

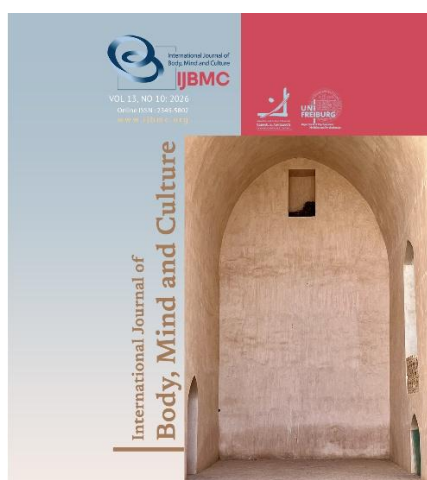
Article type:
Original Research

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Comparing the Effectiveness of Floortime Play Therapy and Neurocognitive Play Therapy on Memory Function in Children with ADHD

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Article history:

Received 23 Mar 2026
Revised 18 May 2026
Accepted 24 June 2026
Published online 01 Oct 2026

How to cite this article:

Taleb Shahrestani, S. F., Gohari, B. A., & Nematzadeh Gotabi, S. (2026). Comparing the Effectiveness of Floortime Play Therapy and Neurocognitive Play Therapy on Memory Function in Children with ADHD. *International Journal of Body, Mind and Culture*, 13(10), Article e2026-1271.
<https://doi.org/10.61838/ijbmc.v13i10.1271>



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ABSTRACT

Objective: This study aimed to compare the effectiveness of Floortime play therapy and neurocognitive play therapy on working memory performance in children with attention-deficit/hyperactivity disorder (ADHD).

Methods and Materials: A quasi-experimental pretest–posttest control-group design with a two-month follow-up was conducted. The participants included 45 children aged 8–12 years diagnosed with ADHD and referred to counseling clinics in Tehran during the 2025–2026 academic year. Participants were selected purposively and randomly assigned to three groups: Floortime play therapy (n = 15), neurocognitive play therapy (n = 15), and control (n = 15). Memory performance was assessed using the Cornoldi Working Memory Test. The intervention groups received their respective play-based programs, while the control group received no intervention. Data were analyzed using mixed-design analysis of variance and Bonferroni post hoc tests.

Findings: The time × group interaction for memory function was significant, $F = 5.78$, $p < .001$, $\eta^2 = .216$, indicating different changes across groups over time. Both Floortime and neurocognitive play therapy groups showed significant improvements compared with the control group. At posttest, memory scores were higher in the Floortime group than the control group (mean difference = 5.94, $p = .017$) and higher in the neurocognitive play therapy group than the control group (mean difference = 8.52, $p < .001$). No significant difference was observed between the two intervention groups ($p = .622$). Improvements remained significant at the two-month follow-up.

Conclusion: Both Floortime play therapy and neurocognitive play therapy effectively improved working memory in children with ADHD, with neither approach demonstrating superiority over the other.

Keywords: Floortime Play Therapy, Neurocognitive Play Therapy, ADHD, Working Memory, Children.

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a common and persistent neurodevelopmental disorder characterized by developmentally inappropriate inattention and/or hyperactivity-impulsivity that interferes with functioning (American Psychiatric Association, 2022). Beyond its behavioral presentation, ADHD is associated with weaknesses in executive functions, including working memory, which supports the temporary maintenance and manipulation of information required for learning, problem solving, and behavioral regulation (Barkley, 2018; Rapport et al., 2013). Epidemiological reviews confirm that ADHD represents a substantial global burden in childhood and adolescence (Polanczyk et al., 2007; Polanczyk et al., 2014; Salari et al., 2023; Popit et al., 2024).

Although medication can reduce core ADHD symptoms, executive-function outcomes vary and may not fully generalize to everyday academic performance; this has sustained interest in psychosocial and neurocognitive approaches (Chacko et al., 2014; Isfandnia et al., 2024). Floortime, grounded in the Developmental, Individual-differences, Relationship-based model, uses affective engagement and reciprocal play to support regulation, attention, and learning. Evidence for relationship-based and play-mediated interventions indicates that meaningful interaction can strengthen engagement and developmental functioning, although much of the Floortime literature has focused on autism rather than ADHD (Casenhiser et al., 2013; Divya et al., 2023). Play-based intervention has also shown promise for reducing impulsivity in young children with hyperactivity (Shaloui-Chaharpaniche & Esmaeili, 2024).

Neurocognitive interventions use repeated, structured exercises to strengthen attention, working memory, inhibitory control, and related executive processes. Their rationale is based on experience-dependent neuroplasticity and systematic practice. Evidence suggests that training can produce near-transfer gains in working memory, but transfer to untrained tasks and everyday functioning is less consistent (Hovik et al., 2013; Mawjee et al., 2017; Rapport

et al., 2013). Cognitive rehabilitation has nevertheless been associated with improved memory performance in individuals with ADHD (Alimjon et al., 2023), and combined neurofeedback and cognitive-game programs have also yielded improvements in attention and working memory (Moradi et al., 2022).

Most previous studies have evaluated relationship-oriented play approaches and task-oriented neurocognitive approaches separately. Direct comparison is clinically useful because working memory in children with ADHD may be influenced by both emotional regulation and repeated cognitive practice. A relational intervention may improve readiness to encode and retrieve information by supporting engagement and arousal regulation, whereas a neurocognitive intervention may strengthen the cognitive operations used to maintain and manipulate information.

Educational and clinical services require brief interventions that are both effective and feasible. Determining whether either approach produces stronger and more durable working-memory gains may guide treatment selection and resource allocation. Accordingly, this study compared Floortime play therapy and neurocognitive play therapy with a control condition and examined whether treatment gains were maintained at a two-month follow-up.

Methods and Materials

Study Design and Participants

This quasi-experimental study used a pretest-posttest control-group design with a two-month follow-up. The statistical population comprised children with ADHD who were referred to counseling and psychological clinics in Tehran during the 2025-26 academic year. Forty-five eligible children were selected through purposive sampling after a preliminary interview and were randomly assigned to Floortime play therapy, neurocognitive play therapy, or control groups ($n = 15$ per group).

Eligibility Criteria

Inclusion criteria were a diagnosis of ADHD by a clinical psychologist; age 8-12 years; adequate intellectual and cognitive functioning based on educational records or professional judgment; no severe psychiatric disorder; no concurrent psychological intervention; and written parental consent together with the child's assent. Children receiving medication were required to have a stable dose for at least one month before the intervention. Exclusion criteria were absence from more than two sessions, withdrawal of consent or assent, concurrent participation in another counseling or psychotherapy program, and failure to complete the pretest, posttest, or follow-up assessment.

Procedure and Ethical Considerations

Following coordination with Kolbeh Aramesh and Anis Andisheh clinics, eligible children were screened and assigned to the three study groups. The two intervention groups completed their respective protocols, whereas the control group received no study intervention. All groups completed the outcome measure at pretest, immediately

after treatment, and 60 days later. Parents and children were informed about the study procedures, voluntary participation, confidentiality, and the right to withdraw. Participation imposed no financial burden.

Instrument

Cornoldi Working Memory Test

Working memory was assessed with a visuospatial matrix task derived from the active-passive working-memory framework described by Cornoldi and colleagues (Cornoldi & Vecchi, 2003; Cornoldi et al., 2000). The task uses a 3×3 matrix with a designated starting square. After viewing the matrix, the child follows a sequence of directional commands (e.g., left, down, right) and indicates the final position. The task is administered across three trials, and performance is scored according to successful completion of the sequences. This format requires both short-term visuospatial storage and active manipulation of information. Summary of floortime play therapy and neurocognitive play therapy are presented in Table 1 and 2.

Table 1.

Summary of Floortime Play Therapy

Session	Session content
First	Introduction of the therapist and mother; description of the treatment process for the mother; answering the mother's questions and ambiguities; administration of the pretest.
Second	Observation of the type of mother-child interaction; identifying the strengths and weaknesses of each; obtaining a realistic view of the level of interaction and intimate communication between mother and child.
Third	The therapist sits beside the mother and performs an interactive action appropriate to the child's developmental levels and sensory-emotional regulation. Floortime is implemented in the therapy session by the mother, possible errors are corrected, and the therapist assigns Floortime practice at home.
Fourth	Based on the child's sensory-emotional-affective rhythm and the type of behavior and request made by the child, a playful and free space is created for the child. Intimacy, interaction, and unstructured play with the child are experienced, and sensory-emotional reactions, including under-responsiveness or over-responsiveness, are recorded.
Fifth	Considering the child's sensory-emotional conditions, the therapist accompanies the child in every movement, from gross to fine movements, in such a way that the experience of shared feeling is attended to, and what the child does receives maximum attention and response.
Sixth	Attention is given to the continuation and expansion of the exchanges that are created. Efforts are made to achieve a higher emotional experience in even simple exchanges. In other words, simultaneous attention is paid to the number of reciprocal exchanges and the depth of the emotional experience.
Seventh	The child is given the opportunity to show their preferences as freely as possible in the therapy-room space, such as choosing the place, sitting position, distance, and body posture, for example lying down or rolling, while being accompanied in these movements.
Eighth	The child is allowed to explore and show curiosity, even toward the therapist's face and body parts. Careful attention is paid to establishing eye contact, emotional transmission, and visual exchanges by bringing the therapist's or child's face closer and farther away. In a cheerful and playful atmosphere, with rhythmic and soothing speech, the therapist plays with the child's fingers, holds and embraces the child, and continues holding according to the child's level of satisfaction.
Ninth	Exaggeration and enlargement of symbolic movements such as eating, making a phone call, bathing, dressing, and falling are used to attract attention and shared engagement, accompanied by speech appropriate to these symbolic movements with maximum emotion.
Tenth	Repetition of movements similar to those performed by the child, accompanying the child in running and falling, using appropriate verbal and nonverbal exchanges, creating harmony, attracting attention, establishing eye contact, laughing, and increasing intimacy.

Eleventh	Symbolically, while maintaining eye contact and reciprocal verbal-sensory-emotional exchanges, attention is attracted and help is requested from the child. Activities include asking for a massage, symbolic requests for food, question-and-answer exchanges, creating appropriate speech contexts, providing extensive emotional feedback accompanied by pleasure, and having the child play the roles of mother, father, doctor, and driver, with appropriate requests made of the child. The child's progress is reviewed with the mother, previous sessions are summarized, conclusions are drawn, and the posttest is administered.
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Table 2.*Summary of Neurocognitive Play Therapy*

Session	Sample game	Activity description	Objective
First	Introduction	Explaining group rules and conducting activities to establish communication between the therapist and children.	Establishing appropriate communication between the therapist and children.
Second	Animal puzzle game	The child is asked to complete the puzzle after observing the model. In the initial sessions, puzzles with simpler shapes and fewer pieces are presented.	Strengthening executive functions.
Third	Sit-and-stand game, direct and reverse	Children must immediately carry out the instructor's sudden instructions individually or in groups and then perform them in reverse.	Strengthening executive functions.
Fourth	Skill pattern	The instructor gives the child a skill designed as sequential cards, and the child must arrange each card according to the stages from beginning to end.	Strengthening executive functions.
Fifth		Word-card games, object displacement games, and mental retention games involving more words, numbers, and shapes within a specified time.	Strengthening executive functions.
Sixth	Balloon game	Number balloons and matching letter and number cards.	Strengthening working memory.
Seventh	Letter game	Searching in a letter table and using the letter table.	Strengthening working memory.
Eighth	Coding games	Finding numbers from a coded table, playing the "bring bread, take kebab" game, moving a bowl of water along a line, and learning how to reach a destination based on the researcher's instructions.	Strengthening working memory.
Ninth	Object memory game	Direct and reverse stepwise counting and using auditory techniques in the object memory game.	Strengthening working memory.
Tenth	Letter-writing game	Writing letters with several colors and writing without dots.	Strengthening working memory.
Eleventh	Session summary	In the final session, all previous sessions were summarized, integrated, and reviewed.	Reviewing the games.

Analysis

Data were analyzed in SPSS version 26 using mixed-design analysis of variance and Bonferroni-adjusted pairwise comparisons.

Findings and Results

The study included 45 boys: 15 in the Floortime group, 15 in the neurocognitive play therapy group, and 15 in the

control group. Mean age was 10.43 years ($SD = 1.45$) in the Floortime group, 10.63 years ($SD = 1.02$) in the neurocognitive group, and 10.47 years ($SD = 0.94$) in the control group. Descriptive statistics for memory function are presented in Table 3.

Table 3.*Mean and Standard Deviation of Memory Function at Pretest, Posttest, and Follow-Up*

Variable	Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Follow-Up Mean	Follow-Up SD
Memory function	Control	59.13	14.93	58.47	14.72	58.87	14.28
Memory function	Floortime play therapy	60.40	16.21	67.33	15.80	67.13	15.70
Memory function	Neurocognitive play therapy	59.27	13.45	66.93	19.34	66.87	19.78

Memory scores changed little across assessments in the control group. In contrast, both intervention groups showed higher scores at posttest and follow-up than at pretest. Before the mixed analysis of variance, distributional and variance assumptions were examined. Kolmogorov-Smirnov tests were nonsignificant ($p > .05$). Levene's tests

were also nonsignificant at pretest ($F = 0.186$, $p = .20$), posttest ($F = 1.105$, $p = .123$), and follow-up ($F = 1.33$, $p = .263$). Box's M test was nonsignificant (Box's $M = 29.73$, $F = 1.04$, $p = .32$). Because Mauchly's test indicated violation of sphericity, Greenhouse-Geisser corrections were used.

Table 4.

Mixed Repeated-Measures Analysis of Variance for Memory Function

Variable	Source of Effect	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Memory function	Group	270.93	2	135.47	0.838	0.440	0.038
Memory function	Time	580.84	1.69	344.46	18.59	<0.001	0.307
Memory function	Time $\times$ Group	361.16	3.37	107.09	5.78	<0.001	0.216

Note. Greenhouse-Geisser-corrected results are reported where applicable. $p < .05$ indicates statistical significance.

The main effect of time and the time $\times$ group interaction were significant (Table 4). The significant interaction indicated that changes in memory differed across groups.

Bonferroni-adjusted comparisons were therefore conducted to compare posttest performance while accounting for baseline scores.

Table 5.

Bonferroni Post Hoc Comparisons of Adjusted Posttest Memory Scores

Variable	Group	Adjusted Posttest Mean	Standard Error	Reference Group	Comparison Group	Mean Difference	p
Memory function	Floortime play therapy	47.16	1.43	Floortime play therapy	Control	5.94	0.017
Memory function	Neurocognitive play therapy	49.75	1.43	Neurocognitive play therapy	Control	8.52	<0.001
Memory function	Control	41.22	1.43	Floortime play therapy	Neurocognitive play therapy	-2.58	0.622

Note. $p < .05$ indicates statistical significance.

At posttest, adjusted memory scores were significantly higher in the Floortime group than in the control group (mean difference = 5.94, $p = .017$) and significantly higher in the neurocognitive play therapy group than in the control

group (mean difference = 8.52, $p < .001$). The difference between the two intervention groups was not significant (mean difference = -2.58, $p = .622$) (Table 5).

Table 6

Pairwise Comparisons of Memory Function Across Assessment Times

Variable	Group	Reference Time	Comparison Time	Mean Difference	p
Memory function	Floortime play therapy	Pretest	Posttest	-5.87	0.006
Memory function	Floortime play therapy	Pretest	Follow-up	-5.53	0.011
Memory function	Floortime play therapy	Posttest	Follow-up	0.33	0.718
Memory function	Neurocognitive play therapy	Pretest	Posttest	-8.27	<0.001
Memory function	Neurocognitive play therapy	Pretest	Follow-up	-7.13	<0.001

Memory function	Neurocognitive play therapy	Posttest	Follow-up	1.13	0.392
Memory function	Control	Pretest	Posttest	0.87	0.520
Memory function	Control	Pretest	Follow-up	-0.47	0.713
Memory function	Control	Posttest	Follow-up	-1.33	0.223

Note. $p < .05$ indicates statistical significance.

Within both intervention groups, posttest and follow-up scores were significantly higher than pretest scores. Posttest and follow-up scores did not differ significantly, indicating maintenance of gains over two months. No pairwise comparison reached significance in the control group (Table 6).

Discussion and Conclusion

This study compared Floortime play therapy and neurocognitive play therapy for improving memory function in children with ADHD. Both interventions produced significant gains relative to the control condition, and these gains were maintained at follow-up. The interventions did not differ significantly from one another, suggesting that each may offer a viable short-term route to improving working-memory performance.

The benefit of neurocognitive play therapy is consistent with evidence that structured working-memory and executive-function practice can produce near-transfer gains in ADHD (Hovik et al., 2013; Mawjee et al., 2017), while broader reviews caution that transfer to untrained outcomes is variable (Rapport et al., 2013). The present findings also accord with reports of improved memory after cognitive rehabilitation (Alimjon et al., 2023) and with evidence that combining neurofeedback with cognitive games can improve attention and working memory in children with ADHD (Moradi et al., 2022).

Floortime may support memory indirectly by improving emotional regulation, reciprocal engagement, and sustained participation in meaningful activity. Relationship-based interventions have been associated with gains in engagement and social communication (Casenhiser et al., 2013; Divya et al., 2023), while cognitive-behavioral play therapy has reduced impulsivity in young children with hyperactivity (Shaloui-Chaharpaniche & Esmaili, 2024). Although these studies address outcomes and populations that are not

identical to those examined here, they support the use of developmentally appropriate play as a vehicle for attention and self-regulation.

The similar outcomes of the two interventions may reflect convergence on shared mechanisms. Floortime emphasizes bottom-up regulation through affective engagement and reciprocal interaction, whereas neurocognitive play therapy emphasizes top-down practice of working-memory operations. Both approaches require active participation, sustained attention, feedback, and repeated practice, which may explain why each improved performance without one demonstrating clear superiority.

The findings should be interpreted in light of the small purposively selected sample, the inclusion of boys only, recruitment from two clinics in Tehran, reliance on a single memory measure, and the two-month follow-up. Future studies should use larger and more diverse samples, blinded outcome assessment, multiple measures of working memory and daily functioning, and longer follow-up periods. Comparative cost-effectiveness and moderator analyses may also help identify which children benefit most from each intervention.

Floortime play therapy and neurocognitive play therapy both improved working memory in children with ADHD, and the gains remained evident two months after treatment. Because neither intervention was superior, treatment selection may reasonably consider the child's developmental profile, preferences, clinical needs, and available resources.

Acknowledgments

The authors express their gratitude and appreciation to all participants.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

Parents and children received information about the study procedures, confidentiality, voluntary participation, and the right to withdraw. Written informed consent was obtained from parents or legal guardians, and children participated voluntarily.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently, with personal funding, and without financial support from any governmental or private institution or organization.

Authors' Contributions

All authors equally contribute to this study.

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