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Relationship between competitive anxiety and mental toughness: a latent regression analysis

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Abstract

Background. One of the most discussed relationships in sports psychology is the relationship between competitive anxiety and sport performance. Competitive anxiety was found to be influenced by individual factors. An important psychological concept found to be related to competitive anxiety is mental toughness, which is defined as the superior mental qualities of an athlete that sustain success and excellence in sports.

Aims. The aim of the present study was to investigate the relationship between mental toughness and competitive anxiety among athlete students.

Methods. Participants were 140 athletes from secondary sport schools, handball players, aged between 13 to 19 years (m = 15.97, SD = 1.622). Self-reports were obtained from all athletes regarding their mental toughness (Sport Mental toughness Questionnaire) and their competitive anxiety (Sport Anxiety Scale-2). Data were analyzed using Structural Equation Modeling framework.

Results. Correlation between Sport Mental Toughness scales ranged between r=.289 and r=.489. Correlation for Sport Anxiety Scale dimensions ranged between r=.418 and r=.633, all of them being positive. Standardized path indicator between Sport Mental Toughness and Sport Anxiety Scale was β = -.843, which explains almost 71% of the latent endogenous variance (R^2=.711).

Conclusions. The results of the current study highlighted the relationship between mental toughness and competitive anxiety.

Key words: mental toughness, competitive anxiety, latent regression analysis.

Introduction

"Competitive trait anxiety is a personality disposition, akin to (trait) test anxiety, that reflects an individual's tendency to perceive threat and experience stress in situation that involve sport competition" (Lewthwaite & Scanlan, 1989). Athletes with higher levels of competitive anxiety experience states involving irrational fear or transient physical and psychological tension more frequently and more intensely in situation than athletes with lower levels of competitive anxiety (Amanendra et al., 2018). According to Martens (1977), anxious athletes believe that necessary cognitive resources are not available to meet the challenges posed by the environment. As a result of this imbalance between demands and cognitive resources, they will experience higher levels of stress and anxiety.

One of the most discussed relationships in sports psychology is the relationship between competitive anxiety and sport performance (Woodman & Hardy, 2001). Due to the impact that anxiety and negative emotions may have on athletes' performance, this research topic has attracted much attention (Neil et al., 2007; Mellalieu et al., 2006). Burton (1990) suggests that an athlete's experiences related to anxiety symptoms must not necessarily be perceived as detrimental to performance. Mahoney & Avener (1977) and Parfitt et al. (1990) maintain that anxiety-related symptoms can help some athletes in terms of mental preparation and performance, although some researchers disagree with the definition of anxiety that facilitates performance, arguing that this premise was fundamentally confused with negative emotions and that a number of top anxiety researchers mislabeled positive emotions as "anxiety" (Burton 1990). Despite some opinions that anxiety cannot facilitate sports performance, over 40 studies examining this direction were published in research journals, making the direction one of the most prominent areas in competitive anxiety literature

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(Hanton et al., 2008).

Competitive anxiety was found to be influenced by individual factors, such as achievement goal orientations (Amit, 2016). Research has highlighted that ego-orientation goals are positively associated with performance anxiety, while mastery or task orientation is negatively related to performance anxiety. Similarly, studies found that high performance anxiety is associated with ego-oriented motivation settings, focusing on optimizing and comparing oneself with others, while lower performance anxiety is associated with mastery (task)-oriented climates (Smith et al., 2006). Research results showed a negative relationship between self-esteem and trait anxiety (Brown, 1998; Wylie, 1979; Smith et al., 2006).

Mental toughness (MT) is one of the most important psychological constructs underlying sport performance. Sport mental toughness is defined as the superior mental qualities of an athlete (Gucciardi et al., 2009). In recent years, the concept of MT has been seen as a major pillar of sport performance. The recognition of MT as a psychological construct that sustains success and excellence in sports has led to the need to better understand this concept, as well as to develop incentives and training strategies based on it (Clough et al., 2002; Crust, 2007; Jones et al., 2007; Loehr, 1986; Cowden & Meyer-Weitz, 2016).

MT is defined as "*a personal capacity to produce consistently high levels of subjective (e.g. personal goals or strivings) or objective performance (e.g. sales, race time, GPA) despite everyday challenges and stressors as well as significant adversities*" (Gucciardi et al., 2014).

Regarding the relationship between MT and stress, stress appraisal, coping and coping effectiveness during competition, higher levels of MT were associated with more problem-focused coping, less emotion-focused and avoidance coping.

There are numerous descriptive and intervention studies that evidence the relationship between MT and competitive anxiety. Hossein et al. (2016) found a significant correlation between MT subscales: confidence, commitment, challenge, control and trait anxiety. A negative correlation between MT and competitive anxiety was also reported by other studies (Algani et al., 2018; Miftakhul, 2018). Intervention studies showed that competitive anxiety can be reduced by increasing mental toughness. Truelove (2014) found that psychological skills associated with MT (such as goal setting, positive self-talk, mental imagery, and relaxation techniques) positively influence pre-competition anxiety and the self-confidence level.

Moreover, some authors (Schaefer et al., 2016; Kaiseler et al., 2009) try to explain the relationship between MT and competitive anxiety, through other important psychological constructs, such as the motivation profiles of athletes, or coping mechanisms. Schaefer et al. (2016) highlights that golfers who scored high on both autonomous and controlled forms of motivation reported lower levels of competition anxiety. Furthermore, golfers who scored high on both autonomous and controlled forms of motivation reported higher levels of MT. Two of the hypotheses of this study were: a. *golfers with motivation profiles higher in autonomous motivation will report lower levels of competition anxiety* and b. *golfers with motivation profiles higher in autonomous motivation will report higher levels of mental toughness*; in both cases only partial confirmation was evident, because golfers high in autonomous motivation were also high in controlled forms of motivation. Golfers scoring high on MT also reported experiencing less competition anxiety, thus, MT was found to mediate a negative association between motivation and competition anxiety, which confirms a third hypothesis.

Coping effectively with the competitive context was found to be influenced by coping strategies (Kaiseler et al., 2009). Bolger & Zuckerman (1995) maintain that personality traits such as MT may influence the coping process both directly through the choice of the coping strategy and indirectly through the stressor type encountered and its appraisal. Nicholls et al. (2008) reported that a high level of MT is associated with problem or approach coping strategies (mental imagery, effort expenditure, thought control, and logical analysis), but less use of avoidance coping strategies (distancing, mental distraction, and resignation); also they analyzed the relationship between MT and optimism and pessimism, and reported moderate to high correlations between total MT and the six subscales of optimism, whereas negative correlations were found for MT and pessimism.

There are also some studies that failed to find any relation between competitive anxiety and mental toughness. A study conducted by Cowden et al. (2014) on psychological predictors of mental toughness, using reports of tennis coaches and athletes, found a non-significant correlation between competitive anxiety traits and mental toughness. Following the same line of argument, Tahmasebi et al. (2012) conducted a study investigating the relationship between emotional intelligence, competitive anxiety and mental toughness. They reported a significant negative relationship between emotional intelligence and competitive anxiety, a positive significant relationship between MT and emotional intelligence, and no relationship between MT and competitive anxiety.

The existing research regarding the relationship between MT and competitive anxiety offers a mixed picture. There are studies that sustain such a relationship, while other studies failed to replicate these results. Given the existing research context, our study aims to test the correlation between MT and competitive anxiety, using a latent variable approach (Fig. 1), given that the correlation or regression coefficient established at latent level represents a better estimation of the true score, compared to manifest variable correlations.

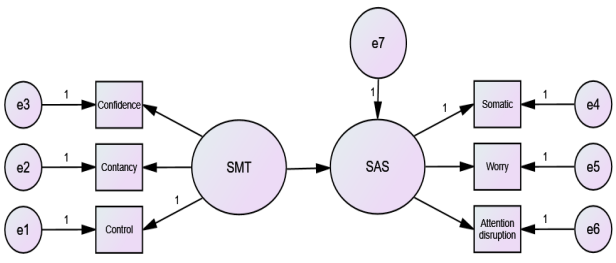

Fig. 1 – The hypothetical model of determination between MT (SMT - Sport Mental Toughness) and competitive anxiety (SAS – Sport Anxiety Scale)

Hypothesis

Based on the conceptualization by Gucciardi et al. (2014), we predicted that athletes with higher levels of mental toughness tend to interpret problems as challenges and even under adverse circumstances are less anxious.

Material and methods

Research protocol

a) Period and place of the research

This research took place between January 17, 2019 and April 20, 2019, in Cluj-Napoca. Six groups of 25 handball athletes came on different days for data collection. We preferred to work with smaller groups to explain the research requirements more easily and to make it easier to supervise them in order to prevent them from talking to each other.

b) Subjects and groups

The sample in this study consisted of 140 participants, young handball players from secondary sports schools. Their age ranged from 13 to 19 years. There were 92.9% females and 7.1% males. Overall mean age was $m = 15.97$ ($SD = 1.622$), females ($M = 16.06$, $SD = 1.66$) being significantly ($t\ (138) = 1.986$, $p = .049$) older than males ($M = 15$, $SD = 0.055$). Participation in this study was on a voluntary basis. A total of 147 ratings were obtained, 7 participants were dismissed, given the high rate of missing responses (over 80%).

c) Tests applied

The following tools were used:

Sport Mental Toughness Questionnaire (SMTQ) (Sheard et al., 2009) is a global measure of MT with 14 items designed on three subscales: confidence, constancy and control. Participants respond to items using a 4-point Likert scale, ranging from (1) not at all true, to (4) very true. Sample items include "I have unshakeable confidence in my ability" (Confidence); "I get distracted easily and lose my concentration" (Constancy); and "I get anxious by events I did not expect or cannot control" (Control).

Sport Anxiety Scale-2 (Smith et al., 2006) is a questionnaire that assesses the competitive trait anxiety experienced by athletes before or during competition. The scale has 21 items and measures responses for three factors: somatic anxiety, worry and concentration disruption, based on a four-point Likert scale for the responses, ranging from one (not at all) to four (very much).

Procedure

Following the informed consent obtained from each participant, they were asked to complete the two self-report measures, namely *Sport Mental Toughness Questionnaire* and *Sport Anxiety Scale-2*. Data collection took place in a group setting, at coaches' convenience, during a team meeting or practice session. In both instances, the completed questionnaire was collected immediately after it was filled out. The research assistant administering the questionnaire read the provided instructions verbatim and appropriate measures were taken to ensure anonymity.

d) Statistical processing

Overall fit of the model with the data was assessed by many fit indices: the root mean square error of approximation (RMSEA, <0.08), comparative fit index (CFI, >0.90), and Tucker Lewis index (TLI, >0.90) (Cheung & Rensvold, 2002; Fabrigar et al., 1999; Hu & Bentler, 1999). Confidence intervals (90%) for RMSEA were provided. A relative Chi-square (Chi-square/degree of freedom, CMIN/DF) was calculated to judge the discrepancy of the model, when the sample size was large. Wheaton et al. (1977) suggested that a value less than 5 could be interpreted as good fit, while Carmines & McIver (1981) considered a CMIN/DF ratio in the range of 2 to 1 or 3 to 1 as an indicator of an acceptable fit. Univariate and bivariate descriptive statistics were conducted using IBM SPSS 23 (SPSS Inc., Chicago, IL, USA), and SEM (Structural Equation Modeling) analysis was conducted using AMOS 21 (Arbuckle, 2012). All correlations and path coefficients were statistically significant at $\alpha = 0.05$ level.

Results

Descriptive, skewness and kurtosis: statistical assumptions were tested prior to using parametric statistics. Data were checked for normality, skewness and kurtosis. Skewness indicators varied between skewness=.243 and skewness =-.374. Similar results were found for kurtosis indicators; their values varied between kurtosis=-.847 and kurtosis=.267. All the estimated confidence intervals for population skewness and kurtosis included zero, a result that could be interpreted as a non-significant deviation from zero. Univariate descriptive statistical indicators are presented in Table I.

Table I
Univariate descriptive statistics of SMT and SAS-2 scale score (N=140)

Variable	Min.	Max.	Mean	Std. Deviation
SMT - Confidence	8.00	23.00	17.22	2.69
SMT - Constancy	6.00	14.00	9.80	1.55
SMT - Control	4.00	16.00	9.71	2.39
SAS-2 - Somatic Anxiety	5.00	16.00	8.71	2.47
SAS-2 - Worry	5.00	20.00	12.43	3.64
SAS-2 - Attention Disruption	5.00	14.00	8.38	2.32

Bivariate correlation: Pearson product–moment correlations examining the relationship between MT and SAS-2 subscales are presented in Table II. Correlation between Sport Mental Toughness scales ranged between r =.289 and r =.489. All correlation indices were positive, given that neither scale includes reversed items. Correlation for Sport Anxiety Scale dimensions ranged between r=.418 and r=.633, all of them being positive. We found a medium to strong negative relationship between Sport Mental Toughness and Sport Anxiety Scale scores, ranging between r = -.086 and = -.568. There was only one non-significant correlation, between Confidence and Somatic Anxiety subscales (Table II).

Testing for latent structural regression: the results of full SEM analysis showed an excellent fit of the model to the data, χ^2 (df = 8) = 17.85, χ^2/df = 2.231, RMSEA = .094 (90% CI for RMSEA = .034–.151), CFI = .96, TLI = .924. The latent regression path coefficient was found to be significant, $\beta = -.694$ ($SE_\beta = .138$), CR =-5.044 ($p = 0.001$). The standardized path indicator was = -.843, which explains almost 71% of the latent endogenous variance ($R^2 = .711$).

Table II
Bivariate descriptive statistics for SMT and SAS-2 scale score (N=140)

	Variable	1	2	3	4	5	6
1	SMT - Confidence	1					
2	SMT - Constancy	.342**	1				
3	SMT - Control	.289**	.429**	1			
4	SAS-2 - Somatic Anxiety	-.086	-.179*	-.418**	1		
5	SAS-2 - Worry	-.377**	-.357**	-.568**	.555**	1	
6	SAS-2 - Attention Disruption	-.307**	-.414**	-.480**	.418**	.633**	1

Table III
Unstandardized and standardized factor loadings of the full SEM model (N=140)

Variable	Unstandardized factor loadings	Standard error	CR	p	Standardized factor loadings	R^2
SMT						
Control	1.000	-	-		.758	.575
Confidence	.670	.147	4.569	0.001	.453	.205
Constancy	.473	.086	5.484	0.001	.554	.307
SAS-2						
Somatic Anxiety	1.000	-	-		.604	.365
Worry	2.146	.305	7.031	0.001	.882	.778
Attention Disruption	1.127	.171	6.577	0.001	.727	.529

Table III shows the results of analyses for testing the measurement component of the SEM model. As shown, all standardized factor loadings were above 0.3, indicating a good local fit of the measurement models.

Discussions

Competitive anxiety was found to be one of the most important individual factors that influence sport performance. Competitive anxiety affects performance through physiological and cognitive mechanisms and also interferes with emotion regulation processes (Neil et al., 2007; Mellalieu et al., 2006; Burton, 1990). Competitive anxiety is influenced by a lot of individual factors such as the psychological coping mechanism, motivation, and more recently it was found to be related to mental toughness.

Research regarding the relationship between MT and competitive anxiety is somehow puzzling (Hanton et al., 2008). There are correlational and experimental studies that offer empirical support to the relationship between anxiety and MT (Mahoney & Avener, 1977; Parfitt et al. 1990). At the same time, studies failed to find any relationship between these two variables (Cowden et al., 2014). Confirming a research hypothesis depends on a multitude of methodological (e.g. scale reliability, discriminant validity of the scales, etc.) and statistical factors (e.g. standard error of estimates). Such factors could explain some fluctuation of the estimated correlations and could be factors that affect the chance of replication (Fabrigar et al., 1999).

Our study tried to control some of these methodological factors using a latent regression approach. One main advantage of SEM modeling, compared to correlations estimated at a manifest variable level, is that it is not affected by measurement errors (Cheung & Rensvold, 2002). By estimating correlations between latent scores, instead of manifest variables, we are estimating relationships between true scores (Arbuckle, 2012).

Using a cross-sectional descriptive design, we tested a latent regression model, having the MT latent variable as a predictor and sport anxiety as a criterion. We found that the measurement model of both scales has an acceptable fit to data. More importantly, we found a significant regression coefficient between these two latent variables; mentally tough athletes tend to be less anxious. This result fits the existing conceptual definition of MT. According to these findings, mentally tough individuals are characterized by high levels of control, commitment and constancy, even under adverse circumstances, and tend to interpret problems as challenges (Gucciardi et al., 2014). This type of motivational and cognitive approach could explain why mentally tough athletes usually experience less anxiety (Schaefer et al., 2016). Formulating in terms of anxiety, mentally tough individuals are less inclined to interpret ambiguous information or high-pressure competitive situations as threatening and to respond with dysfunctional thoughts and maladaptive behavior (Hossein et al., 2016).

Our results offer more empirical support to our research hypothesis that MT would influence competitive anxiety. This would suggest that being in control of one's emotions might be of benefit to athletes while competing (Kaiseler et al., 2009).

Conclusions

1. CFA analysis showed that Sport Metal Toughness Questionnaire is a self-report instrument with sound psychometric characteristics.

2. The obtained results of latent regression analysis support the influence of mental toughness, as a personality trait-like individual characteristic, on competitive anxiety. As a consequence, any intervention that will increase athletes' mental toughness will also indirectly contribute to reducing the sport anxiety level.

Conflicts of interests

The authors declare that there is no conflict of interest.

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The present research paper is part of a larger research project that investigates the concept of mental toughness and the possibilities to increase mental toughness in sport. All authors have equally contributed to the elaboration of the research design, data collection and writing of the research paper.

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