

## ORIGINAL RESEARCH

# The moderating role of mindfulness in the relationship between threat appraisal and negative emotions in male elite footballers

Serdar Solmaz<sup>1,\*</sup>, Yunus Emre Yarayan<sup>2</sup>

<sup>1</sup>Department of Sport Management,  
Faculty of Sport Sciences, Batman  
University, 72000 Batman, Turkey

<sup>2</sup>Department of Physical Education and  
Sports Education, School of Physical  
Education and Sports, Siirt University,  
56000 Siirt, Turkey

**\*Correspondence**

serdar.solmaz@batman.edu.tr  
(Serdar Solmaz)

**Abstract**

**Background:** The aim of this study is to examine the relationship between perceived threat appraisal before competition and negative emotions in elite football players, and to analyze the moderating role of mindfulness in this relationship. **Methods:** A cross-sectional study was conducted with 299 elite male football players from Turkish football leagues. Data were collected using the Mindfulness Inventory for Sport, Emotions Inventory for Sport, and Challenge and Threat Scale. The data were analyzed using Structural Equation Modeling (SEM). **Results:** The results revealed a positive correlation between threat appraisal and negative emotions, indicating that higher threat appraisal is associated with increased negative emotions. Mindfulness was found to have a negative relationship with both threat appraisal and negative emotions. Additionally, mindfulness was found to mitigate the relationship between threat appraisal and negative emotions, suggesting that mindfulness can help manage the emotional impact of threat appraisal. **Conclusions:** These findings imply that athletes' emotional states can be better regulated in high-pressure situations through mindfulness. The study provides practical implications for athletes and coaches, and emphasizes the need for further longitudinal and experimental research to explore the effects of threat appraisal and mindfulness in greater detail.

**Keywords**

Elite football players; Stress; Threat appraisal; Negative emotion; Mindfulness

## 1. Introduction

Simone Biles, 6 Olympic medals, withdrew from the Tokyo 2020 Olympic Games, citing her mental health with the words, "I think the girls need to do the rest of the competition without me..." [1]. According to a systematic review analysis, it was reported that a minimum of one out of every three athletes participating in competitions experienced mental health issues [2]. Considering the increasing mental health problems in athletes, there has been an observed increase in scientific research [3]. Furthermore, research conducted to date has pinpointed poor performance, non-selection, rivalry, financial status, and defeat as the key factors impacting the psychological well-being of athletes [3–5]. These reasons can cause problems such as sleep disturbances [6], depressive symptoms [7], adjustment disorder with anxiety [8], especially for elite athletes. So much so that even suicidal situations can be observed in athletes [9]. Given these circumstances, further research is warranted to address and control mental health issues in competitive environments [10].

Lazarus and Folkman [11], define the term stress as "a relationship between the person and the environment that the person considers as challenging or exceeding their resources

and endangering their well-being" (p.19). Various research investigations have highlighted the impact of stress on the psychological well-being of athletes. The unpredictability surrounding the results of competitions [12], and concerns about whether athletes can meet performance expectations [4, 13, 14], can create significant stress for them. On the other hand, when it is considered that sports have become a universal dimension in the globalizing economy [15], it becomes easier to create stressful situations, especially for elite athletes. Viewed from the standpoint of elite male athletes, the continual pressure to deliver superlative performances may result in a range of emotional challenges for male footballers [16, 17]. This situation can also affect the performance of professional athletes [18]. While research findings may differ, multiple studies have indicated that male athletes in professional sports exhibit a higher incidence of depression [19]. Therefore, there is still a need to investigate the emotional states of the sample group consisting of elite athletes. In addition, the current study is expected to contribute to the literature in terms of evaluating the deficiencies of the theory of threat and struggle in sports in reference groups in different cultures and different geographies.

Stress arises when demands exceed an individual's compe-

tencies [11]. According to the field of sports psychology, the primary objectives of achieving victory and delivering a strong performance instigate a sense of rivalry among athletes. Consequently, this element of unpredictability poses a significant challenge for athletes in managing stress effectively [14, 20]. Athletes engage in cognitive appraisals before competitions, evaluating their situation and personal characteristics. This initial appraisal can lead to different types of stress appraisals. According to The Theory of Challenge and Threat States in Athletes theory (TCTSA), athletes assess their stress as either a challenge or a threat. According to the theory, threat appraisal occurs when athletes possess limited self-efficacy, a diminished sense of control, and a tendency to concentrate on evading adverse consequences [14]. However, recent research has indicated that stress in athletes may not manifest solely as threat appraisal or challenge appraisal. It has been emphasized that the complex emotions of excitement and anxiety experienced by athletes can coexist with both threat appraisal and challenge appraisal. In this context, it has been suggested that a more flexible relationship exists [14, 21]. In this study, threat appraisal was chosen because it involves higher stress levels compared to challenge appraisal [14, 22]. The main focus of the study was to explore how effective stress management strategies, including mindfulness practices can moderate the research problem in threat appraisal [23]. Therefore, the study focused solely on threat appraisal.

According to Scherer's five-component emotion model, emotions begin with the evaluation of an event (Appraisal component), which leads to changes in motivation (Behavioral tendencies), physiology (Somatic changes), and expression (Facial and vocal expressions). Changes in these four components modulate the emotion component (a conscious reflection of all these changes) [24]. Emotions play a significant role in sports, influencing athletes with both positive and negative effects, which can be attributed to elements like competition and the unpredictability of outcomes [25]. Athletes encountering a stressful situation may enter into a threat appraisal within this situation [26]. According to Meijen *et al.* [14] TCTSA theory and Lazarus and Folkman's [11] stress and coping theories, individuals within threat appraisal may experience negative emotions triggered by perceptions of adverse outcomes and loss. Additionally, various studies have demonstrated a positive relationship between threat appraisal and negative emotions [27–29]. In light of both theories and findings from various studies, it can be hypothesized that threat appraisal among elite footballers could be associated with negative emotions.

Emotion regulation plays a vital role in handling stressful situations, achieving peak performance, and preserving or enhancing both physical and psychological well-being, considering the impact of emotional aspects on athletes' performance [30, 31]. The process of emotion regulation involves the ability of athletes to enhance or diminish both positive and negative emotions [32]. Cognitive reappraisal is one of the significant strategies for controlling emotions [33]. It proactively redefines an adverse emotional state, reshaping the significance assigned to a trigger, consequently diminishing the influence of negative emotions [34]. For instance, an athlete might view an upcoming competition as a challenge

rather than a threat, thereby altering the emotional impact of what was previously perceived as a potentially harmful situation [33, 35, 36]. Mindfulness, which plays an important role in emotion regulation, is defined by Kabat-Zinn [37], as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally”. Mindfulness involves embracing one's present circumstances without bias, refraining from assessing them as either good or bad, positive or negative, or beautiful or ugly, and avoiding the impulse to classify them [38]. Mindfulness enables individuals to focus on the present moment, allowing athletes to concentrate on their current mental and physical state rather than on external stressors perceived as threats. This practice helps prevent athletes from becoming fixated on these threatening thoughts, thereby reducing their levels of stress and anxiety [39]. Indeed, numerous studies in the literature support this concept [33, 40–42]. Due to these factors, mindfulness is adopted as a guiding principle to boost athletes' performance and manage stress in the Olympic Games, emerging as a groundbreaking approach for regulating emotions [34, 42, 43]. While cognitive reappraisal seeks to change the situation by positively reinterpreting it, mindfulness involves accepting the moment as it is without judgment [33, 34]. Studies have shown that mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) have supportive effects on well-being [23, 40, 41, 44, 45]. Especially for athletes, mindfulness helps increase focus on present challenges without distractions and serves as a guiding paradigm for coping with stress [43, 46, 47].

Athletes' ability to stay present and nonjudgmental in the face of distractions enables them to navigate different emotional states like anxiety without getting caught up in thoughts of the past or future [47]. Therefore, examining the mediation and moderation effects of mindfulness on different psychological characteristics is crucial [48]. Studies indicate that athletes employ mindfulness techniques to manage and control their emotions, ultimately enhancing their psychological resilience [49]. For instance, Jekauc *et al.* [50] found that mindfulness-based training programs were more effective than traditional sports psychology programs. Furthermore, mindfulness-based programs have been reported to reduce stress by enhancing athletes' awareness. Kabat-Zinn [37] highlighted that high levels of mindfulness improve attention and emotion regulation. Recent research has highlighted the importance of mindfulness in regulating emotions [51, 52]. In summary, mindfulness is hypothesized to moderate the relationship between threat appraisal and negative emotions.

The primary objective of this research is to investigate how the assessment of threats influences the presence of negative emotional states in elite soccer players, particularly in situations where stress levels are elevated. The secondary goal is to explore whether mindfulness acts as a moderator in the association between threat appraisal and negative emotions. In doing so, we aim to highlight the importance of both the TCTSA in sports psychology and the practical perspective of using MBCT for stress reduction among managers and coaches in the field of sports management. Lastly, this study is the first to investigate the moderating role of mindfulness in the relationship between threat appraisal and negative emotions in elite football players, where competition is intense.

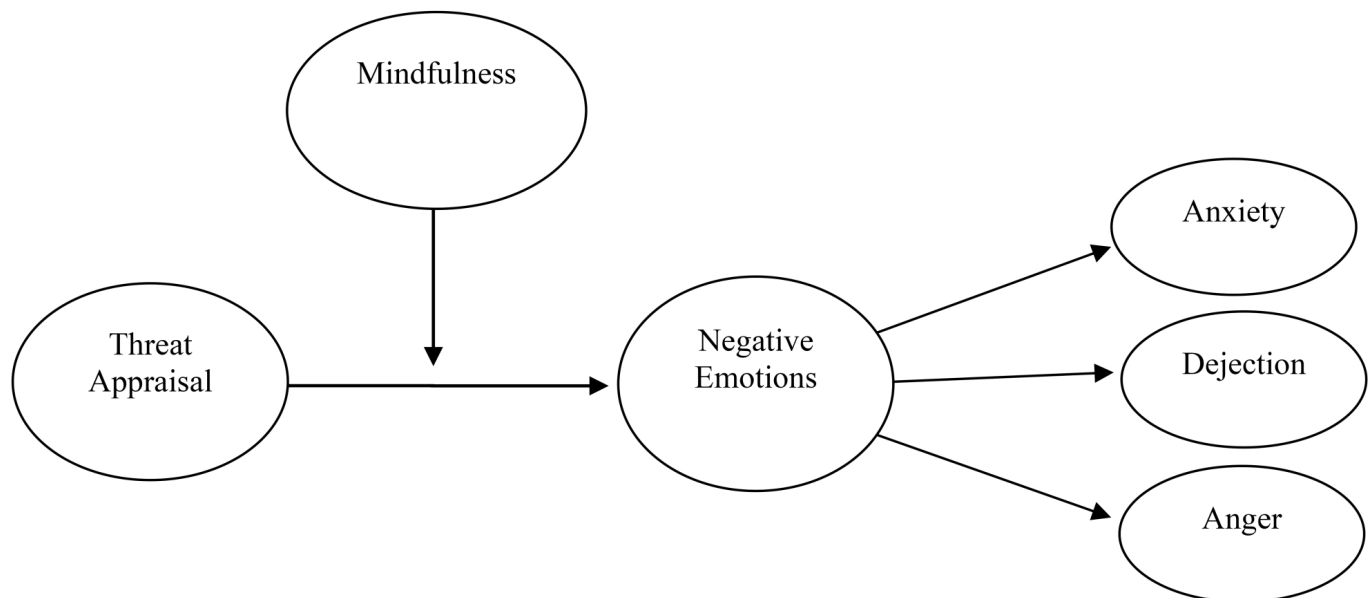


FIGURE 1. Hypothesized conceptual model.

The current physical health status of elite athletes has been included as a control variable in the study, as it is considered a significant predictor variable that can influence their negative emotions. The constructed model is illustrated in Fig. 1 [53].

## 2. Methods

### 2.1 Procedures

First, ethics committee approval was obtained from the researcher's university. Afterwards, professional football clubs were contacted. Out of the 50 professional football club managers who were approached, feedback was received from only 39, with the remaining 11 choosing not to respond. The data was then gathered from players belonging to the 39 football clubs that granted permission for the research to be conducted. The researcher supplied the players with essential details, outlining the study's purpose, the goals of data collection, guarantees of confidentiality regarding personal details, as well as obtaining consent for their participation. Data were collected over approximately one month. Throughout the season, data were collected once from each team, typically during weekdays, using Google Forms and paper-based surveys completed with a pen. Collecting data before the weekend league matches enhances the validity of the research by capturing the athletes' stress levels and threat appraisal related to the competition [14].

### 2.2 Participants

Data were collected from 322 licensed elite male football players operating in professional football clubs in Turkey. However, 23 participants answered the two attention check questions incorrectly (e.g., "I am an athlete in a professional basketball club") and did not fill in the questionnaires, thus they were not included in the study. Consequently, the analysis was conducted with the remaining 299 valid data sets. Participant characteristics are detailed in Table 1.

Within the scope of the research, it has been determined that G\*Power (latest ver. 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, NRW, Germany) is required to ascertain the necessary sample size for setting  $1 - \beta$  power at 95%,  $\alpha = 0.05$ , and Cohen's  $d$  effect size = 0.10. The analysis has indicated a need for 204 participants for Multivariate Regression. Following the recommendation of Suresh and Chandrashekar [54], it is advised to augment the sample size by around 10% to account for potential data omissions or inadequacies. In adherence to this advice and in anticipation of missing data points and anomalies, the study incorporated a total of 299 athletes [54].

### 2.3 Data collection

Participants were asked to complete three questionnaires: The Mindfulness Inventory for Sport (MIS), The Emotions Inventory for Sport (EIS), and The Challenge and Threat Scale (CTS).

#### 2.3.1 The mindfulness inventory for sport (MIS)

Mindfulness scale developed by Thienot *et al.* [55] and adapted to Turkish by Tingaz [56] was used to measure the awareness of elite and amateur athletes because of attention and experience. The survey comprises 15 items organized into 3 factors (Awareness, Non-judgmental, refocusing) to evaluate the athletes' mindfulness perception. Participants rated each item on a 6-point Likert-type scale ranging from 1 (not at all) to 6 (very much). Examples of the scale items include: "When I become aware that I am not focusing on my own performance, I am able to quickly refocus my attention on things that help me to perform well" and "When I become aware that I am thinking about how tired I am, I quickly bring my attention back to what I should focus on". High scores are interpreted as indicating higher levels of mindfulness. The reliability coefficients of McDonald's Omega ( $\omega$ ) for this

**TABLE 1. Participants' characteristics.**

Characteristic	Category	n	%
<b>Gender</b>			
	Male	299	100
<b>National Athlete Status</b>			
	National Athletes	54	18.1
	Non-National Athletes	245	81.9
<b>Educational Status</b>			
	Bachelor's Degree	95	32
	High School Graduate	201	67
	Master's Degree	3	1
<b>Age</b>			
	18–20 yr	117	39.5
	21–23 yr	136	45.5
	24–30 yr	34	11.4
	31 yr and Older	11	3.7
	Mean (age)	21.50 (SD = 2.86)	
<b>League Experience</b>			
	1–3 yr	55	19
	4–6 yr	170	56
	7–9 yr	74	25
<b>Physical Injury Status</b>			
	No Physical Injury	179	59.9
	Physical Injury	120	40.1

*SD: standard deviation.*

study were as follows: 0.90 for Non-judgmental, 0.95 for Refocusing, 0.93 for Awareness, and a total of 0.96.

### 2.3.2 Emotions inventory for sport (EIS)

To measure many emotions in athletes at the same time, the scale developed by Jones *et al.* [57] and adapted to Turkish by Urfa and Aşçı [58] was used. The research included three components (Anxiety, Dejection, Anger) representing unfavorable feelings from the 5-factor scale. The athletes' emotional statuses were assessed using a 5-point Likert-type scale ranging from 0 (Never) to 4 (Very much) for all the items. Examples of scale items include: "How much do you feel unwell during competition periods?" and "How much do you feel demoralized during competition periods?". High scores are interpreted as indicating higher levels of negative emotions. The reliability coefficients calculated for McDonald's Omega ( $\omega$ ) in this study are as follows: 0.96 for Anxiety, 0.94 for Anger, and 0.94 for Dejection, with a total reliability coefficient of 0.94.

### 2.3.3 Challenge and threat scale (CTS)

The Rossato *et al.* [28] Challenge and Threat scale, which was customized for Turkish elite athletes Türkyılmaz and Altıntaş [59], was employed to evaluate the elite football players' perception of threat. This sub-dimension of the appraisal scale includes seven questions and follows a 6-point Likert scale

format. Examples of scale items include: "I worry that I will say or do the wrong things" and "I worry that others will find faults in me". High scores are interpreted as indicating high levels of threat appraisal. The reliability coefficient for the internal consistency of the scale, as calculated in this study, was 0.77 for McDonald's Omega ( $\omega$ ).

## 2.4 Data analysis

Descriptive statistics, correlations and reliabilities for the variables of the study are presented in Table 1. The results indicate that skewness ranged from  $-0.55$  to  $-0.26$  and kurtosis ranged from  $-1.26$  to  $-0.44$ , all within the criteria of normality [60]. Before the analysis, assumptions regarding multivariate statistics were checked. It was observed that all Mahalanobis distances were below 15. Multicollinearity was controlled through variance inflated factor (VIF) and tolerance values. Since the VIF values were below 10 and the tolerance value was above 0.10, indicating no multicollinearity and residuals problems. As a result, all assumptions were met following the recommendations of Field [61]. Therefore, the Maximum Likelihood (ML) estimation method was used.

In the research, a model was created in which threat appraisal is the input variable, negative emotions are the output variable, and mindfulness is the moderator variable [62]. Path analysis was used to determine the moderator effect in the

study. In the research, first, two-stage data analysis recommended by Anderson and Gerbing [63] was carried out. In the first stage, the measurement model was tested, and in the second stage, path analysis was carried out. Maximum Likelihood (ML) method was used to calculate measurement and path analysis. In the study, standard factor values and their  $t$  values were used to determine the significance values of the variables.  $\chi^2/df$ ,  $p$  value of  $\chi^2$ , Comparative Fit Index (CFI), Root Mean Square Error Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) values recommended by Kline [64] for SEM studies were reported. In this context,  $\chi^2/df < 3$ , CFI  $> 0.90$ , RMSEA  $< 0.08$ , SRMR  $< 0.08$  are taken as cut-off points [64]. The bootstrap technique was used to verify whether the created model and the relationships between variables were statistically significant. In the current study, 5000 resampling options were preferred and calculated at a 95% confidence interval.

Data analysis was performed using R Studio (ver., 4.0.5, RStudio, Inc., Boston, MA, USA) and SPSS 26 software (IBM Corporation, Armonk, NY, USA). Firstly, primary tests such as skewness, kurtosis, VIF and tolerance values were conducted using SPSS. Measurement model and moderation analyzes “lavaan” (ver., 0.6-19, R Package: Leuven, Belgium), “semTools” (ver., 0.5-6, R Package: Vienna, Austria) for confidence intervals packages are used.

### 3. Results

#### 3.1 Evaluation of the measurement model

We performed CFA (Confirmatory Factor Analysis) to evaluate the full measurement model of the scales. Firstly, a second-level model representing the mindfulness variable by three subscales was constructed. Following this, a bifactor model where all items loaded onto the mindfulness factor was constructed. The data for the measurement model can be found in Table 2. Upon comparing the two measurement models, it was discovered that the second model exhibited superior fit indices and offered simplicity. Consequently, the bifactor model was deemed to be the more suitable choice [65]. The factor loadings for each construct vary between 0.45–0.94 and are significant. Additionally, composite reliability (CR) values were  $> 0.60$ . (See Table 3). Also, Threat average variance extracted (AVE) is less than 0.50. In such cases, convergent validity can be achieved if the CR value is greater than 0.60 [66, 67]. Furthermore, there were no instances of severe multicollinearity or singularity problems detected, as the correlation coefficients among the variables were all below 0.85 [64]. For discriminant validity, the square roots

of the AVE values were compared with the correlations of the relevant variables. When Table 3 is examined,  $\sqrt{AVE}$  values are higher than all other correlations between factors. It can be said that this provides discriminant validity [66].

#### 3.2 Moderation testing

Aligned with the theoretical framework proposed in the study, the primary objective was to investigate how the mindfulness variable moderates the impact of threat appraisal on negative emotional states among elite football players. Consistent with the hypothesized model, a structural equation model was developed to represent negative emotions like “Anxiety, Dejection, Anger” as second-order constructs, while mindfulness and threat variables were included as observed variables at the first-order level (Fig. 2). Before the analysis, the values of the estimation and moderator variables were standardized. As a result of the analysis, acceptable goodness-of-fit values of the model were reached. The fit indices of the structural model are presented in Table 2. The parameters obtained for the analysis are given in Table 4. All predictive variables were found to explain approximately 50% ( $R^2 = 0.50$ ) of the variation on negative emotions. It was determined that all predictive variables had a positive and significant effect on negative emotions. In addition, the interactional effect of the Threat and Mindfulness variables on negative emotions was found to be significant ( $b = -0.27$ ,  $p < 0.01$ ).

The findings from Fig. 3 indicate that the influence of the moderator variable can be seen in how the degree of mindfulness impacts the link between threat evaluation and experiencing negative emotions. In particular, a pronounced link between low mindfulness levels and heightened negative emotions is observed ( $b = 0.61$ ,  $p < 0.001$ , 95% CI: [0.485, 0.632]), underscoring the substantial impact of threat appraisal on the escalation of negative emotions. With a medium level of mindfulness, the relationship remains significant but weaker ( $b = 0.34$ ,  $p < 0.01$ , 95% CI: [0.210, 0.454]), showing a reduced impact of threat appraisal on negative emotions. However, when the level of mindfulness is high, the relationship becomes non-significant ( $b = 0.06$ ,  $p > 0.05$ , 95% CI: [-0.109, 0.321]), suggesting that a high level of mindfulness buffers the effect of threat appraisal, effectively diminishing its influence on negative emotions. This indicates that increased mindfulness helps in reducing the adverse emotional impacts of threat appraisal.

**TABLE 2. Summary of the model testing procedure.**

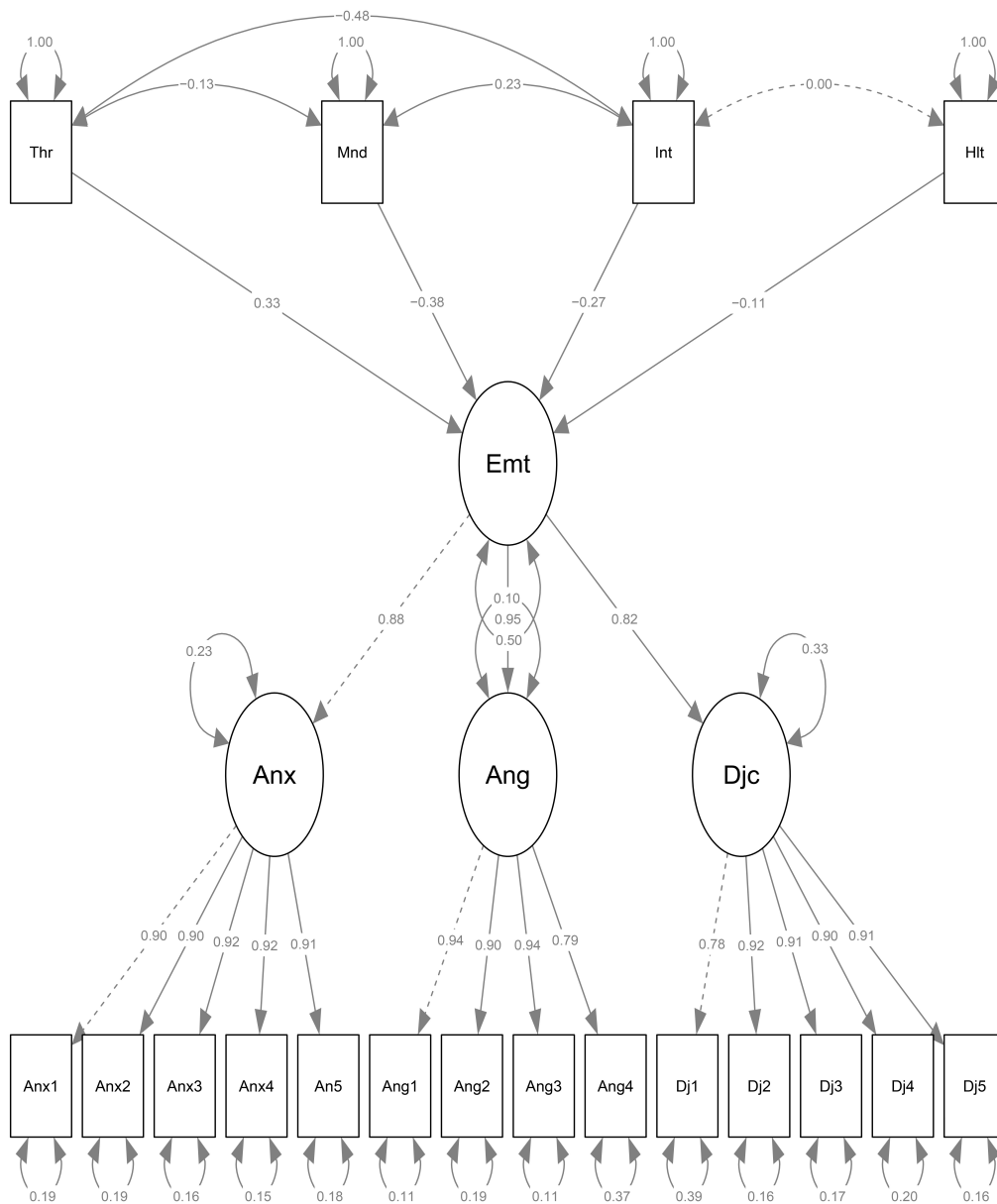
Model	$\chi^2$	$df$ .	RMSEA (95% CI)	CFI	SRMR
1. Three-factor	1163.672	584	0.058 (0.053, 0.062)	0.95	0.076
2. Bifactor model	1099.236	566	0.056 (0.051, 0.061)	0.95	0.075
3. Structural model	340.849	129	0.074 (0.061, 0.084)	0.96	0.071

RMSEA: Root Mean Square Error Approximation; CI: Confidence Interval; CFI: Comparative Fit Index; SRMR: Standardized Root Mean Square Residual;  $df$ .: degrees of freedom.

**TABLE 3. Square root of the average variance extracted (AVE), correlations matrix, CR and AVE.**

Scale	Descriptive Statistics and Reliabilities							Correlations			
	Skewness	Kurtosis	Mean	SD	CR	AVE	$\sqrt{AVE}$	1 (a)	2 (b)	3 (c)	4
(1) Mindfulness	-0.55	-1.09	3.84	1.32	0.96	0.67	0.81	1.00			
(2) Negative Emotion	0.03	-1.10	1.86	0.92	0.81	0.78	0.88	-0.48**	1.00		
(a) Anxiety	-0.03	-1.21	2.06	1.15	0.96	0.83	0.91	(1.00)			
(b) Dejection	0.26	-1.03	1.78	1.17	0.94	0.78	0.88	(0.66*)	(1.00)		
(c) Anger	0.00	-1.24	2.03	1.16	0.80	0.94	0.96	(0.82*)	(0.76*)	(1.00)	
(3) Threat Appraisal	-0.10	-0.44	3.69	1.09	0.84	0.45	0.67	-0.13**	0.50**	1.00	
(4) Health Status (Control Variable)			-	-	-	-	-	0.51	-0.27**	-0.26**	1.00

Note: \* $p < 0.05$ , \*\* $p < 0.01$ , SD: standard deviation; CR: Composite reliability; AVE: Average variance extracted. Health Status was dummy coded such that 1 = current injury and 0 = no current injury. The values in parentheses ( ) represent the subdimensions of negative emotions.



**FIGURE 2. Moderator analysis pattern diagram.** Thr: Threat Appraisal; Mnd: Mindfulness; Hlt: Health Status (Control Variable); Int: Threat X Mindfulness (Interaction term); Emt: Negative Emotions; Anx: Anxiety (subdimension of Negative Emotions); Ang: Anger (subdimension of Negative Emotions); Djc: Dejection (subdimension of Negative Emotions).

TABLE 4. Findings on the moderator relationship.

Variables	95% CI					
	$\beta$	LL	UL	Std. Err	z-value	$p (> z )$
Health status → Negative Emotions	-0.11*	-0.397	-0.036	0.092	-2.354	0.019
Threat Appraisal → Negative Emotions	0.33**	0.193	0.446	0.065	4.939	0.001
Mindfulness → Negative Emotions	-0.38**	-0.466	-0.283	0.047	-8.015	0.001
Moderated Effect						
Threat Appraisal X Mindfulness → Negative Emotions	-0.27**	-0.331	-0.122	0.053	-4.238	0.001

\* $p < 0.05$ , \*\* $p < 0.01$ , CI: Confidence Interval; Std. Err: Standard Error; LL: Lower Limit; UL: Upper Limit; Standardized beta coefficients ( $\beta$ ) are reported.

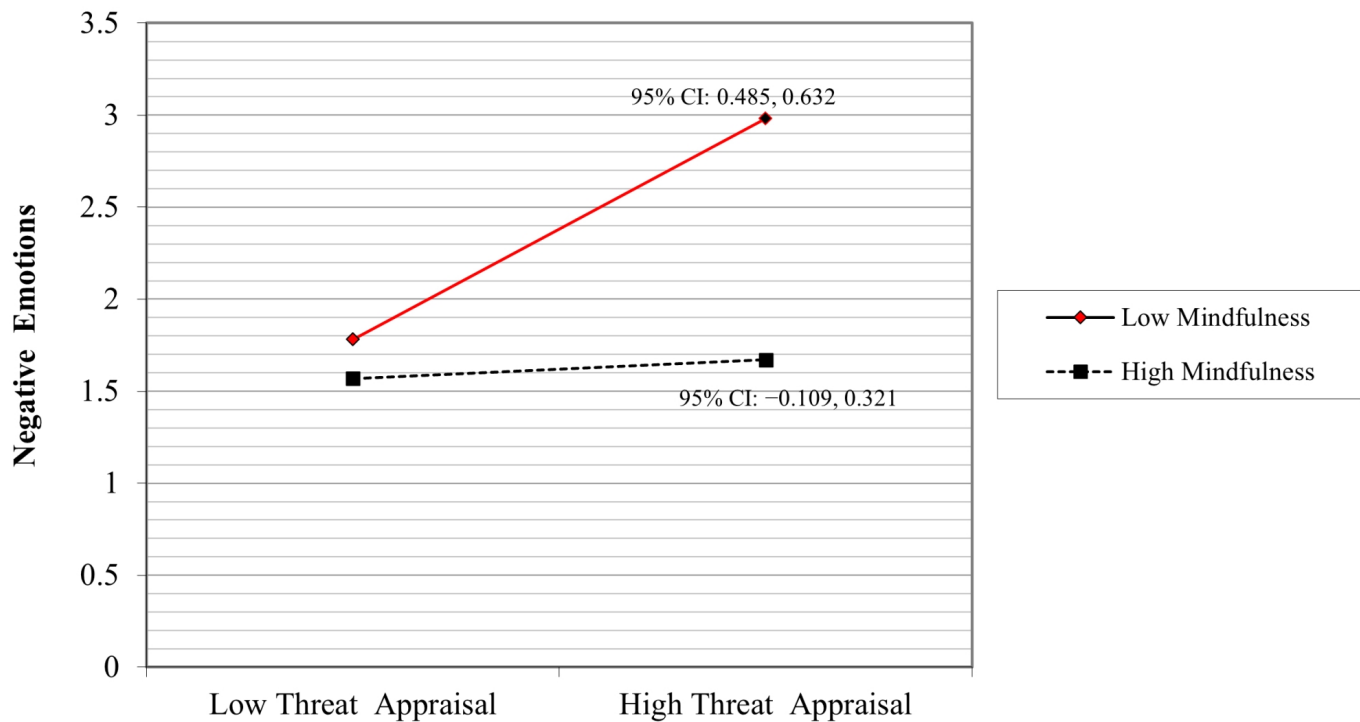


FIGURE 3. Graphical representation of the mindfulness modifier effect. CI: Confidence Interval.

#### 4. Discussion

The analysis revealed that threat appraisal has a significant negative impact on negative emotions. Additionally, mindfulness was found to have a significant negative effect on threat appraisal. At higher levels of mindfulness, the negative relationship between threat appraisal and negative emotions was found to be non-significant. Finally, these findings suggested that mindfulness may have moderated the relationship between threat appraisal and negative emotions.

Due to the competitive nature and unpredictable outcomes of sporting events, athletes may experience a sense of threat appraisal triggered by factors like the drive to meet performance expectations and fan pressure [3–5]. This situation is of greater importance in terms of football, as football is the most popular sport in the world in terms of both the number of players and the largest number of spectators [68]. Apart from the aforementioned scenarios, it can be argued that the globalization of football worldwide has intensified the stress particularly on professional footballers [13, 69].

Because it can be said that the intensity of the perception of performing more and winning is higher in elite athletes, due to the heightened responsibility and pressure associated with maintaining high performance levels. The strain experienced by elite athletes can result in heightened perception of danger, as they constantly face the expectation to excel. This research adds to the existing body of sports psychology literature by uncovering the connections between elite footballers' threat assessment and their experience of adverse emotions. On the other hand, we offer solutions to the literature for sports managers by highlighting the mindfulness antidote on how to manage the negative emotions of athletes who are under threat appraisal.

According to the results of our research, we found that threat appraisal has a significant effect on negative emotions. Based on this finding, it is possible that elite soccer players who perceive their circumstances as threatening could encounter emotional responses like anxiety, despondency and frustration. Skinner and Brewer found that the anxiety state of the athletes being in threat appraisal before the competition increased [70].

Similarly, for both team athletes and individual athletes, it was determined that the anxiety states of the athletes and the threat appraisal increased at the same time [28]. According to certain research, anxiety may arise as a result of the way a challenge is assessed [71]. Cerin [72] and Izard [73] stated that the reason for this is related to the fact that anxiety is a complex emotion that includes both approach and avoidance tendencies. Regarding emotions of elite football players for the risk of injury, environmental pressures, and loss of image in case of losing the match, pressure and anxiety may cause threat appraisal, and this may lead to increase in anxiety.

In addition, different studies have been conducted on the relationship between the threat state and cognitive anxiety. Moore *et al.*'s [74] study on golf players stated that threat appraisal is more related to cognitive anxiety than somatic anxiety. Quested *et al.*'s [75] study on dancers also stated that dancers feeling under threat appraisal are significantly associated with both somatic and cognitive anxiety states. Similarly, Chadha *et al.*'s [76] study on golf players reported that both cognitive and somatic anxiety states were significantly associated with threat appraisal. Conversely, numerous researchers have found that varying forms of negative emotions, including anger, can be triggered by the evaluation of potential threats [76, 77]. As a result, in a professional branch such as football, where winning and losing are the determining factors, football players who evaluate threat cause emotional states such as anger and dejection.

In our study, we reached the conclusion that the negative emotions of athletes decreased with increased levels of mindfulness (Table 4). According to meta-analysis research, it has been documented that mindfulness plays a role in controlling and inhibiting negative emotions [47, 78, 79]. However, similar results were found in different studies. Dehghani *et al.* [80], in their experimental research on basketball players, stated that mindfulness significantly reduces the anxiety level of basketball players. In the studies of Oguntuase and Sun [48] on male football players, it has been concluded that with mindfulness, players can cope with problems more easily and regulate their emotions by focusing on the moment without judging the distractions. Furthermore, meta-analytic research has revealed notable connections between mindfulness and cognitive reappraisal, showing heightened correlations in males in contrast to females [81, 82]. According to Garland's hypothesis mindfulness influences cognitive reappraisal. Mindfulness enhances cognitive flexibility through acceptance and decentering, and by improving present-moment awareness, it assists individuals in more easily relinquishing initial negative appraisals and replacing them with positive ones [83, 84]. This process facilitates increased cognitive reappraisal [83–85]. Research has indicated that mindfulness-based regulation techniques are more closely linked to decreases in negative emotions in contrast to cognitive reappraisal [86, 87]. Hou *et al.* [88] found that mindfulness effectively reduces depression and that cognitive reappraisal moderates this effect. Considering the context of our study, it can be inferred that mindfulness, which mitigates negative emotions, could act as a mediator in the increase of positive emotions through cognitive reappraisal. Previous research and our own study findings suggest that mindfulness serves as a crucial factor in emotion regulation,

particularly among elite male soccer players, highlighting its pivotal role in enhancing and sustaining the psychological well-being of male athletes when gender differences are taken into consideration. However, despite the finding that mindfulness has stronger relationships for men compared to women in elite contexts, more research is needed to substantiate this claim.

## 5. Conclusions

In our study, the model we proposed aims to uncover how mindfulness moderates the link between threat appraisal and negative emotions. In our current study, we found that the increase in threat evaluation in elite football players caused an increase above negative emotions. But the most important thing is that we found that mindfulness made the relationship between these two variables meaningless (Fig. 3). Therefore, it may be asserted that the increase in mindfulness dampens the stress assessment in the athlete and prevents the emergence of negative emotions. Athletes who possess a strong sense of mindfulness are adept at concentrating on the current moment without passing judgment, which enables them to detach from troubling thoughts and heightens their consciousness of the present situation [42, 89]. This process helps individuals evaluate threats more objectively. Thus, mindfulness fundamentally enhances individuals' ability to manage stress and emotions [38, 43, 50]. Athletes who possess a strong sense of mindfulness tend to assess threats in a more composed manner than their counterparts, a quality that proves essential in effectively handling negative emotions [47, 78]. Tingaz *et al.* [40] in their study, high mindfulness rates in athletes showed a decrease in anxiety, stress and depression, and it was determined that this had a positive effect on the performance of the athletes. According to systematic reviews, it was reported that mindfulness has the effect of decreasing and regulating negative emotions and levels of stress [47, 79]. In general, the research model we put forward and the results of previous studies are parallel to each other. The results we obtained in our study are particularly consistent with the principles of MBCT. In conclusion, we can say that mindfulness-based support therapies for athletes may help alleviate negative emotions and enhance their performance.

## 6. Practical implications

This part of our study presents a series of practical implications for the regulation of pre-match stress and mood in elite football players. The first inference is that elite football players who are in threat appraisal can minimize this situation with mindfulness. By practicing mindfulness, elite athletes, particularly those preparing to compete in high-stress environments, can effectively manage distractions and concentrate on the task at hand. Unlike other strategies that involve disregarding pressure and distractions, the fundamental principle of mindfulness is embracing and ultimately conquering these obstacles. Hence, in a possible stress situation, mindfulness may minimize the threat appraisal situation and will make elite football players feel more comfortable before the match.

Negative emotions are likely to occur in elite football players



who are in threat appraisal before an important contest. In this scenario, it is possible to reduce the impact of negative emotions and potentially cultivate positive emotions. Mindfulness could serve as a guiding framework for managing perceived threats and emotional responses in this situation. With mindfulness, awareness of the current situation is achieved by focusing on the present without focusing on the past or the future. This awareness enables athletes to tolerate anxiety and other negative moods.

Positive results have been observed with mindfulness therapies in various sports [43]. Specifically, interventions such as MBCT, Acceptance and Commitment Therapy (ACT), and MBSR can be effectively implemented with elite football players [90, 91]. To make these therapies more applicable, coaches and sports psychologists could include mindfulness exercises, structured cognitive-behavioral techniques, and stress reduction practices customized to meet the specific requirements of the athletes in their training programs.

## 7. Limitations and directions for future research

While our study's findings using structural equation modeling based on various theories validate the proposed model, it is crucial to acknowledge the limitations. The proposed model is based on causal relationships. If the moderator is the variable, although it has an important role between the input and the output variable, it is possible that there are different variables between the two variables. Moreover, our study is of a cross-sectional nature, and conducting longitudinal studies could yield more dependable results. In addition, in future studies, a wider structural model can be established by adding the performance of the athletes as the output variable. Nevertheless, faced with challenges in accessing elite football players and the growing number of questions to be included in the questionnaires, we opted to prioritize obtaining accurate results with a reduced number of variables. This decision aimed to maintain research reliability by avoiding an increase in variables that could potentially compromise the study's integrity. Additionally, studies on different anxiety states have been conducted in the literature (these situations are discussed in the discussion section). Future research avenues may explore different anxiety types and self-compassion, a pivotal mindfulness component, across various sports disciplines [40, 44, 92]. Furthermore, since our study sample consists solely of athletes from the Turkish football leagues, our findings are specific to this population. Consequently, stress and threat appraisal may differ across cultures, which could lead to different outcomes.

### AVAILABILITY OF DATA AND MATERIALS

The data will be made available by the authors through sending email to the corresponding author at email address: serdarsolmaz11@gmail.com.

### AUTHOR CONTRIBUTIONS

SS—Article writing: (Introduction/Literature Review/Result/Discussion). YEY—(Ethical Approval/Data collecting/Methods).

### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All subjects gave their informed consent for inclusion before they participated in the study. The study design complies with the Declaration of Helsinki (2013) ethical standards. The ethics committee approval for the present study was obtained from the Scientific Research and Publication Ethics Committee of the Faculty of Social Sciences and Humanities at Siirt University (Date/Approval 03 March 2023/4375).

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### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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