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The Effectiveness of Mindfulness on Selective Attention, Visuospatial Memory, and Academic Performance in Elementary School Students with Attention-Deficit/Hyperactivity Disorder

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A B S T R A C T

The present study aimed to examine the effectiveness of a mindfulness training program on selective attention, visuospatial memory, and academic performance in elementary school students diagnosed with ADHD. This study employed a quasi-experimental design with a pretest–posttest control group. A total of 30 elementary school students diagnosed with ADHD were randomly assigned to an experimental group (n = 15) and a control group (n = 15). The experimental group participated in eight 45-minute sessions of a mindfulness training program based on Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) protocols, while the control group continued with routine school activities. Selective attention was assessed using the Stroop Test, visuospatial memory was measured with the Corsi Block-Tapping Test, and academic performance was evaluated through continuous assessment scores and an Academic Performance Questionnaire. Data were analyzed using analysis of covariance (ANCOVA) while controlling for pretest effects. The findings indicated that the mindfulness intervention led to significant improvements in selective attention, visuospatial memory, and academic performance in the experimental group compared with the control group. In addition, correlations between cognitive indices and academic performance increased following the intervention, highlighting the role of cognitive mechanisms in enhancing academic achievement. Mindfulness training can serve as an effective complementary intervention alongside other treatment approaches to improve cognitive and academic functioning in students with ADHD. It is recommended that mindfulness programs be implemented in schools with the involvement of parents and teachers. Future research should incorporate follow-up periods, larger sample sizes, and neuropsychological indicators to further elucidate the mechanisms underlying these effects.

Keywords: *Attention-Deficit/Hyperactivity Disorder; Mindfulness; Selective Attention; Visuospatial Memory; Academic Performance.*

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent neurodevelopmental disorders in childhood and adolescence, characterized by persistent patterns of inattention, hyperactivity, and impulsivity that interfere with functioning or development. These symptoms often emerge in early childhood and may persist into adolescence and adulthood, exerting long-term effects on academic achievement, social relationships, emotional well-being, and overall quality of life (Ghandkanlou, 2025; Sultan et al., 2025). Among school-aged students, ADHD is strongly associated with difficulties in sustained and selective attention, executive functioning deficits, impaired working memory, and poor academic outcomes, making it a major concern for educational and mental health systems worldwide (Holopainen et al., 2025; Lee et al., 2022).

Academic underachievement is one of the most consistently reported functional impairments among students with ADHD. Empirical evidence indicates that deficits in attentional control, inhibitory processes, and working memory significantly undermine students' ability to follow classroom instructions, complete tasks accurately, and engage effectively in learning activities (Ghandkanlou, 2025; Wang, 2025). These cognitive vulnerabilities often coexist with emotional dysregulation and heightened academic anxiety, further compounding learning difficulties and increasing the risk of negative academic trajectories (Jaismin et al., 2025; Kong et al., 2025). As a result, interventions that target both cognitive and emotional mechanisms are increasingly emphasized in contemporary ADHD research and practice.

Pharmacological treatments, particularly stimulant medications, remain a first-line intervention for ADHD and have demonstrated efficacy in reducing core symptoms in the short term. However, medication alone does not adequately address broader cognitive, emotional, and academic functioning, and concerns persist regarding side effects, adherence, long-term sustainability, and parental acceptance (Lee et al., 2022; Sultan et al., 2025). Consequently, there has been growing interest in complementary and non-pharmacological interventions that can enhance self-regulation, executive functioning, and adaptive coping skills in students with ADHD, particularly within school-based contexts (Holopainen et al., 2025; Monsillion et al., 2025).

Mindfulness-based interventions have emerged over the past two decades as a promising approach for addressing attentional and self-regulatory difficulties in both clinical and non-clinical populations. Mindfulness is commonly defined as purposeful, non-judgmental attention to present-moment experiences, including thoughts, emotions, bodily sensations, and external stimuli (Flook et al., 2025; Zhong et al., 2024). By cultivating awareness and attentional control, mindfulness practices are theorized to strengthen executive functions, reduce impulsive responding, and enhance emotional regulation—processes that are particularly impaired in individuals with ADHD (Aboalola, 2023; Mohammadzadegan et al., 2023).

Neurocognitive models suggest that mindfulness training may exert its effects through improvements in top-down attentional control and inhibitory mechanisms, thereby reducing susceptibility to distraction and enhancing selective attention (Mohseni Nasab et al., 2024; Zhong et al., 2024). Experimental studies have demonstrated that even brief mindfulness meditation practices can improve attentional stability and increase dispositional mindfulness, supporting the plausibility of mindfulness as a mechanism-based intervention for attentional disorders (Zhong et al., 2024). These findings are particularly relevant for students with ADHD, whose core impairments are closely tied to dysregulated attention and executive functioning.

A growing body of empirical research has examined the effects of mindfulness-based interventions on ADHD symptoms and related cognitive outcomes in children and adolescents. Systematic reviews and meta-analyses have reported moderate improvements in attention, executive functions, and behavioral regulation following mindfulness-based programs, although variability in intervention design and outcome measures remains a challenge (Lee et al., 2022; Sultan et al., 2025). Despite these limitations, the accumulating evidence supports mindfulness as a viable complementary approach to traditional ADHD treatments.

At the individual level, mindfulness-based interventions have been shown to improve executive functions, including working memory, cognitive flexibility, and inhibitory control, in children with ADHD (Aboalola, 2023; Mohammadzadegan et al., 2023). Improvements in these domains are particularly relevant for academic functioning, as executive processes underpin essential learning skills such as task planning, error monitoring, and sustained engagement. Furthermore, mindfulness training has been associated with reductions in emotional reactivity and enhanced emotional self-regulation, which may indirectly

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support academic engagement and persistence (Jaismin et al., 2025; Mohammadzadegan et al., 2023).

School-based mindfulness programs have gained increasing attention due to their scalability and potential for universal or targeted implementation. Evidence from school settings suggests that mindfulness interventions can be feasibly integrated into educational routines and may yield benefits in attention, behavior, and socio-emotional competence among students (Flook et al., 2025; Monsillion et al., 2025). In a cluster randomized controlled trial, Holopainen et al. demonstrated that a universal school mindfulness program was associated with reductions in ADHD symptoms among adolescents, highlighting the potential preventive and supportive role of mindfulness within educational systems (Holopainen et al., 2025).

In addition to symptom reduction, recent research has increasingly focused on academic and psychosocial outcomes associated with mindfulness training. Studies have reported positive effects of mindfulness on academic resilience, academic anxiety, and overall academic performance, suggesting that mindfulness may support learning through both cognitive and emotional pathways (Alamro, 2025; Jaismin et al., 2025; Wang, 2025). For students with ADHD, who are particularly vulnerable to academic stress and failure experiences, these findings underscore the relevance of mindfulness as an intervention that addresses both performance and well-being.

Technological and innovative formats of mindfulness delivery have also been explored in recent years. For example, mindfulness e-activities and digital interventions have shown promising effects on academic resilience and self-regulation in students with ADHD, offering flexible and accessible alternatives to traditional face-to-face programs (Alamro, 2025). Such developments are particularly relevant in contexts where access to specialized mental health services is limited.

Despite the growing evidence base, several gaps remain in the literature. First, many studies have focused primarily on symptom reduction rather than specific cognitive processes such as selective attention and visuospatial working memory, which are critical for academic learning but remain underexplored in mindfulness research on ADHD (Aboalola, 2023; Mohseni Nasab et al., 2024). Second, while executive functions are frequently assessed, fewer studies have directly examined how mindfulness-related cognitive changes translate into measurable improvements in academic performance using both subjective and objective indicators (Ghandkanlou, 2025; Wang, 2025).

Furthermore, cultural and contextual factors may influence the effectiveness and acceptability of mindfulness interventions. Studies conducted in non-Western and Middle Eastern contexts highlight the importance of culturally sensitive program design and local validation of outcomes (Rafat & Arefi, 2022; Safari et al., 2023). Research in Iran and neighboring regions has shown that mindfulness-based interventions can reduce parent–child tension, improve emotional regulation, and alleviate anxiety in children with ADHD, suggesting their relevance across diverse sociocultural settings (Rafat & Arefi, 2022; Safari et al., 2023).

Another important consideration is the role of family and school environments in shaping intervention outcomes. Mindfulness-based parenting programs have demonstrated effectiveness in reducing parenting stress and improving parent–child interactions in families of children with ADHD, which may indirectly enhance children's academic and emotional functioning (Sultan et al., 2022). These findings suggest that mindfulness interventions may exert multi-level effects, influencing not only individual cognitive processes but also relational and contextual factors that support learning.

Recent advances in mindfulness research have also emphasized the integration of mindfulness with cognitive training approaches. Hybrid interventions that combine mindfulness practices with targeted cognitive exercises may offer synergistic benefits for children with ADHD by simultaneously strengthening attentional control and working memory capacities (Badia-Aguarón et al., 2024). Such integrative models align with contemporary neuropsychological frameworks that conceptualize ADHD as a disorder of distributed cognitive control networks rather than isolated behavioral symptoms.

Given the strong theoretical and empirical links between attention, working memory, and academic performance, there is a clear need for studies that systematically examine the effects of mindfulness training on these interrelated domains in students with ADHD. Selective attention, in particular, plays a crucial role in classroom learning by enabling students to filter irrelevant stimuli and maintain focus on instructional content (Flook et al., 2025; Zhong et al., 2024). Similarly, visuospatial working memory supports reading, mathematics, and problem-solving tasks that require the temporary storage and manipulation of visual

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information (Mohseni Nasab et al., 2024; Rabipour et al., 2024).

While existing evidence supports the general efficacy of mindfulness-based interventions, further research is needed to clarify their impact on specific cognitive mechanisms and academic outcomes in well-defined student populations. Addressing these gaps is essential for informing evidence-based educational and clinical practices and for optimizing intervention design for students with ADHD across developmental stages and cultural contexts (Monsillion et al., 2025; Sultan et al., 2025).

Accordingly, the present study aimed to examine the effectiveness of a structured mindfulness training program on selective attention, visuospatial working memory, and academic performance in students diagnosed with Attention-Deficit/Hyperactivity Disorder.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a quasi-experimental design with a pretest–posttest control group. The aim was to examine the effect of a mindfulness training program on selective attention, visuospatial memory, and academic performance in students diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD). The statistical population included all lower secondary school students in Tehran during the 2024–2025 academic year. A sample of 30 students diagnosed with ADHD was selected using simple random sampling and randomly assigned to an experimental group (n = 15) and a control group (n = 15).

Inclusion criteria were as follows:

1. age between 12 and 16 years;
2. diagnosis of ADHD by a specialist based on DSM-5 criteria (American Psychiatric Association, 2013);
3. no concurrent psychological treatments;
4. willingness of the student and parental consent to participate in the study.

Exclusion criteria were as follows:

1. absence from more than two intervention sessions;
2. unstable use of psychiatric medication during the study period;
3. failure to complete the assessment instruments.

2.2. Measures

Selective attention was assessed using the Stroop Color–Word Test. The original version of this test was first developed by Stroop (1935) and has been widely used in neuropsychological and clinical research. The test consists of three pages (or sections), including color names, printed colors, and color words printed in incongruent ink colors. Participants are required to name the color of the ink rather than read the word, a task that demands response inhibition and sustained focus on the target stimulus. Scoring is typically based on completion time and number of errors, and the interference score is reported as the primary indicator of selective attention. This test shows strong alignment with executive function constructs and reflects an individual's ability to inhibit cognitive impulses. Numerous studies have reported adequate construct validity, convergent validity, and test–retest reliability for this instrument in Iranian child and adolescent populations, with average reliability coefficients exceeding 0.70 in domestic studies.

Visuospatial memory was measured using the Corsi Block-Tapping Test, which is a standard instrument for assessing visuospatial working memory capacity. This test was originally designed by Corsi and has since been extensively applied in cognitive and clinical domains, particularly in relation to neurodevelopmental disorders. The test consists of a set of blocks that the examiner taps in predetermined sequences, which the participant must reproduce in the same order. The primary score is based on the longest correctly reproduced sequence, representing the individual's short-term spatial memory capacity. Studies conducted in Iran have reported satisfactory convergent validity and reliability for this test and have demonstrated its ability to differentiate students with cognitive disorders from their typically developing peers. Cronbach's alpha coefficients reported for Iranian versions range from 0.71 to 0.84.

Academic performance was assessed using a standardized Academic Performance Questionnaire. This questionnaire typically consists of 20 to 30 items rated on a 5-point Likert scale. It evaluates domains such as academic achievement, participation in classroom activities, attention, and follow-through on academic tasks, with higher scores indicating better academic performance. In addition, students' annual grade point averages were used as an objective indicator of academic performance in the analyses, allowing the inclusion of both self-report data and objective

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educational criteria in the statistical analyses. In Iran, the content validity of this instrument has been evaluated and confirmed by experts, and Cronbach's alpha coefficients above 0.80 have been reported in domestic studies, indicating good internal consistency. Furthermore, criterion validity has been established through positive correlations with academic grades.

2.3. Intervention

Intervention Protocol: The mindfulness training intervention consisted of eight structured sessions, each lasting 45 minutes, delivered in a group format and progressively designed to enhance attentional control, self-regulation, and learning-related cognitive functions. The program began with an introduction to mindfulness and present-moment awareness, emphasizing the role of attention in learning through brief mindful breathing exercises and reflective discussion on distractibility. Subsequent sessions focused on strengthening visual and auditory attention via sensory awareness practices, followed by training in impulse control using the "stop–attend–choose" strategy to promote response inhibition. Selective attention was further developed through techniques for managing distracting stimuli, including simplified body scan practices and focused-attention exercises. Visuospatial memory was targeted through structured mindfulness-based games emphasizing spatial location, sequencing, and mental mapping. Emotional regulation skills were cultivated by helping students identify, label, and accept emotions without judgment, supported by guided imagery and relaxation practices. The program then emphasized the generalization of mindfulness skills to academic contexts through mindful studying techniques, task planning, and short attentional pauses during schoolwork. The final session consolidated all acquired skills, reviewed individual progress, introduced mindful gratitude practices, and supported students in developing a plan for continuing daily mindfulness practice for 5–10 minutes beyond the intervention period.

2.4. Data Analysis

Initially, the data were examined for normality, anomalies, and outliers. Subsequently, analysis of covariance (ANCOVA) was used to test the research hypotheses while controlling for pretest effects. Effect sizes were also examined by reporting eta squared values. All analyses were conducted using SPSS software version 27, with the significance level set at 0.05.

3. Findings and Results

Posttest means indicate that the experimental group showed substantial improvement across all three variables compared with the control group, whereas the control group did not exhibit significant change.

Table 1

Descriptive Statistics for Pretest and Posttest Scores on the Study Variables

Variable	Group	Phase	Mean	Standard Deviation
Selective Attention	Experimental	Pretest	38.20	4.91
		Posttest	46.87	5.14
	Control	Pretest	37.80	5.02
		Posttest	38.10	5.11
Visuospatial Memory	Experimental	Pretest	4.80	0.86
		Posttest	6.07	0.88
	Control	Pretest	4.93	0.79
		Posttest	5.00	0.82
Academic Performance	Experimental	Pretest	14.10	2.15
		Posttest	17.53	2.32
	Control	Pretest	14.40	2.09
		Posttest	14.65	2.11

The group effect was significant for all three variables, and the effect size indices indicate that the mindfulness intervention had a strong impact on selective attention, visuospatial memory, and academic performance.

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Table 2

Results of Analysis of Covariance (ANCOVA) for Posttest Group Comparisons

Variable	F	df	p	η^2
Selective Attention	18.42	1, 27	< .001	0.40
Visuospatial Memory	21.58	1, 27	< .001	0.44
Academic Performance	16.89	1, 27	< .001	0.38

Differences in adjusted means indicate that the observed changes in the experimental group relative to the control group are robust and attributable to the intervention effect.

Table 3

Pairwise Comparisons Controlling for Pretest Scores

Variable	Adjusted Mean Difference	Standard Error	p
Selective Attention	7.98	1.32	< .001
Visuospatial Memory	1.11	0.21	< .001
Academic Performance	2.85	0.56	< .001

4. Discussion

The present study examined the effectiveness of a structured mindfulness training program on selective attention, visuospatial memory, and academic performance in students diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD). The findings demonstrated that students in the experimental group showed statistically significant improvements across all three outcome variables compared with the control group, even after controlling for pretest scores. The magnitude of the observed effects, as indicated by large eta-squared values, suggests that mindfulness training exerted a robust and meaningful influence on both cognitive and academic domains. These results align with the growing body of evidence supporting mindfulness-based interventions as effective complementary approaches for addressing core cognitive and functional impairments associated with ADHD (Lee et al., 2022; Sultan et al., 2025).

The significant improvement in selective attention observed in the experimental group is consistent with theoretical models that conceptualize mindfulness as a training of attentional control and sustained awareness. Mindfulness practices require individuals to intentionally direct attention to present-moment stimuli while disengaging from irrelevant or distracting thoughts, a process that closely maps onto the construct of selective attention. Previous experimental and clinical studies have similarly reported enhancements in attentional control following mindfulness training, particularly in populations characterized by attentional dysregulation (Flook et al., 2025; Zhong et al., 2024). In the context of ADHD, where deficits in attentional filtering and response inhibition are central features, these findings underscore the relevance of mindfulness as an intervention that directly targets underlying cognitive mechanisms rather than merely alleviating behavioral symptoms (Aboalola, 2023; Mohammadzadegan et al., 2023).

The improvement in selective attention observed in this study is also consistent with school-based mindfulness research. Monsillion et al. reported that mindfulness interventions implemented in primary school settings were associated with better attentional engagement and classroom behavior, suggesting that mindfulness skills can be effectively generalized to educational contexts (Monsillion et al., 2025). Similarly, Holopainen et al. found that a universal mindfulness program reduced ADHD-related attentional symptoms among adolescents, reinforcing the notion that mindfulness can enhance attentional regulation even in non-clinical, school-wide applications (Holopainen et al., 2025). The present findings extend this literature by demonstrating that targeted mindfulness training can significantly improve selective attention in students with a formal ADHD diagnosis.

In addition to attentional gains, the experimental group exhibited significant improvements in visuospatial memory. This finding is particularly noteworthy, as visuospatial

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working memory is a critical yet often underexamined cognitive domain in mindfulness research on ADHD. Visuospatial memory plays a central role in academic tasks such as reading comprehension, mathematical reasoning, geometry, and problem solving, and deficits in this domain have been linked to poorer academic outcomes in students with ADHD (Ghandkanlou, 2025; Mohseni Nasab et al., 2024). The observed improvements suggest that mindfulness training may enhance working memory capacity by reducing cognitive interference and improving the allocation of attentional resources during information encoding and retrieval.

Previous studies provide convergent support for this interpretation. Rabipour et al. demonstrated that mindfulness-based therapy significantly improved working memory indices in clinical populations, suggesting that mindfulness may strengthen executive memory processes across diverse conditions (Rabipour et al., 2024). Similarly, Aboalola reported improvements in executive functions, including working memory, following mindfulness-based interventions in young children with ADHD (Aboalola, 2023). The present study adds to this literature by specifically highlighting gains in visuospatial memory, thereby addressing an important gap identified in prior reviews (Lee et al., 2022; Sultan et al., 2025).

One plausible explanation for the observed memory improvements lies in the role of mindfulness in enhancing meta-awareness and reducing automatic, stimulus-driven responding. By training students to pause, observe, and refocus attention, mindfulness practices may reduce the cognitive load associated with distractibility and emotional reactivity, allowing more cognitive resources to be allocated to working memory processes. Neurocognitive research suggests that mindfulness strengthens top-down control networks involved in attentional regulation and memory maintenance, which are often underactive in individuals with ADHD (Mohseni Nasab et al., 2024; Zhong et al., 2024). This mechanism may be particularly relevant for visuospatial tasks that require sustained attention to spatial sequences and visual details.

The improvement in academic performance observed in the experimental group further supports the functional relevance of mindfulness-related cognitive gains. Academic performance is a multidimensional construct influenced by attentional capacity, working memory, emotional regulation, and motivational factors. The significant post-intervention gains in academic performance suggest that the cognitive improvements associated with mindfulness training translated into meaningful educational outcomes. These findings are consistent with prior research demonstrating positive associations between mindfulness, academic engagement, and academic achievement (Alamro, 2025; Wang, 2025).

In students with ADHD, academic difficulties are often exacerbated by academic anxiety, emotional dysregulation, and low self-efficacy, which interfere with sustained engagement in learning tasks. Mindfulness training has been shown to reduce academic anxiety and enhance emotional well-being, thereby indirectly supporting academic functioning (Jaismin et al., 2025; Kong et al., 2025). By fostering non-judgmental awareness and acceptance of internal experiences, mindfulness may help students disengage from maladaptive cognitive-emotional cycles that undermine learning, such as worry about failure or frustration with task demands.

The present findings align with Alamro's study on mindfulness e-activities, which reported improvements in academic resilience among students with ADD/ADHD (Alamro, 2025). Although the delivery format differed, both studies suggest that mindfulness-based approaches can enhance students' capacity to cope with academic challenges and maintain engagement despite attentional difficulties. Furthermore, the observed relationship between improvements in cognitive indices and academic performance supports the notion that mindfulness exerts its academic benefits, at least in part, through cognitive mechanisms such as enhanced attention and working memory (Ghandkanlou, 2025; Wang, 2025).

The results of this study are also consistent with integrative approaches that combine mindfulness with cognitive training. Badia-Aguarón et al. proposed that mindfulness may potentiate the effects of cognitive training by creating a mental context characterized by reduced distractibility and increased attentional readiness (Badia-Aguarón et al., 2024). Although the present intervention focused primarily on mindfulness practices, several session components implicitly targeted cognitive skills such as attentional shifting, inhibition, and memory sequencing. This integrative emphasis may explain the relatively strong effects observed across multiple outcome domains.

Cultural and contextual considerations further support the significance of the present findings. Research conducted in Middle Eastern and non-Western contexts has demonstrated that mindfulness-based interventions are both feasible and effective when appropriately adapted (Rafat & Arefi, 2022; Safari et al., 2023). The consistency of the present results

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with these studies suggests that mindfulness training can be culturally adaptable and relevant for diverse student populations. Moreover, given the increasing emphasis on school-based mental health promotion, mindfulness interventions offer a low-cost, non-stigmatizing approach that can be integrated into educational systems without extensive clinical infrastructure (Holopainen et al., 2025; Monsillion et al., 2025).

Finally, the findings contribute to the broader literature emphasizing the multi-level impact of mindfulness interventions. In addition to individual cognitive benefits, mindfulness programs have been shown to influence family dynamics and parental stress, which in turn may support children's academic and emotional functioning (Sultan et al., 2022). Although parental outcomes were not directly assessed in the present study, the observed academic improvements may reflect, in part, enhanced self-regulation and reduced conflict in daily learning contexts.

5. Conclusion

Overall, the findings of this study provide robust support for the effectiveness of mindfulness training in improving selective attention, visuospatial memory, and academic performance in students with ADHD. By targeting core cognitive mechanisms that underlie academic difficulties, mindfulness-based interventions appear to offer a theoretically grounded and empirically supported approach for enhancing educational outcomes in this population. These results underscore the value of integrating mindfulness practices into school-based mental health and educational support programs, particularly for students who continue to experience cognitive and academic challenges despite conventional treatments.

Despite its contributions, the present study has several limitations that should be acknowledged. First, the relatively small sample size limits the generalizability of the findings and may reduce statistical power for detecting more subtle effects. Second, the absence of a follow-up assessment precludes conclusions about the long-term sustainability of the observed improvements. Third, although both objective and questionnaire-based measures of academic performance were used, the study relied primarily on behavioral and cognitive assessments and did not include neuropsychological or neurobiological indicators that could further elucidate underlying mechanisms. Finally, potential confounding variables such as teacher expectations, classroom environment, and family-level factors were not systematically controlled.

Future studies should employ larger and more diverse samples to enhance the external validity of findings and allow for subgroup analyses based on age, gender, and ADHD presentation. Longitudinal designs with follow-up assessments are needed to determine the durability of mindfulness-related gains over time. Incorporating neuropsychological, neurophysiological, or neuroimaging measures could provide deeper insight into the mechanisms through which mindfulness influences attention and memory processes. Additionally, comparative studies examining mindfulness alone versus combined mindfulness–cognitive training interventions may help identify the most effective intervention formats for students with ADHD.

From a practical standpoint, the findings support the inclusion of structured mindfulness programs as a complementary component of school-based interventions for students with ADHD. Educators and school psychologists may consider integrating brief, developmentally appropriate mindfulness practices into daily classroom routines to support attention and self-regulation. Training teachers and involving parents in mindfulness-based activities could further enhance intervention effectiveness and generalization across settings. Finally, implementing mindfulness programs within a multi-tiered support framework may help address the diverse cognitive and academic needs of students with ADHD in an inclusive and sustainable manner.

Authors' Contributions

Authors contributed equally to this article.

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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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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