from a variety of sports. To their credit, these researchers also included coaches and sport psychologists within their sample in order to gain a broader perspective. A three-stage procedure was adopted in both studies which progressed from a small focus group
three participants), to individual interviews and follow-up interviews to confirm the definitions of mental toughness and the attributes of mentally tough performers that emerged during the initial stages of the research. Jones et al. (2007, p. 247) defined mental toughness as:

Having the natural or developed psychological edge that enables you to, generally, cope better than your opponents with the many demands (competition, training, lifestyle) that sport places on a performer and, specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure.

Jones et al. (2007) reported thirty attributes of mental toughness which were presented within four separate dimensions. These four dimensions consisted of Attitude / mindset (belief, focus), Training (using long-term goals as the source of motivation, controlling the environment, pushing yourself to the limit), Competition (handling pressure, belief, regulating performance, staying focused, awareness and control of thoughts and feelings, controlling the environment) and Post-competition (handling failure, handling success).

The definition and conceptualisation of mental toughness proposed by Jones et al. appears to have achieved significant support from other researchers who have adopted similar qualitative approaches, and studied elite, mainstream sports participants (Bull et al., 2005; Thelwell et al., 2005). However, it is necessary to be cognisant of findings that offer alternative perspectives on mental toughness, as previous research has not universally supported the findings of Jones et al. Despite advances, a number of theoretical and methodological issues require greater clarification.

Limitations and Theoretical Problems
While the work of Jones et al. clearly moves towards a more thorough, multidimensional understanding and conceptualisation of mental toughness, criticisms remain. Crust (2007) highlighted concerns with using small numbers in the initial focus group stage of the research, since researchers and theorists have consistently recommended between 6 and 8 participants in focus group research (Bloor, Frankland, Thomas, & Robson, 2001). Such group sizes enable individuals to sufficiently challenge one another, as well as re-consider and re-evaluate their own positions in order to move beyond individual interpretations (Kitzinger, 1995). While it could be argued that the comprehensive nature of the second and third stages of the Jones et al. (2002; 2007) research negates such concerns, the focus group itself does appear rather limited, given that it is the foundation of the research.

Furthermore, it could be argued that the emerging attributes of mental toughness are little different to those found previously (Loehr, 1995; Fourie & Potgieter, 2001). Another concern, highlighted by Middleton et al. (2004a) is that the definition of mental toughness presented by Jones et al. does not represent what mental toughness is, but rather what mental toughness can allow athletes to do. There is also an underlying assumption that elite and super elite participants will be mentally tough, with no objective measure of mental toughness attempted to verify this. Jones et al. (2007) justify their approach on the basis that mental toughness should be related to successful outcomes, and interestingly because ‘there is no validated measure of mental toughness’ (p.244). Given that a number of instruments have been developed to measure mental toughness, and have been found to be valid and reliable (MT48 – Clough et al., 2002), and possess adequate psychometric properties (PPI-A – Golby, Sheard, & van Wersch, 2007) this statement is inaccurate and misleading. Finally, despite the research being
guided by personal construct theory, the work is not underpinned by any extant theories of personality or development.

While the work of Jones et al. (2002; 2007) has sought to address the conceptual weaknesses of previous studies, and thus reduce the conceptual confusion, ambiguity and contradictions of previous work, there is an alternative view that has been overlooked: such problems in previous research might, in part, have been a reflection of individual difference and the fact that the term ‘mental toughness’ may have various idiosyncratic meanings to different athletes in different sports (cf. Fawcett, 2005).

While numerous attributes have been found to consistently represent mental toughness (cf. Crust, 2007) in a variety of settings, other attributes are less frequently reported and are not consistent with the findings of Jones et al. (i.e. mental self-concept, religious convictions, task familiarity, ethics, self-knowledge, patience, flexibility, and sociability).

Little attention appears to have been given to the proposal of Bull et al. (2005), who suggested different forms of mental toughness, and differentiated between ‘final putt’ or pressure mental toughness; ‘endurance’ mental toughness or mental toughness in relation to heavy training schedules; and mental toughness in circumstances of extreme physical danger. While an over-arching framework of mental toughness, with central attributes has recently been presented (Jones et al., 2007), in practical terms, the mental toughness required of a snooker player is not likely to be congruent to that of a rower, or a mountaineer. If the ultimate outcome is to intervene and help athletes to develop higher levels of mental toughness, it would appear that ignoring such differences is to the detriment of knowledge development, and this is dangerous as it might lead researchers down a metaphoric ‘blind alley’.
Another problem with the dominant conceptualisation of mental toughness is the predominant focus on elite and super elite sports participants and coaches (i.e. Bull et al., 2005; Fourie & Potgieter, 2001; Jones et al., 2002; 2007; Thelwell et al., 2005). The implicit assumption seems to be that successful athletes must be mentally tough without any attempt to objectively evaluate the mental toughness of participants. It is quite conceivable that for many of the participants, that physical characteristics, abilities, or physiological factors were more influential in relation to success. Jones et al. (2007, p. 244) are quick to acknowledge that because their own definition of mental toughness ‘contains a dimension that relates to successful outcomes, mental toughness should be investigated in a sample of athletes who have achieved ultimate success in their respective sports’. While it is easy to agree that mental toughness includes an outcome dimension, it is difficult to conceive why mental toughness should only be studied with elite or super elite participants. This approach would appear restrictive given that successful outcomes are perhaps more appropriately conceived in relative, rather than absolute terms, reflecting what Bull et al. (2005) revealed as a ‘determination to make the most of ability’. Similarly, Loehr (1995) defined mental toughness in relative terms, describing the ability to consistently perform toward the upper range of ones talent and skill, regardless of competitive circumstances. Since athletes all have differing levels of ability, conceiving mental toughness in absolute, rather than relative terms appears to be problematic.

Furthermore, the definition of mental toughness presented by Jones et al. (2002; 2007) is not consistent with concepts such as self-efficacy, which emphasise the need for other non-psychological prerequisites when considering the relationship with successful outcomes (Bandura, 1986). Previous mental toughness researchers have also stressed the importance of both psychological and physical prerequisites (Fourie &
Potgieter, 2001). Although using elite and super elite performers to study mental toughness has intuitive appeal, there is a danger that mental toughness erroneously becomes a concept only attributable to such athletes.

**Qualitative and Quantitative Research**

In moving towards a clearer understanding of mental toughness it is important to consider the future role of qualitative and quantitative investigations. Undoubtedly, qualitative research methods have a significant role to play in acquiring knowledge of how mental toughness develops. However, while qualitative research has been instrumental in providing rich, descriptive interpretations, and have revealed mental toughness to be multidimensional, future researchers should also be encouraged to employ quantitative approaches to examine perceptual, affective, cognitive, and behavioural differences between athletes with differing levels of mental toughness.

Experimental research investigating aspects of the conceptualisation of mental toughness such as decision-making under pressure, performance consistency, or risk taking are becoming increasingly necessary. Indeed, in viewing the progress of related research from health psychology, the importance of quantitative research is evident in establishing relationships between hardiness and variables such as, blood pressure, self-care, coping, and performance (cf. Maddi, 2004).

Research by Clough and colleagues (Clough et al., 2002; Crust & Clough, 2005; Levy, Polman, Clough, Marchant, & Earle, 2006) using the MT48 and MT18 questionnaires has already established various perceptual and behavioural differences between participants with self-reported varying levels of mental toughness (cf. Crust, 2007). Furthermore, other researchers such as Golby and colleagues (Golby, Sheard, & Levallee, 2003; Golby & Sheard, 2004), and Gucciardi, Gordon, and Dimmock (2007) have also begun to move the study of mental toughness forwards by employing
quantitative methods. However, given that the predominant approach appears to be the use of self-report questionnaires, future researchers should look to use multi-source measures of mental toughness to help reduce the likelihood of socially desirable responding. Encouragingly, recent research in Australian football, comparing self-reported mental toughness to coach and parent evaluations using the authors own Australian Football Mental Toughness Inventory, found no evidence that football players were giving socially desirable responses (Gucciardi et al., 2007). While future refinements to existing measurement instruments are necessary (Crust, 2007), the recent advancements in this area appear promising and likely to encourage more objective testing.

Transferability

From a theoretical perspective, one of the most important aspects of mental toughness which researchers urgently need to establish is the concept of transference. Given that mental toughness is most often proposed to be a personality disposition (cf. Crust, 2007), it would seem reasonable to expect that high mental toughness would be demonstrated in various aspects of athletes' lives, and not just in their main sports. Indeed, it is difficult to conceive mental toughness as only applicable to sport, as many other competitive and pressured environments exist beyond sport (performing arts, business etc.). There is some evidence of broadening out the study of mental toughness already, with relationships found with effective lifestyle management and dealing with organisational stress (Fawcett, 2005).

Studies such as Jones et al. (2002, 2007) have used samples of athletes from a variety of different sports to better understand the concept of mental toughness. This approach appears to assume that mental toughness is a generic, multidimensional concept that is best understood by piecing together common perceptions of elite
athletes. However, participants in such investigations are primarily considered mentally
tough through being elite or super elite performers in respect of their own sport. To
advance knowledge of mental toughness, there needs to be attempts to consider how far
the concept impacts on perceptions, cognitions, affect, and behaviour, beyond the
individual’s primary sport performance. Does a professional soccer player, who has
high mental toughness, demonstrate mental toughness when faced with other life
challenges such as dealing with difficult inter-personal relationship issues, needing to
take action in an emergency situation, problem-solving, parenting, or even competing in
a charity endurance challenge? The key question is how do mentally tough individuals
cope with pressure and adversity outside of their own sport?

With the related concept of hardiness, a personality disposition discovered by
health psychologists to be an influential resistance resource when confronting stress
(Kobasa, 1979; Kobasa, Maddi, & Kahn, 1982; Maddi, 2004), it has been found that
hardy individuals are not just particularly effective at managing their work related
stress, but rather in managing all aspects of their lives (cf. Maddi, 2004). Kobasa et al.
(1982) emphasised the relationship between personality dispositions and coping,
suggesting that hardiness might influence coping, and this mechanism might be
responsible for buffering stress. More recently Maddi (2004) has described the positive
relationship between transformational coping and hardiness, with hardy individuals
more likely to diminish (rather than avoid) the threat of a potential stressor by
addressing not only the problem but also the emotions that it arouses. On this basis, and
as others have already pointed out (Crust, 2007; Nicholls & Polman, 2007), there is a
need to understand the relationship between mental toughness and coping, including the
evaluation of both cognitive appraisal, and action aspects. Are the same coping process
used by athletes in their particular sport, also employed when confronting stresses in
other contexts? Furthermore, understanding the influence of mental toughness beyond specific sports contexts has important implications for practitioners and researchers considering the best approach to developing mental toughness. If mental toughness is a broader personality disposition, then consistent with Gould, Dieffenbach, & Moffett (2002), cultural and environmental influences from both inside and outside of sport, and more general life based skills would likely be important in developing mental toughness.

Bridging the Gap between Theory and Practice

While it is important to establish a clear conceptualisation of mental toughness, and to understand how mental toughness develops, from an applied perspective, practitioners are most likely to be concerned with developing mental toughness in their athletes. One key question concerns the degree to which mental toughness is caught via environmental influences, or taught through training (Gordon et al., 2007). For some time, numerous texts have existed concerning what might broadly be called ‘mental toughness training’ (Bull et al., 1996; Goldberg, 1998, Loehr, 1995), although these texts appear to lack sufficient theoretical underpinning. Recently, some initial progress has been made in understanding how mental toughness develops through interviewing elite athletes, with evidence appearing to suggest a pivotal role for environmental factors (Bull et al., 2005; Connaughton et al., 2008; Gould et al., 2002). In their mental toughness pyramid, which was developed through the study of elite English cricketers, Bull et al. (2005) propose environmental influences provide the foundation of mental toughness development on the two key levels of upbringing and transition. In terms of upbringing, participants reported the importance of parental influence and childhood background. In relation to transition, the early part of a junior playing career was found
to be important because of exposure to tough environments (playing abroad, as an outsider) and providing opportunities to survive early setbacks (learning from failure).

Connaughton et al. (2008) studied the development of mental toughness in elite athletes in relation to Bloom’s (1985) subdivision of career phases (early, middle, later).

Findings provide further evidence of the importance of environmental influences, with various individuals (parents, coaches, siblings, senior athletes, sport psychologists etc.) contributing to development, and to social support networks, that extended beyond sport contexts. These researchers also suggested the importance of an appropriate motivational climate (enjoyment and mastery), which is likely to have important implications for transition periods as junior players develop, and attend training academies. Given the highly competitive nature of elite sport, research is needed to establish what type of climate is best suited to developing mental toughness in aspiring junior athletes. While the work of Connaughton et al. (2008) and much research in physical education contexts suggests the importance of promoting a mastery based climate, it is clear that elite sport is far more oriented towards outcomes and winning. It is therefore legitimate to consider what constitutes the most appropriate environment to enable the development of mental toughness. On the basis of ‘toughening-up’, the application of stress inoculation training, a widely used method in applied sport psychology (Clough et al. 2002), assumes that gradual exposure to stress (rather than avoidance) would be most appropriate. Research into physiological toughness also appears to support the notion that stress tolerance can be increased with intermittent exposure to stressors (cf. Dienstbier, 1989). Research focusing on the relationship between motivational climate and mental toughness would appear to be vital to evaluate whether the promotion of mastery climates in sports academies is the best preparation for the psychological demands of professional sport.
Future researchers should be encouraged to study the development of mental toughness in respect of established theories of development, such as Erikson’s Psychosocial Theory (1963). This theory might be particularly suited to the study of mental toughness given that Erikson’s most important contribution was considering the individual in context of both family and society, and by identifying the essential concerns of adulthood, including trust, identity, and competence (Wade & Tavris, 1996). The use of longitudinal research methods is needed to determine how mental toughness changes over time and to establish the crucial developmental periods.

While the influence of environmental factors on the development of mental toughness appears to have initial support, the role of traditional sport psychology interventions (mental skills training) is less clear. Bull et al. (2005, p.226) suggests that it ‘is also interesting to note that very little of the output relates directly to mental skills training’, and propose the integration of mental skills training into the appropriate environment rather than focusing on such techniques in isolation. Interestingly, there is evidence that interventions can be successfully used to develop hardiness (cf. Maddi, 2004), although as Crust (2007) highlights, the prototypical form of hardiness training used was clearly more holistic than most sport-based mental skills training approaches. Other evidence appears to show that such skills as goal-setting and self-talk have an important role in the development of mental toughness (Connaughton et al., 2008). With the emergence of instruments to measure mental toughness, there is scope for testing the impact of psychological interventions on mental toughness and this would certainly advance the knowledge base. Questionnaires such as the MT48 (Clough et al., 2002), which not only measure overall mental toughness, but also include measures of various subscales (Commitment, Challenge, Control – emotional and life, and Confidence – in abilities, and interpersonal) allow specific components of mental toughness to be
targeted, rather than applying more generic interventions. As such, case study research, focusing on the needs and developments of individuals, might be an ideal starting point in relation to advancing knowledge in this area.

Another important future direction of mental toughness research that might be used to bridge the gap between theory and practice is the identification of observable behaviours that are associated with mentally tough performers. Such behaviours are likely to be observed in both the approach of participants to practice and training sessions, and in competitive contexts. This work appears to have begun with Davis and Zaichkowsky’s (1998) study of mental toughness in ice-hockey. These researchers asked coaches, scouts and managers to rate players mental toughness in respect to: (1) adversity response (i.e. increased work rate), (2) over-achievement (exceeds usual performance under stress), (3) effort (consistency), (4) enthusiasm (encourages teammates), and (5) skill (subjective assessment of demonstrated ability). However, the results remained equivocal since no justification for the five listed categories was given, and no standardised performance / behavioural checklists were produced to allow quantifiable analysis. Despite this, if behavioural checklists could be established in specific sports, then coaches and psychologists might be able to work with players to promote such behaviours, and in team sports, use mentally tough players to cultivate such behaviour in others (perhaps most influentially in relation to younger, developing players). This is consistent with the findings of Connaughton et al. (2008) which identified the importance of vicarious experience and role models.

In related research involving social interactions, hardiness has been found to be associated with both giving and receiving encouragement, and various leadership behaviours (cf. Maddi, 2004). Further research into the related behaviours associated with mental toughness might also allow coaches to become more able to identify mental
toughness in relation to team recruitment, although such approaches must be cautiously
developed given past misuse of personality measures. A further additional benefit from
the development of behavioural checklists is the potential to add to multi-modal
measures of mental toughness and potentially establish more accurate and trustworthy
measurements.

Physiological Toughness

Another line of research that has important implications for the study of mental
toughness is provided by Dienstbier (1989) in his review of arousal and physiological
toughness. It would seem important to consider physiological toughness given that
researchers have considered physical toughness as a component of mental toughness
(Gucciardi et al., 2007) and other researchers have noted a relationship between mental
toughness and physical endurance / pain tolerance (Crust & Clough, 2005). Dienstbier
considered literature concerning human and non-human confrontations with stress
(defined by appraisals of threat or harm rather than of challenge). The observations that
Dienstbier made in regards to the interrelationship between arousal, performance and
personality would appear to be particularly pertinent to the concept of mental toughness.

Dienstbier (1989) reviewed a number of studies that reported relationships
between task performance and hormonal levels. Evidence from both non-human and
human studies showed that better performances across a variety of tasks appeared to be
associated with increased catecholamine levels and quicker return to baseline rates
following stressful manipulations. In turn, those participants who experienced greater
increases in catecholamine were also shown to be more socially adjusted, and to have
greater emotional stability (Johansson, Frankenhaeuser, & Magnusson, 1973), lower
levels of anxiety (Rauste-von Wright, von Wright, & Frankenhaeuser, 1981) and greater
adaptive capacity or stress tolerance (Roessler, Burch, & Mefferd, 1967). These same
characteristics appear in definitions and as attributes of mentally tough performers.

Dienstbier summarised these findings by stating that ‘the same manipulations that increase emotional stability and stress tolerance, also increase central and peripheral catecholamine availability’ (p. 86).

Another important aspect of Dienstbier’s (1989) work is the distinction he made in regards to different kinds of arousal; that is Sympathetic Nervous System-adrenal-medullary arousal (stimulates the release of the catecholamines adrenaline and nor-adrenaline) and pituitary-adrenal-cortical arousal (stimulates the release of cortisol).

High levels of cortisol, an important biomarker of stress reactivity (Clow, 2004) appears to be related to poor performance and defensiveness (Ursin, Baade, & Levine, 1978; Vaernes, Ursin, Darragh & Lambe, 1982). Evidence from both human and non-human studies suggest that high levels of cortisol are maintained by a lack of appropriate responses (Dienstbier, 1989). Increasing participant control and enabling participants to define the situation as ‘challenging’ prevents high levels of cortisol and depletion of catecholamines (Miller, 1980). Indeed, children who were found to cope more effectively with hospitalisation were shown to have lower cortisol levels (Knight, Atkins, Eagle, et al., 1979).

In relation to personality correlates, high cortisol levels have been found to be associated with anxiety, depression and neuroticism (Anisman & La Pierre, 1982) and with low self-esteem (Pruessner, Hellhammer, & Kirschbaum, 1999). Coping more effectively with stress appears to require an ability to suppress the cortisol response and to resist catecholamine depletion (Dienstbier, 1989). Evidence suggests the cortisol response to standardised stressors can be attenuated by cognitive behavioural interventions (cf. Clow, 2004). This finding could have important implications for
researchers wishing to evaluate the role of mental skills training on the development of mental toughness.

The sum of Dienstbier’s (1989) work was the proposal of four toughening manipulations that affect physiological mediators, which are consequently reflected in performance and temperament characteristics. These four manipulation are (1) early experience (early life exposure to stress), (2) passive toughening (intermittent exposure to stress that is equivalent to stress inoculation training), (3) active toughening (such as exercise) and (4) ageing (opposite effects than other three manipulations, reduces toughening). The second and third of these four proposed manipulations certainly suggests that appropriate interventions could result in ‘toughening up’.

On the basis of psychophysiological research, it might be hypothesised that a mentally tough individual would exhibit different patterns of reactivity to standardised stressors, than would a less tough individual. Specifically, it could be hypothesised that high levels of mental toughness would be characterised by increased arousal to meet the challenge (larger adrenaline increases) and the ability to cope with stressors more effectively (lower cortisol rates). Assessing the impact of mental toughness training on bio-markers of stress (i.e. cortisol) would also help to understand exactly how mental toughness operates. Moreover, the establishment of links between multi-source measures of mental toughness would help to establish more accurate measurement of mental toughness.

**Potential Drawbacks of being Mentally Tough**

The vast majority of research thus far, has considered mental toughness as a positive psychological construct, linked to successful outcomes. However, recent research does suggest some possible drawbacks to being mentally tough, especially in relation to recovery from injury. Levy et al. (2006) found support for previous research that
suggested mental toughness was associated with greater pain tolerance (Crust & Clough, 2005), but reported that participants with low mental toughness showed better adherence to clinic based rehabilitation activity. These researchers suggest this finding might be due to ‘high mentally tough individuals appraising their injury to be less severe and less susceptible to reoccur and thereby perceive compliance to clinic based activity to be less important’ (Levy et al., 2006, p. 252). On this basis, future researchers might consider testing whether mental toughness is associated with playing on while injured, and injury reoccurrence. There are fascinating arguments that pertain to the relationship between mental toughness and injury that will probably be more appropriately approached as research evidence develops. In essence, is mental toughness about playing on while injured, risking long-term damage, and potentially reducing team efficiency; or is it taking the difficult decision to stop training and competing, seeking medical support, focusing on adhering to a program of rehabilitation, and returning to action as soon as possible? With the ‘no pain, no gain’ philosophy that apparently pervades elite sport, this would appear to be an important question for future researchers.

Conclusion

While the study of mental toughness has clearly advanced through more rigorous recent studies (Bull et al., 2005; Jones et al., 2002; 2007) a number of research limitations and theoretical problems are evident. In the present paper it is proposed that the narrow focus on elite and super elite athletes is somewhat restrictive and that mental toughness should more appropriately be considered in relation to an individuals potential. Furthermore, it is argued that research which has assumed that elite and super elite athletes are mentally toughness with no objective measures sets a dangerous precedent. While qualitative research has undoubtedly facilitated greater understanding of what
mental toughness is, and how mental toughness develops, with advancements in appropriate psychometric measurement instruments, more quantitative studies are to be encouraged. Such research will help mental toughness research expand and avoid replication. The challenge that faces future researchers is to be innovative in regards to research methods, and explore mental toughness in broader contexts. It is unlikely that mental toughness is only relevant in the sport domain, so attention is needed to determine how mentally tough individuals behave in other areas of their lives. Since cognitive and physiological functioning are not discrete entities, researchers should be encouraged to explore the physiological correlates of mental toughness. In relation to the development of mental toughness, much more work is needed to determine the effects of environmental manipulations and skills training approaches to developing this important construct.

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