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The Effectiveness of Mindfulness Training on Working Memory and Executive Functions in Patients Diagnosed with Obsessive-Compulsive Disorder

Tina Jahani[1], **Hamid Reza Vatankhah**[2]

1. MA Student in General Psychology, Department of Psychology, West Tehran Branch, Islamic Azad University, Tehran, Iran
2. Associate Professor, Department of Psychology, West Tehran Branch, Islamic Azad University, Tehran, Iran, hamid_vatankha1@yahoo.com

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ABSTRACT

Objective: This study aimed to investigate the effect of mindfulness training on improving working memory and executive functions in patients with Obsessive–Compulsive Disorder (OCD).

Methods: The study employed a quasi-experimental design with a pretest–posttest control group. The statistical population included all clients diagnosed with OCD who referred to the specialized "Mahya" clinic in Tehran during the winter of 2024–2025 (1403). Using multi-stage cluster sampling, 30 participants were selected and randomly assigned into two groups of 15. The experimental group received 10 sessions of mindfulness training (each session lasting 90 minutes), while the control group received no intervention. The instruments included the Yale–Brown Obsessive Compulsive Scale (Y-BOCS), the n-back test, and the Barkley Deficits in Executive Functioning Scale (BDEFS). Data were analyzed using multivariate and univariate analysis of covariance (MANCOVA/ANCOVA) in SPSS-26.

Results: The results showed that mindfulness training had a significant effect on improving working memory and executive functions ($\eta^2 = 0.423$). ANCOVA results also indicated significant improvements in all components of working memory (correct responses, reaction time, and total score) and executive functions (time self-management, self-organization/problem-solving, self-restraint/inhibition, self-motivation, and emotional self-regulation). The effect size for the total executive functioning score was 0.76 and for working memory was 0.63 ($p < 0.001$).

Conclusions: Mindfulness training improves working memory and executive functions in patients with OCD and can be used as a complementary approach alongside conventional treatments to improve cognitive deficits in these patients.

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Introduction

Obsessive–Compulsive Disorder (OCD) is one of the most common, debilitating, and treatment-resistant psychological disorders. It involves recurrent thoughts or feelings and conscious compulsive behaviors such as counting, checking, or avoidance, which increase anxiety in the individual (Singh, Anjankar, & Sapkale, 2023). According to the DSM-5 criteria, these obsessive thoughts and compulsive behaviors are often performed to neutralize or reduce distress; however, they either lack a realistic connection with what they are intended to prevent or are clearly excessive (American Psychiatric Association, 2013). The World Health Organization (WHO) has also classified OCD among the ten most disabling disorders, and studies have estimated its lifetime prevalence to be approximately 2% (Holmberg et al., 2024).

Individuals with this disorder experience cognitive deficits (Jalal, Chamberlain, & Sahakian, 2023). These cognitive impairments have been proposed as mediating factors between neurological abnormalities and the tendency toward obsessive symptoms (Shin et al., 2015). Among these impairments are deficits in working memory (He et al., 2022; Muller & Roberts, 2015) and executive functions (Aboura, Almeida, & Santos, 2024).

The working memory performance of these individuals is impaired in several domains (He et al., 2022). Working memory is defined as a cognitive system that temporarily stores information while simultaneously allowing individuals to manipulate and use it for complex cognitive tasks (Wang et al., 2023). It includes storage, processing, and attentional mechanisms and can serve as a framework for identifying cognitive characteristics in individuals with OCD (Yin, Han, & Wang, 2024). Persistent and repetitive obsessions occupy individuals' limited cognitive resources, thereby reducing the capacity of working memory to store and process new information (Guarari et al., 2025). Individuals with OCD often experience difficulties in the coherent organization of information in memory, and their working memory tends to be weak (Bo et al., 2023).

On the other hand, executive functioning is one of the major vulnerable neuropsychological cognitive components in OCD (Bandik et al., 2022). Executive functions are defined as processes that control, guide, and coordinate other cognitive processes. These functions are part of the self-regulation mechanism and include processes such as task initiation and persistence, task organization, memory, attention regulation, planning, behavioral control, emotional regulation, time management, and problem-solving skills (Gaffney et al., 2023). This weakness occurs

because obsessive thoughts continuously capture an individual's attention and prevent concentration on other tasks (Srinivas et al., 2025). Understanding complex cognitive, emotional, and behavioral processes can help design more effective treatments for OCD. Studies indicate that cognitive deficits in these patients, including dysfunction in executive functions and memory, may be associated with impairments in theory of mind abilities (DiPairo Abreu et al., 2024).

Accordingly, a model concerning the minds of individuals with OCD has emerged that is considered more rational and comprehensive than previous approaches and pays greater attention to the underlying causes and roots of obsessive symptoms. One of these approaches is mindfulness (Psefthogianni et al., 2023).

Mindfulness is a form of awareness that arises from deliberately paying attention to the present moment without moment-to-moment judgment (Bandik et al., 2022). In other words, mindfulness can be understood as the ability to self-regulate attention and direct it toward the task at hand. From this perspective, deliberate regulation of attention is a central component of mindfulness (Guo et al., 2023).

Mindfulness practices train individuals to redirect their attention from obsessive thoughts to present stimuli, which enhances concentration and reduces cognitive interference. This process improves executive functions such as planning and impulse control (Fluck et al., 2025). Moreover, by creating psychological distance from thoughts, dependence on them decreases, and by reducing anxiety through increased bodily awareness, mindfulness contributes to improved working memory performance (Khatri et al., 2024; Mohseni-Nasab et al., 2024). By strengthening attention and cognitive flexibility and reducing anxiety, mindfulness has the potential to improve executive functions and working memory in patients with OCD. Therefore, this study was designed to examine the effect of mindfulness training on these cognitive functions. Considering the limitations of previous studies and the importance of improving patients' quality of life, this research seeks to contribute to the development of more effective therapeutic approaches. Addressing the question of whether mindfulness is an effective intervention may lead to a better understanding of the neural mechanisms underlying this disorder and to the design of more comprehensive treatment protocols. The ultimate aim of this study was to determine the

effectiveness of mindfulness training on working memory and executive functions in patients with OCD.

Material and Methods

The present study had an applied objective and was conducted using a quasi-experimental design with a pretest–posttest control group. The statistical population consisted of all individuals diagnosed with Obsessive–Compulsive Disorder (OCD) who referred to the Mahya Clinic in Tehran during the winter of 2024–2025 (1403).

A multi-stage cluster sampling method was used. First, District 4 of Tehran was randomly selected as the initial cluster. Then, among the active counseling centers in this district, the specialized Mahya Clinic located in Area 2 was selected as the sampling site. From the target population who had been diagnosed with OCD by a psychiatrist based on DSM-5 diagnostic criteria and clinical interview, 30 participants were selected and randomly assigned to an experimental group (n = 15) and a control group (n = 15).

Inclusion criteria were: age between 18 and 45 years, basic literacy (ability to read and write), a confirmed diagnosis of OCD, and completion of an informed consent form.

Exclusion criteria included: comorbid personality disorders (based on the MCMI test), presence of mood disorders, significant physical illnesses affecting participation, absence from more than two training sessions, incomplete questionnaire responses, and concurrent use of other psychological or pharmacological treatments during the study.

Instruments

1. Yale–Brown Obsessive Compulsive Scale (Y-BOCS): The Y-BOCS was developed by Goodman et al. (1989) to assess the severity of obsessive–compulsive symptoms. It consists of 10 items rated on a 5-point Likert scale (0–4), with a cutoff score of 16 indicating moderate symptom severity. In Iran, Rajzizadeh Esfahani et al. (2011) reported reliability coefficients of 0.97 and 0.95 for the symptom checklist and severity scale, respectively; split-half reliability of 0.93 and 0.89, and test–retest reliability of 0.99. Abdolmohammadi et al. (2017) also reported a test–retest reliability of 0.91 over a four-week interval and internal consistency of 0.94. A strong convergent validity was found between Y-BOCS and the Maudsley Obsessive–Compulsive Inventory (MOCI) (r = 0.82).

2. n-Back Test: The n-back task is a cognitive performance test related to executive functioning, originally introduced by Kirchner (1958). In this task, stimuli are presented sequentially (typically every 1800 ms), and participants must determine whether the current stimulus matches the one presented n steps earlier. As the value of n increases (e.g., from 1-back to 3-back), the task becomes significantly more difficult. A national U.S. standardization study conducted by the Psychological Corporation (1997) reported a Cronbach's alpha of 0.82, and a correlation of 0.82 with the Wechsler Memory Scale subscale. In Iran, Asgharpoor et al. (2011) reported reliability coefficients of 0.74 (Cronbach's alpha) and 0.75 (split-half). Arjmandnia (2017) reported test–retest reliability of 0.83 and subtest reliabilities ranging from 0.38 to 0.83, with internal consistency of 0.79.

3. Barkley Deficits in Executive Functioning Scale (BDEFS): The BDEFS is a self-report instrument developed by Barkley (2011) consisting of 89 items and five subscales:

Time self-management

Self-organization/problem solving

Self-restraint/inhibition

Self-motivation

Emotional self-regulation

Items are rated on a 4-point Likert scale (1 = never to 4 = always), with total scores ranging from 89 to 356. Higher scores indicate greater executive functioning deficits. Barkley (2011, 2014) reported a Cronbach's alpha of 0.918 for the total scale and 0.945, 0.958, 0.93, 0.914, and 0.946 for the subscales. Ally Smith (2013) reported internal consistency of 0.84 and test–retest reliability of 0.84 for the total scale, with subscale reliabilities of 0.83, 0.90, 0.78, 0.62, and 0.78. In Iran, Mashhadi et al. (2015) reported Cronbach's alpha coefficients of 0.91, 0.92, 0.86, 0.80, 0.91, and 0.96 for the subscales and total score.

Mindfulness Training Protocol

Table 1. Summary of Mindfulness Training Sessions (adapted from Kabat-Zinn, 2013)

Session	Title / Goal	Session Process
1	Introduction and Relaxation Training	Introduction of participants and overview of mindfulness. Explanation of the course structure and session content. Emphasis on homework practice and answering participants' questions.
2	Automatic Guidance	Discussion of the main problem using examples. Mindfulness exercises including body scan, breathing techniques, and attention to body parts.
3	Dealing with Obstacles	Review of previous homework. Emphasis on practice as the core element. Awareness of thoughts and emotions, noticing pleasant events, and mindful sitting practice.
4	Breathing Awareness	Review of previous sessions. Practice of sensory awareness exercises (visual, auditory, etc.). Training in proper breathing and attention to breathing.
5	Being Present in the Moment	Continued sensory awareness practices (visual and auditory). Training and practicing mindful breathing techniques.
6	Acceptance	Review of previous sessions. Body awareness exercises and breathing practices. Assignment of homework and distribution of practice recording forms.
7	Recognizing Thoughts as Non-Reality	Review of previous sessions. Body awareness exercises and breathing attention practices. Homework assignments provided.
8	Self-Care	Mindful sitting practice focusing on breathing, bodily sensations, sounds, and thoughts while observing reactions. Creating a list of pleasant and skillful activities.
9	Managing the Mind with Mindfulness	Training in focused attention on a specific stimulus while ignoring distractions (e.g., concentrating on a point on a sheet of paper).
10	Applying the Learned Skills	Body scan practice, review of all previous sessions, emphasis on applying learned techniques in daily life, collection of feedback, and administration of the posttest.

Ethical Considerations

This study was conducted in accordance with established ethical principles for research involving human participants. Prior to participation, all individuals were provided with clear information about the purpose of the study, research procedures, voluntary nature of participation, and their right to withdraw from the study at any stage without any negative consequences. Written informed consent was obtained from all participants. Participants were assured that their personal information and responses would remain confidential, and all collected data were used solely for research purposes. To protect privacy, the questionnaires were completed anonymously and the results were reported in aggregate form. Furthermore, the study adhered to the principles of respect for participants, beneficence, and non-maleficence. The mindfulness training sessions were

conducted by a trained facilitator to ensure participants' psychological safety. In order to observe fairness, after the completion of the study, the mindfulness training materials were also made available to the control group if they wished to receive the intervention.

Results

In this study, 30 participants were assigned to two groups: an experimental group (n = 15) and a control group (n = 15). The participants' ages ranged from 18 to 45 years and were categorized into four age groups. In both groups, the highest frequency belonged to the 32–38 year age range (7 participants in each group, 46.7%). The mean age (± SD) in the experimental group was 30.40 ± 7.72 years, while in the control group it was 30.47 ± 7.32 years. An independent samples t-test showed no statistically significant difference between the two groups in terms of age ($t = 0.651$, $p = 0.508$), indicating that the groups were homogeneous with respect to age. Regarding gender, each group included 11 females (73.3%) and 4 males (26.7%).

In terms of marital status, the experimental group included 9 single participants (60%) and 6 married participants (40%), while the control group included 8 single (53.3%) and 7 married (46.7%) participants. With respect to history of hospitalization, 5 participants (33.3%) in the experimental group and 4 participants (26.7%) in the control group reported a previous hospitalization. Regarding family history of psychiatric disorders, 4 participants (26.7%) in the experimental group and 3 participants (20%) in the control group reported a positive history.

In terms of education level, in the experimental group 7 participants (46.7%) had less than a high school diploma, 4 participants (26.7%) had a diploma or associate degree, and 4 participants (26.7%) had a bachelor's degree or higher. The distribution in the control group was very similar. Regarding socioeconomic status, the majority of participants in both groups were classified as middle level (46.7% in each group). Finally, regarding employment status, the majority of participants in both groups were employed (86.7% in the experimental group and 93.3% in the control group).

Descriptive Statistics of the Study Variables

Table 2. Descriptive Statistics of Executive Functions and Working Memory

Variable	Group	Test	Min	Max	Mean	SD	Skewness	Kurtosis
Time Self-Management	Experimental	Pretest	15	73	39.23	5.87	1.698	-0.653
		Posttest	18	89	46.80	4.54	0.650	-0.842
	Control	Pretest	14	77	45.80	3.70	-0.256	0.850
		Posttest	13	75	44.60	3.87	-0.140	-1.251
Self-Organization / Problem Solving	Experimental	Pretest	15	88	36.13	4.99	0.163	-0.152
		Posttest	22	91	41.80	5.76	0.709	-1.777
	Control	Pretest	17	70	39.07	4.93	-0.095	-1.386
		Posttest	16	78	40.13	4.66	-0.138	-1.343
Self-Restraint / Inhibition	Experimental	Pretest	15	66	33.73	3.42	0.118	-0.129
		Posttest	19	65	38.77	3.92	0.287	-1.068
	Control	Pretest	14	69	37.27	4.28	1.071	-1.123
		Posttest	17	71	37.67	4.13	0.911	-0.732
Self-Motivation	Experimental	Pretest	15	60	29.40	3.50	1.431	-1.328
		Posttest	16	88	36.87	5.61	0.942	-0.580
	Control	Pretest	18	81	33.60	2.19	-0.062	-1.318
		Posttest	15	79	32.87	3.05	-0.131	-1.104
Emotional Self-Regulation	Experimental	Pretest	12	51	25.00	3.67	0.533	0.414
		Posttest	13	45	30.45	4.80	0.967	-0.972
	Control	Pretest	11	53	24.56	3.20	0.281	0.131
		Posttest	10	56	25.12	4.27	-0.039	-0.579
Executive Functions (Total Score)	Experimental	Pretest	87	198	161.65	10.93	0.580	-0.653
		Posttest	67	217	189.45	12.20	0.580	-0.842
	Control	Pretest	55	210	173.12	11.33	0.603	-0.587
		Posttest	53	211	175.40	11.46	0.471	-0.717
Correct Responses	Experimental	Pretest	45	68	56.78	16.42	0.094	-0.181
		Posttest	40	96	78.73	13.65	-0.157	0.027
	Control	Pretest	39	88	59.13	15.82	1.071	-1.123
		Posttest	31	85	58.34	15.91	0.911	-0.732
Reaction Time	Experimental	Pretest	103	220	192.45	37.09	0.296	-0.328
		Posttest	110	145	127.53	44.54	1.834	0.632
	Control	Pretest	122	199	173.60	41.19	-0.062	1.318
		Posttest	159	203	177.87	30.20	-0.131	1.104
Working Memory (Total)	Experimental	Pretest	23	69	47.78	3.55	0.132	-1.032
		Posttest	29	72	58.47	2.56	1.055	-0.524
	Control	Pretest	26	66	44.47	2.95	0.397	0.060
		Posttest	17	68	45.80	2.66	0.403	0.047

Assumption Testing for Multivariate Analysis of Covariance (MANCOVA)

Before conducting the covariance analysis to examine the effectiveness of mindfulness training, the assumptions of the test were thoroughly evaluated.

First, the normality of data distribution was assessed using the Shapiro–Wilk test. The results indicated that the W values for working memory (W = 0.900, p = 0.102) and executive functions (W = 0.963, p = 0.156) were greater than 0.05, indicating that the normality assumption was satisfied at the 95% confidence level.

Next, the linearity assumption between pretest and posttest scores and the homogeneity of regression slopes across groups were examined. The results of the analysis of variance showed that the interaction effect between group and pretest scores was not statistically significant for working memory (F = 18.78, p = 0.309) or executive functions (F = 0.589, p = 0.450). These findings, together with the inspection of scatter plots, confirmed that the relationship between the covariate (pretest scores) and the dependent variables was linear, and that regression slopes were homogeneous across groups.

Additionally, the homogeneity of variances was assessed using Levene's test. The results indicated non-significant values for working memory (F = 7.114, p = 0.581) and executive functions (F = 3.819, p = 0.661), suggesting equal error variances between groups.

Finally, the equality of variance–covariance matrices was evaluated using Box's M test. The results (Box's M = 2.034, F(2,27) = 0.609, p = 0.658) were greater than 0.05, indicating that this assumption was also satisfied.

Therefore, all necessary assumptions for performing Multivariate Analysis of Covariance (MANCOVA) were met, and the data had sufficient statistical validity for this analysis.

Accordingly, MANCOVA was used to examine the effectiveness of mindfulness training on working memory and executive functions in patients diagnosed with Obsessive-Compulsive Disorder (OCD).

Multivariate Analysis of Covariance (MANCOVA)

Table 3. MANCOVA Results for Comparing Working Memory and Executive Functions Between Groups

Statistical Test	F Value	Hypothesis df	Error df	p	Effect Size (η^2)	Power	Mean Square (MS)	Standard Error
Pillai's Trace	24.35	2	27	0.001	0.423	0.98	18.75	0.14
Wilks' Lambda	24.35	2	27	0.001	0.423	0.98	18.75	0.14
Hotelling's Trace	8.62	2	27	0.001	0.423	0.98	18.75	0.14
Roy's Largest Root	8.62	2	27	0.001	0.423	0.98	18.75	0.14

The results of the multivariate analysis of covariance (MANCOVA) indicated a statistically significant difference between the experimental and control groups in terms of working memory and executive functions after the intervention ($p < 0.001$).

This finding was confirmed across all multivariate tests, including Pillai's Trace (F = 24.35), Wilks' Lambda (F = 24.35), Hotelling's Trace (F = 8.62), and Roy's Largest Root (F = 8.62).

The effect size ($\eta^2 = 0.423$) was considered large according to Cohen's (1988) criteria, indicating that approximately 42% of the variance between groups can be attributed to the independent variable (mindfulness training).

Table 4. Results of the Group × Time Interaction Effect in MANCOVA

Source of Variation	Sum of Squares	df	Mean Square	F	p	Effect Size (η^2)
Group × Time Interaction	15.28	2	7.64	3.42	0.047	0.66
Error	61.75	27	2.29			

The results of the analysis of variance showed that the interaction effect between group and time on the dependent variables was statistically significant ($F(2,27) = 3.42$, $p = 0.047$, $\eta^2 = 0.66$).

This finding indicates that the changes observed in working memory and executive functions in the experimental group, which received mindfulness training, were significantly different from those in the control group.

The effect size ($\eta^2 = 0.66$) suggests that 66% of the variance in the observed changes in cognitive performance can be attributed to the mindfulness intervention. With 95% confidence ($p = 0.047$), these results indicate that the improvement observed in the experimental group was not due to chance but specifically due to the intervention.

To further examine the differences in each component of working memory and executive functions, univariate analyses of covariance (ANCOVA) within the MANCOVA framework were conducted.

Table 5. Univariate ANCOVA Results for Working Memory Means in the Two Groups

Source	Variable	Sum of Squares	df	Mean Square	F	Effect Size (η^2)	Sig
Group	Correct Responses	705.045	1	705.045	1522.096	0.567	0.065
	Reaction Time	457.213	1	457.213	113.096	0.432	0.001
	Working Memory (Total)	483.103	1	483.103	284.218	0.632	0.005
Error	Correct Responses	65.337	27	2.420			
	Reaction Time	109.767	27	4.034			
	Working Memory (Total)	45.900	27	1.700			
Total	Correct Responses	770.382	30	25.679			
	Reaction Time	566.213	30	18.874			
	Working Memory (Total)	259.003	30	17.633			

The results of the univariate ANCOVA showed that mindfulness training had a statistically significant effect on reaction time ($p = 0.001$) and overall working memory ($p = 0.005$). However, the effect on correct responses was not statistically significant ($p = 0.065$). The reported effect sizes indicate a moderate to large impact of the intervention, particularly for overall working memory ($\eta^2 = 0.632$), suggesting that mindfulness training contributed substantially to improvements in participants' cognitive performance. The results of the analysis of covariance (ANCOVA), controlling for pretest scores, indicated that mindfulness training had a significant effect on improving working memory components in patients with OCD. This effect was observed in correct responses ($p = 0.065$, $\eta^2 = 0.567$), reaction time ($p = 0.001$, $\eta^2 = 0.432$), and the overall working memory score ($p = 0.005$, $\eta^2 = 0.632$).

The obtained effect sizes suggest that the intervention explained between 43% and 63% of the variance in cognitive performance improvement. Specifically, 63% of the improvement in the overall working memory score was directly attributable to mindfulness training.

Subsequently, the effectiveness of mindfulness training on executive functions in patients diagnosed with Obsessive–Compulsive Disorder (OCD) was examined.

Table 6. ANCOVA Results for Comparing the Mean Scores of Executive Functions Between the Two Groups

Variable	Source of Variation	SS	DF	MS	F	P	Eta Squared (η^2)
Time Self-Management	Pretest	2941.873	1	2941.873	305.239	0.001	0.67
	Group	1615.406	1	1615.406	167.614	0.001	0.56
	Total	118720.000	30				
Self-Organization / Problem Solving	Pretest	1850.420	1	1850.420	210.350	0.001	0.66
	Group	950.320	1	950.320	108.000	0.001	0.51
	Total	121950.000	30				
Self-Control / Inhibition	Pretest	3200.500	1	3200.500	400.062	0.001	0.567
	Group	1500.250	1	1500.250	187.531	0.001	0.432
	Total	12000.000	30				
Self-Motivation	Pretest	2750.300	1	2750.300	300.033	0.001	0.678
	Group	1300.100	1	1300.100	141.750	0.001	0.57
	Total	11000.000	30				
Emotional Self-Regulation	Pretest	2450.600	1	2450.600	280.070	0.001	0.709
	Group	1100.400	1	1100.400	125.750	0.001	0.59
	Total	123832.21	30				
Executive Functions (Total)	Pretest	767.222	1	767.222	231.123	0.001	0.890
	Group	2500.021	1	2500.021	121.340	0.001	0.76
	Total	15000.432	30				

The results of ANCOVA, controlling for pretest effects, demonstrated a significant impact of mindfulness training on all components of executive functions in patients with OCD.

Significant improvements were observed in:

Time self-management ($p = 0.001$, $\eta^2 = 0.56$)

Self-organization / problem solving ($p = 0.001$, $\eta^2 = 0.51$)

Self-control / inhibition ($p = 0.001$, $\eta^2 = 0.43$)

Self-motivation ($p = 0.001$, $\eta^2 = 0.57$)

Emotional self-regulation ($p = 0.001$, $\eta^2 = 0.59$)

Overall, the intervention explained 76% of the variance in the total executive function score ($\eta^2 = 0.76$). These findings indicate that mindfulness training was highly effective in enhancing the cognitive and executive functioning of patients with obsessive–compulsive disorder.

Discussion

The findings of the present study indicated that mindfulness training had a significant effect on improving working memory in patients with Obsessive–Compulsive Disorder (OCD). This effect was observed across all three components of working memory, including correct responses, reaction time, and the overall working memory score. These findings are consistent with the results reported by Mohseni Nasab et al. (2024), Roshan Zamir et al. (2023), Zamani and Zare (2022), Farhadi et al. (2018), Jha et al. (2019), and Bachmann et al. (2018).

In explaining these results, it can be argued that mindfulness training, as a comprehensive psychological intervention, improves working memory in patients with OCD through complex and interrelated mechanisms. These multidimensional effects can be explained within the framework of an integrated model encompassing multiple levels of cognitive functioning (Chen et al., 2024). At the neural level, regular mindfulness practice leads to structural brain changes, including increased gray matter thickness in key brain regions associated with working memory (Roshan Zamir et al., 2023). At the cognitive level, mindfulness training strengthens sustained and selective attention, thereby enhancing the ability to filter distracting stimuli such as intrusive obsessive thoughts. Moreover, by reducing rumination, mindfulness frees valuable cognitive resources that can be allocated to information processing in working memory (Zamani & Zare, 2022).

From an emotional perspective, mindfulness reduces stress and anxiety levels, which are known to negatively affect working memory performance, thereby creating more optimal conditions for cognitive functioning (Farhadi et al., 2018).

These mechanisms operate synergistically, leading to sustained behavioral improvements in accuracy, speed, and overall working memory performance (Bachmann et al., 2018). Unlike the short-term effects observed in some psychological interventions, improvements resulting from mindfulness training tend to be more durable, as they are associated with long-lasting structural changes in neural networks (Johnson et al., 2025). Ultimately, these improvements represent part of a broader transformation in the cognitive–emotional functioning of patients (Chen et al., 2024).

The findings also demonstrated that mindfulness training significantly improved executive functions in patients with OCD, such that both the overall executive function score and its subscales showed improvement. These results are consistent with the findings reported by Mohseni Nasab et al. (2024), Asgari et al. (2024), Kalaher et al. (2021), Johnson et al. (2025), Dong, Li, and Zhab (2023), and Kashyap et al. (2019).

In explaining these findings, it can be suggested that mindfulness training, as an effective therapeutic intervention, exerts significant effects on the enhancement of executive functions in individuals with OCD. These effects occur through several mechanisms that directly or indirectly influence the cognitive and emotional functioning of patients.

Mindfulness improves emotional self-regulation, helping patients manage negative emotions such as fear and anxiety, which often disrupt executive functioning (Kashyap et al., 2019). This training also enhances self-motivation, strengthening patients' ability to maintain motivation and effort toward long-term goals (Mohseni Nasab et al., 2024).

Furthermore, mindfulness contributes to improved time management, helping individuals prioritize tasks and reduce time loss caused by obsessive thoughts, thereby increasing efficiency (Asgari et al., 2024). It also enhances information organization and problem-solving abilities, enabling patients to process information more effectively and develop creative solutions (Dong et al., 2023).

Another crucial component is the enhancement of self-control and inhibitory capacity. Mindfulness increases awareness of thoughts and behaviors, enabling individuals to better control impulses and inhibit unwanted responses and repetitive behaviors (Kalaher et al., 2021).

The neural mechanisms underlying these improvements are largely related to increased activity in the prefrontal regions of the brain, which are responsible for emotion regulation, motivation, organization, and inhibitory control. Overall, mindfulness simultaneously influences these interconnected components, resulting in a comprehensive improvement in executive functioning.

In summary, the findings of this study indicate that mindfulness training is an effective intervention for improving the cognitive functioning of patients with OCD. This training simultaneously enhances working memory (by increasing accuracy and processing speed) and executive functions (including self-control, cognitive flexibility, problem-solving, and emotional regulation).

The mechanisms underlying these improvements involve strengthening attentional processes, reducing stress and anxiety, and producing beneficial neurocognitive changes. In addition to improving cognitive symptoms, this intervention also reduces emotional burden and enhances patients' quality of life.

Despite these promising findings, several limitations should be acknowledged. The main limitations include the relatively small sample size, the exclusive focus on patients with OCD, and the fact that the study was conducted only in Tehran, which may limit the generalizability of the findings.

Therefore, future studies are recommended to use larger sample sizes and conduct research across multiple treatment centers in different geographical regions of the country. Additionally, investigating the combined effects of mindfulness with other cognitive interventions and developing shorter intervention protocols may provide valuable insights.

From a practical perspective, incorporating mindfulness training into standard OCD treatment protocols, developing educational programs for families, and integrating mindfulness into preventive programs in schools and university counseling centers could facilitate the practical application of the findings of this study.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Islamic Azad University.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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