

Cognitive Appraisals in Sport: The Direct and Moderating Role of Mental Toughness

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Abstract The aims of this study were to investigate the relationship between mental toughness and cognitive appraisals, in addition to exploring the moderating influence of mental toughness upon cognitive appraisals. A total of 296 athletic participants (male $n = 200$; female $n = 96$) aged between 16 and 51 years (M age = 21.92 years, $SD = 4.61$) took part in this study. Moderated multiple regression analysis revealed mental toughness had a significant negative relationship with threat appraisal and a significant positive relationship with challenge. Additionally, mental toughness had a moderating influence upon the centrality-threat appraisal relationship. Overall, these findings imply interventions aimed at threat appraisal manipulation could be targeted at lower mentally tough athletes.

Keywords MentalToughness, Appraisal, Athletic

1. Introduction

Stress occurs when the relationship between the person and his or her environment is perceived as taxing or exceeding one's resources and thus endangering well-being[1]. The degree of stress experienced by an individual depends on his or her cognitive appraisal of a situation. Appraisal is the process of categorizing an encounter in relation to its significance to the well-being of a person, with this construct containing two types of appraisals, primary and secondary[1]. Primary appraisal refers to an individual's evaluation regarding the personal significance of the situation for their well-being. Secondary appraisal is an evaluation of what might and can be done to manage the situation. Based upon Lazarus and Folkman's[1] transactional approach, Peacock and Wong[2] proposed three dimensions of primary appraisal, 1) *threat appraisal*: the potential for harm or loss in the future, 2) *challenge*: anticipation for gain or growth, and 3) *centrality*: the importance of an event. Three secondary appraisal dimensions, associated with stressor controllability, were also identified by Peacock and Wong[2], 1) *controllable-by-self*: judgement as to whether one can control the situation, 2) *controllable-by-others*: judgement as to whether one can rely on others to help manage the situation, and 3) *uncontrollable-by-anyone*: events that are appraised as not being controllable by anyone.

To date, research in sport has primarily focused on cognitive appraisals in relation to sport performance[3-4], emotions[5-6], and coping[7-8]. However, scant attention has explored the relationship between other factors that are thought to influence the appraisal process, such as personality. According to DeLongis and Holtzman[9] personality can influence the cognitive appraisal of a stressful event. Guntert, Cohen, and Armeli[10], using the big five personality dimensions, found neuroticism to be associated with threat appraisal and an inability to effectively manage a stressful encounter. Extraverts appraised stressful events as a challenge and perceived they had the personal resources to deal with a stressful event. An alternative personality characteristic which is thought to influence the cognitive appraisal of a stressful situation is mental toughness. Clough, Earle, and Sewell[11] conceptualised mental toughness as a trait like construct that shares similarities with hardiness[12]. Research has suggested that hardiness is associated with cognitive appraisal. For example, Wiebe[13] found hardy participants rated the same objective stressor as less threatening and reported greater control, compared to their low hardy counterparts.

Although similar, Crust[14] asserted confidence in ones ability and inter-personal confidence, due to their importance in sport, are salient components that distinguish mental toughness from hardiness. As such, in his review of mental toughness in sport, Crust[14] recognised the need to understand the relationship between mental toughness and cognitive appraisals more comprehensively. To date, minimal empirical research has focused on investigating this relationship among athletes. One exception is the study by Kaiseler, Polman, and Nicholls[15] who found total mental

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toughness scores predicted stressor intensity and stressor control appraisals. That is, compared to their less mentally tough counterparts, mentally tough athletes had lower levels of stressor intensity and higher levels of perceived stressor control. Although Kaiseler *et al.*'s [15] study was the first to consider the mental toughness- cognitive appraisal relationship, two limitations warrant mention. First, each appraisal was measured using a single item scale. Such scales could, potentially, be marred by measurement error, and do not allow Cronbach Alphas to be obtained, thus reliability cannot be verified. Therefore, research is required using reliable multi-item scales to assess appraisals, with one such scale being the Stress Appraisal Measure (SAM) [2]. Second, primary appraisals were not assessed, which is not in keeping with Lazarus and Folkman's [1] transactional approach to stress. Polman, Clough, and Levy [16] speculated athletes who are more mentally tough would appraise situations as a challenge, whereas athletes who are less mentally tough would appraise situations as a threat. To test this assertion, further research inclusive of primary appraisals (i.e., threat and challenge) is necessary.

It is possible that personality constructs, like mental toughness, not only have a direct effect upon cognitive appraisals but also a moderating effect. In order to determine the moderating influence of mental toughness it is necessary to delineate the relationship between cognitive appraisals. According to the transactional perspective of stress, "primary appraising does not necessarily come first nor does it operate independently of secondary appraising, and there is an active interplay on the part of both" [17, p.78]. The "active interplay" was recently investigated by Nicholls, Polman, and Levy [18]. Findings revealed significant associations between stressor controllability (controllable and uncontrollable-by-anyone) and stress appraisals (threat/ challenge), alongside significant associations between centrality (importance) and stress appraisals (threat/ challenge). The extent to which these relationships influence each other may depend, at least in part, on the moderating role of mental toughness. A moderator is a variable that alters the direction or strength of the relation between the predictor (i.e., stressor controllability) and criterion variable (i.e., stress appraisals) [19].

In summary, this paper explored the constructs of cognitive appraisal and mental toughness among an athletic population. The aim of this study was to investigate the direct relationship between mental toughness on both challenge and threat appraisals. We hypothesised there would be a positive relationship between mental toughness and challenge appraisal and a negative relationship between mental toughness and threat appraisal. Another aim of this study was to explore the moderating role of mental toughness on threat and challenge appraisals. Based on the aforementioned Nicholls *et al.* [18] findings, we hypothesised that mental toughness would moderate the relationship between 1) stressor controllability and stress appraisals (i.e., threat and challenge), 2) centrality and stress appraisals (i.e., threat and challenge).

2. Method

2.1. Participants

Two hundred and ninety six UK based athletes (200 males, 96 females) with a mean age of 21.92 ($SD = 4.61$) years participated in the study. The sample consisted of beginners ($n = 20$), club/ university ($n = 141$), county ($n = 74$), national ($n = 51$), and international ($n = 10$) level athletes. Collectively, participants had 9.65 ($SD = 5.11$) years of competitive sport experience. All participants provided consent and approval was gained from a University's Research Ethics Committee.

2.2. Questionnaires

Mental Toughness. The Mental Toughness Questionnaire (MTQ48) [11] is a 48-item questionnaire that assesses total mental toughness and its six subcomponents: challenge, commitment, interpersonal confidence, confidence in own abilities, emotional control, and life control. The items are rated on a 5-point Likert scale anchored at 1 = *Strongly disagree* to 5 = *Strongly agree*. The MTQ48 in the present study had an overall Cronbach Alpha value of .90. Five of the subscales of the MTQ48 had acceptable Alpha values (α between .60 and .80) with the exception of emotional control ($\alpha = .51$), which suggests some unreliable items. We recalculated alpha coefficients following iterative deletion of items. Deletion of item 26 and 34 resulted in an improved value ($\alpha = .60$; see Kaiseler *et al.* [15] for similar findings). The psychometric properties of the MTQ48 have recently been shown to be adequate [20]. In addition, a number of studies have provided support for the predictive, face, construct, and criterion validity of the MTQ48 [14].

Cognitive Appraisals. The Stress Appraisal Measure (SAM) [2] was used to assess cognitive appraisals. The SAM is a 28-item questionnaire, and examines six dimensions of appraisal. Three components of the SAM measure primary appraisal: threat, challenge and centrality. The SAM also examines three secondary appraisals, relating to stress controllability: controllable-by-self, controllable-by-others and uncontrollable-by-anyone. In addition to the SAM measuring primary and secondary appraisal, it also measured the overall perceived stress, referred to as stressfulness. Participants answered questions in relation to the following instructions: "This questionnaire is concerned with your thoughts about the forthcoming sport competition. There are no right or wrong answers. Please respond according to how you view this situation right now." All items were rated on a 5-point Likert-type scale anchored at 1 = *Not at all* to 5 = *Extremely*. Peacock and Wong [2] reported that the Cronbach's alpha coefficients for the SAM ranged from .74 to .90. The Cronbach alpha coefficients in the present study for primary appraisals (threat $\alpha = .70$, challenge $\alpha = 0.73$, centrality $\alpha = .79$), secondary appraisals (controllable-by-self $\alpha = .84$, controllable-by-others $\alpha = .85$, uncontrollable-by-anyone $\alpha = .67$), and stressfulness ($\alpha = .68$) were acceptable.

2.3. Procedure

Participants were recruited from sports clubs and universities. After agreeing to take part in the study, they received an information letter and provided informed consent before completing the questionnaires. Participants completed the SAM one hour before their competitive event started. The MTQ48 was measured one hour following competition. Research assistants administered the questionnaires in the same order and were available to answer questions.

2.4. Data Analyses

After screening for outliers and normality, Cronbach alphas and descriptive statistics were obtained for all study variables. Following this, correlations between the variables were calculated. To investigate whether appraisal variables predicted if a self-selected stressor was perceived as a challenge or a threat and whether this was moderated by levels of mental toughness we conducted moderated multiple regression analysis[21]. At Step 1, we entered total mental toughness and at Step 2 centrality, controllable-by-self, controllable-by-others, uncontrollable-by-anyone and perceived stressfulness. In Step 3 the interaction between mental toughness and the appraisal variables was entered (product term of the multiplication of the centred predictor variables). Prior to data analysis variables were centred by subtracting the sample mean of the variable measured on a continuous scale to obtain a sample mean of zero. The F test, representing the stepwise change in variance explained because of the addition of the product term is an indicator of the significance of the moderator effects[19]. However, in the instance of a non-significant interaction term we removed the term from the model. In such an occasion, the first order effects became unconditional and therefore standardized Betas are also reported[21]. Interaction effects were explored by plotting regression equations for the centred data for the outcome variables at mean, low (-1 SD from the mean) and high (+1 SD from the mean) values[22]. All analyses were conducted using SPSS, version 18.3.

3. Results

Table 1 provides the mean and standard deviations for the variables, whereas Table 2 provides the results of the correlational analysis. These findings showed mental toughness had and inverse relationship with threat appraisal and a linear relationship with challenge appraisal.

Table 1. Means and Standard Deviations for Cognitive Appraisals and Mental Toughness

	Means and Standard Deviations
Threat	7.35 (2.53)
Challenge	13.73 (2.90)
Centrality	9.52 (3.29)
Controllable-by-self	15.58 (3.03)
Controllable-by-others	12.79 (3.66)
Uncontrollable-by-anyone	6.50 (2.52)
Stressfulness	9.56 (2.50)
Mental Toughness	3.62 (0.39)

e results of the moderated multiple regression analysis for threat and challenge are presented in Table 3. For threat a small but significant change in variance was explained by the interaction term. This explained an additional 2% of variance over and above the 50% explained by the first order effects of mental toughness and appraisal variables. However, only the mental toughness by centrality interaction was statistically significant. Figure 1 shows the regression of threat on centrality at three levels of mental toughness. It indicates that at higher levels of centrality (mean and +1SD) individuals with lower levels of mental toughness experience more threat than individuals with mean or high mental toughness. In addition, there appears to be an increasing threat appraisal at mean and +1SD between the mean and high mental toughness individuals.

The first-order effects suggest that higher levels of mental toughness are less likely to be associated with seeing the situation as a threat. In addition, independently of mental toughness, higher levels of centrality, uncontrollability, and stressfulness increased the likelihood that a stressful event was seen as a threat whereas control by-others was associated with decreased likelihood that a stressful event was seen as a threat.

With regards to challenge, the third step (interaction term) of the regression analysis did not significantly contribute to the overall model. This indicates that mental toughness did not moderate the relationship between appraisal and challenge. There were however first order effects. Higher levels of mental toughness were associated with increased change of evaluating an event as a challenge. In addition, higher levels of centrality, controllable-by-self, controllable-by-others, and stressfulness predicted that the stressful event would be perceived to be a challenge.

Table 2. Pearson Product Moment Correlations for Cognitive Appraisals and Mental Toughness

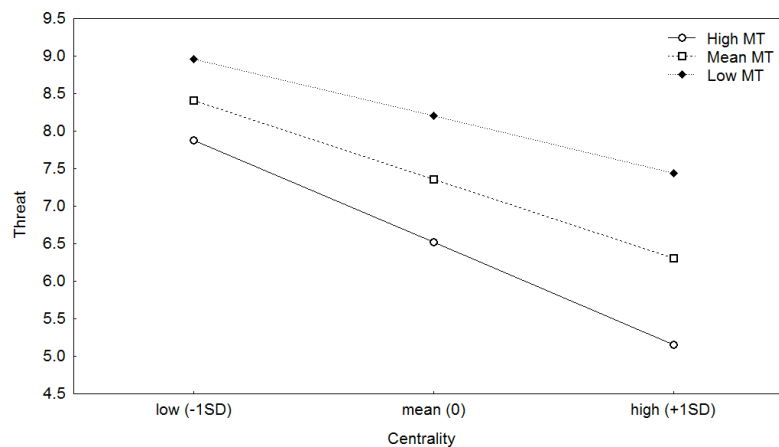
	Challenge	Centrality	Controllable-by-self	Controllable-by-others	Uncontrollable-by-anyone	Stressfulness	Mental Toughness
Threat	.05	.40**	-.25**	-.21**	.36**	.58**	-.33**
Challenge		.49**	.43**	.32**	-.19**	.24**	.28**
Centrality			.18**	.11	.06	.44**	.04
Controllable-by-self				.44**	-.31**	-.08	.48**
Controllable-by-others					-.28**	.05	.22**
Uncontrollable-by-anyone						.14*	-.27**
Stressfulness							-.18**

*p< .05; **p< .01

Table 3. Results of the Moderated Multiple Regression Analysis

Step and variable	B	Beta	R ²	ΔR ²
Dependent variable: Threat				
Step 1: Mental Toughness	-2.12	-0.33**		
Step 2: Centrality	0.18	0.23**		
Controllable-by-self	-0.06	-0.07	.11**	.11**
Controllable-by-others	-0.10	-0.14**	.50**	.40**
Uncontrollable-by-anyone	0.19	0.18**		
Stressfulness	0.44	0.43**		
Step 3: MT * Centrality	-0.19	-0.10*		
MT * Controllable-by-self	0.03	0.01		
MT * Controllable-by-others	-0.07	-0.04	.52**	.02*
MT * Uncontrollable-by-anyone	-0.18	-0.07		
MT * Stressfulness	-0.07	-0.03		
Dependent variable: Challenge				
Step 1: Mental Toughness	2.07	0.28**		
Step 2: Centrality	0.34	0.39**		
Controllable-by-self	0.22	0.23**	.08**	.08**
Controllable-by-others	0.10	0.12*	.41**	.33**
Uncontrollable-by-anyone	-0.10	-0.08		
Stressfulness	0.13	0.12*		
Step 3: MT * Centrality	0.01	0.00		
MT * Controllable-by-self	-0.24	-0.11		
MT * Controllable-by-others	0.24	0.13*	.42	.02
MT * Uncontrollable-by-anyone	0.27	0.09		
MT * Stressfulness	-0.22	-0.08		

*p < .05; **p < .01

**Figure 1.** Regression of Threat on Centred Centrality at Various Levels of Mental Toughness (MT)

4. Discussion

Expanding Kaiseler et al.'s.[15] findings, the present study found mental toughness had a significant negative linear relationship with threat appraisal and a significant positive linear relationship with challenge, and thus supports our hypothesis. These findings reveal that mentally tough athletes were less likely to perceive an encounter threatening and more likely to perceive an encounter as a challenge. Conversely, low mentally tough athletes were more likely to perceive an encounter as a threat and less likely to perceive an encounter as a challenge. These findings align with the hardiness literature, which suggested hardy individuals appraised situations as less threatening and more challenging compared to their lower hardy counterparts[12]. Correlational findings from the present study found higher levels of mental toughness to be significantly associated with lower stressfulness ($r = -.18$). Therefore, it is possible that being mentally tough will act as a buffer to stress. Present findings suggested this might be due to mentally tough athletes being able to appraise stressful situations as a challenge and less threatening. Future research is required investigating the mediating variables that explain the relationship between mental toughness and stress appraisals. One such variable could be coping self-efficacy, a belief that one is able to cope with a stressful encounter. Indeed, Lazarus and Folkman[1] considered coping self-efficacy to influence stress appraisal during a stressful event. However, its mediating influence accounting for the mental toughness-stress appraisal relationship among athletes has yet to be investigated.

Present findings suggested mental toughness did not significantly moderate the relationship between stressor controllability and stress appraisal. Similarly, the centrality-challenge appraisal relationship had no moderating influence by mental toughness. However, mental toughness did significantly moderate the centrality-threat appraisal relationship. That is, when a stressful encounter had a greater level of importance, lower mentally tough individuals were likely to appraise their situation as more threatening, compared to those who were mentally tough. On this basis, interventions that manipulate threat appraisals could be targeted at lower mentally tough athletes, with a view to decreasing their exposure to stress of important events. Considering that mental toughness has a personality dispositional orientation, such interventions may not change their level of mental toughness, but rather allow the individual to effectively manage their interaction with the external environment[16]. Future intervention studies may wish to incorporate imagery. Recently, Williams, Cumming, and Balanos[23] found imagery to be a significantly effective technique to help athletes alter their threat appraisal of a stressful situation.

It is important that the findings from this study are considered in the context of some limitations. First, inferences regarding causality cannot be inferred from the current findings due to its cross-sectional design. Second, it should

be noted the moderated effect found, only explained an additional 2% of the variance. However, this study did use more stringent moderation analysis, which is more robust than the moderation analysis initially put forward by Baron and Kenny[24]. Furthermore researchers may wish to consider other personality variables, which may have a greater moderating influence upon stress appraisals (e.g., big five personality taxonomy) using sophisticated moderation analysis as used in the current study. Third, for statistical purposes only overall mental toughness scores were used for analysis, its multi-dimensional components were omitted. A larger and better balanced sample would have permitted the use of structural modeling, allowing the inclusion of mental toughness constructs, as measured by the MTQ48.

In conclusion, current findings suggested mentally tough athletes are more likely to perceive a situation as a challenge, whereas lower mentally tough athletes are likely to appraise a situation as a threat. In addition, mental toughness has the potential to moderate stress appraisals. This study indicated encounters appraised of greater importance are likely to be perceived as more threatening by lower mentally tough athletes. Interventions that manipulate threat appraisals among low mentally tough athletes have the potential to facilitate better emotional and coping responses, which ultimately may enhance sport performance.

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