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Do Developmental Differences in Mental Toughness Exist Between Specialized and Invested Australian Footballers?

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Abstract

Using a cross-sectional design, the primary purpose of the present study was to examine developmental differences in mental toughness between specialized and invested Australian footballers. A secondary purpose was to examine the psychometric properties of the Australian football Mental Toughness Inventory (AfMTI; Gucciardi, Gordon, & Dimmock, 2009a) with a sample of youth footballers. Participants were 350 footballers aged between 13 and 18 (M = 15.88; SD = 1.71); 144 (M_{age} = 14.06; SD = .89) and 206 (M_{age} = 17.02; SD = 1.06) footballers from the specialized and investment developmental stages, respectively. A confirmatory factor analysis of the AfMTI using AMOS did not reveal support for its psychometric structure; however, a revised version received support. A MANOVA revealed the presence of a significant difference between the two developmental groups, and follow-up ANOVA's indicated that the desire success and sport awareness subscales contributed to multivariate effect. It appears that developmental differences should be considered in future theorizing on the development of mental toughness.

Keywords: developmental model of sport participation; youth sport; psychological development; Australian football

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Introduction

With an increased number of athletes and coaches attributing outcomes in sport to mental toughness, or a lack of it, and an increase in demand from athletes, coaches, and practitioners for procedures to develop mental toughness (Crust, 2008), it is no surprise that researchers have allocated greater attention to understanding this desirable construct in recent years. One of the most challenging tasks in the study of mental toughness in sport has been to develop an understanding of mental toughness, the processes by which it operates, and the outcomes associated with mentally tough processes. Despite the challenges inherent in mapping out an understanding of mental toughness, researchers have recently made important progress in elaborating taxonomies of key mental toughness characteristics using qualitative methodologies and elite athletes who have achieved performance success.

Although sport-general studies sampling participants from a variety of different sports facilitate an examination of a greater diversity of experiences, more recently researchers have conducted sport-specific investigations in the hope that context-specific components of mental toughness can be more accurately captured (for reviews, see Connaughton & Hanton, 2009; Crust, 2008; Gucciardi, Gordon, & Dimmock, 2009a). Regardless of the sampling procedure, perceptions on mental toughness obtained from the available research suggest that it is multifaceted; made up of multiple key components including values, attitudes, cognitions, emotions, and behaviors; consists of a core group of key components that would not vary significantly by sport (e.g., self-belief, attentional control, self-motivation/work ethic, positive and tough attitude, enjoy and handle pressure, resilience, quality preparation, and sport awareness); and is important for both positive (e.g., winning streak) and negative (e.g., injury) life experiences (Gucciardi et al., 2009a).

Consensus about a core constellation of key mental toughness characteristics has important implications for the conceptual evolution of this construct, as researchers are better placed in their quest to understand the processes by which these key characteristics enable one to be mentally tough. Recognizing this as an important gap in the literature, Gucciardi et al. (2009a) have recently presented a conceptual model of mental toughness that has considerable potential to guide future research and practice. Rather than prescribing a specific make-up of mental toughness, these authors have forwarded a process model, which is grounded in the theoretical framework of personal construct psychology (Kelly, 1955/1991; see also, Gucciardi & Gordon, 2009), as a means to better understand the processes by which mental toughness operates and the associated outcomes of such processes. Within this conceptual framework, the key components of mental toughness are said to influence the way in which an individual covertly and overtly approaches, appraises, and responds to events demanding varying degrees of challenge, adversity, and pressure. Feedback obtained from the self and others are then employed to evaluate the processes one has gone through in dealing with a particular event in relation to one's personal goals. In integrating previous research with their process model, Gucciardi et al. (2009a, p.69) proposed the following construct definition:

> 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.

Three important considerations for the conceptual evolution of mental toughness are highlighted in the aforementioned definition and conceptualization. Specifically, for future research to clarify and advance current conceptualizations of mental toughness, researchers should be concerned with an understanding of mental toughness in the context of its opposite, the situations that demand mental

toughness (cf. Gucciardi, Gordon, & Dimmock, 2008), and the goals that drive one's behavior in the performance setting.

With regard to the development of mental toughness, inherent within the aforementioned definition and conceptualization is the notion that mental toughness is underpinned by innate factors and factors that are caught and taught during an individual's development. Quantitative and qualitative research has provided preliminary support for the developmental notions outlined in Gucciardi et al.'s (2009a) definition and conceptualization. For example, research adopting the MT48 (Clough, Earle, & Sewell, 2002) – the psychometric properties of which have yet to be adequately reported in the literature (Connaughton & Hanton, 2009; Gucciardi et al., 2009a) – indicated that a significant portion of variance in individual differences in mental toughness scores of monozygotic and dizygotic twins were explained by genetic and non-shared environmental factors (Horsburgh, Schermer, Veselka, & Vernon, 2009). It is important to note, however, that a significant amount of variance in individual differences in mental toughness was not explained by genetic and non-shared environmental factors thereby suggesting the presence of other important factors. In contrast, qualitative research attempting to understand key stakeholders' perceptions has highlighted the interaction of a performer's environment, attitudes, cognitions, values, and emotions as making the greatest contribution to the development of mental toughness (Bull, Shambrook, James, & Brooks, 2005; Connaughton, Wadey, Hanton, & Jones, 2008; Gucciardi, Gordon, Dimmock, & Mallett, in press). More recent research has highlighted the usefulness of psychological skills training as a specific technique for facilitating the development of mental toughness with youth sport participants (Gucciardi, Gordon, & Dimmock, 2009c, 2009d) and maintaining high levels of mental toughness in later years (Connaughton et al., 2008).

In moving towards conceptual clarity, it becomes appropriate that quantitative methodologies become a greater focus on the research radar of future investigations. Importantly, quantitative approaches afford a means by which to sample a greater number of athletes and strengthen generalizations inferred from qualitative research. Accordingly, the Australian football Mental Toughness Inventory (AfMTI; Gucciardi, Gordon, & Dimmock, 2009b), which was developed on the basis of qualitative research with elite Australian football coaches (Gucciardi et al., 2008), was employed to measure mental toughness in the present study. Information describing the 11 key mental toughness characteristics in Australian football (self-belief vs. self-doubt; work ethic vs. lazy; personal values vs. poor integrity and philosophy; self-motivated vs. extrinsically and unmotivated; tough attitude vs. weak attitude; concentration/focus vs. distractible/unfocused; resilience vs. fragile mindset; handling pressure vs. anxious and panicky; emotional intelligence vs. emotionally immature; sport intelligence vs. lack of sport knowledge; and physical toughness vs. weak sense of toughness) was employed by Gucciardi et al. to develop items that tapped into these 11 characteristics. With a confirmatory factor analysis failing to support the a priori 11-factor solution, an exploratory factor analysis provided support for an alternative four-factor solution involving the following components: *thrive through challenge*, which relates to dealing with and thriving when challenged by internal and external forces; *sport awareness*, which relates to an understanding of individual and team performances; *tough attitude*, which describes attitudes directed towards becoming the best one can be; and *desire success*, which relates to achieving individual and team success (Gucciardi et al., 2009b). Recent research has provided support for the applicability of the AfMTI as a measure of mental toughness (Gucciardi et al., 2009c).

Purpose of the Present Study

The developmental model of sport participation (DMSP; Côté, Baker, & Abernethy, 2007; Côté & Fraser-Thomas, 2007), which is founded on research with expert athletes, outlines specific stages of sport participation (sampling [6–12 years old]; specializing [13–15 years old]; investing [16+ years old]) according to positive physical, psychological, and social development patterns. During the sampling years, sport participants are said to sample various sports and actively engage in a high amount of deliberate play (activities that are designed to maximize inherent enjoyment and which are regulated by participants or adult supervisors) and a low amount of deliberate practice (highly structured practice designed to improve specialized performance and correct errors). The balance between deliberate play and practice becomes more equal and a reduced involvement in several sports is evidenced during the specializing years. Invested participants focus their attention on one sport and engage in a high amount of deliberate practice and a low amount of deliberate play. Despite being generated from research on the development of sport expertise, the DMSP affords one of the most comprehensive frameworks for examining the developmental pathways of mental toughness in sport.

There has been no research to date that has explored developmental differences in mental toughness among youth sport participants. Using the DMSP (Côté et al., 2007; Côté & Fraser-Thomas, 2007) as the guiding theoretical framework, we examined and compared mental toughness profiles between specialized and invested Australian footballers using the AfMTI (Gucciardi et al., 2009b). In particular, examinations with individuals currently involved in the development process have important methodological implications as they are less susceptive to limitations of retrospective recall that are inherent with those athletes who have already reached a mature level of performance (Côté, 1999). Consistent with previous research and theory on talent development (e.g., Tranckle & Cushion, 2006), the DMSP (cf. Côté et al., 2007; Côté & Fraser-Thomas, 2007) and mental toughness (e.g., Connaughton et al., 2008), we predicted that the invested group would report higher levels of mental

toughness than the specialized group. Given the exploratory nature of the current research, however, the exact nature of these differences and similarities were not hypothesized. A secondary objective was to examine the psychometric properties of the AfMTI with a youth sample of Australian footballers.

Methods

Participants

A total of 350 male footballers aged between 13 and 18 (M = 15.88; SD = 1.71) participated in this research. The "specializers" (n = 144; M_{age} = 14.06; SD = .89) were primarily engaged in Australian football during the winter season but also playing a secondary sport during the summer season (e.g., cricket, athletics). Specializers had been playing competitive football for between three and seven years (M = 4.96; SD = 1.12). In contrast, the "investors" (n = 206; M_{age} = 17.02; SD = 1.06) were engaged solely in Australian football with the majority of their summer taken up by pre-season training. Investors had been playing competitive football for between four and 10 years (M = 7.65; SD = 1.84).

Instrumentation

Australian football mental toughness inventory (AfMTI; Gucciardi et al., 2009b). The 24-item context-specific inventory is designed to assess four components of mental toughness in Australian football: eight items that measure *thrive through challenge* (e.g., "I am able to persist through any adversity that I face"); six items that measure *sport awareness* (e.g., "I am aware of the roles and responsibilities of my teammates"); five items that measure *tough attitude* (e.g., "Physical fatigue does not affect my performance"); and five items that measure *desire success* (e.g., "Being part of a successful team is important to me"). Participants responded to each item on a 7-point scale ranging from *false* (1) to *true* (7). In addition to having adequate internal reliability ($\alpha > .70$), the AfMTI has evidenced support for its construct (i.e., positive relationships with resilience and flow) and

discriminative validity in terms of age, playing experience, and playing level (Gucciardi et al., 2009b). It has also shown to be effective in gauging changes in multisource perceptions of mental toughness stemming from an intervention program (Gucciardi et al., 2009c).

Procedure

After receiving Institutional Ethical approval, we contacted head coaches of local football teams and asked for their footballers' participation in the study. Those coaches allowing access to their players were sent an information sheet for players and parents to read. Specifically, participants were informed that the study examined psychological variables of performance in Australian football, honesty in responses was essential, participation was voluntary, and responses would remain confidential. After obtaining players' interest to participate in the research, the coach contacted the researcher and organized a session where players could complete the questionnaire package. These sessions were held before or after a training session. During this session the researcher described the research project to the players and emphasized that all footballers were free to participate or not in the study; no player declined the invitation to participate in the study. Participants completed and returned the questionnaire package during that session.

Data Analysis

Prior to the main analyses, a confirmatory factor analysis (CFA) with maximum likelihood estimation using AMOS 17.0 was applied to examine the measurement validity of the AfMTI (Gucciardi et al., 2009b). In addition to the χ^2 goodness-of-fit statistic, several other traditional criteria (incremental fit index [IFI], comparative fit index [CFI], and Tucker-Lewis index [TLI] $\geq$.90, root mean square error of approximation [RMSEA] scores $\leq$.08; Browne & Cudeck, 1992) were adopted as indicators of adequate fit with Hu and Bentler's (1999) criteria (IFI, CFI, and TLI $\geq$.95, RMSEA scores

≤.06) as evidence of good fit. Taken together, these indices provide a more conservative and comprehensive evaluation of model fit than any single index alone.

SPSS 17.0 was employed for all subsequent analyses. After calculating internal consistency estimates and correlations between subscales of the AfMTI, a multivariate analysis of variance (MANOVA) using developmental group (i.e., specialized [13-15 years] or invested [16+ years]) as the independent variable and mental toughness subscale scores as the dependant variables was performed. All assumptions of MANOVA were met indicating the suitability of this analysis.

Results

Psychometric Analyses of the AfMTI

Descriptive statistics, reliabilities, and correlations between mental subscale scores for both developmental groups are presented in Table 1. An analysis of the AfMTI (Gucciardi et al., 2009b) factor measurement model using AMOS did not reveal support for its psychometric structure [$\chi^2(246) = 469.14$, $p<.001$, Bollen-Stine $p = .001$, RMR = .08, CFI = .85, IFI = .86, TLI = .84, RMSEA = .05 (90% CI = .04 to .06]. Given findings of inadequate model fit, we adopted a more exploratory data analytical approach to identify a better fitting model. In keeping with the strategy advocated by Jöreskog (1993) and employed by others (e.g., Lonsdale, Hodge, & Rose, 2008; Mullan, Markland, & Ingledew, 1997), one-factor congeneric models in which a CFA is performed on individual subscales were initially examined. Items were considered for deletion if they displayed: large standardized residual covariances (>2), if modification indices suggested that the error term of an item correlated with that of another item, if an item had a low factor loading (<.40; Mullan et al., 1997), or if modification indices suggested that an item cross-loaded on an unintended latent variable. Following an examination of each of the four subscales, which resulted in the deletion of one item from sport awareness and three items from thrive through challenge, the full model was tested. The revised

version of the AfMTI provided adequate fit with the data [$\chi^2(164) = 260.18$, $p<.001$, Bollen-Stine $p = .026$, RMR = .07, CFI = .91, IFI = .91, TLI = .90, RMSEA = .04 (90% CI = .03 to .05)]. Reliability estimates for each subscale across both developmental groups exceeded the .70 minimum recommended by Nunnally and Bernstein (1994) for use in basic research. The revised version of the AfMTI was employed for all subsequent analyses.

Developmental Differences Analyses

An inspection of the correlations between the four mental toughness subscales presented in Table 1 indicates that overall significant and low to moderate relationships between the four mental toughness subscales for the specialized and invested groups as well as the total sample. Nonetheless, developmental differences in correlations between the four mental toughness subscales between the specialized and invested footballers exist. Specifically, invested footballer's evidenced significant and moderate relationships between the four mental toughness subscales, whereas specialized footballers' scores evidenced mostly non-significant and low correlations.

Significant differences were found between the developmental groups on mental toughness ($F_{4, 345} = 37.11$, $\lambda = .70$, $p <.001$, $\eta_P^2 = .30$). The effect size indicated that 30% of the variance in the dependant variables was attributable to the developmental stage. Follow-up ANOVA's on each mental toughness subscale was employed to identify those variables that maximized differences between the groups. Sport Awareness ($F_{1, 348} = 37.68$, $p <.001$, $\eta_P^2 = .27$) and desire success ($F_{1, 348} = 13.18$, $p <.001$, $\eta_P^2 = .07$), but not thrive through challenge ($F_{1, 348} = .16$, $p = .48$, $\eta_P^2 = .001$) and tough attitudes ($F_{1, 348} = .02$, $p = .87$, $\eta_P^2 = .00$), contributed to the significant multivariate effect. An examination of the estimated marginal means indicated that the invested developmental group reported higher levels of sport awareness and desire success than the specialized developmental group.

Discussion

The primary purpose of the present study was to examine mental toughness from a developmental perspective by comparing profiles between specialized and invested Australian footballers. Previous research on mental toughness (Connaughton et al., 2008), the DMSP (Côté et al., 2007; Côté & Fraser-Thomas, 2007) and talent development (Tranckle & Cushion, 2006) suggests that psychosocial differences should exist with invested participants reporting greater levels of mental toughness than specialized participants. Unfortunately however, quantitative research examining such developmental differences has yet to be examined. A secondary purpose of the present study was to examine the within-network properties of the AfMTI (Gucciardi et al., 2009b) using a youth sample of Australian footballers.

Although the sample employed by Gucciardi et al. (2009b) to develop their AfMTI included specialized and invested footballers (n=157), results suggested that the measurement model of the 24-item AfMTI as originally proposed did not fit the data with a youth only sample of Australian footballers. This is despite the fact that subscale responses were found to be internally consistent. After deleting four items based on several criteria (e.g., standardized residual covariances >2, modification indices, factor loadings <.40), the revised 20-item, four-factor model provided an adequate fit with the data and evidenced adequate internal reliability estimates (>.70) thereby providing support for the use of the revised version of the AfMTI in the present study. Nonetheless, construct validation is an ongoing process (Marsh, 1997) and although support was found for a revised version of the AfMTI further research is required to cross-validate the results of this study with a greater variety of Australian footballers.

The development of psychological characteristics such as mental toughness through the developmental stages of sport participation is consistent with previous research adopting the DMSP framework (see Côté et al., 2007; Côté & Fraser-Thomas, 2007). As hypothesized, differences between

specialized and invested Australian footballers existed with invested footballers reporting higher levels of mental toughness. The exact nature of these differences was not predicted, yet indicated that invested footballers reported higher levels of sport awareness (understanding of team and individual performance) and desire success (achievement in football) components of mental toughness than specialized footballers. As to be expected with young aspiring footballers in the investment stage of development playing the highest form of competition for their age group, most participants reported higher levels of desire success than those participants in the specializing stage. All invested footballers in the present study were selected into their respective team from a larger pool of footballers playing community-based competitions. In contrast, specialized footballers were still involved in junior competitions in which participants of all skill ranges and abilities are encouraged to play. Such an interpretation is consistent with previous qualitative research in which the foundations for desiring success are said to occur in the sampling years yet are further nurtured during the specializing and investment years through such mechanisms as increased competitive rivalry, critical incidents, demonstration of ability, goal setting, and mastery (Connaughton et al., 2008).

That invested footballers reported greater levels of sport awareness, which refers to knowledge of the structure and procedures of the game, is perhaps a reflection of the focus on deliberate practice in one particular sport in the investment developmental stage whereas there is an equality of deliberate practice and play in the specialized developmental stage (cf. Côté et al., 2007; Côté & Fraser-Thomas, 2007). It may also be a reflection of the quality of coaching received in the developmental stages with Australian football coaches having coached at the highest level as well as being involved in coach development programs recognizing the importance of helping a developing player acquire an understanding of the game, how it is played, and the many obstacles, challenges, and pressures that one

is likely to encounter for the development of mental toughness (Gucciardi et al., in press). Clearly, further research is required to examine such interpretations.

It is also important to recognize that no significant differences in thrive through challenge and tough attitudes were evidenced between the specialized and invested groups. In contrast, previous research has revealed significant differences in these two components of mental toughness between youth (14-17 years old), late adolescents (18-19 years old), and young adults (20-30 years old) (Gucciardi et al., 2009b). Taken together with this research, the current findings suggest that these two mental toughness components may require a greater number and variety of experiences before developmental differences in thrive through challenge and tough attitudes emerge. An understanding of the developmental histories of these participants using established methodologies (e.g., Côté, Ericsson, & Law, 2005) may prove useful in revealing evidence to support such claims.

Although the results indicate significant differences between specialized and invested footballers in desire success and sport awareness components of mental toughness, it is important to note that across the sample most footballers demonstrated scores towards the mental toughness pole of the continuum for all four components. In other words, most footballers reported moderate to high levels (>5) of mental toughness relative to the rating scale (1 to 7). Nonetheless, correlation data indicated that invested footballers reported more consistent levels of mental toughness in which the four components evidenced significant and moderate relationships. Specialized footballers, on the other hand, reported less consistent levels of mental toughness in which the four components evidenced mostly low and non-significant relationships. In other words, higher levels of one component of mental toughness were associated with higher levels of the other three components of mental toughness for the invested group but not the specialized sample. Considering the improvements in relationships between the four components of mental toughness for the invested footballers relative to the specialized

footballers, it may also be that the gap between mental toughness strengths and weaknesses may close as footballers devote more time and themselves to one sport as well as more concentrated forms of deliberate practice.

Limitations, Future Research, and Conclusions

The main limitation of the current study was the cross-sectional design. Extending the current work, subsequent research should ascertain whether mental toughness changes over time and examine relationships between improvements in mental toughness and other positive psychological characteristics such as achievement goals, self-esteem, and emotional well-being. A further drawback of the current study was that only self-reported mental toughness was considered. More creative measurement of mental toughness, beyond the sole use of questionnaires, would substantially benefit the field. For example, the Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998), which indirectly measures an individual's automatic associations between trait descriptors and the self rather than directly inquiring about a person's view of personality, could help form the basis for an implicit measure of mental toughness. It may also be useful to consider mixing methods whereby quantitative data are complimented with qualitative descriptions of mental toughness development using well-established interviews protocols (e.g., Côté et al., 2005). Finally, we do not yet know how developments in mental toughness relate to objective measures of sporting performance (e.g., decision-making, perceptual skill).

The current study provides a cross-sectional snapshot of the differences in mental toughness between specialized and invested Australian footballers. Specifically, the findings regarding developmental differences in self-reported desire success and sport awareness components of mental toughness provide quantitative evidence to support qualitative research suggesting that mental toughness develops within similar stages of those presented in the DMSP (Connaughton et al., 2008). It

is clearly important that developmental differences should be considered in future theorizing on the development of mental toughness.

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Table 1.

Descriptive statistics, reliabilities, and correlations between mental subscale scores for both developmental groups.

		M	*SD*	Tt	Sa	Ta	Ds	α
Specialized Group (13-15 years)	Tt	5.65	.60	-				.81
	Sa	5.67	.68	.07	-			.79
	Ta	5.23	.78	.17*	.05	-		.72
	Ds	5.91	.88	.21*	.08	.15	-	.70
Invested Group (16+ years)	Tt	5.69	.54	-				.80
	Sa	6.34	.43	.43**	-			.78
	Ta	5.25	.79	.56**	.19**	-		.70
	Ds	6.31	.73	.52**	.36**	.29**	-	.71
Total Sample	Tt	5.68	.60	-				.80
	Sa	6.06	.64	.22**	-			.78
	Ta	5.24	.89	.36**	.15*	-		.72
	Ds	6.14	.73	.34**	.25**	.20**	-	.70

Note: * Significance is at $p < .05$. ** Significance is at $p < .01$. Tt = Thrive through challenge; Sa = Sport awareness; Ta = Tough attitude; Ds = Desire success.