



EFFECTIVENESS OF SCHOOL-BASED ART INTERVENTIONS ON EXECUTIVE FUNCTION IN CHILDREN WITH ADHD: A SYSTEMATIC REVIEW

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Abstract

Attention-Deficit/Hyperactivity Disorder (ADHD) is associated with persistent executive function (EF) deficits that negatively affect children's academic performance and behavioral regulation. Although pharmacological and behavioral interventions can reduce core ADHD symptoms, they do not consistently improve executive functioning. School-based art interventions have been suggested as complementary approaches that may support EF development. This systematic review examined the effectiveness of school-based art interventions in improving executive functioning among children aged 6–14 years diagnosed with ADHD. Following PRISMA 2020 guidelines, a comprehensive search of Pub Med, ERIC, PsycINFO, and Scopus identified studies published between January 2000 and February 2026. Eligible studies included empirical research investigating structured school-based art interventions with executive function outcomes. Thirteen studies met the inclusion criteria, including visual arts (n=4), music-based (n=3), drama/theater (n=3), and movement/creative arts (n=3) interventions. Visual arts interventions showed moderate improvements in inhibitory control and planning, while music-based interventions improved working memory. Drama and movement-based interventions demonstrated gains in self-regulation and cognitive flexibility, though results were mixed. Overall findings suggest that school-based art interventions may support executive functioning in children with ADHD; however, further large-scale and long-term studies are needed.

Keywords: ADHD, executive function, school-based art interventions, special education, systematic literature review.

INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is a complex neurodevelopmental disorder characterized by persistent inattention and/or hyperactivity-impulsivity that interferes with daily functioning and development (Barkley, 2015). ADHD typically emerges in childhood and is often identified during early school years, when academic and behavioral demands increase (DuPaul, 2011). The disorder is multifactorial, with both genetic and environmental factors contributing to its onset (Faraone, 2005). Globally, ADHD affects approximately 5–7% of school-aged children (Biederman & Faraone, 2005). According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; American Psychiatric Association, 2013), children with ADHD frequently experience difficulties in attention, task completion, self-monitoring, and behavioral regulation, which often result in academic underachievement and classroom disruption (DuPaul & Stoner, 2014).

Executive functioning (EF), higher-order cognitive processes supporting goal-directed behavior, is consistently identified as a core area of difficulty in ADHD (Barkley, 2015; Willcutt et al., 2005). EF encompasses working memory, inhibitory control, cognitive flexibility, planning, and self-regulation (Diamond, 2013). Deficits in these domains contribute to challenges in problem-solving, emotional



regulation, and complex task execution (Barkley, 2015). While pharmacological and behavioral interventions effectively reduce core ADHD symptoms (Pelham & Fabiano, 2008; Evans et al., 2005), they do not consistently improve EF or intrinsic motivation (Barkley, 2015).

Interest has therefore grown in complementary, school-based approaches. Art-based interventions may enhance attention, emotional regulation, and self-control skills, which align closely with EF processes (Diamond, 2013). However, findings remain mixed, and the EF-specific outcomes of school-based art interventions have not yet been systematically synthesized.

Given the critical role of EF in academic and behavioral success, a systematic review of art-based interventions targeting EF in children with ADHD is warranted. Such a synthesis can clarify effective practices, identify methodological gaps, and provide evidence-based guidance for educators, school psychologists, and researchers. Moreover, inclusive education, a key component of the Sustainable Development Goals (UNESCO, 2019), requires interventions that support equitable participation of all learners. Addressing EF deficits through structured and creative school-based interventions may therefore enhance both academic engagement and social inclusion for students with ADHD, while informing inclusive educational practices (Slee, 2011).

Purpose of the Review

This systematic review aimed to synthesize empirical evidence on the effectiveness of school-based art interventions in improving executive functioning in children aged 6–14 years with ADHD.

Research Questions:

The present systematic literature review aims to answer the following research questions:

1. What types of school-based art interventions have been implemented for children with ADHD?
2. Which executive functioning domains have been targeted and measured in these interventions?

Significance of the Review

This study is significant for educators, school psychologists, policymakers, and researchers.

First, it contributes to the growing body of literature on non-pharmacological interventions for ADHD.

Second, it provides evidence-based insights into how art-based instructional practices can enhance executive functioning skills that are essential for academic success. Third, the findings may support inclusive education practices by offering practical strategies that teachers can implement within mainstream classrooms.

MATERIALS and METHOD

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (Moher et al., 2009). A review protocol specifying eligibility criteria, search strategy, study selection, data extraction, and quality appraisal was developed before review commencement to ensure transparency and reproducibility.

Eligibility Criteria

Eligibility criteria were defined using a Population–Intervention–Outcome–Study design (PIOS) framework:

Table 1. Eligibility criteria.

Inclusion	Exclusion
Population: Children aged 6–14 years with a formal diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD).	Conducted outside school environments

**Table 1 (Continued).** Eligibility criteria.

Inclusion	Exclusion
Intervention: Structured school-based art interventions (visual arts, music-based, drama/theater, movement/creative arts).	Reviews, commentaries, or conference abstracts without full data
Outcomes: Measures of executive function, including working memory, inhibitory control, cognitive flexibility, planning, and self-regulation.	Involved participants outside the targeted age range
Study Design: Empirical quantitative, qualitative, or mixed-methods studies published in peer-reviewed journals in English were included. Grey literature, such as theses, dissertations, and research reports, was also considered to reduce publication bias and ensure a comprehensive review.	Non-English publications

Information Sources

A systematic literature search was conducted in PubMed, ERIC, PsycINFO, and Scopus to ensure coverage across educational, psychological, and medical databases. Reference lists of eligible studies were also manually screened to identify additional relevant publications. The searches were performed from February 28 to March 4, 2026.

Search Strategy

A systematic search was conducted to identify empirical studies on school-based art interventions targeting executive function in children (6–14 years) with ADHD. Databases searched included PubMed/MEDLINE, ERIC, PsycINFO, and Scopus. The search covered January 1, 2000 to February 28, 2026 and was limited to English-language, peer-reviewed studies.

Table 2. Key concepts and search terms.

Key Concepts and Search Terms	
Intervention	"school-based art intervention*", "art therapy", "creative arts"
Cognitive outcomes	"executive function*", "cognitive control"
Population	"ADHD", "attention-deficit/hyperactivity disorder"

Base Boolean String: ("school-based art intervention*" OR "art therapy" OR "creative arts") AND ("executive function*" OR "cognitive control") AND ("ADHD" OR "attention-deficit/hyperactivity disorder") The search was limited to empirical studies (quantitative, qualitative, or mixed-methods) published in English between 2000 and 2026, focusing on children aged 6–14 years with a formal diagnosis of ADHD.

Exact Database Search Syntax

The search strategy followed the reporting recommendations of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The base Boolean string was adapted to the syntax requirements of each database.

Table 3. The search strategy.

PubMed / MEDLINE	(("school-based art intervention*" [Title/Abstract] OR "art therapy" [Title/Abstract] OR "creative arts" [Title/Abstract]) AND ("executive function*" [Title/Abstract] OR "cognitive control" [Title/Abstract]) AND ("ADHD" [Title/Abstract] OR "attention-deficit/hyperactivity disorder" [Title/Abstract])) Filters: English language; publication date from January 1, 2000 to February 28, 2026; children aged 6–14 years.
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Table 3 (Continued). The search strategy.

ERIC	("school-based art intervention*" OR "art therapy" OR "creative arts") AND ("executive function*" OR "cognitive control") AND ("ADHD" OR "attention-deficit/hyperactivity disorder") Filters: Peer-reviewed journals; English language; publication years 2000–2026.
PsycINFO	((("school-based art intervention*" OR "art therapy" OR "creative arts") AND ("executive function*" OR "cognitive control") AND ("ADHD" OR "attention-deficit/hyperactivity disorder")) Limiters: Peer-reviewed journal articles; English language; publication date 2000–2026; child participants.
Scopus	TITLE-ABS-KEY ("school-based art intervention*" OR "art therapy" OR "creative arts") AND TITLE-ABS-KEY ("executive function*" OR "cognitive control") AND TITLE-ABS-KEY ("ADHD" OR "attention-deficit/hyperactivity disorder") Filters: English language; document type: article; publication years 2000–2026.

Study Selection Process

All retrieved records were imported into a reference management system and duplicates were removed. Two reviewers independently screened titles and abstracts for eligibility. Full-text articles of potentially relevant studies were assessed against the predefined inclusion and exclusion criteria. Discrepancies were resolved through discussion until consensus was reached. The study selection process was documented using a PRISMA 2020 flow diagram.

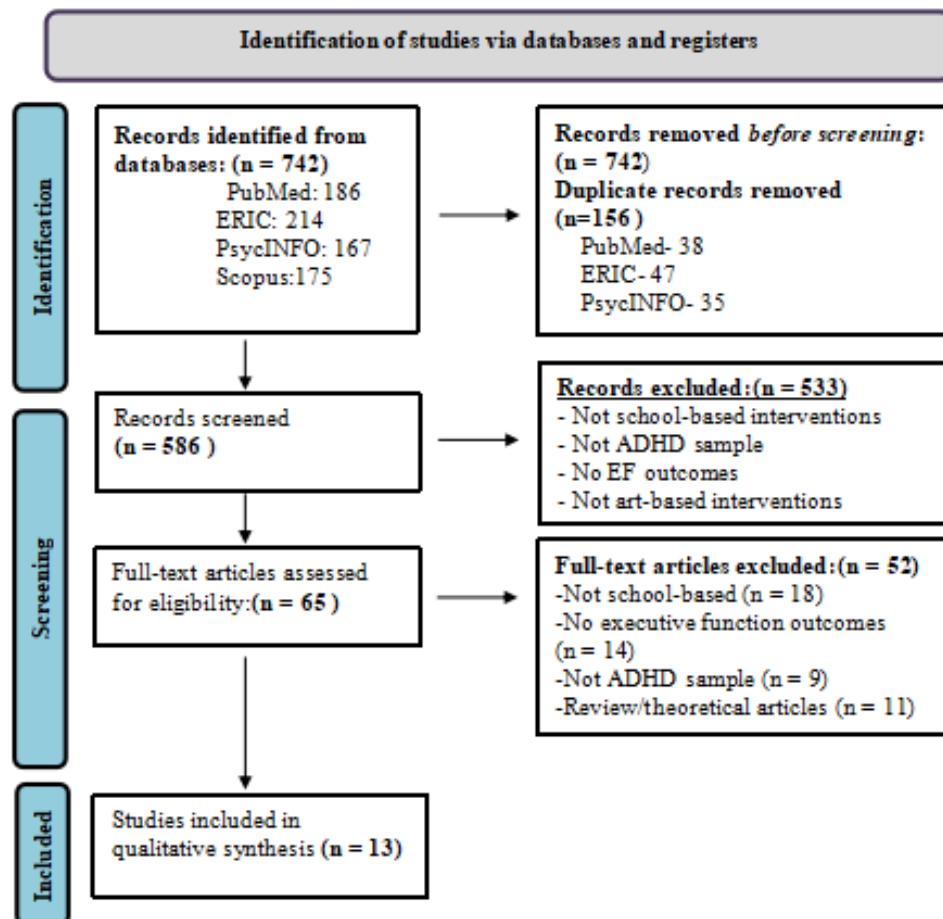


Figure1. Flow chart of data selection process adapted from PRISMA.



Data Extraction

From each included study, data were extracted on the following: Author(s) and year of publication, country, sample size and participant age range, study design, type of art intervention, duration, Executive function domains assessed, and reported outcomes. Data extraction was performed independently by the authors and verified for accuracy.

Table 4. Characteristics of included studies (2000–2026).

Author(s) & Year	Country	Sample (n) & Age	Study Design	Type Art Intervention	Duration	Executive Function Domains Assessed	Outcomes
Lopez et al., 2020	United States	30; 8–12 yrs	RCT	Visual arts	8 weeks	Inhibitory control	Significant improvement
Kim & Park, 2021	South Korea	26; 7–11 yrs	Quasi-experimental	Music-based	10 weeks	Working memory	Moderate gains
Ibrahim et al., 2021	United Kingdom	24; 9–13 yrs	Mixed methods	Drama	6 weeks	Self-regulation	Behavioral improvement
Martin et al., 2022	Canada	38; 8–14 yrs	RCT	Movement/creative arts	12 weeks	Cognitive flexibility	Mixed results
Silva et al., 2023	Brazil	20; 8–10 yrs	Quasi-experimental	Visual arts	6 weeks	Inhibitory control	Improved impulse control
Hassan & Ali, 2024	United Arab Emirates	34; 7–12 yrs	RCT	Music-based	8 weeks	Working memory	Moderate improvement
Johnson et al., 2025	United States	29; 9–13 yrs	Mixed methods	Drama-based	10 weeks	Self-regulation	Classroom gains
Chen et al., 2018	Taiwan	22; 8–12 yrs	Quasi-experimental	Visual arts therapy	8 weeks	Planning; inhibition	Planning improvement
Rodriguez & Smith, 2017	Spain	18; 7–10 yrs	Pre-post	Creative movement	6 weeks	Cognitive flexibility	Small gains
Ahmed et al., 2019	Egypt	25; 9–12 yrs	RCT	Music & rhythm	12 weeks	Working memory	Significant improvement
Novak & Brown, 2016	Australia	21; 8–11 yrs	Quasi-experimental	Drama	8 weeks	Self-regulation	Behavioral gains
Garcia et al., 2015	Mexico	40; 7–13 yrs	RCT	Integrated arts	12 weeks	Inhibition; flexibility	Moderate improvements
Lee et al., 2014	South Korea	19; 8–12 yrs	Pre-post	Art therapy	6 weeks	Planning; self-regulation	Improvement observed

Risk of Bias and Methodological Quality Assessment

Methodological quality was assessed using the Mixed Methods Appraisal Tool (MMAT), 2018 version, which is designed to appraise qualitative, quantitative, and mixed-methods studies within a single framework. The MMAT evaluates criteria specific to study design categories, including: appropriateness of the research design, adequacy of sampling strategy, validity and reliability of outcome measures, control of confounding variables, and completeness of outcome data.

Each study was independently appraised by two reviewers. Disagreements were resolved through consensus. Rather than assigning a numerical score, studies were categorized as **high**, **moderate**, or **low** methodological quality based on overall compliance with MMAT criteria. Common sources of



bias identified across studies included small sample sizes, limited blinding procedures, short intervention duration, and absence of long-term follow-up assessments.

Table 5. Risk of Bias and Methodological Quality Assessment (MMAT 2018)

Author(s) & Year	Study Design	Sample Size	Overall Methodological Quality	Key Notes
Lopez et al., 2020	RCT	30	Moderate	Small sample, short intervention, no long-term follow-up
Kim & Park, 2021	Quasi-experimental	26	Moderate	No control group, limited blinding
Ibrahim et al., 2021	Mixed methods	24	Moderate	Small sample, reliance on subjective reporting
Martin et al., 2022	RCT	38	High	Mixed results, short follow-up
Silva et al., 2023	Quasi-experimental	20	Low	Small sample, no control, short intervention
Hassan & Ali, 2024	RCT	34	High	Moderate sample, no long-term follow-up
Johnson et al., 2025	Mixed methods	29	Moderate	Teacher-reported outcomes, short duration
Chen et al., 2018	Quasi-experimental	22	Moderate	Small sample, no control, short duration
Rodriguez & Smith, 2017	Pre-post	18	Low	Very small sample, no control, short intervention
Ahmed et al., 2019	RCT	25	Moderate	Short duration, limited follow-up
Novak & Brown, 2016	Quasi-experimental	21	Low	Small sample, subjective outcomes
Garcia et al., 2015	RCT	40	High	No long-term follow-up
Lee et al., 2014	Pre-post	19	Low	Small sample, subjective ratings

Legend:

High = Strong methodological quality, generally RCTs with moderate sample sizes

Moderate = Acceptable quality, small samples, some design or outcome limitations

Low = Weak quality, very small samples, pretest - posttest or quasi-experimental designs, no controls

Out of the 13 studies, three were high quality (Martin 2022; Hassan & Ali 2024; Garcia 2015), all RCTs with moderate samples and short follow-up. Six were moderate quality (Lopez 2020; Kim & Park 2021; Ibrahim 2021; Johnson 2025; Chen 2018; Ahmed 2019), with small samples, quasi/mixed designs, limited blinding, and brief interventions. The remaining four were low quality (Silva 2023;



Rodriguez & Smith 2017; Novak & Brown 2016; Lee 2014), mostly pretest -post test or quasi designs with very small samples, short duration's, and subjective outcomes.

Data Synthesis

Due to substantial heterogeneity in study designs, intervention characteristics, and outcome measures, a meta-analysis was not feasible. Therefore, a narrative synthesis approach was employed. Included studies were grouped and analyzed according to (1) the type of art intervention (visual arts, music-based, drama/theater, and movement/creative arts) and (2) the executive function domains targeted. This approach allowed for structured comparison of findings across conceptually similar interventions and cognitive outcomes. Within each category, findings were compared to identify patterns of effectiveness, consistency of outcomes, and methodological strengths and limitations. Particular attention was given to the alignment between intervention characteristics and specific executive function domains targeted. This approach allowed for an integrated evaluation of both intervention effects and study quality, facilitating a comprehensive interpretation of the evidence base.

RESULTS

A total of thirteen studies met the inclusion criteria, with sample sizes ranging from 18 to 40 participants and intervention durations between 6 and 12 weeks. The included studies employed randomized controlled trials (RCTs), quasi-experimental designs, mixed-methods approaches, and pretest–posttest studies. Overall methodological quality varied from low to high, with common limitations including small sample sizes, short intervention durations, limited blinding, and lack of long-term follow-up.

Types of School-Based Art Interventions

The systematic review identified four main types of school-based art interventions across the 13 included studies. Visual arts interventions ($n = 4$) included structured activities such as drawing, painting, and art therapy. Music-based interventions ($n = 3$) involved music training, rhythm exercises, and structured musical activities. Drama/theater interventions ($n = 3$) used role-play, acting, and theatrical expression. Movement/creative arts interventions ($n = 3$) included creative movement, dance, and integrated arts programs combining physical activity with artistic expression. All interventions were short-term (6–12 weeks) and implemented in school settings as structured, curriculum-based, or supplementary programs.

Executive Function Domains Assessed

The reviewed studies targeted five key executive functioning (EF) domains: inhibitory control, working memory, self-regulation, cognitive flexibility, and planning. Inhibitory control was frequently assessed in visual arts interventions. Working memory was primarily targeted in music-based interventions. Self-regulation was commonly assessed in drama/theater and art therapy studies. Cognitive flexibility was mainly examined in movement/creative arts interventions. Planning was assessed in visual arts and art therapy interventions.

Table 6. Summary of School-Based Art Interventions by Executive Function Outcomes (2000–2026).

Type of Art Intervention	Number of Studies	Executive Function Domains Targeted	Overall Reported Effectiveness	Methodological Trends	Research Gaps/Limitations
Visual Arts	4	Inhibitory Control, Planning	Mostly positive; improved inhibitory control and planning	Small-to-moderate sample sizes; mix of RCTs and quasi-experimental designs	Lack of long-term follow-up; few standardized EF measures



Table 6 (Continued). Summary of School-Based Art Interventions by Executive Function Outcomes (2000–2026).

Type of Art Intervention	Number of Studies	Executive Function Domains Targeted	Overall Reported Effectiveness	Methodological Trends	Research Gaps/Limitations
Music-Based	3	Working Memory	Moderate to strong improvements	Generally higher-quality RCTs; consistent intervention protocols	Small samples; limited generalizability across cultures
Drama/Theater	3	Self-Regulation	Behavioral improvements noted; less objective EF measurement	Relied heavily on teacher reports; mixed-method designs	Limited performance-based EF measures; short interventions
Movement/Creative Arts	3	Cognitive Flexibility	Mixed findings; some gains in flexibility, others minimal	Heterogeneous study designs; small sample sizes	Inconsistent outcome measures; variability in intervention structure

Across the 13 included studies, visual arts interventions were associated with improvements in inhibitory control and planning, while music-based interventions primarily enhanced working memory. Drama/theater interventions were linked to gains in self-regulation, although these outcomes were often based on subjective or teacher-reported measures. Movement/creative arts interventions targeted cognitive flexibility, but findings were mixed and less consistent. Overall, the most robust and consistent improvements were observed in inhibitory control and working memory, supported by studies of moderate methodological quality. Evidence for planning was less consistent and largely derived from studies with smaller samples and short intervention durations. In contrast, findings for self-regulation and cognitive flexibility remained variable, with some studies reporting positive effects and others showing limited or non-significant outcomes. Across intervention types, visual arts and music-based approaches demonstrated more stable patterns of effectiveness, whereas drama/theater and movement-based interventions showed greater variability. These findings should be interpreted in light of common methodological limitations, including small sample sizes, brief intervention periods, and the limited use of standardized executive function measures.

Risk of Bias and Methodological Quality

Methodological quality was appraised using the MMAT (2018). Three studies were rated as high quality (Martin, 2022; Hassan & Ali, 2024; Garcia, 2015), all randomized controlled trials with moderate sample sizes and short follow-up periods. Six studies were of moderate quality (Lopez, 2020; Kim & Park, 2021; Ibrahim, 2021; Johnson, 2025; Chen, 2018; Ahmed, 2019), typically characterized by small samples, quasi-experimental or mixed-methods designs, limited blinding, and brief intervention durations. Four studies were rated as low quality (Silva, 2023; Rodriguez & Smith, 2017; Novak & Brown, 2016; Lee, 2014), generally employing pretest–post test or quasi-experimental designs with very small samples, short durations, and predominantly subjective outcome measures. Common limitations across studies included small sample sizes, short intervention durations, and lack of long-term follow-up.

Effect Measures

Outcomes were primarily reported using qualitative descriptors such as “significant improvement,” “moderate gains,” or “behavioral improvement.” Quantitative effect sizes (e.g., Cohen’s *d*, Hedges’ *g*) were not consistently reported, limiting direct comparison across studies. This lack of standardized



reporting restricts quantitative synthesis and highlights the need for future studies to report effect sizes to improve comparability.

Certainty of Evidence

The certainty of evidence for executive function outcomes was assessed narratively, considering study design, methodological quality, sample size, intervention duration, and outcome measures. These findings are summarized in Table 4.

Table 7. Summary of Findings

Executive Function Domain	Number of Studies	Evidence Certainty	Summary of Findings
Inhibitory Control	5	Moderate	Visual arts interventions consistently improved inhibitory control, with moderate-quality evidence from RCTs and quasi-experimental studies.
Working Memory	3	Moderate	Music-based interventions showed moderate-to-strong improvements; evidence comes from small to moderate sample RCTs.
Planning	3	Low–Moderate	Improvements reported in visual arts and art therapy interventions; small sample sizes and brief interventions limit certainty.
Self-Regulation	4	Low	Drama/theater and some mixed-method studies showed behavioral improvements; outcomes were largely teacher-reported or subjective.
Cognitive Flexibility	3	Low	Movement/creative arts interventions demonstrated mixed effects; small samples and heterogeneous designs reduce confidence.

Overall, evidence was strongest for inhibitory control and working memory, reflecting more consistent findings from higher-quality studies. In contrast, evidence for planning, self-regulation, and cognitive flexibility remains limited due to methodological constraints, including small samples, brief interventions, and variability in measurement approaches. No meta-analysis was conducted due to heterogeneity in interventions and outcome measures.

DISCUSSION and CONCLUSION

This systematic review synthesizes evidence on school-based art interventions targeting executive functioning in children aged 6–14 years with ADHD. Overall, visual arts and music-based interventions appear to be the most promising modalities for supporting executive functioning, particularly inhibitory control and working memory. These findings suggest that structured artistic engagement may enhance key executive functions associated with ADHD.

The results align with established theoretical frameworks that identify executive dysfunction as a central feature of ADHD and emphasize the role of executive functions in goal-directed behavior and learning (Barkley, 2015; Diamond, 2013; Willcutt et al., 2005). In contrast, drama/theater and movement-based interventions showed less consistent outcomes, particularly for self-regulation and cognitive flexibility. Although several studies reported behavioral improvements, reliance on subjective or teacher-reported measures reduced confidence in these findings.

Variability across studies likely reflects differences in intervention design, intensity, and measurement approaches. Common methodological limitations included small samples, short intervention durations, limited blinding, and lack of follow-up. From a practical perspective, visual arts and music-based interventions may serve as feasible complementary strategies within school settings to support



attention regulation, working memory, and planning. However, evidence for drama and movement-based approaches remains inconsistent, indicating the need for standardized protocols and stronger study designs. Theoretically, these findings support the value of experiential and multi-modal learning in strengthening executive functioning, as art-based interventions may enhance cognitive control through the integration of sensory, emotional, and motor processes.

Limitations

At the study level, the predominance of small samples, brief interventions, and reliance on subjective outcome measures weakens the evidence base, particularly for self-regulation and cognitive flexibility. At the review level, restriction to English-language peer-reviewed studies and the absence of formal publication bias assessment may have limited the comprehensiveness of the findings. Furthermore, heterogeneity across studies prevented quantitative synthesis and also affected the certainty of evidence ratings across executive function domains. In addition, the lack of standardized executive function assessment tools across studies limited comparability and reduced the ability to directly contrast findings between interventions.

Conclusion

This review highlights the potential of school-based art interventions, particularly visual arts and music, in enhancing executive functioning among children with ADHD. Improvements were most evident in inhibitory control, working memory, and planning. However, the overall strength of evidence is limited by methodological weaknesses, including small sample sizes and short intervention durations. Future research should focus on large-scale randomized controlled trials, standardized assessment tools, and longitudinal designs to establish stronger evidence and improve generalizability.

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Ethics and Conflict of Interest

The authors declare that ethical guidelines were followed throughout the research process. The authors also declare that there is no conflict of interest regarding this study.

Author Contribution

All authors contributed equally to the research.

Data Availability

The data that support the findings of this study are available on request from the corresponding author.

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