



The relationship between mindfulness and self-rated performance in student-athletes: the mediating role of depression, anxiety and stress

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Abstract

The effect mechanism of mindfulness on athletic performance is still trying to be understood. In the present study, we examined the mediating role of depression, anxiety, and stress in the relationship between mindfulness and self-rated performance. Three hundred sixty-three student-athletes (61.2% male, 38.2% female, $M_{age} = 21.47$, $SD = 3.30$) were asked to fill the Mindfulness Inventory for Sport (MIS), the Depression Anxiety Stress Scale-21 (DASS-21), and the Self-rated Performance Questionnaire. While mindfulness was positively related to athletic performance, it was negatively related to depression, anxiety, and stress. The relationship between mindfulness and athletic performance was partially mediated by depression, anxiety, and stress. While the cross-sectional design does not permit causal inferences, these findings raise the possibility, in this population, that mindfulness may positively affect perceived performance by reducing depression, anxiety, and stress.

Keywords Mindfulness · Depression · Anxiety · Stress · Athletic performance

Introduction

The number of evidence showing that there is a positive relationship between mindfulness and athletic performance [1, 2] and that mindfulness-based interventions increase athletic performance [3, 4, 5] has been growing. Mindfulness

involves non-judgmental and moment-to-moment awareness of the present experience [6]. Increased mindfulness is associated with lower levels of anxiety, depression [7, 8], and stress [9]. There are many pieces of evidence indicating that mindfulness-based interventions reduce depression, stress, and anxiety [10, 11, 12]. It was previously reported that mindfulness-based interventions reduced negative thoughts and perceived stress in athletes while improving their quality of life [13]. In the study conducted by Gross et al. [3] comparing the traditional Psychological Skills Training (PST) and Mindfulness-acceptance-commitment (MAC) programs, it was notably found that the MAC intervention reduced depression, anxiety, and distress in athletes [3].

Depression, anxiety, and stress can be counted among the important structures that may hinder athletic performance. It was previously reported that athletes with lower levels of stress demonstrated higher performance [14]. In the meta-analysis study conducted by Jokela and Hanin [15], athletic performance was closely related to anxiety. In another meta-analysis study, it was found that there was a relationship between successful performance and lower levels of depression [16]. Although there is much evidence for the correlations between mindfulness and athletic performance, the researchers have not touched on the mediating role of depression, anxiety, and stress. Based on this, this

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study will explore the mediating role of depression, anxiety, and stress in the relationships between mindfulness and athletic performance among student-athletes. It is hypothesized that depression, anxiety, and stress have a mediating role in the relationship between mindfulness and perceived performance.

Methods

Participants

The sample size varies from 100, 200, to 500 or more subjects as the rules of thumb used in structural equation modeling [17, p. 240]. While Kline [18, p. 111] suggested that the ratio of the number of cases to the number of free parameters should be 20:1 for structural equation modeling, he stated that the ratio of 10:1 is a more realistic target. Therefore, it was decided to include 370 participants in the sample. Considering the rate of non-responsiveness or incorrect response, the sample was increased by 10% and 405 participants were included in the study. 42 participants who used psychiatric drugs and answered the control question incorrectly (we are in 2020, true or false) were not included in the study. 363 student athletes from individual and team sports (61.2% male, 38.2% female, mean age = 21.47 SD = 3.30, mean sports year = 5.42, SD = 4.75) from two state universities in Turkey (Hatay Mustafa Kemal University School of Physical Education and Sports and Ahi Evran University

School of Physical Education and Sports) constituted the study sample.

Measurements

All measurements were collected through Google Forms and in a fixed order. There was no interval between the measurements. All athletes were given written information about the study design. The study protocol was approved by the ethics committee of Hatay Mustafa Kemal University Rectorate, Social and Human Sciences Scientific Research and Publication Ethics Board (Approval No.: 21817443-050.99).

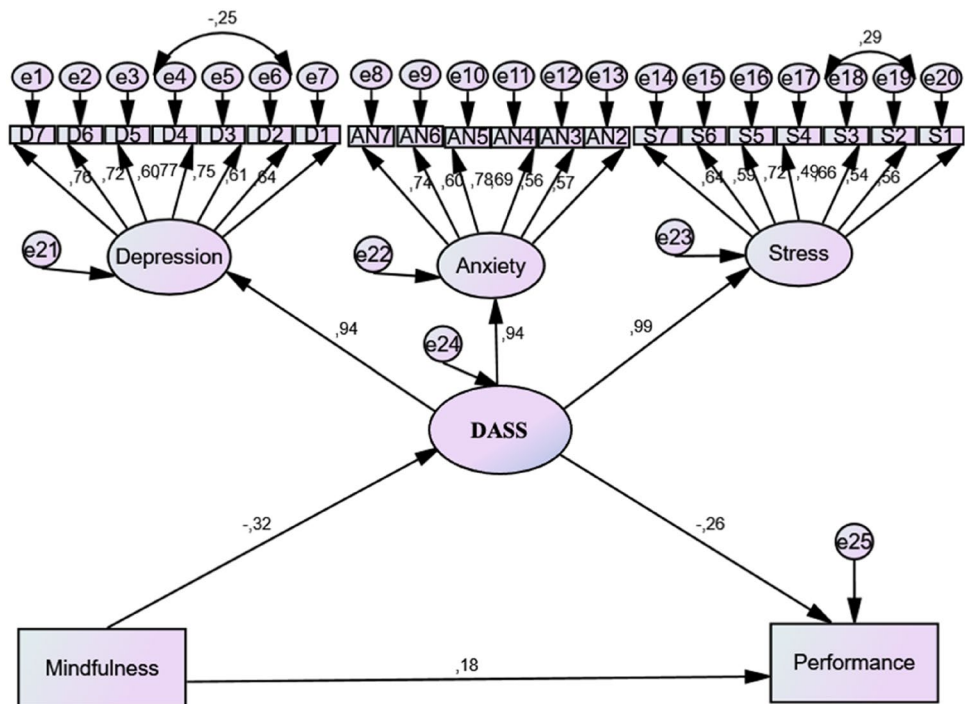
Demographics

The participants were asked to fill out a self-report questionnaire including information regarding the participants' age, gender, sports year, branch, and psychiatric drug use (Fig. 1).

The mindfulness inventory for sport (MIS)

The Mindfulness Inventory for Sport, which was developed by Thienot et al. [19] and adapted to Turkish by Tingaz [20], consists of 15 items and 3 sub-dimensions consisting of awareness, non-judgment, and refocusing. The items in the inventory are rated on a 6-point Likert scale (1 = almost never, 6 = almost always). The Cronbach's alpha internal consistency coefficient was calculated as 0.82 for the overall inventory while the values for the sub-dimensions are as

Fig. 1 The model of mindfulness → DASS (depression, anxiety, stress) → performance



follows: awareness: $\alpha = 0.81$, non-judgment: $\alpha = 0.70$, and refocusing: $\alpha = 0.77$. The test–retest correlation coefficient was $r = 0.89$ for the overall inventory while the correlation values for the sub-dimensions are as follows: awareness: $r = 0.72$, non-judgment: $r = 0.77$, and refocusing: $r = 0.96$. The split-half reliability test result was calculated as $r = 0.80$. High scores from the inventory indicate high levels of mindfulness, while low scores indicate low levels of mindfulness [20]. The scale was negatively correlated with irrational performance belief [21] and positively correlated with impulsivity [22] and rumination [23], and cognitive flexibility [21] and self-understanding [24].

Depression Anxiety Stress Scale-21 (DASS-21)

The Depression Anxiety Stress Scale-21 (DASS-21) was originally developed by Lovibond and Lovibond [25] and adapted into Turkish by Sarıçam [26]. The scale consists of three sub-dimensions involving depression (7 items), anxiety (7 items), and stress (7 items). The items in the inventory are rated on a 4-point Likert scale (0 = never, 3 = always). With a normal sample, the test–retest correlation coefficient was calculated as $r = 0.68$ for the depression sub-scale, $r = 0.66$ for the anxiety sub-scale, and $r = 0.61$ for the stress sub-scale. The Cronbach's alpha internal consistency coefficients of DASS-21 are as follows: Depression: $\alpha = 0.85$, Anxiety: $\alpha = 0.80$, and Stress: $\alpha = 0.77$ [26].

Self-rated performance

As measuring perceived performance with a single question instead of multiple questions is regarded as a more reliable approach [27], the participants were asked to answer the question "How would you rate your performance in training over the last week?" on a 10-point Likert scale (1 = very poor, 10 = very good). It is known that this method of measurement was used in other studies as well [27, 28].

Data analysis

IBM SPSS 25 (Statistical Package for Social Sciences Version 25) was used to examine the descriptive statistics, the relationship between variables, and normality tests. Two-stage data analysis proposed by Anderson and Gerbing [29] for structural equation model (SEM) analysis was performed using SPSS Amos 24 program. In the first step, a confirmatory factor analysis (CFA) was performed to test the construct validity of the measurement instruments. As a second step, the hybrid models were formed for the mediation analysis of depression, anxiety, and stress in the relationship between mindfulness and self-rated performance. The significance of this mediating role was examined using a bootstrap test. Standard factor values and their t values were used

to determine the significance values of the path coefficients of the latent variables. In the goodness of fit indices, the p value of χ^2 , χ^2/df , CFI (comparative fit index), RMSEA (root mean square error of approximation), and SRMR (standardized root mean square) values recommended by Kline [30] for SEM studies were reported. In this context, $\chi^2/df < 3$, $CFI < 0.90$, $RMSEA < 0.08$, and $SRMR < 0.08$ were taken as cut-off points [31, 32, 33, 30].

Results

Preliminary test

Descriptive statistics were checked first, and no missing data or invalid data were detected. Then kurtosis and skewness values of the items of all scales used to control the normal distribution of the data, which is the necessary assumption for SEM, were examined. The values for skewness and kurtosis ranged from ± 2.00 for all items suggested by George and Mallery [34]. In this context, the data were suitable for SEM analysis since the kurtosis and skewness values of all the examined scale items are within the recommended critical cut points.

Confirmatory factor analysis of the Mindfulness Inventory for Sport (MIS)

With CFA, it was aimed to confirm the projected hypothetical framework of the inventory and establish its validity. Since the data were normally distributed in all items, the maximum likelihood estimation method was used [30]. As a result of the CFA, the accepted goodness of fit indices could not be achieved ($\chi^2[87, N = 363] = 330,930$; $p < 0.01$; $\chi^2/df = 3.804$; $CFI = 0.86$; $RMSEA = 0.08$; $SRMR = 0.07$). The Modification indices were re-examined; covariance was created between two items in the non-judgment factor and between two items in the refocusing factor, and the analysis was repeated. The goodness of fit indices ($\chi^2[85, N = 363] = 238.687$; $p < 0.01$; $\chi^2/df = 2.808$; $CFI = 0.91$; $RMSEA = 0.07$; $SRMR = 0.07$) indicates that the proposed three-factor model is compatible with the data and acceptable [31, 32, 33, 30]. These results showed that the data obtained from the present study were confirmed by the projected hypothetical structure (three-factor model) of the MIS.

Confirmatory factor analysis of the Depression Anxiety Stress Scale-21 (DASS-21)

The maximum likelihood estimation method [30] was used as the data were normally distributed in all items. As a result of the CFA, the accepted goodness of fit indices could not be

achieved ($\chi^2[168, N=363]=620,769; p<0.01; \chi^2/df=3.695; CFI=0.85; RMSEA=0.08; SRMR=0.11$). Modification indices were re-examined, and an item belonging to the anxiety factor was excluded from the model because of its tendency to cross-load on a different item under the stress factor. In addition, covariance was created between the two items in the Stress factor and between the two factors in the depression factor, and the analysis was repeated. The goodness of fit indices ($\chi^2[147, N=363]=370.762; p<0.01; \chi^2/df=2.522; CFI=0.92; RMSEA=0.06; SRMR=0.04$) indicates that the proposed three-factor model is compatible with the data and acceptable [31, 32, 33, 30]. These results showed that the data obtained from the present study were confirmed by the projected hypothetical structure (three-factor model) of DASS-21.

Since the research is a cross-sectional study, the partial correlation procedure recommended by Podsakoff et al. (35, 36) was applied to control any common method variance (CMV) problem that may arise. In this context, there is a negative and significant relationship between mindfulness and anxiety ($r=-0.206, p<0.01$), stress ($r=-0.219, p<0.01$) and depression ($r=-0.241, p<0.01$), while there is a positive and significant relationship between mindfulness and self-rated performance ($r=0.184, p<0.01$). In addition, there is a negative and significant relationship between self-rated performance and anxiety ($r=-0.235, p<0.01$), stress ($r=-0.185, p<0.01$), and depression ($r=-0.246, p<0.01$). The correlation intervals were evaluated based on Schober et al. [37] (0.00–0.10: insignificant, 0.10–0.39: weak, 0.40–0.69: moderate, 0.70–0.89: strong, 0.90–1: very strong).

Hybrid models

Before the hybrid models were formed since the scales included in the model were measured with different Likert types and in order not to affect the results of the correlation analysis to be performed, the data were standardized values (Z score). Since the data were normally distributed, a covariance matrix was formed using the maximum likelihood estimation method. After the CFA of the scales was performed in the first step, the hybrid model was formed as the second step. The model in which the latent and observed

variables are together was preferred to test the hypothesis of the research based on theoretical grounds. This model in which the latent and observed variables are used together is expressed as a hybrid model by Gana and Broc [38] and as a non-standard model by Bentler [39].

Mindfulness \rightarrow depression, anxiety, stress \rightarrow performance

After the measurement model was verified ($\chi^2[203, N=363]=481,708; p<0.01; \chi^2/df=2.373; CFI=0.91; RMSEA=0.06; SRMR=0.04$), the study hypothesis was tested through the hybrid model. According to the analysis results, mindfulness predicted performance ($\beta=0.26; p<0.01$) and explained 7% of the change (variance) in performance. Mediation model analysis results showed that mindfulness predicted anxiety, stress, and depression ($\beta=-0.32; p<0.01$). The effect of anxiety, stress, and depression (the mediating variable) on performance ($\beta=-0.26; p<0.01$) was significant. The path from mindfulness to performance was still significant ($\beta=0.18; p<0.01$) with the inclusion of the mediating variable in the model (Table 1). Along with the mediating variable consisting of anxiety, stress, and depression, mindfulness explained 13% of the change (variance) in performance. The fact that the fit indices obtained as a result of the model analysis were within the acceptable threshold values, the model is compatible with the data and acceptable ($\chi^2[203, N=363]=481,708; p<0.01; \chi^2/df=2.373; CFI=0.91; RMSEA=0.06; SRMR=0.04$) [31, 32, 33, 30].

In the mediating effect analyses performed with the Bootstrap technique, the values within the 95% confidence interval (CI) obtained as a result of the analysis must not include the value zero (0) for study hypothesis to be supported [40]. The indirect effect of mindfulness on performance was determined to be significant through the mediator variable consisting of anxiety, stress, and depression ($\beta=0.082, 95\% CI [0.053, 0.120]$). The lower and upper Bootstrap confidence interval values obtained using the percentile method do not involve the value 0 (zero). These results indicate the mediating effect of anxiety, stress, and depression in the relationship between mindfulness and performance.

Table 1 Partial correlation between mindfulness, depression, anxiety, stress, and self-rated performance

Variable	Mean	SD	1	2	3	4	5
1. Mindfulness	4.23	0.44	–				
2. Anxiety	0.89	0.70	–0.206**	–			
3. Stress	1.21	0.72	–0.219**	0.711**	–		
4. Depression	0.95	0.75	–0.241**	0.678**	0.742**	–	
5. Self-rated performance	5.90	2.58	0.184**	–0.235**	–0.185**	–0.246**	–

** $p<0.01$

Discussion

We examined the mediating role of depression, anxiety, and stress in the relationship between mindfulness and self-rated performance. While mindfulness was negatively related to depression, anxiety, and stress, it was positively related to athletic performance. This result is similar to the literature on the relationships between mindfulness, depression, anxiety, stress [41], and athletic performance [42, 43].

Depression had a partial mediating effect in the relationship between mindfulness and self-rated performance. Athletes may experience symptoms of depression when their performance declines or when they show catastrophic performance [44]. The relationship between depression and athletic performance in athletes is included in the related literature. For instance, in a meta-analysis study, reviewers concluded that successful performance was associated with lower depression [16]. In a study with 50 varsity swimmers, Hammond, Gialloreti et al. [45] found that performance failure was significantly associated with depression. In addition, Birrer et al. [46] reported that the experiential aspects of mindfulness, which are non-judgmental and act with awareness of the present moment, were significant predictors of depression. Based on this rationale, it is reasonable to infer that depression plays a partially mediating role in the relationship between mindfulness and athletic performance.

Anxiety was a partial mediator of the relationship between mindfulness and athletic performance. According to Yerkes and Dodson Law, extreme anxiety in sports affects performance negatively [47]. There is evidence showing the presence of a negative relationship between competition anxiety and athletic performance [48]. In the meta-analysis study conducted by Hoffman et al. [49], it was concluded that mindfulness-based interventions reduced anxiety. Additionally, other notable systematic reviews and meta-analysis studies show that mindfulness-based interventions increase athletic performance [42, 50]. These results support the idea of the mediator role of anxiety in the relationship between mindfulness and self-rated performance.

Stress had a partial mediating effect on the relationship between mindfulness and self-rated performance. Decreased stress can be considered as a benefit of mindfulness on athletic performance. Preparing for a competition, getting injured, or experiencing defeat in a competition may be stressful for any athlete. The way this stress is assessed by athletes differs. While this situation may cause excessive stress for some athletes and have a negative impact on their performance, some others may utilize this stress to improve their performance. It was previously

reported that high levels of perceived stress in athletes had a positive relationship with burnout and negative affect, it has a negative with positive affect [51]. It was found that athletes with low levels of stress demonstrated higher levels of performance [14] and that more mindful athletes had lower levels of perceived stress [51]. Considering the results indicating that mindfulness-based interventions provide better stress management for athletes [52] and the findings in the present study, it is not a surprising result that the partial mediating role of stress in the relationship between mindfulness and self-rated performance.

Conclusions

Finally, it can be tentatively concluded that mindfulness may increase athletic performance by decreasing depression, anxiety, and stress. Mindfulness-based interventions may be beneficial for student-athletes with the help of reducing depression, anxiety, and stress. The present study adds to the sport-related mindfulness literature by providing a more informed understanding of how variations in mindfulness are linked to athletic performance.

Limitations

This study has some limitations. Even though, the results imply the mediator role of depression, anxiety, and stress in the relationship between mindfulness and athletic performance, it is not possible to make a causal inference. However, we investigated only depression, anxiety, and stress as a mediator in the relationship between mindfulness and athletic performance. Other mediators should be included and tested to figure out the mechanism of mindfulness and athletic performance. We measure the self-rated performance through a single-item questionnaire. Although the same approach was adopted in other studies as well [27, 28], future research might use a different type of athletic performance measurements. Finally, the study data are limited to student-athletes, and the generalizability to other athletes is unclear.

Data availability statement The dataset generated and analyzed during the current study is available from the author on reasonable request.

Declarations

Conflict of interest The authors declare that no conflict of interests exists in this paper.

Ethical approval The study protocol was approved by the ethics committee of Hatay Mustafa Kemal University Rectorate, Social

and Human Sciences Scientific Research and Publication Ethics Board (Approval No.: 21817443-050.99).

Informed consent All athletes were given written information about the study design.

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