Development and preliminary validation of a mental toughness inventory for Australian football

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ABSTRACT

Objectives: This paper describes the development and preliminary evaluation of the Australian football Mental Toughness Inventory (AfMTI).

Methods: Confirmatory and exploratory factor analyses were employed to explore the factor structure of a pool of items designed to capture the key components of mental toughness in Australian football [Gucciardi, D.F., Gordon, S., & Dimmock, J.A. (2008). Towards an understanding of mental toughness in Australian football. *Journal of Applied Sport Psychology, 20*, 261–281.] Correlations between the four-factor inventory and flow, resilience, and social desirability were examined. The discriminant validity of the inventory was also assessed. Multisource ratings (self, parent, and coach) of the AfMTI were examined in experiment two.

Results: The AfMTI is a 24-item scale that measures four components of mental toughness in Australian football – thrive through challenge, sport awareness, tough attitude, and desire success. It was shown to have adequate internal reliability estimates across different raters ($\alpha = .70–.89$). Moderate correlations with flow and resilience were evidenced, while minimal correlations existed with social desirability. Multisource data were somewhat equivocal; correlational data suggested a disagreement between raters, whereas an ANOVA suggested agreement between raters.

Conclusions: Preliminary data on the factor structure, internal reliability, and construct validity of the AfMTI were encouraging. However, the factor structure, reliability, and validity of the AfMTI must be verified through further psychometric examinations before it can be considered a useful tool for measuring mental toughness in Australian football.

Introduction

The psychological factors involved in athletic performance have long been of interest to athletes, coaches, and sport psychologists. Empirical examinations have largely focused on individual psychological factors (e.g., confidence, motivation, attention, visualisation, and psychosomatic skills) and their influence on performance. More recently, researchers have adopted a holistic approach in which the whole and the interdependence of its parts are emphasised. This approach is none more evident than in research examining the construct of mental toughness. Although once considered a little-understood phenomenon (e.g., Jones, Hanton, & Connaughton, 2002), the knowledge base contributing to current conceptualisations of mental toughness now has a scent of scientific rigour owing to the efforts of several groups of researchers (e.g., Bull, Shambrook, James, & Brooks, 2005; Gucciardi, Gordon, & Dimmock, 2008; Jones, Hanton, & Connaughton, 2002, 2007).

However, despite the conceptual advancements in this area resulting from this burgeoning line of enquiry, few attempts have been made to develop and validate inventories that profile and measure mental toughness among athletic cohorts.

Loehr's (1986) Psychological Performance Inventory (PPI) was the pioneering "mental toughness" inventory in applied sport psychology. It is designed to assess an athlete's individual mental strengths and weaknesses on seven factors (self-confidence, attention control, negative energy, motivation, attitude control, positive energy, and visual and imagery control). These seven factors are what Loehr claimed to be the most essential characteristics of the many mentally tough athletes and coaches that he had worked with. The PPI is a 42-item inventory that includes items describing athletes' specific psychological behaviours (e.g., "Before competition, I picture myself performing perfectly") and self-evaluations (e.g., "I see myself as more of a loser than a winner in competition"), which are recorded on a five-point Likert scale anchored by "almost always" and "almost never." Seven subscale scores are obtained, with scores ranging from six (low) to 30 (high) and a total score ranging from 42 to 210. Although the PPI has been widely used by

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sport psychology consultants and researchers (e.g., Golby & Sheard, 2004; Golby, Sheard, & Lavallee, 2003), Loehr offered no psychometric support for its use and little rigorous research has been conducted on the psychometric properties of the PPI.

Recent research indicates that the PPI may not be a psychometrically sound measure of mental toughness. Middleton et al. (2004) evaluated the construct validity of the PPI with a sample of 263 (163 males; 101 females) student-athletes (aged 12–17) from an elite sports high school in Sydney, Australia. Initially, a confirmatory factor analysis was not supportive of the a priori model and was of poor fit. An exploratory factor analysis was then performed and an alternative five-factor model was offered. However, although the alternative structure provided a sounder model fit when compared with the original structure, it showed weaker correlations with some of the hypothesised key correlates of mental toughness such as physical self-description ($r = .02–.45$), perceptions of success ($r = −.03–.33$), elite athlete self-description ($r = .01–.66$), and flow ($r = .02–.70$). Middleton et al. concluded that neither the original nor the alternative five-factor structure was psychometrically sound measures of mental toughness and suggested that further conceptual/theoretical work was required. In addition, further exploration of the PPI was necessary given limitations associated with the small sample size (cf. Meyers, Gamst, & Guarino, 2006) and external validity (e.g., mean age of participants being 13.8 years) in Middleton et al.'s study.

An examination of the psychometric properties of the PPI utilising a larger participant sample that was more representative of a wider athlete population than that used by Middleton et al. (2004) produced equivocal findings (Sheard, 2006). Participants in this study included 303 males aged 14–63 ($M = 25.68$, $SD = 6.28$) and 105 females aged 12–44 ($M = 19.78$, $SD = 5.95$) from a variety of team (e.g., rugby union, basketball, soccer) and individual sports (e.g., swimming, slalom canoeing). Support for the factorial structure of the PPI as assessed via both exploratory and confirmatory factor analytical techniques was not provided. For example, the PPI subscales demonstrated adequate internal consistency ($\alpha = .67–87$) and were slightly better than those found by Middleton et al. ($\alpha = .63–77$). The PPI was also found to be moderately correlated with hardiness ($r = .06–.48$) and distinguished between international and national (elite) participants and county/provincial and club/regional (sub-elite) participants. However, while an initial exploratory factor analysis of the PPI suggested a six-factor solution as opposed to the seven-factor a priori solution, a subsequent confirmatory factor analysis showed satisfactory support for the seven-factor model with incremental fit indices showing better fit than the absolute fit indices. Problems at the subscale level were also evidenced for the negative energy control and attitude control subscales. Taken together with Middleton et al.'s research, it appears that empirical support for the psychometric properties of the PPI is still warranted.

One explanation for the equivocal results regarding the PPI is that it may not effectively capture context-specific components of mental toughness across different sports. While there seem to be several keys to mental toughness common to most sports (e.g., self-belief, concentration and focus, motivation, thriving on competition, resilience, handling pressure, positive attitude, quality preparation, goal setting, determination and perseverance, and commitment), there are other variances in key characteristics which provide sport-specific information. When compared with sports such as athletics, swimming, and tennis, adventure/explorer sports consistently involve more life threatening situations and one can see how the characteristic of "safety and survival" (Fawcett, 2006), for example, may be considered a key component of mental toughness by adventurer/explorers but not by athletes in the former sports. Moreover, the attribute of "team unity" (Fourie & Potgieter, 2001) may not be as relevant to individual sports (e.g., tennis) when

compared with team-orientated sports (e.g., rugby). Sport-specific measures of mental toughness, therefore, represent an exciting avenue for future research.

The initial design and foundation of the present investigation is based on recent qualitative research conducted by Gucciardi et al. (2008). These authors conducted 1–1 interviews with 11 coaches, all of whom had considerable playing and coaching experience at the elite-level, using an interview protocol guided by personal construct psychology (Kelly, 1955/1991; see also, Gucciardi & Gordon, in press-a, in press-b) to gain an understanding of mental toughness in Australian football. Grounded theory analytical procedures (Strauss & Corbin, 1998) were employed to analyse the transcribed verbatim data from the interviews and three central categories were identified. The first category, characteristics, incorporated 11 characteristics considered as keys to mental toughness (self-belief, work ethic, personal values, self-motivated, tough attitude, concentration, resilience, handling pressure, emotional intelligence, sport intelligence, and physical toughness). The two other categories, situations and behaviours, provided an understanding of the relationship between the key characteristics and the performance process. Specific situations identified as demanding a large degree of mental toughness included injuries and injury rehabilitation, preparation for training and competition, challenges (personal, on- and off-field), peer and social pressures, and internal (e.g., fatigue/endurance and low in confidence) and external pressures (e.g., environmental and playing conditions, match variables and physical risk). Several overt mentally tough general (e.g., meticulous preparers, consistent performance) and competition-specific behaviours (e.g., repeatable good performance, versatility, superior decision makers, do the 1%er's) were also revealed. Based on their findings, Gucciard et al. (2008) concluded that:

> Mental toughness in Australian football is a collection of values, attitude, behaviours, and emotions that enable you to persevere and overcome any obstacle, adversity, or pressure experienced, but also to maintain concentration and motivation when things are going well to consistently achieve your goals (p. 278).

Using Gucciard et al.'s (2008) research as a foundation, the purpose of this study was to describe the development and preliminary validation a sport-specific measure of mental toughness for Australian football. Specifically, we describe two experiments that utilised within-network examinations exploring the factor structure (i.e., confirmatory and exploratory factor analysis) or dimensionality and between-network examinations exploring the relationship between the construct and other related constructs (cf. Marsh, 2002). The purposes of experiment one were to examine the factorial validity of the inventory and examine correlations between the factors and two hypothesised key correlates of mental toughness (flow and dispositional resilience) and social desirability. The influence of age, playing experience, and playing level (elite, sub-elite, and amateur) on mental toughness subscale scores was also examined. Given that the key correlates employed in experiment one were based on self-reports, the purpose of experiment two was to further explore the construct validity of the inventory developed in experiment one via multisource ratings (i.e., self, coach, and parent). Multisource ratings also provided a medium through which to examine further the effects of socially desirable responding.

Experiment one

Method

Participants

The study sample consisted of 418 male Australian footballers aged 15–30 ($M = 18.97$, $SD = 3.71$) ranging in skill, years playing ($M = 10.33$, $SD = 3.57$), and playing level (elite and sub-elite) who