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ORIGINAL RESEARCH

Effectiveness of four components of mindfulness based on acceptance and commitment (MAC) on cognitive and physical anxiety of female athletes during the COVID-19 pandemic

Mahdi Fahimi[1], Mohsen Akbarpour Beni[2], Melinaz Rahman Gholhaki[3], Mobina Mirgalouye Bayat[1]

[1] *Department of Sport Psychology, Faculty of Sport Sciences, Shahab Danesh University. Qom, Iran.* [2] *Department of Physical Education and Sport Sciences, Faculty of Literature and Humanities, University of Qom.* [3] *Sport Sciences Department, Islamic Azad University, Science and Research Branch, Tehran, Iran.*

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Abstract

The aim of the study was to test whether mindfulness based acceptance/commitment (MAC) could reduce cognitive-physical anxiety of female athletes to an active control group. This study was a semi-experimental design, Randomized controlled trail with an 8 week (16 sessions, 90 min each) and the active control group. Fifty female fitness athletes (Mage=25.14; SD=1.5) were randomly assigned either to MAC intervention or active control condition. All participations completed Kentucky Mindfulness Inventory (KIMS) and Smith Anxiety Inventory. MANOVA analyses were used to assess time by interactions. Significant value by group interaction effects were found for all outcomes. In the MAC group, Observational and Descriptive Aspects of Mindfulness are more effective in reducing cognitive anxiety rather than physical anxiety. In the active control group, the outcomes remained relatively stable. The present finding suggest that among female aerobic athletics, a MAC intervention has the potential to reduce cognitive and physical anxiety by increase observational and descriptive aspects more than Act with awareness, Accept without judgment aspects. The MAC model is one of the best systematic approaches to mindfulness training in sport psychology and has positive impact on performance, as well as the overall development of mental health and well-being.

Keywords: Anxiety, cognitive, mindfulness, observation, physical.

Introduction

Kabat-Zinn (1994), a renowned expert in mindfulness, has eloquently described this concept as "paying attention in a specific way, on purpose, in the present moment and non-judgmentally" (Cangur et al., 2017). Brown & Ryan have contributed to this definition by characterizing mindfulness as the state of being fully present and aware of one's surroundings in real-time (Tinkler et al., 2020). Similarly, Marlatt & Kristeller have defined mindfulness as the act of giving one's undivided attention to experiences, describing any transformations that may

✉ M. Fahimi, e-mail: fahimi. mahdi@yahoo.com

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occur in a moment-to-moment basis (Mercader-Rubio & Angle, 2023). Segal et al. (2004) have further expounded on this notion, asserting that true mindfulness requires openness to inquiry into one's experiences without automatic judgment or reactivity (Agustus & Zizzi., 2022).

At its core, mindfulness embodies two fundamental components: a keen attention and awareness of the present moment experience, and an acceptance of naturally fluctuating moment-to-moment experiences. These components distinguish mindfulness from other psychological frameworks and intervention models, as they entail an active engagement with one's consciousness (Salles et al., 2023).

When viewed as an emotion regulation strategy, acceptance encourages athletes to remain present with their emotional experience, thus allowing them to maintain awareness of their tasks. This approach causes the emotional experience to pass without resorting to any futile attempts at escape or control, all while co-opting no cognitive resources. As such, it fundamentally alters the trajectory and intensity of one's emotional experience (Chen & Meggs, 2020).

To attain optimal attention, an individual must possess the requisite level of awareness to discern when their attention strays from its intended object and possess the cognitive flexibility to release internal or external distractions by practicing acceptance. The consequences of attentional conflict may result in momentary disruptions that necessitate renewed focus on the appropriate task/stimulus or a cascading series of distractions, frustration, worry, and rumination (Josefsson et al., 2020).

From a theoretical standpoint, it is now widely acknowledged that attempting to change or control the content or frequency of thoughts and feelings may not necessarily be an effective approach for managing internal experiences. Rather, new mindfulness-based models propose viewing such experiences as natural, non-threatening, and limited, without necessitating their reduction or control (Gardner et al., 2014). These models differ fundamentally from traditional psychological skills training methods that have been a staple of sport psychology practice and research since the late 1970s adaptation of Donald Meichenbaum's stress inoculation training model (Hussey et al., 2020). In contrast to traditional control-based models that emphasize the need for optimal internal states to achieve and maintain peak performance, mindfulness-based models contend that purposeful control of internal states is unnecessary and may even undermine optimal performance. Mindfulness-based techniques assert that optimal performance can be realized by increasing moment-to-moment non-judgmental awareness through attending to task-relevant cues and stimuli while accepting naturally occurring internal states such as thoughts, emotions, and physiological states. This approach leads to greater and more sustained commitment to valued actions and behaviors (Filho & Tenenbaum, 2020).

Anxiety has two separate parts, but at the same time, they are interdependent. Physical and cognitive anxiety, while they are often studied separately, but they behave interactively (Leary, 1982), cognitive anxiety creates concerns about the results of cognitive and physical anxiety in sports performance, and creates a negative role in the negative conversation with It shows itself. Physical anxiety, on the other hand, is an effective and emotional part of anxiety, and it is a physiological arousal that includes contraction of blood flow, contraction of muscles, etc. (Hardy & Parfitt, 1991). Worry and anxiety in this case can be caused by lateness or earliness: Maturity, fear, embarrassment, ignorance of new conditions and the inability to adapt one's behavior to these conditions. Cognitive anxiety is the mental part of anxiety and is caused by a negative evaluation of performance and performance, while physical anxiety is the physiological and emotional element of the anxiety experience and is related to the arousal of the autonomic nervous system. Based on this, physical anxiety symptoms include heart palpitations, sweating palms, increased heart rate, muscle tension, and shortness of breath (Chen & Meggs, 2020). In addition, recent researches have shown that brain regions are involved in different levels of anxiety, specifically, cognitive anxiety and physical anxiety activate specific areas in the brain, and these results support the distinction between cognitive and physical anxiety provides (Goette et al., 2015) stress is an indispensable part of human life, but its high or long duration is harmful and causes changes in behavior, critical and emotional states. Women will be considered as vulnerable people due to the fact that they are facing various tensions and stresses at the society level, but for many reasons they are facing more tensions and stresses

at the society level. Some of the results showed that the origin of some of the stress thoughts are the individual's own thoughts and include the individual's feelings and views about himself, his attitudes towards others, his interpretations and evaluations of situations, events and behavior of others.

Anxiety is among the factors that appear to be related to mindfulness. It is defined as a set of cognitive, physical, and behavioral responses to perceived external or internal stimuli that pose a potential threat, causing individuals to desire particular outcomes (Zadkhosh et al., 2019). Cognitive anxiety pertains to the mental aspect of anxiety and results from negative evaluation of performance and outcomes, whereas physical anxiety pertains to the physiological and emotional elements of the anxiety experience and is linked to autonomic nervous system arousal. Physical anxiety symptoms include heart palpitations, sweaty palms, increased heart rate, muscle tension, and shortness of breath (Zadkhosh et al., 2019).

The COVID-19 pandemic has caused widespread anxiety among people globally, including athletes. The suspension of sports activities due to the pandemic has prompted numerous studies aimed at identifying effective techniques for reducing COVID-19-related anxiety. However, relatively little research has been conducted on psychological issues in the era of COVID-19 with regard to sports. Therefore, this study seeks to investigate the impact of mindfulness-based acceptance/commitment techniques on the cognitive and physical anxiety levels of female athletes during the COVID-19 pandemic.

Methods

Our study was designed as a randomized controlled trial with an intervention and an active control condition. The inclusion of an active control condition was deemed essential to detect unique effects of the mindfulness intervention (Baskin et al., 2003). The aim of this research is to explore the impact of mindfulness-based acceptance/commitment techniques on cognitive and physical anxiety levels among female athletes during the COVID-19 pandemic.

Participants

The criteria for entering the research include the age range of 20 to 37 years, getting lower scores in mental flexibility (minimum score 20), getting high scores in physical and cognitive anxiety (the lowest score for each factor is 5), not participating in simultaneous research and not having physical illness, not having acute mental problems (personality disorders, etc.) and not receiving psychiatric drugs and psychological treatments, informed consent to participate in the research, ability to answer questionnaire questions and exit criteria, including absence of more than 2 training sessions, Not giving homework, occurrence of events beyond the participants' control, simultaneous participation in psychological treatment courses and creating confusion in the educational process were related.

Confidentiality of the participants' information in the research, obtaining satisfaction from the participant sample, not disseminating information to others, and creating an atmosphere of confidence were part of the standards and ethical considerations in this research. And all cases of this research were reviewed and approved by the ethics committee of the university. This study has an ethical code number IRQOM.REC.1400.009.02.

The statistical population of interest in this study comprises all female athletes residing in Qom city, constituting an impressive 15,969 individuals based on sports insurance records in 2022. To achieve the study's objectives, we randomly selected 360 athletes with Morgan's table prototype, and provided them with an internet link to complete an anxiety questionnaire. After screening the responses, we further refined our sample by Convenience Sampling purposefully selecting 50 candidates who exhibited similar levels of anxiety. According to research, the sample size for causal and experimental research should be at least 15 people. In studies that need to classify the community for sampling, at least 20 to 50 people are suggested. This indicates that the selected sample size for this study can be regarded as sufficient (Hafeznia, 2003). These 50 subjects were then assigned, through randomization, to either the control group (consisting of 22 individuals) or the experimental group (comprising 28 individuals).

Over the 8-week intervention period, the experimental cohort participated in several exercises as per the established protocol, with each participant required to

attend three weekly sessions. Meanwhile, the control group did not engage in any mindfulness practices during this time. Through these carefully designed procedures, this study seeks to advance our understanding of how mindfulness-based approaches can play a pivotal role in managing anxiety levels among female athletes during the COVID-19 pandemic.

Tools

Kentucky Inventory of Mindfulness Questionnaire (KIMS)

Mindfulness has become an increasingly popular topic of research in recent years, and as such, there are various tools available for its measurement. One widely used instrument is the Kentucky Mindfulness Self-Report Inventory, which was developed by Baer et al. (2004). This questionnaire comprises 39 questions that assess various aspects of mindfulness, including emotional regulation techniques, which are considered crucial for effective practice. Its high internal consistency (0.73) is indicative of its reliability, while the subscales of observation, descriptiveness, concentration, and acceptance exhibit impressive Cronbach's alpha coefficients of 0.91, 0.84, 0.83, and 0.87, respectively. And Cronbach's alpha coefficients in this study were 0.85. The Kentucky Mindfulness Skill Inventory is a 39-question tool used to measure mindfulness skills, which includes four subscales of observation, description, focus, and acceptance. This questionnaire has a 5-point Likert scale (1 for completely disagree and 5 for completely agree). Questions 3, 4, 14, 18, 22, 23 are graded inversely.

Moreover, the validity of this tool has been examined across various cultures, with Dehghan Manshadi et al. (2021) investigating its use in Iran. Their findings revealed a strong level of internal consistency, with a Cronbach's alpha of 0.82, while the convergent validity of its subscales was reported to be 0.78. As such, the Kentucky Mindfulness Self-Report Inventory has proven to be a valuable tool in quantifying mindfulness skills in diverse populations, particularly in the context of addressing mental health concerns.

Smith Anxiety Questionnaire

To investigate the complex construct of cognitive anxiety, a well-validated instrument was employed in this study. The cognitive anxiety questionnaire developed by Smith et al. (1990) is a widely used tool comprising 21 items that assess various dimensions of anxiety, including physical anxiety, cognitive anxiety, and lack of concentration. The comprehensiveness of this measure is noteworthy, as it considers both physiological and cognitive aspects of anxiety, which are relevant to understanding the multifaceted nature of this phenomenon. This questionnaire consists of 21 questions including physical anxiety (nine questions), cognitive anxiety (seven questions) and lack of concentration (five questions). In this scale, 1 point is given to the option at all, slightly, 2 points, moderately, 3 points, and very much, 4 points.

The psychometric properties of this questionnaire have been extensively examined, and its reliability and validity have been consistently supported in research. Specifically, Hadinejad (2012) conducted a meticulous evaluation of the questionnaire's psychometric properties in an Iranian population, providing valuable data on its internal consistency and test-retest reliability. Results revealed a Cronbach's alpha value of 0.849, indicating high internal consistency, while the coefficient of the two-half test was 0.837, further attesting to its reliability. And Cronbach's alpha coefficients in this study were 0.86. Moreover, the coefficient of the Guttman test exceeded eight tenths, highlighting the strong reliability of this tool.

Overall, the cognitive anxiety questionnaire provides a robust tool for assessing cognitive anxiety and related constructs. Its widespread use and successful cross-cultural application attest to its utility in diverse populations. The inclusion of multiple dimensions of anxiety in this measure underscores the complexity of cognitive anxiety and supports a comprehensive assessment approach to better understand this complex phenomenon.

Procedure

The present study aimed to investigate the effects of a mindfulness-based intervention on mental health and sports performance in athletes. The participants were randomly divided into two groups: an experimental group and a control group. The mindfulness intervention was specifically implemented with the experimental group for eight weeks, with each week focusing on one of the seven modules of the Mindfulness model based on acceptance/commitment (MAC).

The MAC model is a well-established, structured approach to mindfulness training in sports psychology that was first introduced in 2001 as an alternative model to traditional sports psychology practice. It aims to

positively impact athletes' performance and overall mental health and well-being by providing them with a systematic approach to mental training. The MAC model consists of seven modules that focus on various aspects of mindfulness and acceptance-based mental training, including flow training, mindfulness training and cognitive deviance, identifying values and behavior based on values, cognitive and emotional acceptance, behavioral commitment, combining mindfulness skills and acceptance and commitment skills, and skill retention.

Throughout the eight-week intervention, the mindfulness group participated in three 30-minute sessions per week, totaling 24 sessions. Each session included a theoretical explanation of the module, client expectations, and discussions related to the weekly module's focus. The aim of this approach was to create a positive impact on performance and mental health while allowing athletes to develop structure and flexibility in their mental training.

Conversely, the control group did not participate in any mindfulness training and continued their daily activities. This allowed for a comparison between the effects of the mindfulness-based intervention and normal daily activities on athlete performance and mental health.

Overall, this study aimed to provide a structured and evidence-based approach to mindfulness training in sports psychology and to investigate its effects on athletes' mental health and performance. By utilizing the MAC model, this study aimed to address the need for systematic and structured approaches to mindfulness training, while also allowing for flexibility and adaptability to athletes' individual needs.

MAC is a seven-step mental and acceptance-based mental training intervention that aims to provide the athlete with structure and flexibility at the same time. Modules redirect to:

Table 1
Content of sessions on mindfulness-based acceptance and con (MAC).

Number of sessions, title and goal	Content of the session
Session 1-3 (week 1) Title: Education phase Goal: Education	Address the participants' need to understand, introduce the concepts MAC
Session 4-6 (week 2) Title: Mindfulness explanation Goal: Mindfulness	Flow training, focus on work alliance, reimagining of athletes' issues, theoretical explanation of MAC program and client expectations, initial discussion of self-regulation and creation of intervention goals.
Session 7-9 (week 3) Title: MAC exercise Goal: *Act with awareness*	Mindfulness training and cognitive deviance, focusing on mind awareness and attention, and cognitive deviance.
Session 10-12 (week 4) Title: Emotional exercise Goal: *Observe*	Identifying values and behavior based on values, focusing on values, the role of emotions, the difference between goals and values
Session 13-15 (week 5) Title: Acceptance exercise Goal: *Accept without judgment*	Cognitive and emotional acceptance, focusing on experiential acceptance versus experiential avoidance.
Session 16-18 (week 6) Title: Commitment exercise Goal: *Describe*	Behavioral commitment, focusing on commitment to actions that are consistent with individual performance and values.
Session 19-21 (week 7) Title: Flexibility exercise Goal: *Combining*	Combining skill and realization, focusing on the combination of mindfulness skills, acceptance and commitment skills; Behavioral flexibility, sobriety and pursuing life in meaningful ways.
Session 22-24 (week 8) Title: Maintaining exercise Goal: *Retention*	Skill retention, focusing on maintaining the skills developed during the program. Based on this model, one of these axes was focused on each week and the athletes were discussed in this field. But the control group did their daily activities and didn't have mindfulness training

Statistical Analysis

In this study, the Shapiro-Wilk test was utilized to determine the homogeneity of data distribution, while a mixed analysis of variance (MANOVA) test was conducted to assess differences between groups. Statistical analysis was performed using SPSS software version 22, with the significance level set at 0.05. By using the Shapiro-Wilk test, we were able to confirm that our data met the requirement for normal distribution, (Hafeznia, 2003) which is necessary for accurate statistical analysis. The mixed MANOVA test allowed us to examine within-subject and between-subject effects, providing valuable insights into potential interactions between different variables.

Results

This study collected data from female athletes in Qom city who were working under the supervision of the physical fitness committee. The results indicated that all respondents were women. In terms of age, the majority of participants fell within the 25-35 year age range (57.4 percent), with educational backgrounds consisting of diploma holders (38 percent) and those with bachelor's degrees (30 percent). Additionally, 31 percent of participants had prior experience winning provincial competitions.

This sample provided valuable insights into the experiences and characteristics of female athletes in Qom city, highlighting the need for further research in this area. By focusing on this specific population, we were able to gain a deeper understanding of the challenges and opportunities facing female athletes in the region, paving the way for future interventions and initiatives aimed at promoting gender equality and sports participation.

The Shapiro-Wilk test was utilized to determine the homogeneity of data distribution, while a mixed analysis of variance (MANOVA) test was conducted to assess differences between groups. By using the Shapiro-Wilk test, we were able to confirm that our data met the requirement for normal distribution (Hafeznia, 2003).

Table 3 indicates that there were significant differences in the average values between the pre-test and post-test stages. Specifically, the experimental group demonstrated a notable decrease in anxiety scores over the course of the study. These findings suggest that the mindfulness-based intervention had a positive impact on participants' mental health outcomes.

Table 2
The result of the Shapiro-Wilk test regarding the normality of the distribution of cognitive and physical anxiety in the studied groups in the pre-test and post-test.

Variable Statistics	Source	Mindfulness Group		Control Group	
		Significance Level	Normality	Significance Level	Normality
Cognitive Anxiety	Pre- Test	0.68	*	0.325	*
	Post- Test	0.165	*	0.172	*
Physical Anxiety	Pre- Test	0.104	*	0.121	*
	Post- Test	0.157	*	0.139	*

Table 3
The cognitive and physical anxiety in the studied groups in pre-test and post-test (Mean±SD).

Variables	Groups	Pre Test	Post Test	Difference
Cognitive Anxiety	Mindfulness	24.29±0.47	16.57±0.96	7.72
	Control	23.86±0.96	21.41±1.48	2.45
Physical Anxiety	Mindfulness	23.64±0.44	16.93±0.58	6.71
	Control	22.77±0.87	19.36±1.29	3.41

Table 4
The results of mixed within-subjects analysis of variance to investigate the main effect of the intervention and the interaction effect of the intervention and the group.

Variable Statistics	Interaction	df	Mean Square	F	p	ηp2
Cognitive Anxiety	Intervention	1	636.976	123.993	0.000*	0.721
	Intervention* Group	1	170.416	33.173	0.000*	0.409
	Error	48	5.137			
Physical Anxiety	Intervention	1	631.294	205.415	0.000*	0.811
	Intervention* Group	1	67.294	21.897	0.000*	0.313
	Error	48	3.073			
Observe	Intervention	1	54.842	12.952	0.001*	0.212
	Intervention* Group	1	3.962	0.936	0.338	0.19
	Error	48	203.248			
Describe	Intervention	1	84.834	43.446	0.000*	0.475
	Intervention* Group	1	7.114	3.643	0.62	0.71
	Error	48	1.953			
Act With Awareness	Intervention	1	139.365	57.355	0.000*	0.544
	Intervention* Group	1	6.525	2.685	0.108	0.053
	Error	48	2.430			
Accept Without Judgment	Intervention	1	166.026	41.150	0.000*	0.462
	Intervention* Group	1	18.586	4.607	0.037	0.088
	Error	48	4.035			

** p<0.05*

Table 5
The results of the analysis of variance test between the subjects with repeated measurements.

Interaction	df	Mean Square	F	p	ηp2
Cognitive Anxiety	1	120.104	2.810	0.000*	0.957
Error	48	42.748			
Physical Anxiety	1	15.086	0.527	0.471	0.11
Error	48	28.619			
Observe	1	329.611	2.286	0.137	0.45
Error	48	144.158			
Describe	1	70.099	2.645	0.110	0.05
Error	48	26.503			
Act With Awarenes	1	2.222	0.041	0.840	0.001
Error	48	53.891			
Accept Without Judgment	1	4.222	0.75	0.785	0.002
Error	48	56.292			

** p<0.05*

According to Table 4, it can be inferred that the main effect of the intervention was significant changes in the levels of both cognitive and physical anxiety. As shown in Table 4, the main effect of the intervention was significant changes in the levels of cognitive and physical anxiety among the athletes. Moreover, the interactive effect of the intervention in the mindfulness group was also significant for both cognitive and physical anxiety levels.

In Table 5, the results of the analysis of variance test between the subjects with repeated measurements of the mindfulness and control groups for Cognitive Anxiety, Physical Anxiety, Observe, Describe, Act with Awareness, Accept without Judgment, revealed that there was no significant difference in the levels of cognitive and physical anxiety in the control group over time. However, in the mindfulness group, the levels of cognitive anxiety significantly decreased.

Discussion

The purpose of this study was to investigate the effect of a mindfulness intervention on the cognitive and physical anxiety of female athletes in Qom province who engaged in physical fitness during the Corona era. Based on this, 50 female athletes in the field of physical fitness were randomly divided into two experimental groups of 28 people (mindfulness training) and a control group of 22 people. Participants in the experimental group had 24 sessions of mindfulness training (8 weeks, with 3 sessions per week), each lasting 30 minutes, while the control group did not receive any training. Before and after the intervention, mindfulness and cognitive and physical anxiety questionnaires were administered to all participants. The results of multivariate variance analysis showed that there was a significant improvement in the reduction of cognitive anxiety in the experimental group compared to the control group.

The current research was conducted with the aim of determining the effectiveness of mindfulness exercises on cognitive, physical and psychological flexibility of female athletes. The findings of the research showed that mindfulness exercises were effective on the cognitive and physical anxiety of female athletes and reduced it. This finding is in line with the research results of Sánchez et al. (2023), Augustus & Zizi (2022), Dana et al. (2022), Tang et al. (2022), Terres-Barcala et al. (2022), Widhi Harita et al. (2022), Zadkhosh et al. (2019), Zadeh et al. (2019) was aligned. This finding can be explained by the theory of Siegel (2004). He believes that mindfulness is defined as a state of aroused attention and awareness of what is happening in the present moment. And it emphasizes the development of the three qualities of refraining from judgment, intentional awareness and focusing on the present moment in one's attention. Focused attention on the present moment enables the processing of all aspects of immediate experience including cognitive, physiological or behavioral activities. Through practice and techniques based on mindfulness, a person becomes self-aware of daily activities, becomes aware of the automatic functioning of the mind in the past and future world, and through moment-to-moment awareness of thoughts, feelings, and physical states, gains control over them, and from the everyday mind and The past and future-focused self is released and negative emotion levels are reduced (Chen & Meggs, 2020). With the help of mindfulness techniques, people learn to observe without judgment and criticism, along with compassion towards themselves and others; they learn to identify the pattern of negative thoughts by observing stressful and sad thoughts and emotions before they are drawn into a vicious cycle. In this way, in the long run, mindfulness makes many changes in the mood and level of happiness and health of people. Scientific research has shown that mindfulness not only prevents depression but also has positive effects on mind patterns in the field of worry, anxiety, depression, irritability and anger (Augustus & Zizzi, 2022).

Other findings of the research showed that mindfulness exercises were effective on the psychological anxiety of female athletes and reduced it. This finding is consistent with the research results of Zhang et al. (2023), Wang et al. (2023), Goisbault et al. (2022), O'Connor et al. (2022), Tebourski et al. (2022), Lewis et al. (2022), Xu et al. (2022), and Lasnier & Durand-Bush (2022). This finding can be explained by the theory of Kabat-Zin (1990). Kabat-Zinn developed his description of mindfulness in a qualitatively structured way and showed how a person can protect his psychological health in the process of mindfulness. These qualities include: non-judgment, acceptance, patience, trust, openness, release, relaxation, generosity, empathy, gratitude, loving kindness and gentleness (Kobat-Zinn, 1990). Considering that mindfulness as a lifestyle, consistent with human

nature, has the ability to influence people's emotional system, i.e. their thoughts, body sensations, raw emotions and action impulses, changing their outlook on life and quality Improve their relationship with themselves, others and the world with compassionate and realistic acceptance (Williams & Penman, 2011). Mindfulness helps people understand that negative emotions may occur, but they are not a fixed and permanent part of the personality. It also allows a person to respond with thought and reflection instead of responding to events involuntarily and without reflection, and perhaps this was the reason for the greater reduction of cognitive anxiety in athletes (Emanuel et al., 2010).

In general, in relation to the research results, it can be stated that mindfulness exercises, by creating a non-judgmental attitude towards emotions, reduce negative emotions such as anxiety and increase the levels of psychological flexibility in athletes. The MAC model has played an important role in the development of its theoretical dimensions based on mindfulness in sports centers over the past few years (Piasecki, 2021). Empirical findings over almost two decades were generally consistent with the theoretical predictions originally proposed by Mack (Josefsson et al., 2020). Mindfulness is one of the main components of the Mac protocol, and there is regular instruction in a variety of meditation exercises throughout the seven modules. The ultimate goal is that the physical and cognitive anxiety promoted by the Mac intervention culminates in both reduced performance and general mental health (Gu et al., 2022).

This research had limitations, such as: the research was conducted only on female athletes, and caution should be exercised in generalizing the results to other age and gender levels. The most important limitation of this research was the available sampling and no follow-up period. It was not possible to control interfering and disturbing variables according to the individual life conditions of female athletes. It is suggested to educational designers that coaches and sports athletes use the mindfulness intervention model to design other sports fields. It is suggested to sports managers and psychologists to provide a basis for mindfulness-based exercises to be included in the training programs and exercises of athletes so that they can benefit from the various capabilities of this category of interventions to reduce negative emotions and reduce cognitive anxiety of athletes.

Conclusion

The current body of research examining the impact of acceptance/commitment-based mindfulness training on performance-related parameters and outcomes in sports has demonstrated that regular engagement in mindfulness practices consistently yields significant improvements in cognitive measures, as well as physiological variables and related psychological factors. These results suggest that mindfulness training may enhance an athlete's ability to regulate their attentional focus, manage stress, and maintain emotional control during competition.

Furthermore, the findings indicate that acceptance-based mental training can lead to continuous improvements in sports performance over time. This highlights the potential value of integrating mindfulness-based interventions into traditional sport psychology practices, as they offer a promising means of promoting both cognitive and behavioral flexibility among athletes. By providing athletes with the tools needed to navigate the challenges inherent in competitive settings, mindfulness training may help them to optimize their athletic performance while also enhancing their overall well-being.

Authors' Contribution

Study Design: MF, MAB; Data Collection: MRGH; Statistical Analysis: MF; Manuscript Preparation: MF, MMB; Funds Collection: MAB

Ethical Approval

The study was approved by the Qom University Ethical Committee (The ethical code number: IRQOM.REC.1400.009.02) and it was carried out in accordance with the Code of Ethics of the World Medical Association also known as a declaration of Helsinki.

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Conflict of Interest

The co-authors and I do not have interests that might be interpreted as influencing the research, and ethical standards were followed in the conduct of the study. All authors declare no conflict of interest.

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