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The Effectiveness of Art Therapy on Psychomotor Skills and Visual Memory in Children with Learning Disabilities

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ABSTRACT

Learning disabilities can have extensive impacts on the social, psychological, and behavioral dimensions of children, leading to reduced attention, motivation, and self-esteem. This study aimed to determine the effectiveness of art therapy on psychomotor skills and visual memory in children with learning disabilities in Gilan Province. The study was a quasi-experimental design with a control group. The statistical population comprised children with learning disabilities in reading, writing, and spelling, aged 8 to 12 years, in Gilan Province during the 2024–2025 academic year. From this group, 32 children aged 8, 9, and 10 years were selected using convenience sampling and randomly assigned to experimental (n = 16) and control (n = 16) groups. The experimental group participated in 10 sessions of 60-minute art therapy, while the control group received no intervention. The assessment tools included the Lincoln-Ozeretsky Test of Psychomotor Skills (Lincoln & Ozeretsky, 1923) and the Kim-Carad Visual Memory Test (Kim & Carad, 1977), which provided precise measurement of children's psychomotor skills and visual memory. Data were analyzed using descriptive statistics and multivariate analysis of covariance (MANCOVA) in SPSS version 26. MANCOVA revealed that art therapy had a significant effect on psychomotor skills ($p = .002$, $F = 11.440$) in children, but no significant difference was observed in visual memory ($p = .07$, $F = 1.299$). These results align with previous studies and attention and focus models related to learning disabilities, indicating that art-based interventions can enhance children's motor abilities. This study demonstrates that art therapy effectively improves psychomotor skills in children with learning disabilities.

Keywords: Art therapy, learning disabilities, psychomotor skills, visual memory, children.

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Introduction

Learning disabilities (LDs) represent a significant global educational and clinical challenge, affecting approximately 5–15% of school-aged children worldwide and imposing profound socio-emotional, cognitive, and academic burdens (1, 2). These neurodevelopmental conditions, characterized by persistent difficulties in reading, writing, spelling, and mathematical reasoning, extend beyond academic domains to disrupt social integration, self-esteem, and psychological well-being (1, 2). Critically, LDs frequently co-occur with deficits in psychomotor skills and visual memory—foundational abilities essential for academic engagement, fine motor coordination, and information processing (3, 4). For instance, children with LDs often exhibit impaired visual-spatial attention, which correlates with difficulties in letter recognition, reading fluency, and mathematical problem-solving (3, 5). Similarly, compromised psychomotor skills—encompassing coordination, balance, and fine motor control—further hinder academic performance by limiting the capacity to engage in writing, drawing, and other classroom activities (4, 6). Despite these well-documented challenges, conventional interventions often prioritize academic remediation while neglecting the holistic development of motor and perceptual-cognitive capacities (7, 8).

The interplay between psychomotor development and cognitive functioning has been extensively documented in developmental neuroscience. Research indicates that visual-motor coordination serves as a critical mediator between perceptual processing and academic achievement, with deficits in this domain directly predicting reading and writing difficulties (4, 5). For example, children with dyslexia demonstrate significant impairments in visual-spatial integration, which manifests as challenges in tracking text, distinguishing letter reversals, and organizing written work (3, 5). Furthermore, visual memory—a component of working memory (9)—is consistently compromised in LD populations, affecting the retention and manipulation of visual information necessary for tasks like spelling, geometry, and diagram interpretation (3, 10). These deficits create a cyclical barrier: poor visual-motor coordination reduces engagement in academic tasks, which in turn exacerbates cognitive load and diminishes self-efficacy (11, 12).

Art therapy has emerged as a promising, evidence-based intervention for addressing these multifaceted challenges. Unlike traditional academic therapies, art therapy leverages creative expression to engage children's sensory-motor systems while simultaneously fostering cognitive and emotional processing (13, 14). The therapeutic process—through activities like drawing, sculpting, and collage—requires precise hand-eye coordination, spatial planning, and sustained visual attention, thereby directly targeting psychomotor and visual memory deficits (8, 13). Neuroscientific studies suggest that art-making activates neural networks involved in visuospatial processing, motor execution, and emotional regulation, creating a synergistic pathway for skill enhancement (15, 16). For instance, a systematic review by Martínez-Vérez et al. (2024) demonstrated that art therapy significantly improved visual-perceptual skills and executive functions in children with LDs, with effect sizes comparable to conventional occupational therapy. Similarly, Greenboim-Zimchoni (2025) reported that structured art therapy sessions enhanced visual attention and memory retention in children with specific LDs, mediated by increased engagement and reduced anxiety.

The efficacy of art therapy is further supported by its alignment with established theoretical frameworks. The *neuroconstructivist model* posits that skill acquisition occurs through the dynamic interplay of sensory input, motor output, and cognitive feedback (10, 15). Art therapy operationalizes this model by providing a structured yet flexible environment where children repeatedly practice visual-motor integration (e.g., tracing shapes, coloring within lines), thereby strengthening neural pathways for attention and memory (8, 13). Additionally, art therapy's emphasis on non-verbal expression aligns with *self-determination theory*, which emphasizes autonomy, competence, and relatedness as drivers of motivation (17, 18). Children with LDs often experience chronic academic frustration, leading to diminished motivation; art therapy restores agency by allowing them to demonstrate competence through creative tasks, thereby bolstering self-esteem and engagement (19, 20).

Despite growing evidence, critical gaps persist in the literature. Most studies on art therapy for LDs have focused on cognitive outcomes (e.g., reading, attention) while overlooking psychomotor and visual memory domains (21, 22). Furthermore, existing research predominantly involves Western populations, with limited studies in non-Western contexts where cultural and educational frameworks may influence intervention efficacy (17, 23). In Iran, where LD prevalence is estimated at 8.7% (24), art therapy remains underutilized in educational settings despite its potential to address culturally specific barriers to learning (e.g., emphasis on rote memorization over creative expression) (19, 24). The British Association of Art Therapy (2018) has emphasized the need for culturally adapted protocols, yet few studies have validated such adaptations in Middle Eastern contexts (25).

Recent systematic reviews underscore the urgency of this research. Martínez-Vérez et al. (2024) identified only 12 high-quality studies on art therapy for LDs across 15 years, with 75% conducted in Europe or North America. Similarly, Power et al. (2023) noted that 89% of art therapy interventions for LDs focused on emotional outcomes, neglecting motor-cognitive integration. This gap is particularly concerning given that psychomotor deficits are prevalent in 60–70% of children with LDs (5, 6). Without targeted interventions, these children face lifelong challenges in academic achievement and occupational functioning (1, 2).

The current study addresses these gaps through a rigorous quasi-experimental design focused on psychomotor skills and visual memory—domains frequently overlooked in LD interventions. Building on Lin and Wai's (2019) validation of art therapy for visual perception in LDs, this research operationalizes the Lincoln–Ozeretsky Psychomotor Skills Test (1923) and Kim-Carad Visual Memory Test (1977) to measure precise, objective outcomes. Crucially, it is the first to examine these outcomes in an Iranian context, accounting for cultural nuances in learning and therapeutic engagement (17, 23). By integrating neurocognitive theory (10, 15) with culturally responsive practice, this study advances the field beyond Western-centric paradigms.

Theoretical and practical implications are substantial. If art therapy significantly enhances psychomotor skills and visual memory, it could be integrated into school-based LD programs as a low-cost, scalable intervention. This would align with the British Association of Art Therapy's (2018) guidelines advocating for art therapy in educational settings to support holistic development (25). Moreover, the findings could inform policy shifts toward multidisciplinary LD management, moving beyond academic remediation to address the full spectrum of developmental needs (26, 27). For clinicians, the study provides evidence-based protocols for tailoring art therapy to specific deficits—such as using dynamic manual coordination exercises for handwriting difficulties or visual memory tasks for spelling challenges (8, 13).

In summary, learning disabilities impose multifaceted challenges that extend beyond academic deficits to encompass psychomotor and visual memory impairments, which are rarely addressed in conventional interventions. Art therapy offers a theoretically grounded, culturally adaptable solution that targets these overlooked domains through neurologically informed creative processes. Despite promising evidence from Western contexts, critical gaps remain in cross-cultural validation and domain-specific efficacy. This study directly addresses these gaps by rigorously evaluating art therapy's impact on psychomotor skills and visual memory in Iranian children with LDs, thereby contributing to a more inclusive, evidence-based approach to LD management.

Methods and Materials

Study Design and Participants

This study was conducted as an applied research with a quasi-experimental design and a control group. The statistical population comprised all children with learning disabilities in reading, writing, and spelling, aged 8 to 12 years in Gilan Province, who had visited learning disability centers in the province during the 2024–2025 academic year and had received a formal diagnosis of learning disability. From this population, 32 children with learning disabilities aged 8, 9, and 10 years were selected using convenience sampling and randomly assigned to experimental (n = 16) and control (n = 16) groups.

Inclusion criteria for the study: willingness to participate in the research, a diagnosis of learning disability (reading, writing, spelling) by a relevant specialist, absence of any severe psychological or physical disorders that could interfere with the research process, and age between 8 and 12 years.

Exclusion criteria from the study: inability or unwillingness to cooperate in the research, withdrawal from completing questionnaires, failure to participate in art therapy sessions, and concurrent enrollment in other educational programs.

Data Collection

Lincoln–Ozeretsky Psychomotor Skills Test: In this study, the Lincoln–Ozeretsky Test of Psychomotor Skills (Lincoln & Ozeretsky, 1923) was used to assess participants' status in the pretest and posttest. This test is a revised version of the Brunink–Ozeretsky Motor Ability Scale, originally designed by Russian psychologist Ozeretsky in the late 19th century for ages 4 to 16. After multiple revisions, the scale was updated by Sloan in 1950, reducing the number of items from 49 to 36, resulting in the Lincoln–Ozeretsky Test of Psychomotor Skills. The test is administered individually and is suitable for ages 5 to 14. It consists of six subscales:

(1) General Static Coordination (GSC): This subscale addresses the ability to maintain balance and control the body in a static position. Test items include standing on one foot, standing on both feet with eyes closed, standing on one foot with eyes closed, standing on toes with eyes open, standing on toes with eyes closed, and maintaining balance of a stick across the index finger and vertically on a chair.

(2) General Dynamic Coordination (GDC): This subscale focuses on balance movements during motion, such as walking, jumping, and turning. Test items include walking backward with heels together, hopping on toes with eyes closed, jumping over a rope, jumping and turning 180 degrees, winding thread around a spool while walking, jumping and touching the heel with the same-side hand, and jumping while slapping the palms.

(3) Dynamic Manual Coordination (DMC): This subscale emphasizes precise and fine hand and finger movements during motion. Test items include touching the nose with the finger with eyes closed, touching the tips of the fingers (thumb to other fingers), bilateral dotting at speed, catching a ball, forming a ball with fingers, winding thread around a spool with dominant and non-dominant hands, tracing a circle in space with fingers, placing matches simultaneously in a box, drawing a line, cutting a circle with scissors, placing coins in a box, and navigating a maze with a pencil.

(4) Movement Speed (MS): This subscale evaluates an individual’s ability to perform rapid movements. Test items include rapid tapping (dotting) and quickly opening and closing the hands.

(5) Symmetrical Simultaneous Voluntary Movements (SSVM): This subscale focuses on symmetrical bilateral movements performed simultaneously. Test items include rhythmic foot and finger tapping in coordination with the hands, alternating hand opening and closing at speed, simultaneous tapping with feet and fingers, and tapping with feet while tracing a circle with fingers.

(6) Asymmetrical Asynchronous Voluntary Movements (AAVM): This subscale assesses the ability to perform different and asynchronous movements on both sides of the body. Test items include precise finger-tapping, asynchronous movement of fingers, winding thread around a spool with dominant and non-dominant hands, simultaneous movement of coins and matches, placing matches simultaneously in a box, winding thread around a spool while walking, throwing a ball with hand-foot coordination, and arranging matches with different hand movements.

In this study, four test items were included in multiple subscales due to the nature of the movements and skills being assessed, which involve multiple aspects of coordination. Specifically:

1. Item 5 (touching finger tips) appears in both the "Dynamic Manual Coordination (DMC)" and "Asymmetrical Asynchronous Voluntary Movements (AAVM)" subscales, as this movement requires both fine coordination during dynamic activities and the ability to perform different and asynchronous movements with both hands.
2. Item 14 (winding thread around a spool) is classified under both "Dynamic Manual Coordination (DMC)" and "Asymmetrical Asynchronous Voluntary Movements (AAVM)" because this complex movement requires simultaneous use of dominant and non-dominant hands and assesses both dynamic coordination and the ability to perform simultaneous and asynchronous hand movements.
3. Item 20 (placing matches simultaneously in a box) is included in both "Dynamic Manual Coordination (DMC)" and "Asymmetrical Asynchronous Voluntary Movements (AAVM)" because this activity requires precise control of both hands simultaneously but with different movements, thereby covering both aspects of coordination.
4. Item 21 (winding thread around a spool while walking) is placed in both "General Dynamic Coordination (GDC)" and "Asymmetrical Asynchronous Voluntary Movements (AAVM)" because this complex movement requires simultaneous coordination of hand and foot movements during motion, thus assessing both dynamic and asynchronous coordination.

Scoring for each item ranges from 0 to 3, with scoring methods varying based on the number of repetitions: some items are performed once, with a score of 3 for success and 0 for failure (e.g., touching the nose with a finger or rhythmic foot and finger tapping); some items are repeated twice, with a score of 3 for success on the first attempt, 2 for success on the second, and 0 for failure on both attempts (e.g., standing on one foot); some items are repeated three times, with scores of 3, 2, and 1 for success on the first, second, and third attempts, respectively, and 0 for failure on all three attempts (e.g., alternating hand opening and closing). At the end, all item scores are summed, with a maximum possible score of 159. Based on the percentile tables provided in the Lincoln–Ozeretsky Test manual for males and females, each participant’s total score is converted to a percentile score according to gender and age. This percentile score indicates how the participant's performance compares to 99% of their peers in the normative sample. The overall reliability coefficient for this test was reported as 96% for boys and 97% for girls (30).

Kim-Carad Visual Memory Test: The Kim-Carad Visual Memory Test (Kim & Carad, 1977) was designed to assess various dimensions of visual memory. In this test, error score is considered an indicator of memory weakness, such that the more negative the score, the better the individual's memory is assessed. Error score is calculated using the formula: (incorrect responses + half-incorrect responses) – possible correct responses = memory score (20). Additionally, the raw correct score, indicating the number of correctly placed pieces, is used to determine the level of memory performance. Based on the test's normative table, memory performance is categorized into three levels: weak, average, and strong. This test evaluates three types of memory: immediate (short-term), complete (mid-term), and accuracy (long-term) memory. The test consists of a cardboard sheet with 20 colored images, some of which are similar in color, shape, and orientation. It also includes a blank 20-cell white sheet and 20 cardboard pieces, each containing one of the images from the original sheet. The test is administered in three phases:

Phase 1: The participant views the geometric images for one minute, after which the sheet with images is removed, and the participant attempts to recall the direction and position of each image on the blank sheet using matching cards.

Phase 2: Similar to Phase 1, the participant views the images for another minute and attempts to recall their direction and position.

Phase 3: The participant attempts to fully recall the direction and position of all geometric images learned.

Scoring method: Each correct direction and position earns a full point (1), an incorrect response earns 0, and a correct position but incorrect direction earns half a point (0.5). The reliability of this test has been reported in various studies using Cronbach's alpha coefficient ranging from .78 to .88. Additionally, this test has been validated in Iran, with results indicating appropriate validity and reliability for this tool.

Intervention

The 10-session art therapy intervention protocol for children with learning disabilities systematically integrates structured creative activities targeting psychomotor skills, visual memory, and emotional regulation through culturally adapted, evidence-based exercises. Each 60-minute session employs three sequential activities: Session 1 focuses on Line Magic (enhancing eye-hand coordination and detail attention through free-form line drawing), Storytelling (developing emotional expression and narrative skills), and Name Painting (strengthening fine motor control and self-identity); Session 2 introduces Word Ball Game (improving visual-motor integration and vocabulary), Geometric Creature Creation (fostering spatial organization and creativity), and What's Missing? (boosting visual memory and attention); Session 3 features Word Puzzle (expanding vocabulary and problem-solving), Color Paper Craft (refining fine motor skills and color composition), and Color Path Walking (enhancing body-mind coordination and spatial awareness); Session 4 emphasizes Happy/Sad Dolls (cultivating emotional awareness), Brush and Watercolor Art (developing visual precision and stress reduction), and Color Obstacle Course (strengthening reaction speed and motor planning); Session 5 includes Clay Play (building fine motor control and emotional expression), Mandala Coloring (increasing focus and symmetry perception), and Memory Card Matching (enhancing visual recall); Session 6 incorporates Colorful Storytelling (merging verbal and visual creativity), Clay Sculpting (refining motor precision and memory), and Mental Path Game (strengthening visual pattern reconstruction); Session 7 features Twig Sculpture (developing fine motor skills and creative satisfaction), Colored Pencil Drawing (enhancing emotional expression and detail focus), and Ant and Elephant Game (improving gross motor coordination and short-term memory); Session 8 includes Secret Card Magic (boosting visual memory and attention), Puppet Show (fostering social-emotional skills), and Nature Material Art (connecting with nature through tactile creativity); Session 9 consists of Collage (integrating visual composition and emotional expression), Group Hand Drawing (cultivating collaborative creativity), and Final Class Reflection (reinforcing learning through verbalization); Session 10 concludes with a culminating Group Art Project to consolidate gains. Each activity explicitly targets eye-hand coordination, fine motor precision, visual memory, emotional regulation, and cognitive processing while incorporating culturally resonant elements (e.g., Persian-inspired patterns in mandalas and clay work) to maximize engagement and therapeutic relevance within Iranian educational contexts.

Data Analysis

For data analysis, descriptive statistics including mean and standard deviation were initially used to describe demographic characteristics and research variables. Subsequently, the Kolmogorov–Smirnov test was employed to assess the normality of data distribution, and Levene's test was used to measure variance homogeneity. Analysis of covariance (ANCOVA) was utilized to compare the mean scores of the experimental and control groups in the posttest, controlling for pretest scores. All statistical analyses were conducted using SPSS version 26.

Findings and Results

The results showed that in the experimental group, 9 individuals (56.3%) were 8 years old, 5 individuals (31.3%) were 9 years old, and 2 individuals (12.5%) were 10 years old. The mean age of the experimental group was 8.56 years. Similarly, in the control group, 9 individuals (56.3%) were 8 years old, 4 individuals (25.0%) were 9 years old, and 3 individuals (18.8%) were 10 years old. The mean age of the control group was 8.62 years.

The independent t-test results indicated no significant difference between the two groups ($p = .08$).

The results also showed that in the experimental group, 9 individuals (56.3%) were female and 7 individuals (43.7%) were male, while in the control group, 6 individuals (37.5%) were female and 10 individuals (62.5%) were male.

Regarding mothers' education levels, in the experimental group, 8 individuals (50.0%) had education below diploma, 5 individuals (31.3%) had a diploma, and 3 individuals (18.8%) had a bachelor's degree. In the control group, 11 individuals (68.8%) had education below diploma, 3 individuals (18.8%) had a diploma, and 2 individuals (12.5%) had a bachelor's degree.

The results also show that in the experimental group, 6 individuals (37.5%) had education below diploma, 9 individuals (56.3%) had a diploma, and 1 individual (6.3%) had a bachelor's degree. In the control group, 10 individuals (62.5%) had education below diploma, 5 individuals (31.3%) had a diploma, and 1 individual (6.3%) had a bachelor's degree.

Table 1. Descriptive statistics for psychomotor skills and visual memory variables in experimental and control groups at pre-test and post-test.

Variable	Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)
Psychomotor Skills			
General Static Coordination	Experimental	12.19 ± 1.60	12.43 ± 1.79
	Control	12.31 ± 1.96	11.06 ± 2.05
General Dynamic Coordination	Experimental	10.00 ± 1.21	11.10 ± 1.21
	Control	11.06 ± 2.52	11.12 ± 2.39
Dynamic Manual Coordination	Experimental	32.32 ± 4.47	34.81 ± 5.39
	Control	30.06 ± 4.96	28.69 ± 4.73
Movement Speed	Experimental	3.00 ± 2.26	3.75 ± 2.27
	Control	1.94 ± 2.12	2.06 ± 2.23
Symmetrical Simultaneous Movements	Experimental	5.62 ± 2.28	6.25 ± 2.55
	Control	4.37 ± 2.87	4.44 ± 3.01
Asymmetrical Asynchronous Movements	Experimental	11.25 ± 1.18	11.25 ± 1.18
	Control	12.81 ± 1.60	11.12 ± 1.71
Total Psychomotor Score	Experimental	74.06 ± 10.39	78.56 ± 12.24
	Control	72.55 ± 12.93	68.44 ± 12.96
Visual Memory			
Immediate Memory	Experimental	3.62 ± 1.26	5.51 ± 2.42
	Control	3.69 ± 1.71	3.94 ± 1.57
Complete Memory	Experimental	8.37 ± 2.16	8.36 ± 3.008
	Control	6.87 ± 2.56	8.31 ± 2.39
Accuracy Memory	Experimental	9.50 ± 1.32	8.44 ± 1.59
	Control	9.50 ± 1.36	10.19 ± 1.26
Total Visual Memory Score	Experimental	21.49 ± 5.18	22.31 ± 4.91
	Control	22.06 ± 5.93	22.44 ± 2.68

Table 1 summarizes pre-test and post-test descriptive statistics for psychomotor skills (six subscales and total) and visual memory (three subscales and total) across experimental and control groups. The experimental group demonstrated a 4.50-point increase in total psychomotor skills (from 74.06 to 78.56) compared to a 4.11-point decrease in the control group (from 72.55 to 68.44), while visual memory scores showed minimal change in both groups (experimental: 21.49 → 22.31; control: 22.06 → 22.44).

The assumptions for the analysis of covariance (ANCOVA) were verified through the Kolmogorov-Smirnov test for normality of residuals and Levene's test for homogeneity of variances, both confirming that the data met parametric analysis requirements ($p > .05$), thereby supporting the validity of the ANCOVA results used to compare post-test means between the experimental and control groups while controlling for pre-test scores.

Table 2. Multivariate analysis of covariance (MANCOVA) results between groups.

Effect	Dependent Variable	Sum of Squares	df	Mean Square	*F*	*p*
Group	Psychomotor Skills	103.065	1	103.065	11.440	.002
	Visual Memory	673.350	1	673.350	1.299	.070
Error	Psychomotor Skills	243.239	27	9.009	—	—
	Visual Memory	156.387	27	5.792	—	—
Total	Psychomotor Skills	178.458	32	—	—	—
	Visual Memory	226.500	32	—	—	—

The multivariate analysis of covariance revealed a statistically significant effect of the experimental group on psychomotor skills ($F(1, 27) = 11.440$, $p = .002$, $\eta^2 = 0.278$), with a sum of squares of 103.065 and mean square of 103.065, while no significant effect was observed for visual memory ($F(1, 27) = 1.299$, $p = .070$, $\eta^2 = 0.045$), with a sum of squares of 673.350 and mean square of 673.350. The error terms for psychomotor skills (sum of squares = 243.239, mean square = 9.009) and visual memory (sum of squares = 156.387, mean square = 5.792) were consistent with the within-group variance, confirming the model's validity for comparing post-test outcomes while controlling for pre-test scores.

Discussion and Conclusion

The present study demonstrated a statistically significant improvement in psychomotor skills among children with learning disabilities following art therapy intervention, as evidenced by the multivariate analysis of covariance (MANCOVA) results ($F(1, 27) = 11.440$, $p = .002$). The experimental group exhibited a mean increase of 4.50 points in total psychomotor skills (from 74.06 to 78.56), while the control group showed a marginal decline (from 72.55 to 68.44). This finding aligns with the neuroconstructivist framework, which posits that structured creative activities strengthen neural pathways for visuospatial processing and motor coordination (10, 15). Art therapy's emphasis on repetitive, goal-directed tasks—such as tracing shapes, manipulating clay, and precise hand-eye coordination during drawing—directly targets the dynamic manual coordination and movement speed domains, which showed the most substantial gains (e.g., Dynamic Manual Coordination: +4.49 points; Movement Speed: +0.75 points). These results corroborate Lin and Wai's (2019) findings that art therapy significantly enhances visual-motor integration in children with learning disabilities, with effect sizes comparable to occupational therapy interventions (8). Similarly, Ko and Thomson (2019) documented that art-based activities improved fine motor control and bilateral coordination in LD populations, attributing this to the therapeutic activation of sensorimotor networks during creative expression (13).

Conversely, no significant improvement was observed in visual memory ($F(1, 27) = 1.299$, $p = .07$), with both groups showing minimal change in total visual memory scores (experimental: 21.49 → 22.31; control: 22.06 → 22.44). This null finding contrasts with some Western studies but aligns with Power et al.'s (2023) systematic review, which noted that art therapy primarily enhances emotional and social outcomes rather than cognitive domains like visual memory in LD populations (20). The lack of visual memory improvement may stem from the intervention's duration (10 sessions) being insufficient to alter deeply ingrained memory processing patterns, as suggested by Facoetti et al. (2010), who emphasized that visual memory deficits in LDs require sustained, multi-modal interventions (3). Additionally, the Kim-Carad Visual Memory Test's focus on immediate and short-term recall may not capture the nuanced, long-term memory consolidation that art therapy could facilitate through emotional engagement (10). This aligns with Martínez-Vérez et al.'s (2024) observation that visual memory improvements in art therapy studies are often inconsistent and context-dependent, particularly when interventions prioritize emotional expression over cognitive training (16). The cultural context of this study may also play a role: Iranian educational systems emphasize rote memorization over visual-spatial learning, potentially limiting the transfer of art therapy benefits to standardized visual memory tasks (23).

The dissociation between psychomotor and visual memory outcomes underscores the domain-specific nature of art therapy's efficacy. While art therapy's motor-intensive activities directly engage and strengthen psychomotor pathways, its impact on visual memory may require complementary strategies—such as integrating visual memory exercises (e.g., pattern recognition, spatial sequencing) into art tasks—to yield measurable cognitive gains. This is consistent with Baddeley's (2012) model of working memory, which posits that visual memory relies on distinct subsystems that may not be fully activated through art therapy alone (9). The study's results thus support the *neuroconstructivist* perspective that skill acquisition is domain-specific and requires targeted interventions (15). Critically, the significant psychomotor gains observed here validate art therapy as a viable, low-cost intervention for addressing motor deficits in LD populations—a gap previously overlooked in Iranian educational settings (19).

This study's limitations warrant careful consideration. First, the small sample size (n = 32) and convenience sampling method—recruiting participants from a single province—limit generalizability to broader Iranian populations or diverse cultural contexts. Second, the 10-session intervention duration may have been insufficient to induce measurable changes in visual memory, which typically requires longer-term, multi-faceted approaches (16). Third, the absence of a long-term follow-up assessment prevents conclusions about the durability of psychomotor skill improvements. Fourth, while the Lincoln–Ozeretsky and Kim-Carad tests are validated tools, their Persian adaptations may not fully capture cultural nuances in motor and memory performance, potentially introducing measurement bias. Finally, the study did not control for concurrent educational interventions (e.g., speech therapy or occupational therapy), which could have confounded results.

Future studies should address these limitations through larger, multi-center trials across diverse Iranian regions to enhance external validity. Longitudinal designs tracking participants for 6–12 months post-intervention would clarify whether psychomotor gains persist and whether visual memory improvements emerge with extended engagement. Researchers should also integrate neuroimaging (e.g., fMRI) to observe neural correlates of art therapy's effects on visuospatial networks, building on Strang's (2024) call for neuroscience-informed art therapy research (15). Crucially, future work must develop culturally adapted art therapy protocols tailored to Iranian educational values—such as incorporating Persian calligraphy or miniature painting—to maximize engagement and relevance. Comparative studies should also examine whether combining art therapy with targeted visual memory exercises (e.g., memory games during art creation) yields synergistic benefits for both domains. Finally, research should explore art therapy's impact on comorbid conditions like ADHD, which frequently co-occurs with LDs and may influence motor-cognitive outcomes (11).

Schools should integrate brief, structured art therapy sessions (15–20 minutes daily) into classroom routines to target psychomotor development without disrupting academic schedules. Teachers can be trained in simple, low-cost art activities—such as clay modeling, tracing, and collage-making—that directly strengthen hand-eye coordination and fine motor skills. For children with pronounced visual memory challenges, educators should pair art tasks with explicit memory strategies (e.g., "visualizing the next step before drawing") to bridge the gap between motor and cognitive gains. School counselors should collaborate with art therapists to develop culturally resonant art therapy programs that incorporate Iranian artistic traditions, fostering both skill development and cultural identity. Crucially, these interventions should be implemented as part of a holistic LD support framework—not as standalone solutions—ensuring alignment with existing academic and behavioral interventions. Finally, policymakers should allocate resources for teacher training in art-based motor skill development, recognizing its potential to reduce long-term academic and social barriers for children with learning disabilities.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

This article is derived from the master's thesis of the first author at the Lahijan branch, Islamic Azad University, Lahijan, Iran, and has been approved by the Research Ethics Committee of Islamic Azad University, Lahijan Branch, with ethics code IR.IAU.LIAU.REC.1404.047.

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.

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