International Journal of Applied Behavioral Sciences **2021; Vol. 8, Fall, 27-34**
DOI: 10.22037/ijabs.v8i3.33684 **Online ISSN: 2423-5253**

Original Article

The Effect of Art Therapy on Motor Skills of Children with Autism

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Received: 8 November, 2021; Revised: 1 December, 2021; Accepted: 15 December, 2021

Abstract

Background and Aim: Autism spectrum disorder is the most common behavioral disorder in children that is associated with communication deficits and stereotyped behaviors. This study aimed to determine the effectiveness of art therapy on the motor skills of children with autism.

Materials and Methods: The research method was quasi-experimental with pre-test, post-test and a control group. The statistical population of the study included preschool and elementary school students in Tehran in 1395-96 school year. Among them, 30 children with autism were selected by purposive sampling and randomly assigned into experimental and control groups. Data collection tools were the Gilliam Autism Rating Scale (Garz) and the Lincoln-Ozertsky Motor Skills Test. Painting-based art therapy was performed in 18 sessions of 20 minutes for the experimental group. Data analysis was performed by analysis of covariance.

Results: The results showed that art therapy affected fine motor skills, the balance and flexibility of the joints ($P<0.001$).

Conclusion: According to the findings, art therapy can improve motor skills in these children by reducing stereotyped movements and coordinating hand and finger movements.

Keywords: Autism spectrum disorder, Fine motor skills, Gross motor skills, Art therapy

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Please cite this article as: Sabet S, Gholami Heidar Abadi Z. The Effect of Art Therapy on Motor Skills of Children with Autism. Int. J. Appl. Behav. Sci. 2021;8(4):27-34.

Introduction

Autism Spectrum Disorder (ASD) has increased over the last two decades. (1). The prevalence of autism spectrum disorder is currently estimated to be 1 out of 88children. According to available statistics in Iran, the prevalence of autism is 6.26 per 10,000 children (2).

Autism spectrum disorders are classified in the group of neurodevelopmental disorders (3). Neurodevelopmental disorders are a set of conditions that interfere with individuals' social, emotional, educational, and/or occupational functioning, beginning in the developmental period (4). Abnormal motor functioning, motor deficiencies, impaired fine motor skills, and inflexibility are some of the features associated with autism spectrum disorder (3). The main features of autism spectrum disorder include deficits in

communication, social interaction, repetitive and stereotypic behaviors, and delayed language skills. (4). These symptoms usually appear before the age of three and limit child's daily functioning (2). Boys are four times more likely to develop this disorder than girls (1). The first signs of autism may be in the form of repetitive and stereotyped movements such as, fluttering, moving the fingers in front of the eyes, inattentive behaviors, resistance to change, limited and specific interests, hypersensitivity or hyposensitivity to stimuli (5). Signs of autism may also appear as a delay in communication, which is the first sign that parents report (6).

Significant developmental delays in motor skills are among the most common problems in children with autism spectrum disorder, which can cause difficulties in learning and acquisition of individual skills of the child, including gross and fine motor skills,perceptual-motor skills, eye and hand coordination. (7, 8). These skills are the basis of academic learning. For example, learning to write, requires motor skills, motor planning, fine motor coordination, and eye-hand coordination (9). Motor skills allow the child to gain more control over his or her living environment (10). Autism spectrum disorder is usually associated with a general deficiency in planning and performing purposeful movements (11). Findings have shown a direct relationship between motor skills deficits and the severity of autism. (12).

Art therapy is a form of expressive therapy that uses the creative process of making art to improve a person's physical, mental, and emotional well-being (13). Art therapy is ideally suited for addressing sensory processing disorder, a pervasive problem associated with autism that contributes to emotional difficulties and problem behaviors. The art therapist communicates with children with autism to help them overcome their isolation, cope with their sensory issues and emotional dysregulation (14, 15). Therefore, this process can lead to an increase in self-esteem among affected children. The use of different colors, chalk pastels, or sculptures with clay and pottery involves tactile stimulation which can improve tactile processing and increase these children's attention (16).

The first tool of art therapy is painting, and it is a window to the use of other arts (17). In many complex developmental disorders, such as autism spectrum disorders, painting can improve communication, social interactions, and stereotypic behaviors (18). Fine motor skills include directional, distinct, precise, and skillful movements that require the use of small, delicate muscles (20). Delicate activities require coordination between the eyes and physical movements (21). Fine motor coordination is directly related to the growth and development of the hand's small muscles, which are used to perform tasks such as writing, drawing, threading, mounting beads, and scissors (22). Moghadam (14) research showed that creative art therapy, including painting, music, and pottery, could help in reducing some of the symptoms associated with. Another finding showed that art therapy could contribute to more psychological flexibility, better self-image, and improved communication and learning skills in children with autism (16). Conventional art therapy elements such as, sensory engagement with sight and touch may improve social behavior, flexibility, and attentive behaviors of children with autism (23).

Therefore, according to studies on art therapy and its effect on the symptoms of autism spectrum disorders, the present study seeks to examine whether painting-based art therapy can improve fine and gross motor skills among affected children.

Methods

The present study was quasi-experimental with pre-test, post-test and a control group. The study's statistical population included preschool and elementary school students diagnosed with autism spectrum disorder in Tehran. By purposive sampling method, 30 students were identified as having autism spectrum disorder and with motor disabilities; They were randomly selected in the experimental and the control groups (15 people in each group). Inclusion criteria wereage range of 6 to 12 years, moderate socio-economic status of the family, delayed learning skills associated with autism. Also, with autism spectrum disorder according to the cut-off score of Garz questionnaire (score 85 or more = probability, score 52-84 = average chance and score 52 or less = unlikely) and have a motor impairment according to Lincoln-Ozertsky questionnaire score (from 0 to 159). Exclusion criteria included other

Table 1: Content of painting-based art therapy sessions (27)

Session	Title Sessions	Content Sessions	Objectives
1	Warming: The first session with the subjects was done with an A4 paper and a crayon.	Main exercise: Painting with contrasting colors. For the main exercise, three shapes of triangle, square, and circle were drawn by the tester. The children painted with contrasting colors (green-red), (yellow-purple), (blue, orange), (black-white) (to increase Attention and Focus and to improve stereotyped and repetitive interests, and establishing optimal communication with the examiner in the first session).	1) Increasing the Attention and focus of the subjects 2) Improving stereotyped and repetitive interests in them 3) Establishing optimal relationships with the examiner. 4) To strengthen the fine motor skills of the hands
	Warming: Tearing the paper and crumpling it, and then the subjects were asked to throw the crumpled paper in the trash.	Basic Exercise: Copy simple to complex images Step 1: Draw jumbled lines without restrictions; Step 2: Line with crayons; Step 3: Purposefully draw lines together and create simple geometric shapes; Step 4: Give the kid or the two geometric shapes of the rat to pull together and combine them.	1) Increase understanding of spatial relationships; 2) Improve social; interaction with peers; 3)Increase attention and focus; 4) Increase motivation
3	Warming: Tearing and crumpling paper. Main exercise: working with pottery	Rolling the dough and then pressing the fingers into it and creating a shape like a cup helps to target the movements of the hands and fingers of autistic children and reduce stereotyped movements. This step is called the finger or push method. Subjects were then asked to place the dough on the pastry molds and press and flatten all the parts with a finger.	1)Increase understanding of spatial relationships; 2) Increase Attention and concentration 3) Improve social interaction with peers; 4) Improve interpersonal communication; 5)Increase motivation; 6) Target hand and finger movements and reduce stereotyped movements 7) Reduce sensory defense (touch)
	Warming: Stripping on paper with colored pencils. Main exercise: making handicrafts.	Watercolor painting (drawing a tree) and cutting it with scissors and sticking cotton (fruit on the tree) and then painting the fruits.	1) Increase Attention and concentration 2) Improve the movements of the hands and fingers 3) Reduce stereotyped movements in the hands and fingers 4) Emotional evacuation 5) Improve interpersonal communication 6) Reduce tactile (sensory) defense 7) Increase creativity.
5	Warming: Spool the thread.	Main exercise: 1)Cut lines with scissors 2)Practice stains and paint The main exercise: 1) Draw vertical and horizontal lines on the paper and then cut them from the lines with scissors. 2)Practice stains and paint (brushing in watercolor and tapping on paper) and painting the ball drawn by the tester.	1) Target behaviors 2) Improve stereotyped hand movements 3) Reduce tactile defense 4) Eye contact 5) Increase Attention and concentration.
	Warming: throw the ball. Main exercise: Impact and purposeful coloring.	The examiner mounted a large piece of paper on the wall and drew a large circle. The subjects were asked first to remove the brush from the table and then dip it into the gouache paint and then tap inside the process and not outside it with a brush (increase attention and Focus).	1) Improve eye contact 2) Increase attention and concentration 3) Increase eye-hand coordination 4) Improve target behaviors 5) Visual perception 6) Visual memory.
	Warming: Throwing the ball between the subject and the examiner. The main exercise: coloring in the form of a	Subjects were asked to pick up the brush and turn it around, then dip it into the paint and tap on the paper on the table. It was slowing down.	1) Improve eye contact 2) Increase attention and concentration 3) Increase eye-hand coordination 4) Improve target behaviors 5) Visual perception 6) Visual memory.

	beat in harmony with hearing slow and fast rhythms.		
8	Warming: Ball game tester and subjects. The main exercise: making a collage.	In this way, the subjects were shown the photos of the magazines, and they chose each of the images that the children liked, then they cut the image with scissors and glued it on the cardboard paper, and then with the watercolor of each painting that They wanted to add to the college (even tapping with a brush)	1) Improve fine motor skills of hands and fingers 2) Reduce stereotyped movements 3) Increase attention 4) Improve interpersonal communication 5) Discharge emotions 6) Increase self-confidence.
9	Warming: Twisting the thread around the spool. Main exercise: Music practice - painting.	In this way, happy music (due to the negative emotions and sometimes the isolation of children with autism spectrum disorders, a piece of music with a comfortable rhythm and melody) was played for the subjects, and they were asked to close their eyes and each The painting they want to draw (with crayons and watercolors). For those who did not know how to draw, the model was drawn to paint or draw on the model.	1) Improve interpersonal communication 2) Enhance eye contact 3) Improve verbal communication 4) Increase attention and concentration 5) Discharge emotions 6) Improve mental image

disorders such as blindness, deafness, motor disability, and cerebral palsy.

The experimental group underwent an art therapy intervention while the control group did not receive any intervention. Immediately after one month of intervention, participants' symptoms in the experimental and control groups were Written consent was obtained from participants' parents. They were informed about the purpose of the research prior to the study. The personal information of the volunteers was protected.

Materials

The Gilliam Autism Rating Scale (GARS)

The Gilliam Autism Rating Scale (GARS) was developed by Gilliam in 1995. GARS is a measurement tool for the assessment of autism and estimating its severity. The GARS gathers information about specific characteristics typically noted in children with autism spectrum disorders in three areas (Stereotyped Behaviors, Communication, and Social Interaction). This scale has three categories of 14 questions, and the score of each question is between 0 and 3. High scores indicate the severity of the disorder, and low scores indicate its mildness (24). Studies have shown an alpha coefficient of 0.90 for stereotyped behaviors, 0.89 for communication, 0.93 for social interaction, 0.88 for developmental disorders, and 0.96 for autism semiotics. The validity of the test has also been confirmed by comparison with other autism diagnostic tools. In Iran, the reliability of this scale was confirmed with a Cronbach's alpha coefficient of 0.89 (25).

Lincoln-Ozertsky Motor Skills Test

Ozertsky designed the Lincoln-Ozertsky Motor Skills Scale to assess the motor ability of children ages 5 to 14 years. This scale has four subscales of gross motor skills, fine motor skills, balance, and flexibility.Also, 36 itemsto measures various motor skills such as finger skills, eye, and hand coordination. Although this scale's primary purpose is to assess motor development, other information such as social, emotional, and physical development can also be obtained. This test's reliability was obtained through Cronbach's alpha and its validity by correlating the score of subscales with the total score of the trial, 0.73 and 0.82, respectively. A study (26) found this test to be standard; in Iran, its validity and reliability have been reported as 0.99 and 0.88, respectively.

Procedure

After obtaining the necessary permission and coordination with the school principal and the relevant teachers, an art therapy program based on painting therapy was implemented on the experimental group subjects. This research was conducted by SepidehSabet for 18, one on one sessions of 40 minutes three days a week in Mehrvarzi religion school. After the parents'

consent, a painting-based art therapy program was performed for the members of the experimental group. The control group participated in the regular school programs, including math and Persian exercises. The art therapy program consisted of two parts: warming exercises and core exercises for each session. Painting-based art therapy intervention was from the book "Introduction to Family-Based Art Therapy and Children with Autism Spectrum Disorders" by Dr. KavehMoghadam (27), a member of the Canadian Art Therapy Association. Data were analyzed by analysis of covariance and SPSS 22.

Results

The highest age group of children were 9 years old and 12 years old with 28.3% and the lowest age group was 7 years, 10 years and 11 years old with 14.3%. The software used in this section is SPSS 22. The mean and standard deviation of the data are reported in Table 2 .

According to the table above results and a comparison with the score description table in the pre-test stage, there is a large difference between the means of the dependent variables of the experimental and control groups in the post-test phase.

Analysis of covariance was used to test the research hypotheses. The results of the Shapiro-Wilk test show that the research variables have a normal distribution. In the assumption of homogeneity analysis of variances, the results of the Levin test confirmed this hypothesis. Assuming the homogeneity of covariances, the M-box index showed the equality of covariance matrices of dependent variables between

groups. After examining the assumptions of multivariate analysis of covariance, the results of this test showed that there was a significant difference between the two groups in the dependent variables (Wilk's Lambda = 0.066, $F_{(4, 21)}$ = 74.45, P <0.001). Univariate analysis of variance was performed to evaluate which of the dependent variables were significantly different from the experimental and control groups.

According to Table 3, F statistics are significant for the

Table 2: Scores of motor skills in the experimental and control groups.

		Pre-test		**Pot-test**	
Variable	**group**	**M**	**SD**	**M**	**SD**
Fine motor skills	Control	10.00	1.41	6/60	1.99
	Experiment	9.93	2.24	19.93	4.78
Gross motor skills	Control	4.20	2.36	4.53	1.88
	Experiment	4.00	3.02	3.93	2.96
Balance	Control	5.40	3.90	5.13	3.90
	Experiment	9.46	7.32	12.46	5.52
Flexibility	Control	3.53	2.58	7.33	2.19
	Experiment	11.13	4.95	19.20	4.95

Table 3: Distinctive results of the effects between the subjects of the experimental and control groups on the scores of fine and coarse motor skills, balance, and flexibility.

Dependent variables	**Group**	**M**	**M-changes**	**SD**	**F**	**P**	**Eta**
Gross motor skills							
	experimental	4.05	-0.37	0.216	1.35	0.256	0.05
	control	4.42					
Fine motor skills							
	experimental	19.59	12.65	0.717	138.79	0.001	0.85
	control	6.94					
Balance							
	experimental	11.66	5.72	0.665	32.97	0.001	0.75
	control	5.94					
Flexibility							
	experimental	18.21	9.9	0/662	99.60	0.001	0.80
	control	18.31					

variables of fine motor skills (138.79), balance (32.97), and flexibility (99.60) at the level of 0.05. The results of table 3 were shown that the mean of the experimental group in fine motor skills (19.59), balance (11.66), and flexibility (18.21) is higher than the standard of the control group. Table 2 shows no statistically significant difference between the experimental and control groups in the variable of gross motor skills. Based on these findings, it can be said that art therapy based on the painting has improved the motor skills of preschool and primary school children with autism.

Discussion

This study aimed to evaluate the effectiveness of art therapy on motor skills and social interaction and other symptoms associated with autism.The results showed that art therapy improved fine motor skills and social interaction.

This result is consistent with Davari Nia et al. (25) and Moghaddam's (27) studies. The researchers found that children with intellectual disabilities were less likely to be socially accepted and less likely to participate in games with their peers. As a result, the lack of experience in motor skills causes weakness in motor skills and social constraints and distance from peers in them. Additionally, Behpajouhet al. (28), in their research, showed that art therapy is one of the most effective ways to communicate with children. In its context, a child of self-destruction can discover something valuable for himself.

The results showed that the experimental group, after painting-based art therapy intervention had a significant difference in fine motor skills scores compared to the control group. Thus, art therapy is useful for the fine motor skills of children with autismMotor deficits in children with autism are classified as symptoms associated with the disorder (31). Studies acknowledge that aspects of movement play a role in the early development of communication skills and that disruption in this area can contribute to the main manifestations of autism (32). Movement disorders can affect a person's experience of life, others' perceptions of the person, and affect the underlying characteristics of autism. In this study, the use of art therapy training improved the fine motor skills of the subjects' hands and caused them to improve the performance of actions related to the fingers and hands (33).

Another result obtained in this study showed that painting-based art therapy intervention did not improve gross motor skills. This result can be explained by the fact that gross motor skills require precise coordination of muscles when performing exercises. Force plays a significant role in these movements. These skills are performed by the body's large muscles and muscles and cause general movements, posture, and balance (28). The better motor skills performance in children with autism is associated with increased social adequacy (34). Motor activities develop the perceptual system and, with their essential role in learning, provide the basis for developing further meaningful understanding such as academic and social skills (35). After the emergence of motor skills, the perceptual system also grows. Therefore, any disturbance in the motor process affects the perceptual system, and consequently learning and causes failure and problems in other areas (36). Therefore, painting-based art therapy could not affect gross motor skills due to more involvement with the hands and fingers.Maintaining balance on a large scale is a task that requires fine motor control.

Recently, a theory that has attracted the attention of researchers is that the body's ability to maintain balance depends on the complicated exchange between the nervous, skeletal, muscular systems and the importance of each of these systems depending on the purpose of movement and environmental position. In this model, the central nervous system uses deep, atrial, and visual methods to be aware of the body's center of gravity relative to the level of reliance during the appropriate response production (36).

The present study had some limitations. Due to the limited statistical population of the study caution should be exercised in generalizing the results. Also, the lack of research in art therapy, especially painting therapy was evident and future studies should extend the current findings. Despite these limitations, the present study has enhanced our understanding that painting-based art therapy may be an appropriate treatment to improve fine motor skills and social interaction among children with autism.

Conclusion

Art therapy exercises based on painting therapy were able to affect the balance of the Lincoln Oseretsky scale. The function of flexibility is one of the executive actions that weakness in this component is characterized by stagnation, repetitive movements and difficulty in adjusting and modifying motor activities and the ability to change thoughts and actions against environmental changes. In this study, art therapy exercises based on painting therapy was able to affect the flexibility and motor complexity of the Lincoln Oseretsky test.

Acknowledgment

None.

Conflict of Interest

The authors declare that they have no conflict of interest.

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