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The Effectiveness of Mindfulness-Based Cognitive Behavioral Therapy on Anxiety and Emotion Regulation in Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD)

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ABSTRACT

Purpose: The aim of the present study was to examine the effectiveness of mindfulness-based cognitive behavioral therapy (MB-CBT) on anxiety and emotion regulation in adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD).

Methods and Materials: This research was applied in nature and employed a quasi-experimental design with a pre-test–post-test format, including a control group and random assignment of participants. The statistical population consisted of all adolescents aged 12–16 with ADHD who visited the Rah-e-No Counseling Center in District 3 of Tehran in 2024. Using purposive sampling, 30 adolescents were selected and assigned to the experimental group (n = 15) and the control group (n = 15). The experimental group underwent ten 60-minute sessions of mindfulness-based cognitive behavioral therapy, while the control group did not receive any treatment. Data were collected using the Anxiety Inventory (Beck et al., 1988) and the Emotion Regulation Questionnaire (Garnefski & Kraaij, 2006). The data obtained from the questionnaires were analyzed using SPSS version 27 in both descriptive and inferential sections (ANCOVA).

Findings: The results indicated that mindfulness-based cognitive behavioral therapy led to a significant reduction in anxiety and an increase in positive emotion regulation.

Conclusion: These findings suggest that MB-CBT can be considered an effective intervention for reducing anxiety and improving emotion regulation in adolescents diagnosed with ADHD.

Keywords: Anxiety, Emotion Regulation, Mindfulness-Based Cognitive Behavioral Therapy, Attention-Deficit/Hyperactivity Disorder (ADHD)

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a prevalent neurodevelopmental disorder affecting approximately 3% to 7% of school-aged children, with boys being diagnosed more frequently than girls at a ratio ranging from 1.9 to 2.1 to 1 (Smith et al., 2024). The etiological basis of ADHD is multifaceted and includes genetic predispositions, developmental anomalies, neurochemical and neurophysiological disruptions, brain injuries, and psychosocial factors (Eisenberg & Palmer, 2024). Children and adolescents with ADHD often struggle with peer relationships, leading to significant limitations in opportunities for social skill development and meaningful social engagement. Their hyperactive behaviors, often perceived as erratic and intolerable, frequently result in social exclusion and rejection by peers, contributing to broader social impairments (Eisenberg & Palmer, 2024).

A common comorbid condition in adolescents with ADHD is anxiety, which is not only widespread but also chronic and debilitating, incurring substantial psychological burden on the individual and considerable economic costs to society (Torres-Granados et al., 2023). Anxiety disorders encompass a spectrum of conditions characterized by excessive fear, anxiety, and associated behavioral disturbances (Crone et al., 2023). According to DSM-5, the primary anxiety disorders include specific phobia, social anxiety disorder, panic disorder, agoraphobia, and generalized anxiety disorder (GAD), along with childhood-related disorders such as separation anxiety and selective mutism (Prasetya et al., 2023). Epidemiological studies estimate the lifetime prevalence of anxiety disorders to be between 25% and 40%, highlighting their profound impact on social, academic, familial, and occupational functioning (Aune et al., 2023). When untreated, anxiety disorders often become chronic and are commonly comorbid with mood disorders, various addictions, and significantly reduced quality of life (Ergisi et al., 2022). These disorders also correlate with psychological and social dysfunctions, including deficits in emotion regulation—a core challenge for adolescents with ADHD (Karbalaee et al., 2023; Poppleton et al., 2019).

Emotion regulation is a fundamental skill that enables adolescents with ADHD to manage the challenges and stressors encountered in academic and daily life. These individuals often experience intense and complex emotional responses, necessitating the ability to identify and understand both positive and negative emotions, and to

comprehend how emotions influence behavior and cognition (Smith et al., 2023). Poor emotion regulation is associated with increased anxiety and stress, particularly in the face of high expectations, academic pressure, and fear of failure. This can negatively impact cognitive functioning, concentration, academic performance, and self-efficacy. Inadequate regulation also impairs peer relationships, as these adolescents may find it difficult to respond adaptively to the emotions and needs of others (Chang & Taxer, 2021; Volkaert et al., 2024).

Moreover, impaired emotion regulation may lead to maladaptive coping strategies, such as deliberately increasing stress to remain stimulated, which exacerbates both physical and psychological issues. It may also result in neglect of basic self-care practices, including nutrition and sleep, further diminishing energy and overall functioning (De Neve et al., 2023). Research has shown that poor emotion regulation is significantly associated with heightened anxiety and stress (Duplenne et al., 2024), lower academic achievement (Faisal & Ghani, 2015), reduced self-efficacy (Merriman, 2012), diminished self-confidence (Alexopoulou et al., 2019), poorer interpersonal relationships (Nourali et al., 2018), and decreased academic motivation and self-concept (Hāshemi & Khorouti, 2020).

One of the third-wave psychological therapies that has demonstrated efficacy in addressing anxiety and emotion regulation is Mindfulness-Based Cognitive Behavioral Therapy (MB-CBT) (Francis et al., 2024). Research suggests that individuals who engage in mindfulness practices experience reduced anxiety, improved interpersonal relationships, enhanced learning, better emotion regulation, and improved mental and physical health outcomes (Lee & Cho, 2021; Sedaghat et al., 2022). MB-CBT integrates traditional cognitive-behavioral techniques with mindfulness training to target both cognitive and affective processes underlying psychopathology (Strauss et al., 2023).

The core mechanisms of mindfulness—such as present-moment awareness, acceptance, desensitization, and nonjudgmental observation—are thought to reduce anxiety symptoms and enhance treatment outcomes (Sverre et al., 2023). The Kabat-Zinn mindfulness protocol includes body scanning and intentional focus on bodily sensations in a nonjudgmental manner (Fortuna et al., 2023). Through mindfulness exercises, individuals learn to respond rather than react to emotional distress, viewing experiences as transient and external to the self (Oraki et al., 2022). MB-CBT emphasizes relapse prevention, identifying high-risk

situations, and fostering adaptive coping strategies. Clients are trained to attentively observe emotional and somatic states without automatic reactivity (Derlic, 2022).

Mindfulness-based practices, such as mindfulness meditation, Vipassana, and yoga, have been linked to reductions in pain, anxiety, depression, and stress across various populations (Burns et al., 2022; John et al., 2022). Short-term mindfulness training has also been shown to improve mood and enhance emotional regulation (Elham et al., 2022). Moreover, MB-CBT contributes to reductions in anxiety and stress while improving confidence and emotional functioning (Dolan et al., 2022).

Adolescents with ADHD, due to the inherent challenges of their condition, often experience significant impairments in both anxiety regulation and emotional control. These difficulties can adversely affect their quality of life, social relationships, and academic outcomes. Given the rising prevalence of anxiety disorders among this demographic and the pivotal role of emotion regulation in mental health, there is a pressing need for evidence-based therapeutic interventions. In this context, MB-CBT emerges as a promising and innovative approach. By fostering mindful awareness and acceptance of internal experiences, MB-CBT equips adolescents with adaptive strategies for managing anxiety and emotional dysregulation.

Despite the growing body of evidence supporting MB-CBT, there is a notable gap in research specifically targeting its efficacy in adolescents with ADHD. This study aims to address this gap by investigating the impact of mindfulness-based cognitive behavioral therapy on anxiety and emotion regulation in adolescents diagnosed with ADHD. It seeks to answer the central question: *Is mindfulness-based cognitive behavioral therapy effective in reducing anxiety and enhancing emotion regulation in adolescents with Attention-Deficit/Hyperactivity Disorder?*

2. Methods and Materials

2.1. Study Design and Participants

The present study utilized a quasi-experimental method with a pre-test–post-test control group design. The statistical population consisted of all adolescents aged 12–16 with hyperactivity who attended the Rah-e-No Counseling Center in District 3 of Tehran in 2024. To select the sample, the Anxiety Inventory and the Emotion Regulation Questionnaire were distributed among the adolescents. Thirty individuals who scored above the cutoff point on the Anxiety Inventory and below the cutoff point on the

Emotion Regulation Questionnaire were selected via purposive sampling and were randomly assigned to experimental and control groups (15 participants per group). The experimental group received mindfulness-based cognitive behavioral therapy over ten 60-minute sessions (twice weekly), while the control group received no intervention.

Inclusion criteria included: high anxiety scores and low emotion regulation scores based on the employed questionnaires, willingness to participate, attendance in group sessions with signed informed consent, no severe physical illness (based on health records), no history of epileptic seizures, absence of severe behavioral disorders, confirmed diagnosis of ADHD, age 12 or older, and an IQ above 90. Exclusion criteria included: absence in more than two sessions, presence of serious academic problems, comorbid Axis I disorders, lack of interest in completing the questionnaires, or unwillingness to cooperate further in the study.

Ethical considerations included maintaining confidentiality of collected information, obtaining informed consent, ensuring participants' data would not be disclosed to others, and establishing a reassuring and secure environment. A briefing session was held and informed consent forms were distributed. For anonymity and proper random assignment, participants in both groups were assessed on anxiety and emotion regulation before the sessions commenced. The experimental group then received mindfulness-based cognitive behavioral therapy. After the intervention sessions concluded, both groups were reassessed using the same research instruments.

2.2. Measures

a) Beck Anxiety Inventory (1988): This is a unidimensional scale with no subscales, consisting of 21 items. Scoring is based on a 4-point Likert scale: “Not at all” (0), “Mildly—it didn’t bother me much” (1), “Moderately—it was very unpleasant but I could stand it” (2), and “Severely—I could barely stand it” (3). Total scores range from 0 to 63. Scores from 0–9 indicate normal anxiety, 10–18 mild to moderate anxiety, 19–29 moderate to severe anxiety, and 30–63 severe anxiety. The cutoff point is 22 and above. Within Iran, the reliability and validity of the scale have been assessed: Cronbach’s alpha was reported as .90 for females, .78 for males, and .81 overall. Internationally, Beck, Steer, and Brown (1996) reported Cronbach’s alpha of .92 and validity coefficient of .67. Other studies have

reported internal consistency ranging from .90 to .94 and test-retest reliability over seven weeks with a correlation of .62. Additional research has reported Cronbach's alpha of .95, split-half reliability of .92, and alpha of .91.

b) Emotion Regulation Questionnaire (2006): This questionnaire consists of 18 items measuring emotion regulation strategies in response to threatening or stressful life events, using a 5-point Likert scale ranging from 1 (never) to 5 (always), across nine subscales: Self-Blame (items 1, 2), Blaming Others (17, 18), Rumination (5, 6), Catastrophizing (15, 16), Positive Refocusing (7, 8), Refocus on Planning (9, 10), Positive Reappraisal (11, 12), Putting into Perspective (13, 14), and Acceptance (3, 4). Higher scores indicate greater use of the respective cognitive strategy. Each subscale score is obtained by summing its two items. The adaptive strategies score is the average of five subscales (Positive Refocusing, Refocus on Planning, Positive Reappraisal, Putting into Perspective, and Acceptance), and the maladaptive strategies score is the average of four subscales (Self-Blame, Blaming Others, Rumination, and Catastrophizing). Cronbach's alpha coefficients for the subscales range from .71 to .81, and test-retest reliability over 14 days ranges from .48 to .61. Emotion regulation strategies can be viewed along a single dimension (cognitive coping) or divided into more adaptive (positive/effective) and less adaptive (negative/ineffective) strategies. The adaptive strategies include Positive Refocusing, Planning, Positive Reappraisal, Putting into Perspective, and Acceptance. Maladaptive strategies include Self-Blame, Blaming Others, Rumination, and Catastrophizing. In Iran, alpha coefficients for subscales have been reported to range from .62 to .91, with test-retest reliability over one week ranging from .75 to .88. Factor analysis using principal component analysis revealed a seven-factor structure comprising: Positive Refocusing/Planning, Positive Reappraisal/Perspective, Acceptance, Blaming Others, Self-Blame, Rumination, and Catastrophizing. Content validity was verified by eight psychology experts, and Kendall's concordance coefficients for subscales ranged from .81 to .92.

2.3. Intervention

The intervention consisted of a 10-session anger management program developed by Jeffrey Kelly (2009) at the University of Philadelphia and tested in clinical trials. In Iran, this protocol was employed by Sedaghat and colleagues (2022) and demonstrated high content validity. The protocol

follows a structured mindfulness-based CBT format and includes: setting the agenda, a brief review of mood states, reviewing the previous session, going over homework, discussing session-specific topics, assigning new homework, summarizing discussions, and providing feedback. Each session lasts approximately 60 minutes. All components must be addressed during each session, though some topics may extend into subsequent sessions. In such cases, unfinished activities are prioritized in the next session's agenda.

In the first session, participants identified their personal goals for treatment. The second session introduced the nature of anger, including its physiological, cognitive, emotional, and behavioral dimensions, accompanied by assertiveness training. The third session focused on identifying anger triggers through body scan mindfulness exercises. The fourth session taught seated meditation for managing anger, while the fifth session emphasized integrating mindfulness into daily life, particularly through focused breathing. In the sixth session, participants practiced using the three-minute breathing space as a coping mechanism during anger-provoking situations. The seventh session addressed attitudinal factors and their influence on anger management, encouraging reflection on personal experiences. The eighth session introduced structured problem-solving skills. The ninth session focused on consolidating the mindfulness and cognitive behavioral components through review and application. Finally, the tenth session encouraged participants to reflect on remaining challenges and personal growth, reinforcing their understanding and use of mindfulness practices. Throughout the protocol, participants engaged in home practice assignments such as completing worksheets, meditative breathing, and reflective journaling to reinforce skills learned in each session.

2.4. Data Analysis

Data collected through the questionnaires were analyzed using SPSS version 27, applying both descriptive and inferential statistics, specifically analysis of covariance (ANCOVA).

3. Findings and Results

This section presents descriptive statistics of the collected data, followed by an examination of the potential differences between the groups across different assessment stages. Descriptive information on anxiety and emotion regulation

is presented in Table 1, separated by pre-test and post-test stages for the experimental and control groups.

Table 1

Descriptive Information on Anxiety and Emotion Regulation by Assessment Stage and Group

Variable	Statistical Index	Experimental Group (Pre-Test)	Experimental Group (Post-Test)	Control Group (Pre-Test)	Control Group (Post-Test)
Anxiety	Mean	29.73	10.20	29.92	30.00
	SD	4.52	5.30	4.23	4.83
Self-Blame	Mean	11.60	8.67	10.60	10.80
	SD	1.55	1.35	1.92	2.43
Other-Blame	Mean	13.80	12.67	13.47	13.73
	SD	1.01	2.16	1.77	2.37
Catastrophizing	Mean	12.33	10.67	12.00	12.27
	SD	1.18	1.84	1.60	1.83
Rumination	Mean	13.47	10.87	12.27	11.93
	SD	1.68	1.64	2.05	1.58
Acceptance	Mean	8.53	10.47	8.60	7.93
	SD	1.96	3.42	1.99	2.02
Positive Refocusing	Mean	10.80	11.67	10.53	10.60
	SD	0.94	1.35	1.06	1.50
Planning	Mean	8.07	11.93	7.87	7.47
	SD	1.87	5.06	2.00	2.97
Positive Reappraisal	Mean	9.60	12.13	9.60	9.27
	SD	1.30	1.85	0.99	1.22
Perspective Taking	Mean	9.47	12.60	8.13	7.93
	SD	2.83	2.59	2.56	2.09

As shown, the mean scores of the experimental group in the post-test stage show a reduction in anxiety and negative emotion regulation strategies and an increase in positive regulation strategies compared to the pre-test stage. Based on the results in the table, it can be concluded that the

implementation of mindfulness-based cognitive behavioral therapy improved anxiety and emotion regulation components in adolescents diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD).

Table 2

One-Way ANCOVA in the Context of Multivariate Covariance Analysis (Anxiety)

Variable	SS	df	MS	F	P	η^2
Pre-test	5027.60	1.00	5027.60	106.82	0.001	0.70
Group	683.17	1.00	683.17	14.51	0.001	0.24
Error	2118.06	45.00	47.07			
Total	166544.50	48.00				

The results presented in Table 2 indicate that, after controlling for the pre-test variable, and based on the calculated F-statistic, there is a statistically significant difference between the adjusted mean anxiety scores of participants based on group membership (experimental vs. control) in the post-test stage ($p < .05$). Therefore, considering the adjusted means reported in Table 2, it can be concluded that mindfulness-based cognitive behavioral therapy had a greater impact on reducing anxiety in the

experimental group compared to the control group. The effect size (practical significance) was .24, meaning that 24% of the total variance or individual differences in anxiety among adolescents with ADHD was accounted for by the intervention.

4. Discussion and Conclusion

The primary aim of this study was to examine the effectiveness of mindfulness-based cognitive behavioral therapy (MB-CBT) on reducing anxiety and improving emotion regulation in adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD). The findings indicated that the intervention had a statistically significant effect on lowering anxiety and enhancing several components of emotion regulation, including self-blame, catastrophizing, acceptance, planning, positive reappraisal, and perspective-taking. These outcomes suggest that MB-CBT serves as an effective intervention for addressing both the emotional and cognitive challenges associated with ADHD in adolescence.

The results showed a significant decrease in anxiety levels in the experimental group compared to the control group, even after controlling for pre-test scores. This finding aligns with previous studies that have documented the efficacy of mindfulness-based interventions in reducing anxiety symptoms across different populations (Burns et al., 2022; Duplenne et al., 2024). For instance, Burns et al. (2022) demonstrated that mindfulness-based stress reduction produced substantial reductions in anxiety and improved pain management, while Duplenne et al. (2024) reported a meta-analytic confirmation of reduced anxiety in gifted individuals after mindfulness-based therapy. These findings reinforce the claim that mindfulness—when integrated with CBT—effectively alleviates cognitive symptoms of anxiety, including rumination, excessive worry, and negative anticipatory thoughts, which are especially prevalent in adolescents with ADHD.

Emotion regulation components also showed significant improvements among participants who received MB-CBT. These results are consistent with the theoretical premise that mindfulness enhances emotional awareness, reduces reactivity, and supports adaptive coping strategies (Francis et al., 2024; Strauss et al., 2023). The increases observed in the experimental group's use of positive emotion regulation strategies, such as acceptance and reappraisal, align with the cognitive mechanisms promoted in mindfulness practice—particularly the development of meta-cognitive awareness and nonjudgmental acceptance of internal experiences (Francis et al., 2024; Sverre et al., 2023). Strauss et al. (2023) emphasized that MBCT promotes cognitive decentering and regulation of emotional responses through increased present-moment awareness, which is particularly beneficial

for individuals who struggle with impulsivity and emotional lability, both of which are core features of ADHD.

Moreover, the reduction in maladaptive emotion regulation strategies, including self-blame and catastrophizing, provides empirical support for the cognitive restructuring component of MB-CBT. These changes are in line with previous research suggesting that MB-CBT reduces automatic negative thoughts by fostering attentional control and promoting psychological flexibility (Shojaeian et al., 2023; Volkaert et al., 2024). Volkaert et al. (2024) argued that affective flexibility—the ability to shift emotional responses based on context—is closely tied to mindfulness practices, and is often impaired in adolescents with internalizing disorders. Shojaeian et al. (2023) found similar improvements in cognitive flexibility and reductions in impulsivity in adolescents with internet addiction after undergoing MB-CBT, which further validates the relevance of this intervention for impulsive populations such as those with ADHD.

The observed improvements in adaptive strategies such as planning and perspective-taking in the MB-CBT group highlight another key strength of mindfulness-based approaches: their ability to engage executive functioning processes. These processes are often underdeveloped in adolescents with ADHD, leading to deficits in forward-thinking and self-monitoring (Hazrati & Abdi, 2024; Karimi & Ghafouri, 2022). The current results are consistent with Karimi and Ghafouri's (2022) findings, which emphasized the need for targeted interventions to enhance planning and attention regulation in hyperactive/inattentive children. MB-CBT appears to fulfill this need by helping participants regulate emotional interference that otherwise impairs goal-directed behavior.

Additionally, the post-treatment increase in acceptance supports prior research suggesting that mindfulness practices facilitate emotional resilience by promoting a non-reactive and accepting attitude toward distressing internal experiences (Dolan et al., 2022; Oraki et al., 2022). Dolan et al. (2022), in their comparative review of mindfulness and CBT in perinatal grief, observed similar benefits of acceptance training for emotional distress. Oraki et al. (2022) demonstrated that MB-CBT improved adaptability and reduced perceived stress in cancer patients, highlighting the intervention's broad applicability for emotion dysregulation across clinical populations.

The improvements in perspective-taking, an important component of emotional intelligence and social cognition, are particularly significant in the context of ADHD, where

interpersonal difficulties are common. Adolescents with ADHD often struggle with empathy, impulse control, and understanding others' perspectives, leading to social rejection and isolation (Eisenberg & Palmer, 2024; Nourali et al., 2018). The increase in this variable suggests that MB-CBT not only improves intrapersonal emotional control but may also contribute to better interpersonal functioning. This finding is supported by the work of Nourali et al. (2018), who found that training in cognitive emotion regulation improved social adjustment and well-being in gifted adolescents.

The current findings further echo the notion that MB-CBT improves mental health outcomes by enhancing mindfulness skills, increasing psychological flexibility, and integrating cognitive reappraisal techniques, all of which are fundamental for regulating emotions in challenging situations (Crone et al., 2023; Lee & Cho, 2021). Lee and Cho (2021) described the integration of mindfulness with traditional CBT as a framework particularly suitable for emotion dysregulation in depressive and anxiety disorders. The improvements observed in this study among adolescents with ADHD suggest a similar mechanism may be at play—one that targets both the attentional and emotional domains of dysfunction.

In summary, the results confirm that MB-CBT is an effective therapeutic strategy for reducing anxiety and enhancing emotion regulation in adolescents with ADHD. These improvements were observed not only in symptom reduction but also in underlying psychological processes and strategies, suggesting that the intervention fosters lasting emotional competence and mental health resilience.

Despite the promising findings, this study has several limitations. The sample size was relatively small and drawn from a specific geographic region, which may limit the generalizability of the results. Additionally, the reliance on self-report questionnaires could introduce response bias, as adolescents might underreport or overreport their emotional states. The study also did not include a long-term follow-up to assess the sustainability of the therapeutic effects of MB-CBT over time. Furthermore, other confounding factors such as family environment, medication status, or comorbid disorders were not controlled, which may have influenced the observed outcomes.

Future studies should aim to replicate these findings using larger, more diverse samples, and across different cultural contexts to enhance external validity. Incorporating longitudinal designs with multiple follow-up assessments would help determine the durability of MB-CBT's effects.

Additionally, future research could employ multi-informant and behavioral observation methods to complement self-report measures. It would also be beneficial to compare MB-CBT with other third-wave therapies (e.g., Acceptance and Commitment Therapy) in adolescents with ADHD to identify the most effective intervention modalities for this population.

Based on the results, practitioners working with adolescents with ADHD are encouraged to incorporate mindfulness-based cognitive behavioral techniques into their therapeutic practice. Interventions should be tailored to address the emotional and attentional challenges specific to this population, with an emphasis on enhancing emotion regulation strategies such as acceptance, cognitive reappraisal, and perspective-taking. School counselors and mental health professionals may also consider implementing MB-CBT programs in educational settings to support students with ADHD in managing anxiety, improving emotional skills, and fostering better academic and social outcomes.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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