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The mediating role of mindfulness in the relationship between the cognitive flexibility and irrational performance beliefs of university student-athletes

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Abstract
The present study aims to examine the mediating role of mindfulness in the relationship between the cognitive flexibility and irrational performance beliefs of university student-athletes. 142 student-athletes from Gazi University Faculty of Sports Sciences were included in the study. The Mindfulness Inventory for Sport, the Irrational Performance Beliefs Inventory-2 and the Cognitive Flexibility Inventory were used as data collection tools. SPSS 25 was used to examine the relationship between descriptive statistics and variables. CFA, SEM and Bootstrap tests were carried out through AMOS 24. In conclusion, it was observed that non-judgment, which is a sub-dimension of mindfulness, had a partial mediating effect on the relationship between cognitive flexibility and irrational performance beliefs.

Keywords Athlete · Cognitive flexibility · Irrational performance beliefs · Mindfulness

Introduction

Rational Emotive Behavior Therapy - REBT (Dryden et al. 2010), the central principle of which is based on Stoic philosopher Epictetus' view that "*Men are disturbed not by things, but by the views which they take of them.*", was developed by Albert Ellis, who was also inspired by other important philosophers such as Immanuel Kant, Spinoza and Schopenhauer. According to REBT, thought is the most important factor in evoking and controlling emotions. For this reason, it is necessary to control thoughts in order to control emotions. Rational and irrational beliefs are the most notable features of REBT that distinguish it from other cognitive-behavioral approaches (Ellis & Dryden 2007). While rational beliefs are flexible, moderate and realistic, irrational beliefs are rigid, extreme and unrealistic. Both rational and irrational beliefs include one primary belief and three secondary beliefs. Preferences constitute the primary belief in rational beliefs while anti-awfulizing, high frustration tolerance; HFT, and self/other acceptance constitute the secondary beliefs. In irrational beliefs, demandingness constitutes the primary belief while awfulizing, low frustration tolerance; LFT, and self/other depreciation can be listed as the secondary beliefs. In sports, the statement "I want to be successful and therefore I must." reflects demandingness beliefs while the "if I do not succeed it will be awful" reflects an awfulizing belief and "it is unbearable to fail." reflects LFT. Additionally, the belief that "When I fail, it means that I am a complete failure" reflects a self-depreciation belief while "when coaches treat me poorly, it proves they are bad people." reflects an other-depreciation belief (Turner 2016). Athlete beliefs such as "*I must win this competition*" or "*I must not be defeated in this competition*" are examples of irrational beliefs. Although irrational beliefs reflect introjected regulation, which is a form of extrinsic motivation, they may affect performance negatively in the long term (Turner 2016). It would be beneficial to mention cognitive flexibility in the rationalization of irrational beliefs. REBT lists flexibility among psychological health criteria. It suggests that healthy and mature individuals tend to be open to change and flexible in terms of their thoughts (Ellis & Dryden 2007).

Cognitive flexibility is a special approach in terms of its ability to modify cognitive sets that distinguish between various cognitive flexibility criteria. In other words, it is the

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ability to notice different cognitive approaches. The individual may not always notice the more rational approaches among different ones. The aforementioned irrational belief can be rationalized in the form of "I may succeed or fail in this competition". On the other hand, cognitive flexibility can also be considered as the structure that allows athletes to notice irrational beliefs such as "*If I fail, my coach will not like me*", "*If I fail, I will look like a failure*" or "*If I fail, it will mean that I am worthless*". At this point, it can be said that mindfulness is required for cognitive flexibility to be functional. Kabat-Zinn (2015) states that "(Mindfulness), can be thought of as moment-to-moment, non-judgmental awareness, cultivated by paying attention in a specific way, that is, in the present moment, and as non-reactively, as non-judgmentally, and as openheartedly as possible.". Additionally, non-judgment can be considered as the main theme of mindfulness. When we are mindful without judging or thoughts and feelings, we can also notice certain positive aspects of them (Kabat-Zinn 2012). Otherwise, in the cases of errors of judgment, irrational beliefs are reinforced (Ruscio 2010). It may be a beneficial approach to accept experiences for what they are or tolerate them instead of regarding them as good or bad. For example, a basketball player may feel angry when their shot is blocked by an opponent. As a result of this anger, self-accusatory thoughts such as "*I should not have let that happen. What is wrong with me?*" may emerge. On the other hand, acknowledging this feeling as anger is an outcome of mindfulness practices (Baltzell and Summers 2018). Following a defeat, athletes who possess the aforementioned beliefs may feel feelings of disappointment, sadness and remorse. However, judging these feelings may increase their intensity and lead to new unpleasant feelings. Noticing and acknowledging one's feelings is the opposite of judgment. Furthermore, judging one's feelings may reinforce irrational performance beliefs.

In this direction, the following hypotheses were tested in the present study. H1. Awareness plays a mediating role in the relationship between cognitive flexibility and irrational performance beliefs. H2. Non-judgment plays a mediating role in the relationship between cognitive flexibility and irrational performance beliefs. H3. Refocusing plays a mediating role in the relationship between cognitive flexibility and irrational performance beliefs.

Method

Participants

Following the simulations performed with various sample sizes ($N = 50$, $N = 100$, $N = 200$, $N = 300$, $N = 500$ and $N = 1000$), it was determined that the intermediacy analysis was suitable for $N \geq 100$ samples (Fairchild et al. 2009). Accordingly, a total of 142 student athletes from Gazi University Faculty of Sports Sciences were included in the present study. 47.9% of the participants were female, 52.1% were male ($M_{age} = 22.68$ years, $SD = 4.99$), 54.2% of the participants were individual sports athletes and 45.8% were team sports athletes.

Data Collection Tools

In the present study, the Demographic Information Form, the Mindfulness Inventory for Sport, the Irrational Performance Beliefs Inventory-2 and the Cognitive Flexibility Inventory were used as data collection tools.

Demographic Information Form

Includes the age, gender and athletic information of the participants.

Mindfulness Inventory for Sport (MIS)

The Mindfulness Inventory for Sport was developed by Thienot et al. (2014) and adapted to Turkish by Tingaz (2020). The inventory consists of 15 items and 3 sub-dimensions involving awareness, non-judgment and refocusing. The Cronbach's alpha internal consistency coefficient was calculated as .82 for the overall inventory, $\alpha = .81$ for Awareness, $\alpha = .70$ for Non-Judgment and $\alpha = .77$ for Refocusing. The 6-point Likert inventory has a scoring range of 40–65 with a minimum score of 40 and a maximum score of 65. While high scores from the inventory indicate high levels of mindfulness in athletes, low scores indicate low levels of mindfulness in athletes.

Irrational Performance Beliefs Inventory-2

The Irrational Performance Beliefs Inventory was developed by Turner and Allen (2018) and adapted to Turkish by Urfa and Aşçı (2018). The 5-point Likert inventory includes 20 items. The inventory consists of four sub-dimensions involving Demandingness, Awfulizing, Low-Frustration Tolerance and Depreciation. High scores from the inventory indicate high levels of irrational beliefs regarding the related sub-dimensions. The Cronbach's Alpha internal consistency coefficient regarding the reliability of the inventory was calculated as .76 for the Demandingness factor, .85 for the Low-Frustration Tolerance factor, .79 for the Awfulizing factor and .87 for the Depreciation factor.

Cognitive Flexibility Inventory

The Cognitive Flexibility Inventory was developed by Dennis and Vander Wal (2010) and adapted to Turkish by Gülüm and Dağ (2012). The 5-point Likert inventory consists of 20 items and two sub-dimensions involving alternatives and control.

Table 1 The post-modification goodness of fit value indices for the measurement tools

Fit Measurements	Good Fit	Acceptable Fit	MIS	CFI	IPBI-2
$\chi 2$ /df	$0 \leq \chi 2/df \leq 2$	$2 < \chi 2$ /df ≤ 3	1.75	1.97	2.26
RMSEA	$0 \leq$ RMSEA $\leq .05$	$.05 <$ RMSEA $\leq .10$	.07	.08	.09
GFI	$.95 \leq$ GFI ≤ 1.00	$.80 \leq$ GFI $< .95$	.90	.85	.85
CFI	$.97 \leq$ CFI ≤ 1.00	$.90 \leq$ CFI $< .97$	.91	.90	.91

MIS Mindfulness inventory for sport, *CFI* Cognitive flexibility inventory, *IPBI-2* Irrational performance beliefs inventory-2

The Cronbach's Alpha internal consistency coefficient was calculated as .90 for the overall inventory, .89 for Alternatives and .85 for Control. The inventory has a minimum score of 20 and a maximum score of 100. For this study, it was found that the Cronbach's Alpha internal consistency coefficient was calculated as .90 for the overall inventory, .87 for Alternatives and .70 for Control.

Data Analysis

The data collection tools were provided to the participants online. Before starting the data analysis phase, the total scores were calculated, extreme value analyses were performed and defective data were determined. 12 out of 154 data were excluded due to the detection of extreme value and defective or missing data. Skewness and Kurtosis values were examined to test the normality of data distribution. As a result, it was observed that the skewness and kurtosis values were within the ±2 range and that therefore, the data were normally distributed (George and Mallery 2020). SPSS 25 was used to examine the relationship between variables and descriptive statistics. Confirmatory Factor Analysis (CFA) was used to test the construct validity of the measurement tools. Structural Equation Modeling (SEM) was used to examine the mediating role of mindfulness in the relationship between cognitive flexibility and irrational performance beliefs. The significance of the mediating role of mindfulness in the relationship between cognitive flexibility and irrational performance beliefs was examined with bootstrap tests. CFA, SEM and Bootstrap tests were carried out through AMOS 24.

Table 2 Examination of the relationships between variables using the pearson product-moment correlation

Variable	Mean	SD	1	2	3
1. M	63.27	7.60	–		
2. IPB	65.79	14.28	$-.24^{**}$	–	
3. CF	72.73	8.12	$.31^{**}$	$.20^{*}$	–

$^{**}p < .01$, $^{*}p < .05$. *M* Mindfulness, *IPB* Irrational Performance Beliefs, *CF* Cognitive Flexibility

Findings

Results of the Confirmatory Factor Analysis for the Measurement Tools

Modifications were made as the fit index values produced by the measurement models that were created with the aim of testing the validity of measurement tools, were not within acceptable limits. The 7th item of MIS was excluded, and a covariance was established between the 2nd and 3rd items, and the 13th and 15th items. The 2nd, 8th and 10th items of CFI were excluded and a covariance connection was established between the 1st and 3rd, 3rd and 5th, and 12th and 19th items. The 3rd, 5th, 7th, 4th and 2nd items of IPBI-2 were excluded and a covariance connection was established between the 1st and 8th, 10th and 19th, and 11th and 15th items. Following the modification of all measurement tools, it was observed that the resulting goodness of fit values were within acceptable or good fit ranges (Forza and Filippini 1998; Schermelleh-Engel et al. 2003; Yu 2002). Table 1 shows the goodness of fit values for the measurement tools.

Relationships between Variables

When the relationships between the variables were examined, it was observed that there was a negative and significant relationship between M and IPB ($r = -24$, $p < .01$), a positive and significant relationship between M and CF ($r = .31$, $p < .01$), and a positive and significant relationship between CF and IPB ($r = .20$, $p < .05$) Table 2.

Results for the Models

In the present study, the direct effects of cognitive flexibility on irrational performance beliefs and the mediating role of mindfulness were tested with SEM. According to Baron and Kenny (1986), the mediating role of variables depend on the following conditions:

Table 3 The models' compliance with the conditions for a mediating effect

Path	1	2	3
1. CF- > Awareness- > IPB	ACCEPTED	REJECTED	REJECTED
2. CF- > Non-Judgment- > IPB	ACCEPTED	ACCEPTED	ACCEPTED
3. CF- > Refocusing- > IPB	ACCEPTED	REJECTED	ACCEPTED

CF Cognitive flexibility, *IPB* Irrational performance beliefs

a. The independent variable has a significant effect on the mediating variable.
b. The mediating variable has a significant effect on the dependent variable.
c. With the addition of the mediating variable to the model, the effect of the independent variable on the dependent variable diminishes or becomes less significant. The reduced significance of the independent variable's effect on the dependent variable indicates a full mediating effect and if this effect is diminished with the mediating variable, it indicates a partial mediating effect.

In this context, three different structural models were created. The mediating effects of awareness, non-judgment and refocus, which are the sub-dimensions of the Mindfulness Inventory for Sport, in the relationship between cognitive flexibility and irrational performance beliefs were examined separately. Table 3 shows the information on the model.

In the first model, the mediating effect of awareness in the relationship between cognitive flexibility and irrational performance beliefs was examined. It was observed that the mediating variable of Awareness had an insignificant effect on irrational performance beliefs ($\beta = -0.01$, $t = -0.12$, $p > .05$). The H1 hypothesis was rejected as it did not meet a condition required for a mediating effect. In the second model, the mediating role of non-judgment in the relationship between cognitive flexibility and irrational performance beliefs was examined. The first condition was met as it was observed that the independent variable of cognitive flexibility had a negative and significant effect on the mediating variable of non-judgment ($\beta = -0.31$, $t = -3.23$, $p < .05$). The second condition was also met as it was observed that the mediating variable of non-judgment had a negative and significant effect on the dependent variable of irrational performance beliefs ($\beta = -0.29$, $t = -2.93$, $p < .05$). Finally, it was observed that the effect of cognitive flexibility on irrational performance beliefs dropped from $\beta = 0.26$ ($t = 3.18$, $p < .05$) to $\beta = 0.17$ ($t = 1.99$, $p < .05$) due to the inclusion of non-judgment. This significant drop indicates the partial mediating effect of non-judgment in the relationship between cognitive flexibility and irrational performance beliefs. Accordingly, the H2 hypothesis was accepted. In the final model, the mediating role of refocusing in the relationship between cognitive flexibility and irrational performance beliefs was examined. The H3 hypothesis was rejected as it was observed that refocusing had an insignificant effect on irrational performance beliefs ($\beta = 0.06$, $t = 0.62$ $p > .05$).

Table 4 shows that the goodness of fit value indices for the model where the mediating role of non-judgment in the relationship between cognitive flexibility and irrational performance beliefs was examined are located within the good fit or acceptable fit value ranges. Non-judgment and cognitive flexibility explain 14% of the total change in irrational performance beliefs while cognitive flexibility explains 10% of the change in non-judgment. Figure 1 shows the results for the structural model created.

Bootstrap Analysis

The Bootstrap analysis was performed to test the significance of the mediating role of non-judgment in the relationship between cognitive flexibility and irrational performance beliefs. Table 5 shows the coefficients and confidence intervals for the direct and indirect paths regarding the analysis.

Table 4 Goodness of fit value indices for the accepted model

Fit Measurements	Good Fit	Acceptable Fit	CF- > Non-Judgment- > IPB
$\chi 2$ /df	$0 \leq \chi 2/df \leq 2$	$2 < \chi 2$ /df ≤ 3	1.69
RMSEA	$0 \leq$ RMSEA $\leq .05$	$.05 <$ RMSEA $\leq .10$	0.70
GFI	$.95 \leq$ GFI ≤ 1.00	$.80 \leq$ GFI $< .95$	0.97
CFI	$.97 \leq$ CFI ≤ 1.00	$.90 \leq$ CFI $< .97$	0.96
AGFI	$.90 \leq$ AGFI ≤ 1.00	$.85 \leq$ AGFI $< .90$	0.92

CF Cognitive flexibility, *IPB* Irrational performance beliefs

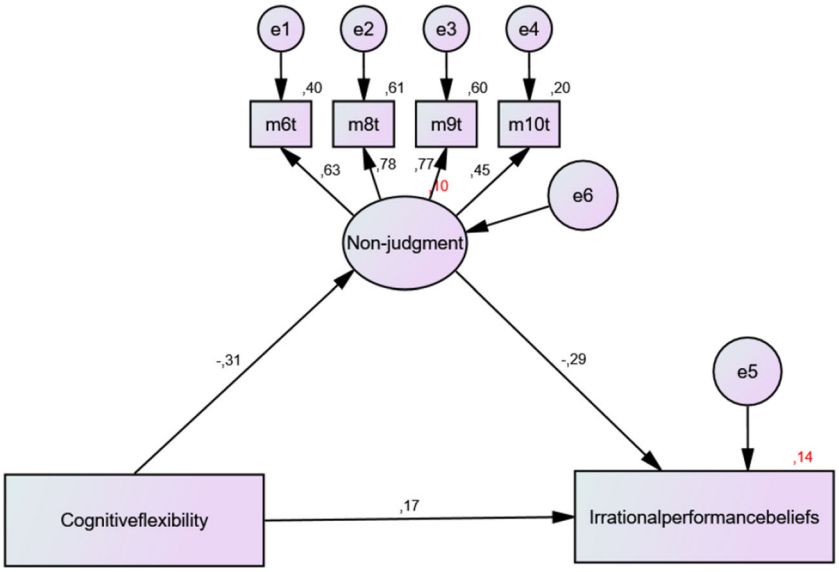


Fig. 1 Analysis values for the structural model

If mediating variables have non-zero lower and upper values within the confidence interval, it indicates a significant mediating role (Preacher and Hayes 2008). Table 5 shows that the standardized bootstrap confidence intervals do not include zero (bootstrap coefficient = .09, Lower-Upper = 0.03–0.19). This situation indicates the significance of non-judgment' mediating role in the relationship between cognitive flexibility and irrational performance beliefs.

Discussion and Conclusion

In the present study, the mediating role of mindfulness in the relationship between cognitive flexibility and irrational performance beliefs was examined with Structural Equation Modeling.

Within the scope of the study, three hypotheses were tested. In conclusion, it was determined that non-judgment had a partial mediating effect in the relationship between cognitive flexibility and irrational performance beliefs. Additionally, it was concluded that awareness and refocusing did not have a mediating effect. Cognitive flexibility positively affects irrational performance beliefs. As stated above, cognitive flexibility can enable one to notice not only rational alternatives but also irrational alternatives. As indicated in the hypothesis of the present study, it is thought that cognitive flexibility may be more functional with mindfulness. On the other hand, cognitive flexibility affects non-judgment negatively. In other words, cognitive flexibility may help increase mindfulness by reducing non-judgment, which is the main theme of mindfulness. Similarly to this result, in the study conducted by Moore (2013) with university students, it was concluded that there was a positive and significant relationship between cognitive flexibility and mindfulness. In the experimental study conducted by Moore and Malinowski (2009) with a meditation group and a control group, it was found that there was a positive and significant relationship between the cognitive flexibility and mindfulness levels of adults. On the other hand, in the study conducted by Butler (2018) with a sample group consisting of a wide range of participants from high-school graduates to doctorate graduates, who were reached via the Ball State University Communication Center email list, Reddit.com, and Facebook posts, it was concluded that there was a negative and significant relationship between cognitive flexibility and mindfulness. This result was attributed to the fact that the sample group was homogeneous, that the participants were mainly reached via social media, and that the variable of meditation practice was regarded as a continuous variable.

Non-judgment, which is a sub-dimension of mindfulness, negatively affects irrational performance beliefs. In other words, non-judgment supports rational beliefs instead of irrational beliefs. As stated above, errors of judgment reinforce irrational beliefs (Ruscio 2010). Similarly, in the study conducted by Frewen et al. (2008) with university students, it was found that there was a negative relationship between

Table 5 The Standardized Bootstrap Analysis for the Model

Model Paths	Coefficient	Lower-Upper
Direct		
CF➔IPB	.16	(0.02)–(0.29)
CF➔Non-judgment	−.31	(−0.44)-(−0.15)
Non-judgment➔IPB	−.29	(−0.47)-(−0.10)
Indirect		
CF➔Non-judgment➔IPB	.09	(0.03)–(0.19)

CF Cognitive flexibility, *IPB* Irrational performance beliefs

extrajudicial acceptance and anxiety, depression and social phobia. Depression and anxiety are closely related to irrational beliefs (Ellis et al. 2010).

Cognitive flexibility may positively affect and increase irrational performance beliefs on its own. On the other hand, non-judgment, which is a sub-dimension of mindfulness, may negatively impact and reduce irrational performance beliefs. At this point, it can be considered that mindful cognitive flexibility, or functional cognitive flexibility may reduce irrational performance beliefs instead of high cognitive flexibility on its own. Finding less functional alternatives for a non-functional thought due to high cognitive flexibility is also a part of cognitive flexibility. It can be considered that the non-judgment component may be required for these alternatives to consist of functional beliefs. According to the results of the present study, athletes may or may not notice the aforementioned unpleasant feelings following a defeat. Additionally, their irrational performance beliefs may become more rational as a result of not judging these feelings.

Conclusion

Awareness and refocusing did not demonstrate a mediating effect in the relationship between student athletes' cognitive flexibility and irrational performance beliefs. Additionally, cognitive flexibility has a positive effect on irrational performance beliefs and a negative effect on non-judgment. Non-judgment, on the other hand, affects irrational performance beliefs negatively. It was observed that non-judgment had a partial mediating effect in the relationship between cognitive flexibility and irrational performance beliefs.

Compliance with Ethical Standards

Conflict of Interest The author declare that he has no conflict of interest.

Ethical Approval The study protocol was approved by the ethics committee of Gazi University, Ankara, (Approval no. 2020–086).

Informed Consent Informed consent was given to all participants in order to get their allowance for this study.

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