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Original Article

The Role of Mental Toughness in the Correlation between Competitive Anxiety and Athlete Burnout in Student-Athletes

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Abstract

Background: Student-athletes have diverse motivations for participating in sports. However, certain negative factors may contribute to athlete burnout, leading to withdrawal from sports. This study aimed to investigate the moderating role of mental toughness in the correlation between competitive anxiety and athlete burnout among student-athletes.

Methods: This was a cross-sectional study with a descriptive-correlational design. The study population included all middle and high school student-athletes in Bojnurd, Iran, from April to July 2024. A total of 273 participants were selected as the sample using convenience sampling. The study used three standardized questionnaires as instruments, including the Competitive Anxiety Questionnaire, the Athlete Burnout Questionnaire (ABQ), and the Mental Toughness Questionnaire (MTQ-10). Structural equation modeling with a variance-based approach was employed to test the research hypotheses. Data analysis was conducted using SPSS version 23 and Smart-PLS 3.2.8.

Results: Competitive anxiety was positively and significantly associated with athlete burnout (β=0.447, t=6.225, P<0.001). Mental toughness significantly moderated this correlation, attenuating the positive link between competitive anxiety and burnout in athletes with higher mental toughness levels (interaction term: β=-0.213, t=3.993, P<0.001). This indicates a buffering (protective) effect of mental toughness.

Conclusions: The findings indicated that there is a direct correlation between competitive anxiety and burnout in athletes, while mental toughness plays a negative moderating role in this correlation. Given the buffering role of mental toughness, interventions aimed at enhancing mental toughness may help mitigate the adverse effects of competitive anxiety on burnout in student-athletes.

Keywords: Competitive Anxiety, Mental Toughness, Athlete Burnout, Student-Athletes, PLS-SEM

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1. Introduction

Many children and adolescents are drawn to sports but often struggle to maintain long-term participation because their developmental needs are not adequately addressed. Excessive involvement, combined with performance-related pressure, can lead to stress, reduced achievement, and eventual withdrawal (1). One outcome is athlete burnout—a state of prolonged dissatisfaction marked by emotional and physical exhaustion, decreased performance, and sport devaluation (2). Smith's Cognitive-Affective Model explains burnout as the result of an imbalance between environmental demands and personal coping resources (3). The model includes four interrelated components: situational, cognitive, physiological, and behavioral. When stressors such as competition exceed an athlete's coping abilities, negative emotions like anxiety and shame may emerge. The athlete's appraisal of the situation influences their emotional and physiological responses, which, in turn, affect behavior and coping strategies. Persistent imbalance and ineffective coping can lead to burnout, highlighting the need for support strategies aligned with young athletes' psychological needs.

One of the most significant negative emotions that athletes, including adolescents, experience in sports is competitive anxiety, which consists of cognitive anxiety, somatic anxiety, and self-confidence (4). Cognitive anxiety involves negative thoughts and worries about oneself, the situation, and potential outcomes. Somatic anxiety reflects the physical perception of anxiety, while self-confidence pertains to belief in one's ability to perform well. Intense training for optimal performance can make sports competitions a negative factor in athlete burnout and withdrawal.

Anxiety, particularly competitive anxiety, is a key factor linked to burnout (5). Previous studies showed that competitive anxiety directly correlates with athlete burnout. For instance, a study by Yang and colleagues found a significant association between competitive anxiety and burnout among students across sports disciplines (6). Also, Raedeke and Smith highlighted that somatic anxiety, worry, and concentration issues are associated with emotional and physical exhaustion, reduced accomplishment, and sport devaluation as the key burnout symptoms (7).

Sport psychologists are working to identify personality traits that help athletes protect themselves from the negative effects of competitive pressures and burnout (8). One such trait is mental toughness, which is closely associated with peak athletic performance and is considered a critical factor in an athlete's success (9, 10). Mental toughness is defined as a set of psychological traits, either innate or developed, that enable athletes to perform better than their competitors, remaining determined, confident, focused, and in control during stressful situations (9, 10). It is a multidimensional construct comprising commitment, control, and challenge. Athletes with higher mental toughness are better equipped to cope with demands, persist under pressure, and maintain focus and confidence (11, 12). Viewed through the lens of positive psychology, mental toughness helps individuals approach, respond to, and evaluate challenges in ways that promote personal growth and excellence, even under physical, psychological, social, and emotional stress (13).

Research indicated that mental toughness positively impacts competitive anxiety. For example, Taheri Naiyam and colleagues found that elite track and field athletes with high mental toughness experienced lower levels of competitive anxiety (14). Other studies confirmed a significant negative correlation between mental toughness and competitive anxiety, suggesting that individuals with higher mental toughness perform better under anxiety-inducing conditions (15, 16). Mental toughness is also recognized as a key factor in optimal athletic performance (8, 17). Empirical evidence highlights its role in protecting against athlete burnout; for instance, Arazeshi and colleagues showed that higher mental toughness reduces the likelihood of burnout during injury periods, underscoring its importance in preventing burnout (2).

Despite the important role of psychological factors in athlete burnout, especially among children and adolescents, relatively limited research has focused on this population. Psychological exposure varies across age groups; during adolescence, when individuals experience significant physical, psychological, and social changes, the use of psychological skills, such as mental toughness, becomes crucial. Adolescents often engage in sports to enhance social abilities, self-confidence, and self-esteem (18). Thus, strategies to keep them involved in sports are essential. High levels of competitive anxiety and burnout can have lasting consequences, leading to early withdrawal from sports. This evidence suggests that mental toughness may act as a buffer, potentially moderating the correlation between competitive anxiety and burnout symptoms (19).

2. Methods

2.1. Design

This was a cross-sectional study with a descriptive-correlational design. A conceptual model (Figure 1) was proposed in this study and data were collected through questionnaires using a field-based approach.

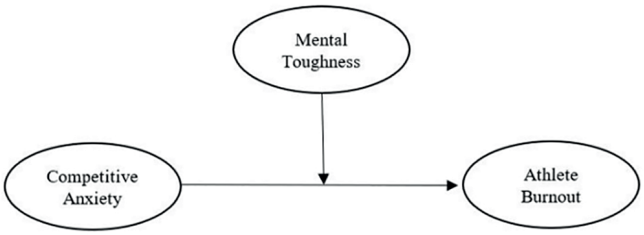

Figure 1: The figure shows the conceptual model of study.

2.2. Selection and Description of Participants

The study population consisted of all student-athletes in Bojnurd, Iran, from April to July 2024. The participants were middle and high school student-athletes (grades 7–12) who took part in school competitions (district, provincial, and national) or were involved in sports clubs and sent to competitions. 650 individuals were estimated to be in the population. The inclusion criteria were: willingness to cooperate with the researcher, enrollment in middle school or high school, at least 6 months of sports experience, and participation in school competitions (district, provincial, national) or involvement in sports clubs with competition

participation. Exclusion criteria included failure to complete the questionnaires.

2.3. Sample Size Determination

As the exact size of the population remained unknown, the method of determining sample size in structural equation modeling was employed, based on the common rule of thumb of 5 to 10 participants per observed variable (question) (20). Based on the total number of questions in the questionnaires used in this study (42 questions), the required sample size ranged from 210 to 420 individuals. The researcher distributed 300 questionnaires to eligible students and, after excluding invalid responses, analyzed the data from 273 completed questionnaires.

2.4. Data Collection and Measurements

Data were collected using a personal information form and three standardized questionnaires:

2.4.1. Personal Information Form: This section of the questionnaire was designed by the researcher to collect data on participants' age, sports experience, gender, and educational level.

2.4.2. Athlete Burnout Questionnaire (ABQ): ABQ, developed by Raedeke and Smith (7), consists of 15 items designed to assess three key dimensions of athlete burnout: emotional and physical exhaustion, a diminished sense of achievement, and devaluation of sport participation. Responses are rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with items 1 and 14 reverse-coded. Reported Cronbach's alpha values for the subscales range between 0.70 and 0.81, indicating acceptable internal consistency (21).

2.4.3. The Revised Competitive State Anxiety Inventory-2 (CSAI-2R): CSAI-2R**,** developed by Cox and colleagues (22), is an updated version of the Competitive State Anxiety Inventory-2 originally designed by Martens and co-workers (23). This questionnaire consists of 17 items measuring three subscales: Somatic Anxiety (7 items: 1, 4, 6, 9, 12, 15, 17), Cognitive Anxiety (5 items: 2, 5, 8, 11, 14), and Self-Confidence (5 items: 3, 7, 10, 13, 16). Each item is scored using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with no reverse scoring. In the present study, the latent variable 'Competitive Anxiety' was operationalized using the somatic and cognitive anxiety subscales as indicators, while self-confidence was modeled as a separate construct due to its facilitative role and negative correlations with anxiety components. Cox and colleagues (22) conducted a construct validity assessment of the English version of the questionnaire using factor analysis, which showed satisfactory construct validity for the revised version. In the study by Mehrsafar and colleagues, the Cronbach's alpha coefficients for the subscales included physical anxiety: 0.83, cognitive anxiety: 0.75, and self-confidence: 0.80 (24).

2.4.4. The Mental Toughness Questionnaire (MTQ-10): MTQ-10, developed by Dagnall and colleagues (25) is a 10-item, short-form version designed to assess mental toughness in sports. The questionnaire uses a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The validity and reliability of this questionnaire were confirmed in the study by Abdi and co-workers (26).

For assessing the validity of the questionnaires, content and face validity were employed. Following contemporary methodological guidelines (27, 28), the Content Validity Ratio (CVR) was first calculated by 10 experts. All items in the questionnaires demonstrated CVR values exceeding 0.8, which surpassed the minimum acceptable threshold of 0.62 established by Lawshe's criteria (29). Subsequently, the Content Validity Index (CVI) was computed, revealing that all 42 items across the measurement instruments achieved excellent CVI scores above 0.79, confirming strong content validity for the research tools. The face validity calculation output for all questionnaire items was above 1.5; all items were accepted.

To evaluate the questionnaires' reliability, Cronbach's alpha was used, and the reliability was assessed using a pilot sample of 30 participants. The results showed acceptable reliability, with Cronbach's alpha values for all questionnaires and subscales exceeding 0.80.

2.5. Procedure

After reviewing the background literature and finalizing the questionnaires, the most recent statistics on the number of student-athletes were obtained from the Bojnurd County Department of Education, Iran. The researcher elucidated the procedure for

completing the questionnaire for the students. After excluding deficient and incomplete questionnaires, 273 completed questionnaires were examined.

2.6. Data Analysis

For data analysis, both descriptive and inferential statistical methods were employed. In the descriptive statistics section, measures such as mean, frequency, percentage, and standard deviation were used, while in the inferential statistics section, the assumptions for using structural equation modeling were examined. The model was then assessed in two parts: the measurement model and the structural model. It is important to note that this study used SPSS version 23 and Smart-PLS 3.2.8 for data analysis. In the partial least squares (PLS) approach, there is no need to meet specific assumptions, such as normality of the data, measurement scale of the variables, or a large sample size.

Table 1: Factor loadings for the measurement of study constructs

Latent Variables	Observed Variables	Factor Loadings	T value	Item VIF Value	Contract VIF Value
Competitive Anxiety	Q1	0.80	28.21	2.182	1.335
	Q2	0.85	58.41	2.806	
	Q3	0.86	63.66	2.998	
	Q4	0.84	47.84	2.593	
	Q5	0.85	38.84	2.774	
	Q6	0.82	21.40	2.521	
	Q7	0.76	29.92	1.894	
	Q8	0.80	58.26	2.047	
	Q9	0.86	32.36	2.861	
	Q10	0.81	48.48	2.094	
	Q11	0.84	45.29	2.340	
	Q12	0.84	45.29	2.384	
	Q13	0.83	43.71	2.184	
	Q14	0.83	40.91	2.138	
	Q15	0.81	38.37	2.261	
	Q16	0.84	42.39	2.312	
	Q17	0.84	43.17	2.319	
Athlete Burnout	Q18	0.84	38.51	2.231	1.146
	Q19	0.86	56.21	2.538	
	Q20	0.78	25.96	2.760	
	Q21	0.81	33.41	2.005	
	Q22	0.79	26.22	1.845	
	Q23	0.79	25.16	1.834	
	Q24	0.77	23.91	2.30	
	Q25	0.81	35.21	2.033	
	Q26	0.83	41.63	2.178	
	Q27	0.82	30.60	2.069	
	Q28	0.80	40.94	2.313	
	Q29	0.80	38.71	2.807	
	Q30	0.69	15.93	1.751	
	Q31	0.80	21.34	2.181	
	Q32	0.80	23.92	2.088	
Mental Toughness	Q33	0.79	30.74	2.321	1.185
	Q34	0.81	39.80	2.691	
	Q35	0.78	27.75	2.387	
	Q36	0.74	18.79	2.067	
	Q37	0.74	24.84	2.007	
	Q38	0.76	25.40	2.137	
	Q39	0.76	24.89	2.081	
	Q40	0.75	24.72	2.066	
	Q41	0.75	24.87	1.958	
	Q42	0.71	17.35	1.755	

VIF: Variance Inflation Factor

However, before performing structural equation modeling (SEM) using PLS, the assumption of no multicollinearity between independent variables should be examined. Kock suggested that when variance inflation factor (VIF) values exceed 3.3, this may indicate problematic collinearity and the potential influence of common method bias. Therefore, models with all VIF values of 3.3 or lower are unlikely to suffer from such bias (30). In this study, all latent variables in both models yielded VIFs below this threshold (Table 1), indicating that common method bias is unlikely to have influenced the results.

3. Results

In this study, 171 participants were male (63.62%) and 102 were female (36.37%). Moreover, 123 participants were aged 13-15 (45.05%), while 150 were aged 16-18 (54.95%). Furthermore, 58 participants were in the 12th grade (21.24%), while 34 participants were in the 7th grade (12.45%). According to the demographic charateristics, 53 participants had 6 months to 1 year of sports experience (19.41%), while 79 participants had 2 to 3 years of sports experience (28.93%).

To examine the relationships among the research variables and to assess the fit of the observed data with the conceptual model, we employed Partial Least Squares Structural Equation Modeling (PLS-SEM). Specifically, we evaluated both the measurement and structural models. For the measurement model, we assessed validity—convergent validity, discriminant validity, and reliability —using three indicators: factor loadings, Cronbach's alpha coefficients, and composite reliability.

As shown in Table 1, the factor loadings obtained from the model execution in this study were above 0.40, and their significance coefficients were above 1.96, indicating that this criterion is suitable.

In this study, to better assess reliability, both Cronbach's alpha and composite reliability criteria were used. As shown in Table 2, all values are above 0.70 and are considered acceptable. Convergent validity refers to the extent to which a construct correlates with its indicators; stronger correlations indicate better model fit. To assess this, Fornell and Larcker (31) proposed the Average Variance Extracted (AVE) as a criterion, suggesting that an AVE value greater than 0.5 reflects satisfactory convergent validity.

To assess the discriminant validity of the measurement model, the Fornell-Larcker criterion and cross-loadings were used (31). As shown in Table 3, the square roots of the AVEs of the latent variables in the present study are higher than the correlations between them, which are located in the cells beneath and to the right of the main diagonal. Based on the findings, it can be concluded that each construct in the present study demonstrates a stronger association with its own indicators than with those of other constructs. This indicates that the model exhibits acceptable discriminant validity.

After evaluating the goodness-of-fit of the measurement models, the study's structural model was assessed. In this study, three criteria were used: the coefficient of determination (R^2), the predictive relevance (Q^2), and the significance coefficient (T values).

3.1. R^2 coefficients for latent variables: The R^2 value indicates the effect of an exogenous variable on an endogenous variable. Three benchmarks—0.19, 0.33, and 0.67—are used to indicate weak, moderate, and strong R^2 values, respectively.

Table 2: Assessment of Reliability and Convergent Validity

Latent Variables	Cronbach's Alpha (Alpha≥0.7)	Composite Reliability (CR≥0.7)	Average Variance Extracted (AVE≥0.5)
Competitive Anxiety	0.820	0.831	0.585
Somatic Anxiety	0.924	0.939	0.688
Cognitive Anxiety	0.893	0.922	0.701
Self-Confidence	0.890	0.919	0.695
Athlete Burnout	0.936	0.944	0.533
Emotional/Physical exhaustion	0.877	0.910	0.670
Reduced Sense of Accomplishment	0.867	0.904	0.654
Sport Devaluation	0.832	0.879	0.594
Mental Toughness	0.921	0.933	0.584

CR: Composite Reliability; AVE: Average Variance Extracted

Table 3: Discriminant validity of the study variables

Construct	Somatic Anxiety	Cognitive Anxiety	Self-Confidence	Emotional/Physical Exhaustion	Reduced Sense of Accomplishment	Sport Devaluation	Mental Toughness
Somatic Anxiety	0.838						
Cognitive Anxiety	0.829	0.867					
Self-Confidence	-0.694	-0.700	0.833				
Emotional/Physical Exhaustion	0.463	0.499	-0.508	0.819			
Reduced Sense of Accomplishment	0.514	0.518	-0.532	0.808	0.826		
Sport Devaluation	0.475	0.519	-0.495	0.687	0.742	0.771	
Mental Toughness	-0.338	-0.365	-0.369	-0.318	-0.333	-0.339	0.764

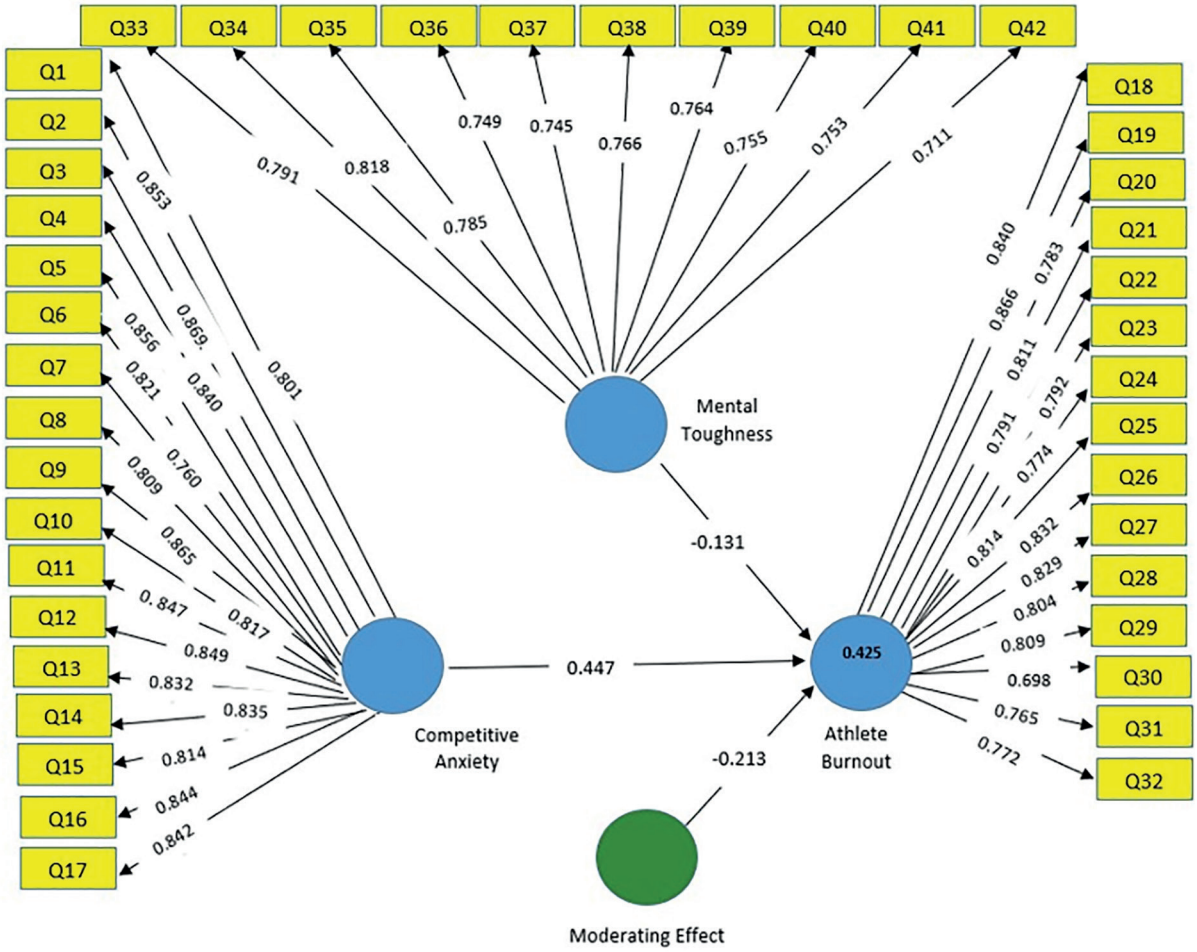

Figure 2: The figure shows the path coefficient and fitness of the structural model using R^2 values.

As shown in Figure 2, the R^2 value for the athlete burnout variable was 0.42, which, based on benchmarks, is considered a moderate level of R^2 (32).

3.2. Predictive relevance (Q^2): The Q^2 criterion indicates the predictive power of the model. If this criterion for an endogenous construct reaches 0.02, 0.15, or 0.35, it signifies weak, moderate, or strong predictive power for the associated exogenous variable, respectively (32). The Q^2 value for the athlete burnout variable was calculated to be 0.22.

3.3. Significance coefficient (T values): As shown in Figure 3, all significant coefficients exceed 1.96, indicating that all relationships between variables in the research model are significant at the 0.99 confidence level.

Finally, the hypotheses of the study were examined. A T value greater than 1.96 indicates that the correlation between the constructs is significant, thereby confirming the study's hypotheses. Table 4 shows the results of the hypothesis testing.

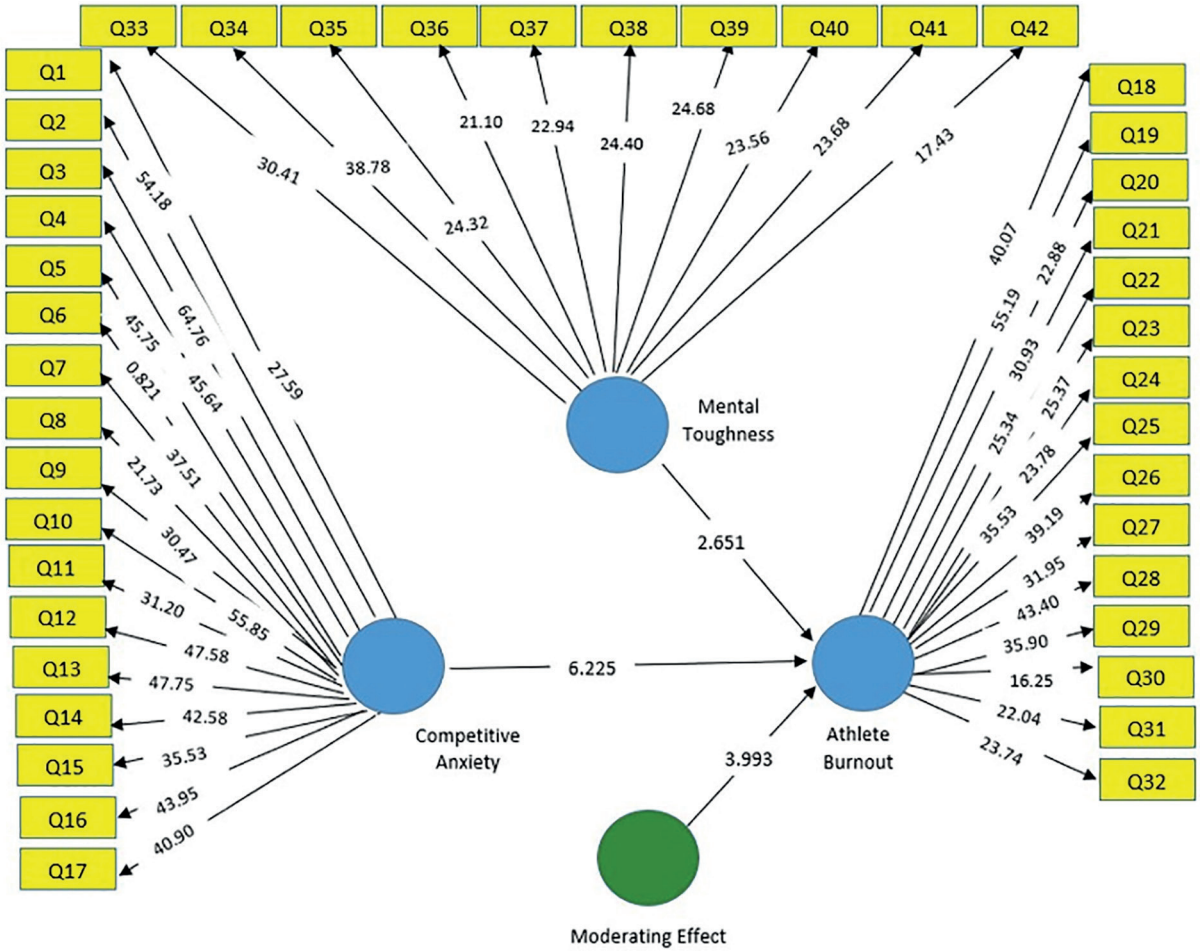

Figure 3: The figure shows the structural model fit assessed using T-values of the path coefficients.

Table 4: The results of the hypothesis test

Paths	Path Coefficient	T value	Result
H1: Competitive Anxiety → Athlete Burnout	0.447	6.225	Accept
H2: Competitive Anxiety * Mental Toughness → Athlete Burnout	-0.213	3.993	Accept

It can be stated that all correlations between the variables in the research model are statistically significant at the 99% confidence level. In other words, all correlations among the model's variables were confirmed.

According to Table 4 and Figure 3, the path coefficient between competitive anxiety and athlete burnout was 0.447. The T value was calculated to be 6.225, which exceeds 1.96, indicating that the observed correlation is statistically significant. Therefore, the first hypothesis of the study is confirmed, this means that competitive anxiety is directly and positively correlated with athlete burnout among student athletes in Bojnurd, Iran. The path coefficient for the second hypothesis was -0.213, and the T value was 3.993, which is greater than 1.96, indicating that the observed correlation is statistically significant. Thus, the second hypothesis is also confirmed. This means that mental toughness plays a moderating role in the correlation between competitive anxiety and athlete burnout among middle and high school student-athletes in Bojnurd, Iran. In other words, as mental toughness increases, a reduction in the effect of competitive anxiety on athlete burnout was observed.

4. Discussion

The present study aimed to examine the moderating role of mental toughness in the

correlation between competitive anxiety and athlete burnout among student-athletes in Bojnurd, Iran. The results of testing the first hypothesis revealed a significant positive correlation between competitive anxiety and Athlete burnout. In other words, as competitive anxiety increased, athlete burnout also increased. These findings aligned with the results of previous studies (6, 33). For example, Yang and co-workers examined the relationship between competitive anxiety and athlete burnout, along with the mediating role of need satisfaction, in a sample of 618 female college athletes from both team and individual sports (6). Their cross-sectional analysis revealed that somatic anxiety and cognitive anxiety (concentration disruption) were positively associated with athlete burnout. Similarly, Cho and colleagues investigated the relationship between perceived coaching behaviors, competitive trait anxiety, and athlete burnout (33). Their research, conducted among 368 collegiate athletes, demonstrated that competitive trait anxiety was significantly correlated with athlete burnout and also emerged as a significant predictive pathway within their model. The results of these two studies showed that athletes with higher levels of competitive anxiety experienced greater athlete burnout. These findings aligned with comprehensive review, highlighting competitive anxiety and chronic stress as primary antecedents of athlete burnout (34).

The explanation for this finding, based on contemporary research, suggested that athlete burnout represents a state of physical and emotional exhaustion resulting from chronic exposure to high-stress sporting environments. Concurrently, competitive anxiety is associated with decreased self-esteem, confidence, self-efficacy, and an increase in maladaptive emotional responses, stress, and motivation loss. Athletes experiencing competitive anxiety often perceive training as monotonous, stressful, and unproductive, which contributes to the connection between competitive anxiety and athlete burnout (34). Weinberg and Gould maintained that individuals with severe competitive anxiety exhibit symptoms such as persistent worry about failure, fear of social evaluation by others, lower satisfaction with performance, low self-esteem, and less enjoyment and perceived fun. In other words, competition-induced anxiety affects both the physical and psychological aspects of athletes. When an athlete becomes anxious in a competition setting, their performance deteriorates, and they are exposed to significant risks (35). Therefore, it appears that students experiencing competitive anxiety feel consequences such as a lack of enjoyment in physical activity, decreased motivation, and dissatisfaction with their performance, which hinders their ability to pursue their goals as they did before. Ultimately, this cycle leads to withdrawal from sports and athlete burnout.

The results of the second hypothesis indicated that mental toughness significantly moderated and reduced the negative correlation between competitive anxiety and athlete burnout among student-athletes. This finding aligned with previous studies (16, 36) regarding the inverse correlation between mental toughness and competitive anxiety. Benjamin and John conducted a study on the moderating effects of mental toughness on perceived stress and anxiety among 320 student-athletes and non-athletes. They showed that mental toughness significantly moderated the correlation between stress and perceived anxiety among non-athletes (16). Mental toughness is a psychological construct that has drawn significant attention for explaining differences in athletes' performance. Mental toughness is a multidimensional psychological construct that equips athletes to effectively manage the demands of competitive sport. According to a narrative review by Gucciardi and colleagues (9), mentally tough athletes exhibit a resilient and focused mindset. This mindset enables them to remain composed, sustain effort, and maintain positive energy when facing pressure, adversity, and setbacks.

We found no study specifically examining the moderating role of mental toughness in the correlation between competitive anxiety and athlete burnout based on the literature search. However, most studies focused on the moderating role of mental toughness in the relationship between intention to engage in physical activity and subsequent behavior (36-38). This suggests that mental toughness can serve as a motivational factor, encouraging individuals to engage in physical activity. Hannan and colleagues explored the application of the Theory of Planned Behavior to physical activity, with mental toughness as a moderating factor. The researchers found that when mental toughness was moderate or high, intentions were significantly and positively associated with physical activity, suggesting that cultivating a

strong mindset may reduce the gap between intentions and behavior in physical activity (37). Cao and co-workers found that mental toughness had a significant, positive moderating effect on the correlation between intention and behavior among students, influencing the transition from intention to physical activity. Individuals with high mental toughness maintained high levels of physical activity regardless of intention, whereas those with low mental toughness showed lower, more unstable levels of physical activity (38). Similarly, one study found a positive, significant moderating role of mental toughness in the relationship between exercise intention and physical activity participation (39). These studies highlighted the prominent role of motivation in the correlation between variables, especially in the context of mental toughness (6, 7). According to Yang and colleagues, individual differences such as motivation affect all components of athlete burnout. While strong motivation for success and excellence is important, in specific situations, it may lead to harmful behaviors that expose an individual to burnout (6). Although fatigue is primarily caused by stress, the decreased sense of progress and feelings of worthlessness in sports are related to motivation. Reduced feelings of success are inversely related to individuals' need for a sense of competence, a need that is a key feature of many motivational theories. Moreover, feelings of worthlessness in sports are also seen as a motivational threat, as the athlete no longer cares about the quality of their performance and related issues that once mattered to them (7).

Based on motivational theories, it can be predicted that mental toughness, as a moderating variable, may weaken the relationship between competitive anxiety and athlete burnout. In other words, higher levels of mental toughness can buffer the negative impact of anxiety on burnout. Furthermore, mental toughness is widely recognized as a positive psychological trait that promotes success (8). Its key characteristics include sustained high motivation, passion for excellence, and unwavering commitment to goals. It also encompasses maintaining optimism under pressure, persevering in the face of adversity, and the ability to mitigate the effects of competitive stress.

Athletes with higher mental toughness tend to focus on improving themselves, rather than yielding to negative emotions, and learning from their experiences. This positive approach can lead to reduced burnout and increased motivation (11). In conclusion, this study suggested that athletes with higher mental toughness typically have a greater ability to manage anxiety and competitive pressures. Therefore, mental toughness can act as a moderating factor in the correlation between competitive anxiety and athlete burnout.

4.1. Limitations

There were certain limitations to this study. First, the cross-sectional design of the study prevents any conclusions about causality. Second, data were collected using self-report questionnaires rather than more in-depth methods, such as interviews, which may have affected the accuracy of the responses. Third, the sample was limited to middle and high school student-athletes from Bojnurd, Iran, limiting the generalizability of the findings to broader populations of student-athletes across educational levels and regions. Moreover, a part of the study was conducted during the students' exam period, which led to limited participant cooperation.

5. Conclusions

The results of this study revealed that competitive anxiety is significantly correlated with athlete burnout, and mental toughness can reduce this correlation. Based on these results, it is recommended that coaches, parents, and sports federations implement interventions and workshops to strengthen athletes' mental toughness. This includes developing appropriate training programs (balancing competition pressure and recovery), creating a supportive environment from parents and coaches, offering individual counseling, setting realistic goals, and simulating competitive conditions. Future research should develop interventions to enhance mental toughness and assess their impact on anxiety and burnout. Longitudinal studies of elite athletes examining moderating variables such as experience, gender, and social support are also recommended.

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Authors' Contribution

Mohammad Mohammadi: Substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data; drafted the work and critically reviewed it for important intellectual content. Hassan Bahrololoum**:** Substantial contributions to the conception and design of the work, supervised the data collection and analysis; reviewed critically the manuscript. Mansoureh Mokaberian**:** Contributions to the conception and design of the work, provided guidance during data analysis and interpretation; reviewed critically the manuscript. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such that the questions related to the accuracy or integrity of any part of the work.

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Ethical Approval

The Ethics Review Board of Shahrood University of Technology, Shahrood, Iran approved the present research with the code of IR.SHAHROODUT.REC.1403.018. Also, written informed consent was obtained from the participants and the confidentiality of the participants' information was guaranteed.

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