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## The Effect of Perceptual- Motor Training on Children's Development Motor Skills Aged Between 8 to 11 with High Function Autistic Disorder (HFA)

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### Keywords

Autistic Disorder  
 Perceptual-Motor Exercises  
 Student  
 Dynamic Skills

### Abstract

The aim of this current study was to investigate the effect of a perceptual-motor training program on children's developing motor skills aged between 8 to 11 with high function autistic disorder. In order to do so 30 girls with HFA disorder aged between 8-11 were selected by cluster among Karaj special schools and based on pre-test scores were placed in control group and experimental group. The testable pre-test and post-test scores were measured by a body of Bruininks-Ozertesky's test. The interposer movement program consisted of perceptual-motor exercises which were done for 16 sessions for these girls. K-S test was used to determine the distribution of data, and Levin's test and Covariance analysis were used to compare means. The results showed that perceptual-motor training program had a significant effect on development of fine scales of agility, running, balance, two-sided coordination and strength in HFA kids ( $P < 0.05$ ). But in fine scales including response rapidity, visual-motor control, speediness and agility of upper limbs there was no significant effect ( $P > 0.05$ ). According to these results it can be claimed that the training program used can probably improve fundamental skills of children with HFA.

### 1. Introduction

pervasive development disorder is one of the most common disorders of childhood that its consequence is outbreak of serious defects in adulthood (1). Based on DSM-IV-TR, autism is the commonest disease in spectrum pervasive development disorder (2). Autism is a general

term means that a person can have slight autism or chronic (extreme) autism. At the highest point of spectrum, Asperger syndrome or autistic disorder there exists with high function that sometimes is called little professor syndrome. The lowest point of spectrum often is called classic autism that usually is with mental retardation (3). Genetics is one of the factors to see autism (4). This disorder

can be generated by any factor that affects central nervous system (5). Researches show that about 75 percent of people with autism have mental retardation (6). The fourth edition of diagnostic guide and statistics of mental diseases (DSM-IV) are the most important syndromes that are essential to recognize autism with high function stereotypical motor, manifest defect in establishing communication with others, severe disorder in social interaction and oral difficulties have been considered that in addition to creating mental and physical harm with themselves, provide a milieu full of anxiety and stress for their families (7). Although social deficiencies belong to main features of autistic disorder, motor function often is abnormal in these kids (8) according to the most recent census given by Centers for Disease Control and Prevention of America, the outbreak of this disorder from 1 in 150 persons in 2007 has increased to 1 in 110 persons in 2011. This increasing rate will be seen in educational centers like school. Education Ministry of the United States shows that a number of students with autistic disorder continuously from 425000 in 1997 to 2255000 have been increasing, while the number of people with mentally retarded disorder from 603000 to 523000 is being decreased (9). The outbreak of this disorder in Iran is 6/26 in every 10000 child (10). Because of many children afflicted with this disorder, and most importantly is the process of it increasing day by day, studying different aspects of this disorder seems to be necessary. In recent years many researches relating to autistic

spectrum disorders have been conducted that all of them have reported weakness in stature sustenance, balance, walking, joint flexibility, moving coordination, motor programming, fine & gross motor skills and velocity of movement in this spectrum (11, 12). Pan & Tsai & Chu (2009), reported children's weakness who have autistic disorder with high function in comparison to normal children (6). Butler & Ghaziuddin (1998), showed that children with autistic disorder have lower motor function in relation to usual a (13). Staples & Reid (2010) in searching Autism Spectrum Disorder by using TGMD- 2 test showed that normal children in TGMD- 2 test acted well and gained high scores (8). Levinson & Reid (1993), Prupas & Reid (2001), evaluated the effect of physical activities on children's stereotypical behaviors and found that that physical activities lead to reduction of stereotypical behaviors of these kids. Barkeky & Zinel & Nichols (2001), reported that physical activity leads to improving communication and social interaction of these persons (14-16). Bahrami and his colleagues (2012) in a research as the effect of Kata exercises to reduce stereotypical behaviors of persons with autistic disorder, they found that this kind of exercise can reduce these persons' stereotypical behaviors (8). Pitteti (2007) showed that a course of a training program for walking on treadmill leads to a significant reduction in index of body accumulation of these persons (17). Atiq (1392) in his research known as the effect of musical moving activities on children's balance function afflicted by autism

with low function of aged 7 to 14 found that musical activities along with intervention of occupational therapy leads to acceleration in improvement of children's balance function who are afflicted by autism with low function (18). Also Fatmeh Shahidi Zand (1394) in her research known as the effect of progressive motor program on improvement of children's motor skills afflicted by autism found that progressive motor program has a significant effect on growth manual skills, replacement and gross skills (19). In a survey of literature and research background of this subject we conclude that a lot of studies have signified deficiency in fine and gross motor skills of children with autism spectrum disorder, but little research has been conducted about fulfilling a motor program on development of these skills. On the other hand, main parts of the conducted research about the effect of physical activities on different aspects of autistic disorder, and investigating its effect on physical education, social and stereotypical behaviors and attention to these children have been paid and little attention has been paid regarding perceptual- motor skills (12). The increase in the number of children with autistic disorder and absence natural development in motor skills of these children, has changed this subject to a main problem in educational places and society. With regard to the importance of perceptual- motor skills in other development aspects of children, an attempt to improve these skills in these children is essential and urgent. On the other hand, lack of facility and suitable place in schools and training centers causes that any

kind of training program so as to improve perceptual-motor skills may not be possible to be fulfilled in training centers; so applying a motor program to fulfill this program in a limited space is essential. One of useful activities that can be done in low price is perceptual-motor exercise. Perceptual-motor exercises comprise a combination of exercises with corporal cognizance, distinctiveness, flexibility, match of perceptual-motor, cognition and eyesight control. So the current study investigates the effect of perceptual-motor exercise on development of children's fundamental motor skills (ASD) and will answer this question whether perceptual-motor exercise has effect on development of these children's fundamental skills?

## 2. Materials & Method

The current research was semi-experimental that was conducted with the cooperation of Karaj special education. The statistical society in this research consisted of 50 little girls aged between 8 to 11 ( $9.2 \pm 0.3$ ) afflicted by autistic disorder with high function that via Kokran's sampling mass (volume) determination and with the satisfaction of parents and school principal, 30 children were selected by cluster sampling method. The research plan follows as pre-test /post-test along with witness group.

### 2.1 Research tools

In order to evaluate fundamental motor skills, Bruininks-Ozertesky's test (BOTMP) was used.

This test is a body of norm test that assesses moving function of children aged 4/5 to 14/5. The total body of this test has formed of eight subscale tests (including 46 separate sections) evaluating fine and gross motor disorder and proficiency. The test's abbreviated form consists of eight subscale tests and 14 separate sections. Bruininks in 1978 with the correction of motor Ozeretsky's proficiency test provided this test. the complete fulfillment of this test needs 45- 60 minutes. Four subscale tests of gross moving skills (running speediness, agility, balance, two-sided coordination, strength), and three subscale tests of fine motor skills (response speed, eyesight-motor control, speed and agility of upper limbs and evaluates one subscale test of both skills. Retest stability coefficient of this body 0.87 and validity coefficient have been reported 0.84 (20). The used training program taken from: (21, 22).

## 2.2 Applying Research Method

After primitive study about development of fundamental skills and different motor program that was held in schools, the perceptual-motor training program was selected as intervention program. After the testable (N=30)able, children participated in Bruininks-Ozertesky's test motor development and after homogeneity based on pre-test scores were divided into two 15 groups of experimental and control. The selected program for 16 sessions and every session was done for 45 minutes, and while doing the selected training program on experimental group, control group was doing its own usual activities in schools.

Table1. Perceptual-motor training program.

Activity	Integrated activities	Concurrent & harmony movements and movement plan	Side preference and identifying body	Replacement skills and manipulation	Space recognition temporal, visual & forms recognition	Dynamic and static balance
Second week	Fastening	Connecting index fingers to each other	Naming body limbs	Kicking the ball on the ground while walking on a straight line	Counting the number of bent fingers from left to right and v.s	Walking on a straight line and standing on one foot
Third week	Review of the past exercises	Looking for small objects in sand	Bouncing on better foot in squares	Wadding papers and newspapers	Drawing on a board and mention that by him/herself	Walking on straight line to back and side, hopscotch
Fourth week	Fastening and unscrewing	Imitation of animals	Holding paper with non-premier hand and cutting with premier hand	While jumping hit a pair of balls toward ground	Moving around the squares that place of right and left feet are distinctive ahead	Jumping with two feet inside square
Fifth week	Review of the past exercises	Taping kite in the air	Puzzle completion of human body		Running and kicking the ball thrown by coach	Standing on balance board
Sixth week	Forming figures with paste	Guessing g figures with closed eyes	Hopscotch with premier foot and landing with both feet	Hitting the ball with head over heels of racket	Passing through obstacles in form of zigzag	Standing on one foot with closed eyes
Seventh week	Review of the past exercises	With eyes closed, touch tip of nose	Drawing human body and naming body parts	Throwing ball into basket	Chasing the pending ball with eyes	Standing on soft foam over one foot
Eighth week	Making figures with paste	Throwing the ring into the distinctive area	Touching limb by the coach and moving it by the child	Jumping with both feet over small obstacle	Taping according to coach by two pieces of wood	Walking on balance board
Ninth week	Review of the past exercises	Standing on tube and imitation of coach's movements	Passing inside through ring	Passing through rings	Drawing figures on paper and making them with paste	Standing on tube
Tenth week	Making mixed figures by paste	Imitation of coach's feet movement	Moving to ahead and dribbling ball to premier foot	Dribbling right and left	Pointing to different directions and child's movement to that direction	angel balance motor
Eleventh week	Review of the past exercises	Throwing the ball to the distinctive spots on the wall	Learning different function of different parts of the body	Bouncing and rotation over one foot with ball in hand	Throwing ball to different places	Bouncing and rotation over one foot
Twelfth week	Painting figures	Bubbling up and chasing it	Holding ball with premier foot and kicking with that foot	Practicing jump with pair feet at right/left side and too low and high	Turning ball inside the jar in the direction of coach's finger	Standing on tube turning over it

### 2.3 Statistical analysis

After collecting information, first by using central indexes, dispersal, and illustrating diagrams and tables, data were mentioned, and in inferential statistics K-S test to see that data are normal, and Lon's test to see variance standardization and for analysis covariance was used. Fine scales were used once before the program and once after fulfilling perceptual-motor training program were measured. Mean of scores before testing two groups was used as interference variability. In covariance analysis test, the difference in score's mean in post-test of both experimental and control groups as interference variability identified and its effect on post-test was omitted. All analytical steps and statistical analysis at level 0.05 were done with SPSS software the 22th version.

### 3. Results

Based on the results gained, mean and standard deviation of testable demographics include age, weight, high and intelligence quotient (18) are as illustrated (table 2).

**Table 2.** demographical information of groups.

Group	Weight (Kg)	Age	Height (Cm)	IQ
HFA Experimental	29.1±0.85		128.14±41.6	91.45±5
Control	28.1±13.6		129.11±36.6	90.26±6

According to the results gained from K-S test and Lon's test, there was significant level in all tests and considered greater than 0.05, so we guess that the state of being normal is approved. There was also significant level in all Levin's tests

considered greater than 0.05 and hence variance similarity was approved. so presuppositions of covariance analysis tests for mentioned variables are suitable.

Based on results gained (table 3) and with regard to any of subscales in both pre-test and post-test and also by considering the amount of P gained, in subscales of running speed and agility (P=0.002), balance (P=0.001), two-sided coordination (P=0.01) and strength (P=0.003) significant difference between pre-test and post-test was found, but in the case of subscales of response speed (P=0.165), visual-motor control (P=0.51) and upper limbs agility and speed (P=0.15) there was no significant difference.

### 4. Discussion

Findings of current research showed significant difference between experimental group and control group in developing motor skills. In relation to subscale of running speed and agility in children with autism it means that there is a significant difference between control group and experimental group mean. Since children with autism face low spasm, this leads to slower development and low performance for them in main steps of development such as walking and running (23). Motor exercises used in this intervention has caused improvement motor system and reduction of this disorder. Results of the present research with results gained of Yelmaz's research that had searched about the effects of exercise frequency on stereotypical

behavior and repetition of these activities during each day of the week on stereotypical behaviors correspond to Petty's results, which are the effects of physical activity on self-stimulatory behaviors and positive responding of adolescents with autism (24, 25). According to the results gained and researcher's ideas, it can be said that exercise and physical activities have great effect on children's motor skills and can lead to increase of speed and agility. Results of this investigation are in contrast with Hadge's research (26). One of the main reasons was about age of testable and there is another possibility that concurrently there were other disorders with this one that could have had effects on this research. In balance subscales, perceptual-motor exercises could affect balance skill in experimental testable group. Regarding that control indexes include lack of balance, balance reactions and disability in holding stature in children with autistic disorder have little development until 12 and usually don't reach adulthood. It seems that physical activities can provide a good way to improve these adequacies and reinforce the other motor skills. These results correspond to Yelmaz's (2004), Pon's (2009), Wang's (2004) and Lahmi's research (1390), but is in contrast with Kosari's and kayhani's research (1390). One of the reasons of this contrast is due to the number of training sessions and type of training program. Kayhani and his colleagues' research (1389) in 12 sessions but the current research have been taken place for 16 sessions. Since balance needs much attention compared to other motor skills, so it requires a lot of practice to

be improved. The effect of physical activity programs that exactly have been planned based on testable needs, can be the main reasons of testable progress in balance skills of this research and this case has been shown well in Wang's research (27). Most children with autistic characteristics show imperfect self-pattern in two-sided movements and difference between performance of lower and upper limbs leading to difficulty of motor coordination. These correlated problems are not related to general clinical problems like cerebral palsy, then we can with exact motor programs reduce this insufficiency to absolute minimum and provide good condition for improving motor skills. Exercise and experience have great effect on these children' harmony with autism, the more exercise is, the more harmony is. Findings of the present research correspond to wang's (2004) Yelmaz's (2004) Ahmadi's (1389) and kosari's research (27-29). Results to compare children's strength HFA in experimental group and control group have showed a significant difference among their means. The results of current research correspond to Yelam's and his colleagues' results but are in contrast to findings of Shaikh and his colleagues (30). It may be said that the reasons for this contrast are in the number of few training sessions of Shaikh's and colleague's study, difference in gender of both researches and different kinds of exercise program.

**Table 3. statistical results of 7 subscales of motor development in children studied.**

Variations	group	Mean $\pm$ SD	F	P	Ata Square	
Running speed and agility	Experimental	Pre-test	2.40 $\pm$ 0.65	32.35	0.002	0.61
		Post-test	5.52 $\pm$ 1.21			
	Control	Pre-test	2.73 $\pm$ 0.57	7.32	0.200	
		Post-test	2.87 $\pm$ 0.54			
Balance	Experimental	Pre-test	4.05 $\pm$ 0.71	29.43	0.001	0.57
		Post-test	7.44 $\pm$ 1.44			
	Control	Pre-test	4.54 $\pm$ 0.61	7.48	0.270	
		Post-test	4.76 $\pm$ 0.63			
Two-sided harmony	Experimental	Pre-test	2.73 $\pm$ 0.89	29.32	0.010	0.54
		Post-test	4.93 $\pm$ 0.70			
	Control	Pre-test	2.66 $\pm$ 0.66	8.56	0.260	
		Post-test	3.33 $\pm$ 0.44			
strength	Experimental	Pre-test	4.69 $\pm$ 0.92	31.88	0.003	0.63
		Post-test	7.54 $\pm$ 0.11			
	Control	Pre-test	4.85 $\pm$ 0.85	4.68	0.772	
		Post-test	4.52 $\pm$ 0.64			
Response speed	Experimental	Pre-test	22.52 $\pm$ 1.22	9	0.165	0.21
		Post-test	19.54 $\pm$ 1.19			
	Control	Pre-test	22.71 $\pm$ 1.72	9.68	0.157	
		Post-test	20.35 $\pm$ 0.42			
Visual-motor control	Experimental	Pre-test	1.46 $\pm$ 0.80	5.34	0.510	0.16
		Post-test	2.21 $\pm$ 0.84			
	Control	Pre-test	1.55 $\pm$ 0.79	5.68	0.450	
		Post-test	1.85 $\pm$ 0.64			
Speed and agility of upper limbs	Experimental	Pre-test	3.65 $\pm$ 1.26	9.87	0.150	0.14
		Post-test	5.70 $\pm$ 1.42			
	Control	Pre-test	3.80 $\pm$ 1.08	8.54	0.260	
		Post-test	4.21 $\pm$ 0.79			

Shaikh and his colleagues (1383) investigated the effect of Spark's 12 training sessions on boys with autistic disorder, but the present research has been done on girls afflicted to autistic disorder with high function for 16 sessions. About the effect of perceptual-motor training program on speed and agility of children's upper limbs (HFA), findings indicate that between means of experimental group and control group is not significant difference.

In other words, present exercises in this training program could not affect the speed skill and agility of upper limbs. Results of the present research corresponds to results of Yelmaz's study and his colleagues (2004), but are in contrast to results of Ahmadi's (1389), Lahmi's (1390), and Mahtari-Ahmad-Abadi (1391) (1,8)(29, 31). One of the main reasons for this contrast can attribute to used training program and testable age. Ahmadi and his colleagues in investigating one trustee, reported the effect of perceptual-motor exercises significantly on motor skills of child with autism. Lahmi and Mahtari-Ahmad-Abadi in their study investigated the effect of Spark's program on perceptual-motor skill development of children with autistic disorder between aged 7 to 10, and finally they gained different results with the present research. The results gained from comparison between means of speed reaction in experimental group and control group showed that a course of 16 sessions of perceptual-motor training program on speed reaction of children with autism aged 8 to 11, had no significant difference. In other words, a course of perceptual-

motor exercise could not increase response speed in experimental group. An effective factor to improve response speed, is speed and agility of upper limbs. Since this intervention program had no significant effect on this factor, it would be predicted that there can't be found improvement in response speed. Results of the present research corresponds to results of Yelmaz's study and his colleagues (2004), but are in contrast to results gained from Pawarz and colleagues (1992) and Mahtari-Ahmad-Abadi (1391), (24, 31). In the case of investigating effect of perceptual-motor on visual-motor control of children afflicted by autistic disorder with high function aged between 8 to 11, the results indicate that between means of experimental group and control group had no significant difference. Since disorder in motor planning and sensory integration lead to disorder in fine motor skills these children such as visual-motor control and graphics activities (Jasman 2009). It can be said that motor program could not improve these two main factors in fine skills. The results of the current research correspond to those of Lahmi's (1390), but with the findings gained from Rezentel-Malek's research (1997) and Mehtari-Ahmad-Abadi (16, 31) are in contrast. One of the main reasons of this contrast is due to different training program and particularly the age of testable. Rental and his colleagues (1997), investigated the effect of a course of stretching program and quick walking on motor skills of children with autistic disorder aged 15, and gained different results compared to the present research. About the quality of training presented to

experimental group in children (HFA), other important factors in preference of this group to control group are included; such as instruction quality, stimulation and kinds of program, exercise program selected based on the play or game and on the other side that each day is different from the day before and encourages the child to participate in program. This program includes many basic skills that a child while participating in this program, every session practices motor skills and this causes experimental group in all skills to acquire acceptable development and progress.

Drug-treatment, psychic and mental status of testees at the time of test, the length of the test may make the testees bored, also children's cultural differences are effective factors on this research.

besides this, with regard to all testers of this research were afflicted by autism, it is recommended that to conduct studies on testees that are concurrently afflicted by several disorders to know whether there are similar results to this research gained or not? According to the results gained from this research, it can be claimed that the used physical activity program in this research can improve children's fundamental motor skills (HFA).

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