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Mental Toughness: Progress and Prospects

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Supplementary Material

Recent Trends in Mental Toughness

A key aim for papers published in *Current Opinions in Psychology* is to provide readers with a synopsis of work published during the past two years. As such, I conducted an electronic search of five databases (Web of Science, Scopus, CINAHL Plus, SPORTDiscus, PsycINFO) on August 11th 2016 using the search term “mental* tough*”. Articles that were accepted for publication or in press were identified using (i) Google Scholar, (ii) manual searches of international journals where researchers have published work on mental toughness (e.g., *The Sport Psychologist*, *Psychology of Sport and Exercise*), and (iii) requested from researchers via the SPORTPSY Listserv on August 12th 2016. Papers were included as part of this review when they met the following criteria: (i) written in English, (ii) published in a peer-reviewed outlet, (iii) mental toughness was a key focus for the study or review, (iv) involved research or theory on humans, and (v) published 2014 onwards. Papers were excluded if the full text of the article could not be accessed. In total, 270 articles were retrieved. After duplicates were removed (n = 111), a review of abstracts and full texts (when the abstract was unclear) indicated that 75 papers met the inclusion criteria. Full citation details of these retained papers are noted below in Appendix A, with summaries of key methodological features of them included in the excel file in the online supplementary material.

From a methodological standpoint, a number of findings can be gleaned from this search. First, the majority of work during this period has involved cross-sectional snapshots of the study variables including an assessment of participants' mental toughness (49%). Researchers have also made use of prospective designs (13%) where the measurement of mental toughness as a predictor or outcome is temporally separated from other key variables by at least 2 weeks, and qualitative designs in which participants' experiences and perceptions of mental toughness are explored (12%). Representing unique cases rather than

general trends, it is encouraging to see the publication of conceptual papers that aim to clarify the theoretical features of mental toughness. For example, my colleagues and I drew from self-determination theory [1] to propose a tripartite model in which we emphasised the importance of understanding the dimensions of striving, surviving and thriving (i.e., what personal resources enable mentally tough individuals to do) for clarifying the conceptual theme of mental toughness [2]. The recent diversification in methodological approaches for the study of mental toughness [e.g., 3,4] is also encouraging because it has the potential to shed light on conceptual features that may not be gleaned through methods that employ standardised self-report questionnaires in which researchers impose their conceptualisation and operationalisation of mental toughness upon participants.

Second, it is pleasing to see that research on mental toughness is being conducted in a range of countries and cultures, which contrasts with an observation that Sandy Gordon and I made only 6 years ago [5]. Excluding review or conceptual papers, the majority of research on mental toughness over the past 2 years where new primary data was collected has involved British (30%), American (19%), Australian (19%), and Swiss (14%) participants. Nevertheless, research on mental toughness has received increased interest in other regions of the world including Asia (e.g., Malaysia, China), Europe (e.g., Denmark, Norway), Africa (e.g., Egypt, Tunisia), and the Middle East (e.g., Iran). This renewed interest in mental toughness from a diverse group of researchers has the potential to enhance the quality of research in this area and therefore evolve theoretical perspectives on this construct. For example, my colleagues and I examined the cross-cultural invariance of the mental toughness inventory [6] as self-reported by Australian, Malaysia, and Chinese athletes [7]. We found that a unidimensional structure of mental toughness generalized across these three cultural groups. However, there were subtle yet substantively meaningful differences on a selection of item means. These findings suggest the need to examine culturally-salient aspects of mental

toughness in future measurement work, which could shed light on the boundary conditions of this construct.

Third, in 58 of the 70 empirical papers, mental toughness was measured using self- or informant-reports. The following scales were most commonly used to measure mental toughness: the MTQ48 (n = 17), SMTQ (n = 10), MTQ18 (n = 8), MTI (n = 7), a bespoke measure for the purposes of the study (n = 5), PPI (n = 4), and PPI-A (n = 2). Consistent with our recent observation [8], these data indicate that the MTQ48 and its shortened version (MTQ18) remain the tool of choice for most researchers interested in mental toughness. However, there are inconsistencies in the ways by which researchers operationalise models of mental toughness through self-report instruments. For example, both the MTQ48 and MTQ18 are underpinned by the 4Cs model of mental toughness, yet they differ in their operationalisation of the dimensionality of the concept; whereas a multidimensional perspective is captured by the MTQ48, a unidimensional concept is assessed by the MTQ18 [9]. A global mental toughness score is often used alongside the sub-components of the MTQ48 [e.g., 10,11] and SMTQ [e.g., 12,13], yet the bi-factor structure of these tools has not yet received support nor been tested for its validity [14]. In other cases, the theorised multidimensionality of mental toughness is captured via a global factor only [e.g., 15,16] without any evidence to support the higher-order structure of the tool in which a second-order factor explains the variance among a set of lower-order factors [14]. It is important for the conceptual evolution and scientific integrity of mental toughness that there is congruence between the conceptual model and its operationalisation in future research.

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Appendix A – Reference Details of Retained Papers from Systematic Review

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