The Relationship Between Developmental Experiences and Mental Toughness in Adolescent Cricketers

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The present study investigated the contribution of positive and negative youth sport experiences (i.e., processes or experiences that occur in a particular activity or setting) to self-reported mental toughness among youth-aged cricketers. A sample of 308 male cricketers aged between 13 and 18 years self-reported mental toughness using the Cricket Mental Toughness Inventory (CMTI; Gucciardi & Gordon, 2009), with 187 of these cricketers also documenting their exposure to a variety of positive and negative developmental experiences. Confirmatory factor and internal reliability analyses supported the hypothesized mental toughness measurement model. Structural equation modeling analyses indicated that a variety of developmental experiences were related to various mental toughness components, with initiative experiences evidencing the strongest overall relationship with mental toughness followed by negative peer influences. The number of years playing experience and hours per week training evidenced largely insignificant relationships with the exception of desire to achieve and attentional control components of mental toughness, as well as its global factor. Collectively, these findings lend support for the validity of the CMTI as a valid measure among adolescent cricketers, and highlight the importance of initiative and interpersonal experiences for mental toughness in cricket.

Keywords: cricket, mentally tough, organized activities, positive youth development, young people, youth experiences survey

The turn of the new millennium saw the mental toughness construct emerge as a popular research agenda for the sport psychology community. Despite a number of initial conceptual ambiguities (e.g., diverse selection of definitions and explanations), recent developments in research and theory have contributed greatly to the conceptual evolution of mental toughness (for reviews, see Connaughton & Hanton, 2009; Gucciardi, Gordon, & Dimmock, 2009a). A glance at the available literature reveals a variety of characteristics and attributes ranging from self-belief to personal values, as well as others such as physical toughness and perseverance that have been placed under the banner of mental toughness. Although the seem-
ingly large list of attributes and characteristics that has emerged might cause some confusion, there do appear to be some primary facets that would not vary by sport (e.g., self-belief, attentional control, resilience, success mindset, optimistic thinking, emotional awareness and regulation, handle challenge, context intelligence). These key mental toughness facets are said to facilitate the achievement of one’s goals when faced with both positive (e.g., winning streak) and negative (e.g., injury) pressures, adversities, and challenges (Gucciardi et al., 2009a). Conceptualized in this manner, it is of no surprise that mental toughness remains an important topic for further study. Focusing on a sample of adolescent cricketers, this study assessed the psychometric rigor of a sport-specific measure of mental toughness with a youth-aged population, as well as the contribution of positive and negative youth sport experiences (i.e., processes or experiences that occur in a particular activity or setting) to self-reported mental toughness.

Mental Toughness and its Measurement

In much of the pioneering work, mental toughness researchers have capitalized on the advantages of qualitative methodologies such as one-on-one interviews and focus groups in advancing current conceptualizations of a new area of research. Whereas some researchers have taken a between-sport approach to understanding mental toughness in sport (e.g., Jones, Hanton, & Connaughton, 2002, 2007), others have opted for a within-sport design in which understanding is imbedded within the sociocultural boundaries of a particular sport such as cricket (Bull, Shambrook, James, & Brooks, 2005) or soccer (Thelwell, Weston, & Greenlees, 2005). Nevertheless, with the emergence of inventories designed to quantitatively assess mental toughness in recent years, there is an opportunity for researchers to consider alternative methodological approaches. Recognizing this gap in the literature, the current study sought to contribute the burgeoning line of inquiry through a quantitative exploration of mental toughness in cricket. In so doing, this study extends previous research by examining the utility of models of mental toughness and its development derived using qualitative methodologies in a way that has the potential to generalize such evidence to the broader population under investigation.

The availability of a psychometrically sound measure of mental toughness that captures several key facets is the primary rationale for choosing cricket as the context in which to conduct the current study. Building on two qualitative investigations in which elite Indian and Australian cricketers were interviewed to identify the key mental toughness components in cricket and assess the suitability of items designed to tap those attributes, Gucciardi and Gordon (2009) conducted two quantitative studies exploring the psychometric properties of the Cricket Mental Toughness Inventory (CMTI). Support for the existence of a five-factor, 15-item model was revealed with three independent samples of cricketers: two contained cricketers from several different countries (n = 285 and 285) and one contained Australian cricketers only (n = 433). The five mental toughness factors included affective intelligence (i.e., ability to regulate emotions to facilitate performance), attentional control (i.e., regulate focus and concentration to facilitate performance), resilience (i.e., ability to bounce back from and/or experience positive outcomes following exposure to a significant adversity or challenge), self-belief (i.e., belief in your physical ability to perform to your potential), and desire to achieve (i.e.,
Between-network analyses revealed that each of the five subscales were positively correlated with dispositional flow, hardiness, and resilience and negatively correlated with athlete burnout. Collectively, these results provide preliminary support for the psychometric structure and construct validity of the CMTI. Although representing a sport-specific measure, the five facets generated using qualitative data and subsequently supported with rigorous psychometric analyses appear to capture a significant portion of the mental toughness conceptual space.

Assumptions of validity of self-report measures are an important consideration when previous validation work has involved contexts or samples that are dissimilar to proposed research (Hagger & Chatzisarantis, 2009). Although adolescent cricketers aged between 14 and 18 years were sampled in the initial development and validation of the CMTI (Gucciardi & Gordon, 2009), it is important to consider potential violations of validity assumptions when using a measure that was developed primarily with adults samples to research involving only young people. Research on the development of a mental toughness inventory for Australian football (Gucciardi, Gordon, & Dimmock, 2009b), for example, reported adequate levels of internal reliability with youth footballers aged 15–16 years yet a subsequent confirmatory factor analysis failed to support the hypothesized measurement model with adolescent footballers (Gucciardi, 2009). Thus, there is a need assess the psychometric rigor of the CMTI with an adolescent sample before using the inventory to examine testable hypotheses. An assessment of the within-network properties of the CMTI using confirmatory factor and internal reliability analyses is the first aim of the current study.

**Mental Toughness Development**

With consensus about the definition and core constellation of characteristics encompassing mental toughness emerging (e.g., Connaughton & Hanton, 2009; Gucciardi et al., 2009a), researchers have turned their attention toward understanding how this desirable construct is developed. Retrospective interviews with elite (Connaughton, Wadey, Hanton, & Jones, 2008) as well as super-elite performers (i.e., Olympic champions; Connaughton, Hanton, & Jones, 2010), for example, revealed that the development of mental toughness involves several unique mechanisms that operate together over a long period of time and through unique developmental stages. In addition to psychological skills and strategies, features relating to the motivational climate (e.g., enjoyment, challenge, mastery), external assets (i.e., coaches, peers, parents, grandparents, siblings, senior athletes, sport psychologists, team-mates), and both sport and nonsport related developmental experiences (e.g., critical incidents, competitive rivalry, vicarious experiences, demonstration of ability) were discussed as the most important mechanisms. Similar findings were revealed with a sport-specific sample of elite female gymnasts (Thelwell, Such, Weston, & Such, 2010).

Research with elite Australian football coaches (Gucciardi, Gordon, Dimmock, & Mallett, 2009) extended initial findings by focusing on how coaches both facilitate and hinder the development of mental toughness. Facilitative mechanisms included the coach-athlete relationship (e.g., gaining the trust and respect of play-
ers, establishing and maintaining positive relationships), coaching philosophy (e.g., prioritizing player development over coaching success, helping players acquire an understanding of the sport), training environment (e.g., continuously challenging players, exposing players to challenges and success), and specific strategies (e.g., developing game awareness, specific coaching behaviors). Several of the strategies and mechanisms reported by the Australian football coaches have gained support from National Collegiate Athletic Association head coaches (e.g., providing learning opportunities, tough physical practice environment; Weinberg, Butt, & Culp, in press). In addition to these facilitative strategies and mechanisms, a coach’s philosophy and behavior (e.g., prioritizing player success over development, focusing on weaknesses rather than strengths) were described as the major ways in which they can hinder the development of mental toughness (Gucciardi et al., 2009). Thus, a key contribution of this study to literature was the recognition that coaches can both positively and negatively influence the developmental process.

Previous qualitative research utilizing retrospective interviews with elite athletes and coaches has shed light on some of the key factors contributing to the development of mental toughness (Connaughton et al., 2008, 2010; Gucciardi et al., 2009; Thelwell et al., 2010; Weinberg et al., in press). A key limitation of this research is the reliance on the perspectives of elite athletes and coaches who are often required to retrospectively recall information and experiences that occurred many years ago. Examinations with individuals currently involved in the development process, in particular, have important methodological implications as they are less susceptible to limitations of retrospective recall that are inherent with those athletes who have already reached a mature level of performance (Côté, 1999). Particularly in organized programs such as sport, adolescents are often active and conscious agents of their own development (Larson, 2000), thereby representing a useful source of information of developmental experiences. Thus, in addition to the adoption of quantitative methods, the current study extends previous research in the area by sampling adolescent athletes. Of particular note is the need to consider both positive and negative developmental experiences that occur within the sporting context for understanding the development of mental toughness.

Developmental Experiences

Related research on youth development offers a foundation upon which to better understand and assess experiences that may be related to mental toughness in adolescents. Qualitative research focusing on youths’ perspectives on “growth experiences” (i.e., processes or experiences by which development can occur) in school and community-based structured activities such as sport, fine arts, and clubs revealed the presence of both positive (Dworkin, Larson, & Hansen, 2003) and negative (Dworkin & Larson, 2006) developmental experiences. These findings were subsequently employed to develop the Youth Experiences Survey (YES; Hansen & Larson, 2005), which has been used to examine developmental experiences across a variety of youth contexts. Specifically, the YES is designed to provide an assessment of development experiences that have been implicated in the youth development literature as occurring across a variety of organized activity settings. In addition to five broad negative experiences (e.g., experiencing stress, encountering
inappropriate adult behavior), the YES inventories positive experiences including personal (i.e., identity work, initiative, basic skills) and interpersonal development (i.e., positive relationships, teamwork and social skills, development of adult networks and social capital) that are of a socioemotional nature (see Table 1).

Subsequent research has demonstrated the utility of the YES in documenting the various developmental experiences that occur within and between different organized contexts. In a study of 2280 adolescents, for example, differing profiles of developmental experiences between various activities (e.g., faith based, sport, arts, service) were observed, with organized sports standing out as a setting for high rates of initiative, in particular, as well as emotional regulation and stress (Larson, Hansen, & Moneta, 2006). Similar findings were reported in a cross-sectional study involving 450 high school students (Hansen, Larson, & Dworkin, 2003). As with the available mental toughness literature (e.g., Connaughton et al., 2008, 2010; Gucciardi et al., 2009), these findings underscore the need to consider both positive and negative features of the sport context, although negative experiences such as stress can facilitate positive development (Dworkin & Larson, 2006).

Recent research indicates that sport contexts are characterized by experiences involving moderate-to-high levels of identity work, initiative, emotion regulation, and teamwork and social skills, moderate levels of interpersonal relationships, and low-to-moderate levels of adult networks (Hansen, Skorupski, & Arrington, 2010). Encouragingly, many of these experiences reflect the kinds of activities that have been discussed as contributing to the development of mental toughness in the early years. For example, positive interpersonal relationships between athletes and coaches (Gucciardi et al., 2009) as well as peers and parents (Connaughton et al., 2008) appear to play a role in developing self-belief, resilience, and personal values. Similarly, initiative experiences that encourage athletes to manage their time, set goals, apply directed effort, and problem solve have been cited as being important for the development of key mental toughness components such as resilience, concentration and focus, self-belief, work ethic, and tough attitudes (Connaughton et al., 2008, 2010; Gucciardi et al., 2009). Thus, the YES (Hansen & Larson, 2005) represents a useful inventory for documenting a broad range of developmental experiences and their relationship with mental toughness in adolescent athlete samples.

**purposes of the current study**

In summary, the general purpose of this study was to explore the relationship between developmental experiences and self-reported mental toughness in a sample of adolescent cricketers. As the central measure of mental toughness was developed with a predominantly adult sample of cricketers (Gucciardi & Gordon, 2009), the first aim was to assess the psychometric properties of this scale with an adolescent sample. Although the current study is the first attempt to assess the validity of the CMTI measurement with an adolescent sample of cricketers, preliminary research with Australian footballers (Gucciardi et al., 2009b) leads to the expectation that the model will not hold up here. Following an examination of the within-network properties of the CMTI is an examination of the relationship between positive and negative developmental experiences and mental toughness. Taking both the youth development and mental toughness literature into consideration, two primary
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<tr>
<th>Developmental Experience</th>
<th>Subcomponents and Example Items</th>
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<tbody>
<tr>
<td><strong>Positive Experiences</strong></td>
<td></td>
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<tr>
<td>Identity experiences</td>
<td>Identity exploration (“tried a new way of acting around people”) and reflection (“this activity got me thinking about who I am”)</td>
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<tr>
<td>Initiative experiences</td>
<td>Goal setting (“learned to find ways to achieve my goals”), effort (“learned to push myself”), problem solving (“observed how others solved problems and learned from them”), time management (“learned about setting priorities”)</td>
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<tr>
<td>Basic skill</td>
<td>Emotional regulation (“learned that my emotions affect how I perform”), cognitive skills (“in this activity I have improved communication skills”), and physical skills (“in this activity I have improved athletic or physical skills”)</td>
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<tr>
<td>Interpersonal relationships</td>
<td>Diverse peer relationships (“learned I had a lot in common with people from difference backgrounds”) and prosocial norms (“learned about helping others”)</td>
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<tr>
<td>Team work and social skills</td>
<td>Group process skills (“learned that working together requires some compromising”), feedback (“I became better a taking feedback”), and leadership and responsibility (“learned about the challenges of being a leader”)</td>
</tr>
<tr>
<td>Adult networks and social capital</td>
<td>Integration with family (“I had good conversations with my parents/guardians because of this activity”), linkages to community (“got to know people in the community”), and linkages to work and college (“this activity helped me prepare for college”)</td>
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<td><strong>Negative Experiences</strong></td>
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<tr>
<td>Stress</td>
<td>“This activity has stressed me out”</td>
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<tr>
<td>Negative peer influences</td>
<td>“Felt pressure by peers to do something I didn’t want to do”</td>
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<tr>
<td>Social exclusion</td>
<td>“Felt like I didn’t belong in this activity”</td>
</tr>
<tr>
<td>Negative group dynamics</td>
<td>“Was discriminated against because of my gender, race, ethnicity, disability, or sexual orientation”</td>
</tr>
<tr>
<td>Inappropriate adult behavior</td>
<td>“Adult leaders in this activity are controlling and manipulative”</td>
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</table>
hypotheses were generated. First, it was hypothesized that positive experiences would evidence positive relations with mental toughness, whereas negative experiences would evidence either inverse and/or positive relationships (e.g., Dworkin & Larson, 2006). Second, it was anticipated that initiative experiences and experiences involving interpersonal interactions (e.g., negative peer influences, interpersonal relationships) would evidence the strongest relationship with mental toughness, as these variables have gained the most widespread support in both the mental toughness and youth development literatures.

Methods

Participants

The sample consisted of 308 male community cricketers (i.e., not selected for participation in their team based on their abilities) aged between 13 and 18 ($M = 15.65; SD = 2.35$). Of the total sample, 187 male cricketers aged between 15 and 18 ($M = 16.15; SD = 1.46$) completed an additional questionnaire (see below) as part of pilot data collection for a larger study. At the time of completing the survey, these 187 cricketers had been playing competitive cricket for between 1 and 11 years ($M = 7.36; SD = 3.31$) and dedicated between 3 and 25 hr per week ($M = 13.04; SD = 4.81$) playing cricket. Cricketers ($n = 187$) who completed the additional questionnaire did not systematically differ from other participants ($n = 121$) who completed the mental toughness measure only (i.e., age, years experience, hours dedicated to cricket per week, mental toughness).

Instrumentation

**Cricket Mental Toughness Inventory (CMTI; Gucciardi & Gordon, 2009).** The CMTI consists of five 3-item scales designed to assess the key mental toughness assets within the cricket context: affective intelligence (e.g., “have high emotional stress tolerance”), self-belief (e.g., “have an unshakeable self-belief in my cricket ability”), desire to achieve (e.g., “am willing to go the extra mile to succeed”), resilience (e.g., “have the ability to bounce back from setbacks”), and attentional control (e.g., “am able to effectively block out non-cricket distractions”). Respondents evaluate the extent to which each item is a true reflection of their current self as a cricketer on a Likert scale ranging from 1 (false, 100% of the time) to 7 (true, 100% of the time). There is preliminary evidence to support the psychometric properties and construct validity of the CMTI (Gucciardi & Gordon, 2009).

**Youth Experiences Survey 2.0 (YES; Hansen & Larson, 2005).** The YES is a 70-item measure that assesses six positive and five negative developmental experiences an individual may encounter in an activity setting (see Table 1). Positive developmental experiences include the following: identity experiences, initiative experiences, basic skill, interpersonal relationships, teamwork and social skills, and adult networks and social capital. Negative developmental experiences include stress, negative peer influences, social exclusion, negative group dynamics, and inappropriate adult behavior. Respondents evaluate the extent to which they
personally experienced each item during their “recent or current involvement” in cricket on a Likert scale ranging from 1 (yes, definitely) to 4 (not at all). Research has found the YES to be a reliable and valid measure with adolescents across a variety of activity settings (e.g., Hansen & Larson, 2005, 2007) and specifically in sport (Strachan, Côté, & Deakin, 2009).

**Procedures**

Participants were recruited via state, territory, and district Game Development Managers. Information regarding the nature of the study was initially provided to each manager, which included a copy of the research proposal and a participant information sheet. Managers then distributed an e-mail containing the information sheet describing the aims and procedures of the research as well as a web link containing the questionnaires detailed in the methods section to coaches and cricketers within their district. Thus, we were not able to compute a response rate due to how participants were recruited. All participants were assured of confidentiality and anonymity in responses, and informed of their right to withdraw consent at any time before obtaining their consent to participate. Instructions for completing each section of the questionnaire package were provided on the web page. Institutional ethics approval was obtained before the commencement of this study.

**Data Analysis**

The analytical strategy was broken down into two stages. First, a confirmatory factor analysis (CFA) with maximum likelihood estimation using AMOS 17.0 was applied to examine the validity of the CMTI measurement model. In line with the original CMTI research (Gucciardi & Gordon, 2009), two measurement models were tested: a lower-order model in which the five subscales were correlated and a second higher-order model in which the covariances between the five subscales were explained by a general mental toughness latent factor (see Figures 1 and 2). In addition to the $\chi^2$ goodness-of-fit statistic, several other traditional criteria (incremental fit index [IFI], comparative fit index [CFI], 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 $\geq .95$, and RMSEA scores $\leq .06$) as evidence of good fit. Taken together, these indices provide a more conservative and comprehensive evaluation of model fit than any single index alone. The difference in $\chi^2$ and an examination of the standardized parameter estimates were explored to assess the superiority of the two CMTI models.

Second, structural equation modeling (SEM) with maximum likelihood estimation using AMOS 17.0 was applied to explore the relationship between developmental experiences and both the higher- and lower-order models of mental toughness (see Figures 3 and 4). Mental toughness was modeled as endogenous variables using the latent structure of the CMTI. However, in light of the small sample size ($n = 187$), the YES subscales were modeled as observed, exogenous variables (i.e., means of items) in an attempt to reach a satisfactory ratio of participants to estimated parameters (Bentler, 1995). Although the observed variable approach does not permit the extraction of measurement error, parameter estimates
generated by a latent variable model become increasingly similar to those generated by an observed variable model as coefficient alpha increases (Hoyle & Kenny, 1999). Covariances between the six positive and five negative youth experiences were included in both models to account for the overlap between these variables. In addition, the amount of years playing cricket (i.e., duration) and the number of hours dedicated to training per week (i.e., intensity) were included as exogenous variables, as research has revealed that sport experience contributes to the development of mental toughness (e.g., Gucciardi, 2010). Those fit indices (e.g., RMSEA, CFI) and criteria described above were also employed to assess the adequacy of the structural models.
Results

Within-Network Properties of the CMTI ($n = 308$)

Preliminary Analyses. With preliminary analyses showing that multivariate normality (Mardia’s statistic = 25.52) was violated, bootstrapping procedures were coupled with maximum likelihood estimation procedures in all CFAs (Byrne, 2010). Bootstrapping procedures calculate parameter estimates from an empirical sampling distribution (1000 bootstrap samples for the current study) rather than the theoretical distributions of tests as $\chi^2$ and normality test (Mooney & Duval, 1993; Nevitt & Hancock, 2001). Consequently, the overall model fit was assessed using the Bollen–Stine $p$ value (Bollen & Stine, 1992), which is a correction of the $\chi^2$ test. All other data assumptions were satisfied (e.g., univariate normality, outliers).
Figure 3 — Hypothesized structural equation model using the lower-order CMTI measurement model and observed variables for the YES factors.
Figure 4 — Hypothesized structural equation model using the higher-order CMTI measurement model and observed variables for the YES factors.
Confirmatory Factor Analyses. An analysis of the lower-order CMTI measurement model (see Figure 1) revealed support for its psychometric structure with the adolescent sample, $\chi^2(80) = 141.61$, Bollen–Stine $p = .105$, CFI = .97, IFI = .97, TLI = .96, RMSEA = .050 (90% CI = .036 to .064). All five subscales evidenced adequate levels of internal reliability (Cronbach’s $\alpha >.70$; Nunnally & Bernstein, 1994) with this first sample of cricketers ($n = 308$). Similar findings were observed for the higher-order CMTI measurement model (see Figure 2), $\chi^2(85) = 198.34$, Bollen–Stine $p = .007$, CFI = .95, IFI = .95, TLI = .94, RMSEA = .066 (90% CI = .054 to .078). These findings indicate that the higher-order general mental toughness factor explains the covariances among the five lower-order variables; that is, the latent higher-order construct represents the common cause of such variation. Nevertheless, the significant difference in $\chi^2 [56.73 (5)]$ between the two models indicates that the lower-order model provides a better fit with the data. As depicted in Figures 1 and 2, all of the lower- and higher-order standardized parameter estimates are statistically significant and are of a similar magnitude in both models.

Descriptive Statistics. Cricketers reported high levels of desire to achieve ($M = 6.03; SD = 1.05$), moderate-to-high levels of affective intelligence ($M = 5.26; SD = 1.02$), resilience ($M = 5.51; SD = .97$), and attentional control ($M = 5.49; SD = .94$), and moderate levels of self-belief ($M = 4.65; SD = 1.17$).

Youth Experiences and Mental Toughness ($n = 187$)

Descriptive Statistics. An overview of the descriptive statistics, internal reliability estimates and zero-order correlations between all study variables is presented in Table 2. All subscales evidenced adequate levels of reliability recommended for exploratory research (Cronbach’s $\alpha \geq .70$; Nunnally & Bernstein, 1994). The five dimensions of mental toughness were all significantly related, with intercorrelations ranging from .27 to .57. Similar results were obtained for correlations within the six positive ($r = .48$ to .68) and five negative ($r = .46$ to .80) youth experience subscales. In contrast, positive and negative youth experiences, on the whole, were unrelated ($r = -.03$ to .17). Correlations between mental toughness and developmental experiences subscales were less consistent than the relationships within subscales of the same inventory. All five mental toughness subscales evidenced moderate and positive relationships with positive youth experiences subscales ($r = .09$ to .48) but, contrary to expectations, only desire to achieve and attentional control evidenced significant inverse correlations with the negative youth experiences subscales ($r = -.14$ to -.24).

Structural Equation Modeling. An overview of the SEM analyses is presented in Table 3. The model predicting the lower-order CMTI model did not provide a good fit with the data, $\chi^2(272) = 578.80$, Bollen–Stine $p = .001$, CFI = .87, IFI = .87, TLI = .81, RMSEA = .078 (90% CI = .069 to .087). An inspection of the modification indices suggested the addition of covariances between the residual terms of the CMTI factors. Allowing the residual terms among the CMTI factors to covary resulted in a much better fitting model, $\chi^2(262) = 374.12$, Bollen–Stine $p = .085$, CFI = .95, IFI = .95, TLI = .93, RMSEA = .048 (90% CI = .036 to .059). Collectively, the developmental experiences explained a significant amount of variance in self-belief (28%), attentional control (28%), resilience (27%), desire to achieve (47%),
Table 2 Descriptive Statistics, Internal Reliability Estimates, and Correlations for All Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
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<td>Affective intelligence</td>
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<td>.92</td>
<td>(.70)</td>
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<tr>
<td>Desire to achieve</td>
<td>6.13</td>
<td>.81</td>
<td>.27**</td>
<td>(.76)</td>
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<tr>
<td>Resilience</td>
<td>5.57</td>
<td>.85</td>
<td>.57**</td>
<td>.51**</td>
<td>(.75)</td>
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<tr>
<td>Attentional control</td>
<td>5.62</td>
<td>.78</td>
<td>.47**</td>
<td>.55**</td>
<td>.48**</td>
<td>(.70)</td>
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<tr>
<td>Self-belief</td>
<td>4.83</td>
<td>1.04</td>
<td>.44**</td>
<td>.34**</td>
<td>.51**</td>
<td>.42**</td>
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<tr>
<td>Identity experiences</td>
<td>3.11</td>
<td>.51</td>
<td>.24**</td>
<td>.17*</td>
<td>.09</td>
<td>.14</td>
<td>(.73)</td>
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<td>Initiative experiences</td>
<td>3.25</td>
<td>.46</td>
<td>.32**</td>
<td>.48**</td>
<td>.33**</td>
<td>.28**</td>
<td>.29**</td>
<td>.60**</td>
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<td>Basic skill</td>
<td>2.75</td>
<td>.54</td>
<td>.28**</td>
<td>.22**</td>
<td>.24**</td>
<td>.18*</td>
<td>.28**</td>
<td>.53**</td>
<td>.57**</td>
<td>(.84)</td>
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<tr>
<td>Interpersonal relationships</td>
<td>2.89</td>
<td>.61</td>
<td>.21**</td>
<td>.33**</td>
<td>.28**</td>
<td>.20**</td>
<td>.32**</td>
<td>.48**</td>
<td>.53**</td>
<td>.62**</td>
<td>(.82)</td>
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<td>3.27</td>
<td>.47</td>
<td>.24**</td>
<td>.30**</td>
<td>.28**</td>
<td>.20**</td>
<td>.32**</td>
<td>.51**</td>
<td>.63**</td>
<td>.58**</td>
<td>.65**</td>
<td>(.84)</td>
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<tr>
<td>Adult networks and social capital</td>
<td>2.71</td>
<td>.64</td>
<td>.26**</td>
<td>.12</td>
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<td>.07</td>
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<td>(.78)</td>
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<tr>
<td>Stress</td>
<td>1.99</td>
<td>.78</td>
<td>-.07</td>
<td>-.15*</td>
<td>-.14</td>
<td>-.15*</td>
<td>-.03</td>
<td>.13</td>
<td>.07</td>
<td>.07</td>
<td>.10</td>
<td>.07</td>
<td>.27**</td>
<td>(.72)</td>
<td></td>
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<tr>
<td>Negative peer influences</td>
<td>1.44</td>
<td>.65</td>
<td>-.13</td>
<td>-.24**</td>
<td>-.14</td>
<td>-.21**</td>
<td>-.01</td>
<td>.05</td>
<td>.01</td>
<td>.14*</td>
<td>.11</td>
<td>.04</td>
<td>.24**</td>
<td>.63**</td>
<td>(.83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social exclusion</td>
<td>1.42</td>
<td>.65</td>
<td>-.08</td>
<td>-.23**</td>
<td>-.09</td>
<td>-.19**</td>
<td>-.03</td>
<td>.05</td>
<td>-.02</td>
<td>.09</td>
<td>.01</td>
<td>-.01</td>
<td>.17*</td>
<td>.50**</td>
<td>.79**</td>
<td>(.81)</td>
<td></td>
<td></td>
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<tr>
<td>Negative group dynamics</td>
<td>1.48</td>
<td>.65</td>
<td>-.03</td>
<td>-.18*</td>
<td>-.02</td>
<td>-.14</td>
<td>.11</td>
<td>.08</td>
<td>.06</td>
<td>.17*</td>
<td>.13</td>
<td>.10</td>
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<td>.56**</td>
<td>.73**</td>
<td>.74**</td>
<td>(.75)</td>
<td></td>
</tr>
<tr>
<td>Inappropriate adult behavior</td>
<td>1.28</td>
<td>.56</td>
<td>-.03</td>
<td>-.23**</td>
<td>-.06</td>
<td>-.15*</td>
<td>.06</td>
<td>.06</td>
<td>-.03</td>
<td>.12</td>
<td>-.02</td>
<td>-.02</td>
<td>.18*</td>
<td>.46**</td>
<td>.66**</td>
<td>.70**</td>
<td>.80**</td>
<td>(.87)</td>
</tr>
</tbody>
</table>

Note. Internal reliability estimates are presented on the diagonal in parentheses; *correlation significant at $p < .05$; **correlations are significant at $p < .01$; all other correlations are nonsignificant.
Table 3  Summary of SEM Analyses Exploring the Relationships Between Developmental Experiences and Mental Toughness

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Affective Intelligence</th>
<th>Desire to Achieve</th>
<th>Resilience</th>
<th>Attentional Control</th>
<th>Self-Belief</th>
<th>Global Mental Toughness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years playing cricket</td>
<td>.07</td>
<td>–.18*</td>
<td>–.01</td>
<td>–.17</td>
<td>.06</td>
<td>–.06</td>
</tr>
<tr>
<td>Hours per week training</td>
<td>.03</td>
<td>.25***</td>
<td>.12</td>
<td>.19*</td>
<td>.16</td>
<td>.18*</td>
</tr>
<tr>
<td>Identity experiences</td>
<td>–.23*</td>
<td>–.05</td>
<td>–.13</td>
<td>–.17</td>
<td>–.17</td>
<td>–.18</td>
</tr>
<tr>
<td>Initiative experiences</td>
<td>.34**</td>
<td>.57***</td>
<td>.26*</td>
<td>.32*</td>
<td>.19</td>
<td>.42***</td>
</tr>
<tr>
<td>Basic skill</td>
<td>.17</td>
<td>–.03</td>
<td>.01</td>
<td>.12</td>
<td>.10</td>
<td>.08</td>
</tr>
<tr>
<td>Interpersonal relationships</td>
<td>–.03</td>
<td>.27**</td>
<td>.15</td>
<td>.18</td>
<td>.13</td>
<td>.17</td>
</tr>
<tr>
<td>Team work and social skills</td>
<td>–.01</td>
<td>–.04</td>
<td>.02</td>
<td>.02</td>
<td>.11</td>
<td>.02</td>
</tr>
<tr>
<td>Adult networks and social capital</td>
<td>.24*</td>
<td>–.17</td>
<td>.14</td>
<td>–.13</td>
<td>.09</td>
<td>.05</td>
</tr>
<tr>
<td>Stress</td>
<td>–.06</td>
<td>–.07</td>
<td>–.23*</td>
<td>–.04</td>
<td>–.18</td>
<td>–.15</td>
</tr>
<tr>
<td>Negative peer influences</td>
<td>–.30*</td>
<td>–.17</td>
<td>–.24</td>
<td>–.28</td>
<td>–.02</td>
<td>–.25*</td>
</tr>
<tr>
<td>Social exclusion</td>
<td>–.01</td>
<td>.01</td>
<td>.08</td>
<td>.01</td>
<td>–.24</td>
<td>–.02</td>
</tr>
<tr>
<td>Negative group dynamics</td>
<td>.02</td>
<td>–.04</td>
<td>.17</td>
<td>–.07</td>
<td>.19</td>
<td>.08</td>
</tr>
<tr>
<td>Inappropriate adult behavior</td>
<td>.14</td>
<td>–.02</td>
<td>–.01</td>
<td>.08</td>
<td>.18</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note. Standardized path coefficients significant at *p < .05; **p < .01; ***p < .001.
and affective intelligence (31%). An inspection of the path coefficients detailed in Table 3 reveals that initiative experiences (.34) and adult networks and social capital (.24) were significantly and positively related with affective intelligence, whereas negative peer influences (–.30) identity experiences (–.23) were inversely related to this mental toughness facet. In terms of desire to achieve, initiative experiences (.57), interpersonal relationships (.27), hours per week training (.25) evidenced a positive relationship, whereas the number of years playing cricket (–.18) evidenced an inverse relationship. Only initiative experiences (.26) and stress (–.23) evidenced a statistically significant relationship with resilience. In terms of attentional control, initiative experiences (.32) and hours per week training (.19) both evidenced a positive and significant relationship. None of the path coefficients leading to self-belief reached statistical significance.

The model predicting the higher-order CMTI model was supported by the data, \( \chi^2(319) = 490.82, \) Bollen–Stine \( p = .085, \) CFI = .93, IFI = .93, TLI = .91, RMSEA = .054 (90% CI = .044 to .063). Collectively, the developmental experiences explained a significant amount of variance in the global mental toughness factor (40%), which in turn accounted for a substantial amount of variance in self-belief (58%) attentional control (67%), resilience (75%), desire to achieve (59%), and affective intelligence (65%). An inspection of the path coefficients detailed in Table 3 reveals that initiative experiences (.42) and hours per week training (.18) were significantly and positively related to global mental toughness, whereas negative peer influences (–.25) were inversely related to this higher-order construct.

**Discussion**

The aims of this study were twofold. The first goal was to examine the psychometric integrity of the CMTI (Gucciardi & Gordon, 2009) with a sample of adolescent cricketers. Contrary to previous research in Australian football (Gucciardi et al., 2009b), support for the hypothesized measurement model of the CMTI (Gucciardi & Gordon, 2009) with adolescent cricketers was revealed. The second goal was to explore the contribution of positive and negative developmental experiences (i.e., processes or experiences that occur in a particular activity or setting) to self-reported mental toughness, while controlling for the numbers of years playing experience (i.e., duration) and hours per week training (i.e., intensity). With the exception of desire to achieve, attentional control, and global mental toughness, the number of years playing experience and hours per week training did not show strong relationships with mental toughness as expected. SEM analyses revealed that both positive and negative development experiences were related to mental toughness, with positive experiences evidencing largely positive relations, and negative experiences evidencing largely an inverse relationship, although there were some exceptions to this generalization (e.g., identity experiences, negative group dynamics). In terms of specific developmental experiences, initiative experiences and negative peer influences surfaced as the most unique and significant contributions to the structural models, with identity experiences, interpersonal relationships, adult networks and social capital, and stress also making at least one important contribution.

The importance of assessing the validity of measurement instruments developed with one sample that are then applied to a different section of the population cannot be understated (Hagger & Chatzisarantis, 2009). Examples in which measurement
instruments that were developed and validated within one context or sample failed to translate directly to other areas exist both in the mental toughness field (e.g., Gucciardi, 2009) and beyond (e.g., Lane, Sewell, Terry, Bartram, & Nesti, 1999; Martens & Webber, 2002). Although the initial CMTI validation work was performed on three independent samples involving adolescent cricketers (see Gucciardi & Gordon, 2009), the current findings alleviate potential concerns relating to sample-specific nuances or chance relationships inherent in previous measurement research (e.g., Gucciardi, 2009). This study adds to the current knowledge base by providing the first piece of evidence to support the replication and validation of the hypothesized CMTI model across independent samples of the population.

Conceptually, these findings align well with previous qualitative research (e.g., Bull et al., 2005; Jones et al., 2002, 2007) thereby supporting the multidimensional nature of mental toughness. Beyond the replication of the multidimensional model of mental toughness observed in the current study, it is important that the issue of measurement invariance with respect to important variables such as age and gender be considered in future research. Measurement invariance has both methodological and conceptual implications for the study of a psychological construct (Cheung & Rensvold, 2002). For example, demonstrations of measurement invariance are necessary for making valid comparisons of group means or pooling data across groups together. In contrast, failure to support stable factor structure or interpretations of items can reflect substantive between-group differences that are of theoretical interest. These methodological issues are not only relevant for future research involving the CMTI but also other measures of mental toughness, particularly inventories such as the Mental Toughness Questionnaire-48 (Clough, Earle, & Sewell, 2002) that have received widespread use with little replication and further documentation of their factor structure beyond their initial validation. In addition to such methodological considerations, the current results also underscore the importance of having a strong conceptual foundation for the development of psychometrically sound inventories.

The number of years playing experience (i.e., duration) and hours per week (i.e., intensity) dedicated to cricket training were explored in the structural models, as there is both qualitative (e.g., Connaughton et al., 2008) and quantitative evidence (e.g., Gucciardi, 2010) to support their influence on mental toughness development. Contrary to expectations, there was a general lack of relationship between years playing experience or training hours and mental toughness, with the exception of the desire to achieve and attentional control facets, as well as global mental toughness. Specifically, the current findings revealed an inverse relationship between the number of years playing experience and desire to achieve; that is, cricketers with more playing experience reported lower levels of this desire than cricketers who were less experienced. In contrast, there was a positive relationship between training hours and desire to achieve, attentional control, and global mental toughness such that cricketers with higher levels of these facets reported higher levels of training hours per week when compared with cricketers with lower levels of these characteristics. Spending more time involved in cricket activities provides the cricketer with more opportunities to gain the skills and experiences that are associated with the context than others who spend less time participating in this activity (Larson & Verma, 1999). Nevertheless, exposure to various experiences or critical incidents
alone may not be a sufficient activity for reaping the benefits of these experiences unless one engages in reflective practice (Connaughton et al., 2010; Hanton, Cropicaly, & Lee, 2009) or behaviorally, emotionally, and/or cognitively engages in the activity context (Bartko, 2005; Fredricks, Blumenfeld, & Paris, 2004).

Results of the current study extend previous qualitative research with elite athletes and coaches (Connaughton et al., 2008, 2010; Gucciardi et al., 2009; Thelwell et al., 2010; Weinberg et al., in press) to provide preliminary evidence on those developmental experiences that are associated with key mental toughness assets in adolescent cricketers. Consistent with the available literature, mental toughness evidenced relationships with both positive and negative experiences. In all cases except for self-belief, at least two variables were associated with various facets thereby supporting previous research in which the development of mental toughness has been associated with a variety of mechanisms and processes rather than one primary driving force (e.g., Connaughton et al., 2008, 2010). Whereas negative experiences such as negative feedback or comments and unrecognized talent by others (e.g., Connaughton et al., 2008, 2010) have largely been described as facilitating the development of mental toughness in previous research, in the current research an inverse relationship was revealed such that stress and negative peer influences surfaced as negative predictors (e.g., higher stress levels are related with lower levels of resilience). The retrospective nature of previous mental toughness research, which has involved elite athletes and coaches who have already reached a mature level of performance and achieved sporting success, may offer an explanation for the equivocal findings. For example, social support particularly in the form of knowledge from others was recognized as helping athletes rationalize these negative experiences such that they were deemed as a positive influence for their development (Connaughton et al., 2008). Nevertheless, the current findings observed with individuals who are currently involved in the mental toughness development process, although preliminary, offer support for the types of developmental experiences that may generalize to the wider population within an adolescent sample.

Initiative experiences surfaced as the most important variable for explaining self-reported mental toughness. Considered one of the core qualities of positive youth development, initiative refers to an intrinsic motivation to apply cumulative effort over time toward achieving a goal (Larson, 2000). That initiative experiences was related to each mental toughness component except for self-belief parallels previous research that has linked sport participation to high rates of initiative experiences (Larson et al., 2006). Previous research indicates that perceived competence or belief in one’s ability is an antecedent of initiative in youth swimmers (Coatsworth & Conroy, 2009) thereby providing one explanation as to why initiative experiences did not impact on the self-belief component of mental toughness. Nonetheless, providing youth cricketers with opportunities to set goals, apply directed effort, solve problems, and manage their time effectively appears most related to mental toughness in cricket. Indeed, adolescence is noted as a particularly valuable time for the development of initiative because this period facilitates the growth of meta-cognitive strategies for self-regulation (Larson, 2000). From the perspective of self-determination theory (Ryan & Deci, 2000), interpersonal involvement, competence-involving structure, and autonomy support are important factors to consider in creating environments in which key mental toughness facets may be “caught.” Moreover, coaches and practitioners can integrate psychological
skills training with traditional physical training to “teach” key mental toughness facets (Gucciardi, Gordon, & Dimmock, 2009d).

Other important developmental experiences related broadly to various interpersonal interactions such as negative peer influences, interpersonal relationships, and adult networks and social capital. The formation and maintenance of quality relationships is a core theme among these interpersonal experiences and is consistent with qualitative research on the development of mental toughness (Connaughton et al., 2008, 2010; Gucciardi et al., 2009; Thelwell et al., 2010). Within the context of the YES (Hansen & Larson, 2005), the interpersonal relationships subscale relates to experiencing diverse peer relationships and prosocial norms. Diverse peer relationships provide adolescents with developmentally salient opportunities to improve their social skills and social competence, and to exchange knowledge and resources (Collins & Steinberg, 2006). Prosocial norms facilitate the adoption of healthy beliefs and clear standards for behavior through, in the case of the YES (Hansen & Larson, 2005), a range of approaches including discussing morals and values, learning to help others, learning to stand up for something that is morally right, and being able to change others for the better. Interpersonal discussions of various psychosocial aspects of the self and others has been reported as facilitating improvements in mental toughness by footballers, coaches, and parents (Gucciardi et al., 2009d). Whether these approaches to establishing prosocial norms result in increased components of mental toughness or whether players who have higher levels of mental toughness are more inclined to stand up for themselves or help others than cricketers with lower levels is an important area of investigation for future research. Peers are of central importance in children’s and adolescents’ academic development, social functioning, and psychological well-being (for a review, see Rubin, Bukowski, & Laursen, 2009). Relationships with peers, in particular, become an important feature during the adolescent years in which key transitions (e.g., junior school to high school) and influential developmental changes in social, biological, and cognitive factors (Eccles & Roeser, 2009) occur. Within the sport context, peer interactions and relationships contribute to the quality of adolescents’ overall experiences (Smith, 2003). For example, whereas the feedback from adult leaders for self-assessing competence is more important for young children under 10 years of age, the peer network is the primary source of competence information for adolescents (Horn & Weiss, 1991). Therefore, it is not surprising that an inverse relationship between negative peer influences (e.g., pressured or ridiculed by peers) and self-reported affective intelligence and global mental toughness surfaced in the current study. Although previous research has supported the positive role of peers (e.g., social support, provide encouragement) on the development of mental toughness (e.g., Connaughton et al., 2008; Thelwell et al., 2010), the current findings indicate that when peer influence includes negative aspects there may be the potential for reduced mental toughness. Thus, there is a need for future research to delineate the mechanisms by which peers can both positively and negatively influence the development of mental toughness in the sport context.

The development of identity is more often facilitated in voluntary activities than in other contexts because such activities provide adolescents with an opportunity exert control, experience autonomy, and play an active role in their own development (Larson, 2000). Thus, it was of no surprise that cricketers in the current
study reported high levels of identity experiences. However, contrary to expectations, identity experiences evidenced an inverse relationship with all five facets of mental toughness (statistically significant for affective intelligence) as well as its general factor. Although participants reported high levels of identity exploration and reflection through their cricket experiences, it may well be that the cricketers have yet to commit to one or more of these alternative identities revealed through experiences of identity exploration and reflection (cf. Marcia, 1966). Alternatively, cricketers may not have dealt with their commitments to the selected identities in an active manner (e.g., continuously monitoring present commitments, by reflecting on one’s choices, searching for information about these commitments, discussing them with others) thereby failing to consciously consider and maintain their commitments (cf. Meeus, 1996). Clearly, these interpretations are speculative and require examination in future research.

Limitations, Future Directions, and Conclusions

Although this study contributes to the burgeoning line of mental toughness inquiry in sport contexts, it is not without its limitations and these should be considered in future research. The main limitation of the current study was the correlational nature of the data, which is not adequately suited to capturing the complex nature of the development process. Extending the current work, subsequent research could adopt a longitudinal or prospective design to ascertain whether mental toughness affects or is an effect of the number of years playing experience and hours dedicated to cricket per week. An additional direction would be to ascertain whether it is the quality or quantity of experiences an individual is exposed to that plays the greatest role in the development of mental toughness. To provide information regarding causality, it would be interesting to examine the relevance of such developmental experiences on mental toughness under experimental conditions.

A second limitation of the current study is that only self-reported data were included. Given the limitations associated with social desirability, future research should consider including multisource ratings of mental toughness from coaches, teammates, and parents or observational data to strengthen the findings from self-reported data (e.g., Gucciardi, Gordon, & Dimmock, 2009b, 2009c). Alternatively, the experience sampling method (Larson & Csikszentmihalyi, 1983; see also, Hektner, Schmidt, & Csikszentmihalyi, 2007) could be used to capture individuals’ in situ experiences of important developmental activities. Using this method, individuals are stopped at certain times at predetermined times (signal contingent) and/or when a particular event occurs (event contingent) and asked to report on their experience in real time (open-ended and/or closed-ended questions).

Third, although the single-sport design has some advantages (e.g., examination of within-sport process), the focus on cricket and male participants also created a more homogenous sample than sampling a greater variety of sports and participants. As there is evidence to support the notion that team sports (e.g., football, cricket) offer a greater number of positive developmental experiences than individual sports such as athletics (Hansen et al., 2010), future investigations are required to ascertain how well the current findings generalize to other sports and across male and female participants.
Finally, with the majority of research to date grounded in elite athletes’ perspectives, there is also a need to consider obtaining adolescents’ views of mental toughness in sport (i.e., its makeup and development) before reaching such mature levels of performance. Although mental toughness appears to be at its highest in the latter part of one’s athletic career (e.g., Connaughton et al., 2010), a key methodological strength of studying young people is that individuals currently involved in the development processes are less susceptible to limitations of retrospective recall that are inherent with those participants who have already reached a mature level of performance (Côté, 1999). In addition to understanding how the best athletes have reached the highest level by having them reflect on their experiences, it is envisaged that there will be both conceptual and practical (e.g., higher buy into intervention programs) implications of also studying young people’s views of mental toughness. For example, young people’s views may support the retrospective accounts of elite athletes thereby strengthening our confidence in such findings. Alternatively, it may be that young people offer unique perspectives on key developmental processes and mechanisms not recalled by elite athletes several years after the fact. From a practical standpoint, appreciating and understanding the specific needs of young people involved in the development process will likely facilitate researchers’ and coaches’ ability to engage adolescents in intervention programs designed to enhance mental toughness. In any case, it is important that young people are not studied in isolation (e.g., one interview at one time point) but rather are followed longitudinally through important developmental periods to ascertain key factors that contribute to change or growth in mental toughness.

In conclusion, the current study is among the first to quantify a relationship between youth experiences and mental toughness in adolescent athletes that was initially revealed in previous qualitative research involving adult samples (e.g., Connaughton et al., 2008, 2010; Gucciardi et al., 2009). In terms of practical implications of these findings, key stakeholders (e.g., coaches, parents) can encourage long-term planning, evaluating progress and adjusting plans as needed, and other self-regulatory processes (e.g., time management), as well as diverse and positive relationships with peers and other adults. As one of the first studies to support the psychometric rigor of a mental toughness questionnaire with adolescent participants, the findings provide support for the robustness and generalizability of the hypothesized measurement model (Gucciardi & Gordon, 2009). Conceptually, these findings have implications for the clarification of key mental toughness components, which has been an issue stemming from the multitude of characteristics being labeled under this umbrella construct. Nevertheless, any conclusions reached on the current data should therefore be considered tentative and awaiting replication and extension. Bearing in the mind the aforementioned limitations, this study contributes to the emerging literature on mental toughness in sport by highlighting several developmental experiences that are important for this desirable construct in a sample of adolescent cricketers. It is hoped that the current findings will provide a platform from which researchers can work toward developing a clear understanding of those factors that facilitate the development of mental toughness.
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References


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