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The Effect Of Motor Exercisesand Games On The Development Of Perceptual Motor Skills In Children With Autism Spectrum Disorder

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Abstract:
This study is aimed at identifying the impact of motor activities and games on the development of motor perception for children aged 5 to 12 years with autism spectrum disorder. The experimental protocol concerned a sample consisting of 30 boys enrolled at local Saudi sports centers.
Method: *Boys were distributed into two equal groups: the experimental group of 15 children performed program of motor activities and games, and the control group of another 15children performed the usual program of their sports center. The motor perception scale (body image CBT- motor execution ME- visual motor coordination VMC- spatial orientation SO- consistency in the size of objects- auditory perception AP) was used. The results were analyzed using the SPSS programbased unpaired samples t-testand independent samples T-test.*
Results: *The motor activities and games program had a positive effect on the development of motor perception compared to other relevant programs, except for the consistency in the size of objects.*
Conclusion: *There were no statistically significant differences in the effectiveness ofmotor activities and games compared to other programs.*
Keywords: *Activities and games motor – Perceptual motor – Autism spectrumdisorder(ASD).*

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I. Introduction

Movement is a key indicator of the children's ability to explore the surrounding environment. Sensory, social, and intellectual functions are certainly developed through movement. Motorperception develops the motor skill andis translated into motor behaviour.

Motor perception is the ability to interact with the environment. Itsrole is to synchronize cognitive function and motor behaviourin children. In other words, the ability of motor perception appears in the form of behavior through the interpretation of all information received from the senses (visual, auditory, touch) that the central nervous system processes to show motor skill (Rachman et al., 2018).The process of motor perception consists of the body's spatial, temporal and directional awareness associated with kinetic dimensions, in addition to aspects of rhythm and balance.Motorperception is developed through activities, motor achievement, and bodily awareness. The best period for developing kinesthetic perception is between the ages of 6 and 12years. Itis promoted through motor activities and games (Elena et al., 2014).

Autism Spectrum Disorder (ASD) is one of the most controversialdevelopmental disabilities. Its rate among children has increased significantly in the recent period to reach1/68individuals. Mostof these children are self-withdrawn and impaired in social skills, notably in terms of verbal and non-verbal communication and social interaction with the surrounding environment (Ketcheson et al., 2016; Mashoor, 2016).

Children with ASD suffer from weak sensory processing at a rate ranging between 42 and 88%, with atypical sensory reactions, and sensory-motor regulation problems arising due to developmental and behavioral disorders of the sensory system. (Karim, Mohammed, 2015). The issues of perceptual-motor abilities are related to the characteristics of the perceptual sensory functions in the brain. Infact, the functions of the sensory systems are mutually linked becausethe senses (visual, auditory, and tactile) work in concert to develop the motor behavior. (Murat et al., 20016).

These disorders in children with ASDhinderthe patients 'adaptation to their environment, which is confirmed by some recent studies. Children with ASD find it difficult to recognizeand process sensory stimuli. Thus, there is aweakness in sensory integration functions, and sensory problems affect adaptive responses to the

situationalrequirements. Thesechildren also show a lackin their awareness of spatial and visual environment (El Garhy& Liu, 2016). One of the major motor skill problems in ASD is the weakness of sensory perception development, notably the process of balancing the body during movementdue tonervous system disorders. Moreover, motor coordination problems appear because of their association with kinesthetic perception (visual and auditory perception) problems, which affects motor skillssuch as walking, running, and balance, in addition to weakness in spatial and temporal perception(Murat et al., 2016).

In addition, 50% of children with ASDshow reluctance to participatein moderate-intensity motor activitiesThey are lethargic and less enthusiastic about participating compared to their peers.This attitudeleads to further health risks like overweight and evenobesity).Practicing motor activities and games helps them to improve physical fitness, stimulate cognitive sensory functions and developmotor skills.(Nguyen el al., 2021).

The current study aimsto identify the effect of kinesthetic activities and games on the development of kinesthetic perception in children with ASDwho have a delay in developmental aspects, including visual and verbal (auditory) communication. Accordingly, the delay in motor skills is due to the fact that kinesthetic perception and motor skills are greatly correlated. Asthe stimuliarementallyprocessedthrough the senses, motor skill is shown, and then motor behavior is promoted.

II. Method:

To achieve the aim of the study in identifying the effect of motor activities and games on the development of motor perception for children with ASD (5 -12 years), the study sample was chosen randomly amongboyswho were diagnosed with ASD.An electronic registration formwas prepared that includes approval of the child's guardian for participation and general data about the child and his living conditions and communication style.A total number of 48children from 4 sports integration centersparticipated to the experimental program.Upon interviewing the parents about their child's condition and acceptance of joining the program,an appointmentfor the pre-measurementwas fixed. Thechildren who did not attend the pre-measurement or did not attend the wholeprogramwere excluded. Thestudy sample consisted of 30 children. They were distributed into two groups. The control group performeda program prepared by the "Hope Smile"center. The number of children in this groupwas15 (age: 7.80± 2.35;weight :29.00 ± 3.14; height:1.30 ± 0.08;BMI:17.24 ± 1.86).The experimental groupconsisted of 15 participants whoappliedthe program of motor activities and games (age:9.07 ± 2.15; weight 28.40 ± 3.81; height:1.36 ± 0.10; BMI:15.28 ± 1.12).

The scale of Romero, Ordonez & Gil (2018) was used to measure the level of motor perception inchildren with ASD.Itconsists of 18 items relating to five measurements: body parts (4 items), motor achievement (6 items), visual-kinesthetic perception (6 items), spatial awareness (2 items).The stability of the size of objects (6 items), and auditory perception (space recognition) (5 items) were added from Haywood's sensory-kinesthetic perceptionscale. After review, 2itemswere excluded. Thus, the final scale included27stepsdistributed over seven measurements. Table No. (1) shows the distribution of the itemsaccording to the measurements**.**

III. Motor skills grading system:

In the grading system, subjects are evaluated according to positivity, i.e., grades (5-4-3-2-1) are given, respectively, for mastered skills. The highest score (5) is attributedwhen the child responds directly or during ashortest period of time.If the response to movement takes5 to 7 seconds, a score of 4 is given. Ifthe taskis repeated several times for the child and he can imitate it, 3 marks are attributed. When the child does not respond even after repetition but makessome attempt, he is given 2 marks. If he does not respond completely, the lowest score (1) is attributed. In the stability of the size of objects and auditory perception from Haywood's scale of sensory-kinesthetic perception, scores (1-2) are given, respectively, for the mastered skills.A score (2) is attributedwhen the answer is correct, and (1) is given forthe wrong answer.Then the scores are collected for each dimension separately to calculate theoverall motor perception score.

Table: (1) Distribution of the tasksat the level of themotor perception scale

	Number	Order
Body Image (BI)	4	1,2,3,4
Motor Execution (ME)	4	5,6,7,8
Visual Motor Coordination (VMC)	6	9,10,11,12,13,14
Spatial Orientation (SO)	2	15 ,16
Consistency in the Size of Objects(CSO)	6	17.18.19.20,21,22
Auditory Perception (AP)	5	23,24,25,26,27
Total	27	1-27

Pre-test measurement:

We trained twospecialists, a psychologist and a coach, in order to carry out pre and post measurements and to set up the grading system. The training continued for 3 weeks, then the initial activitywas tested on a group of normalchildren 3 times.To find out the extent of their proficiency in applying the standards and after ensuring the integrity of the activity, theprotocolwas administered to the sample.After that, the premeasurement of the study sample was applied during the period 26-30 June, 2022 in the Elias Center, thevenue of the experimental program, so that the measurement takes place in one day (6 children only).

Movement activities and games program:

After reviewing the literature related to activities and motor games for children with ASD, a kinetic educationprogram was administered to develop sensory-kinesthetic perception among children with ASDaged from 5 to 12 years. The program was distributed over 18sessions of 45 minutes each, distributed as follows: 5minutes to prepare the child to play, then the first 20 minutes in which the child exercises motor activity by playing in the 3 stations, so that he plays in one station for 6 minutesand moves to a new one in order to break the routine.After that, the child rests for a period of 5 minutes and plays again at the same stations for a period of 5 minutes for each station. The total time of the 18-session program thus amounted to 18 x 45 = 810 minutes.

Volunteers collaboratedto implement the program. Theywere introduced to the characteristics of children with ASD and the best practicesto deal with them, and then learnedthe method of playing at each station before starting. Thus, each child in the program would have a volunteer who would monitor him while playing at the station by helping him at the beginning and then supportinghim forprogress, as well as correcting hismistakes.The program was supervised by a researcher withoutinterfering with the children's performance of motor games, but ratherto monitorthevolunteers.

Accordingly,the program was implemented from2 to22 July 2022.This period was selectedbecause it corresponded to thesummer vacation for students and children. Some centers set up additional programs for children with ASD and other disabilities.To avoid the impact ofthese programs, it was agreed with the Elias Center to set up the program for the experimental group, as well as the Hope Smile Center that the control group would be in parallel and make priorand postmeasurements as well. It was confirmed that the participantsdidnot participate in anyother programs.

Dimensional measurements:

The dimensional measurements took place immediately after the completion of theprogram at the Elias Center during theperiod24-28 July 2022 with an average of 6 children per day for the control and experimental groups.

Statistical analysis:

After completing the measurements, all data were treated with the Statistical Program for Social Sciences (SPSS), using the following statistical treatment. The arithmetic mean and standard deviation were considered to identify the characteristics of the study sampleT-test Paired Samples to find out the differences between the pre- and post-measurements of the experimental group. The (T) test for independent groups (T-test Independent Samples) served to find out the differences between the dimensional measurements of the control and experimental groups.

IV. Results:

The values of the T- test paired samples, with the averages of the pre and post measurement of the experimental group with the motor perception scale are shown in Table 2.

Table:(2):The value of the (T-test Paired Samples) andthe averages ofthe pre and post-measurement of the experimental group with the motor perception scale (N = 15)

	Post measurement		Pre measurement		(T) value	P
	M	S	M	S		
(B I)	17.07	3.53	9.20	4.44	8.45*	0.01
(ME)	16.20	2.21	10.60	3.85	6.82*	0.01
(VMC)	21.33	2.69	12.33	5.61	6.54*	0.01
(SO)	7.74	1.99	3.73	2.01	7.17*	0.01
(CSO)	9.33	1.87	7.13	1.30	9.05*	0.01
(AP)	9.20	1.26	6.53	1.55	5.19*	0.01

*P < 0.01

According to Table (2),there are statistically significant differences between the averages of the pre and post-measurement of the motor perception scale (BI, ME, VMC, SO, CSO, AP) in the experimental group of children with ASD, and reached the value of (T) (8.45, 6.28, 6.45, 7.17, 9.05, 5.19) respectively for the dimensions scale and all of them are statistically significant at the level (0.01) in favor of the dimension measurement**.**

Table:(3) the value of (T-test independent groups).The differences between the post-measurement averages between the experimental and the control group using the motor perception scale (n = 30)

	Experimental group (N15)		Control group (N15)		(T) value	P
	M	S	M	S		
(B I)	17.07	3.53	12.17	3.32	3.83*	0.01
(ME)	16.20	2.21	11.67	2.66	5.07*	0.01
(VMC)	21.33	2.69	15.00	4.82	4.44*	0.01
(SO)	7.74	1.99	5.13	1.95	3.23*	0.01
(CSO)	9.33	1.87	7.93	1.94	2.01	0.06
(AP)	9.20	1.26	6.13	0.83	7.84*	0.01
P < 0.01						

It is clear from Table (3) that there are statistically significant differences between the post-measurement averages of the motor perception scale (body parts, motor performance, visual-kinesthetic perception, spatial awareness, consistency in the size of objects, auditory perception) between the control and experimental groups of children with ASD, and reached the value of (T) (3.83, 5.07, 4.44, 3.23, 7.84) respectively for the dimensionscale.All data are statistically significant at the level of (0.01) in favor of the experimental group. Therewere no statistically significant differences at the level of (0.05) for the dimension (Consistency in the size of objects). The value of (T) is (2.01).

V. Discussion:

The motor activities and games showed significant positive effectsonthe development of motor perception in children with ASD, except for the stability of the size of objects, as there was no difference between the activities and motor games program and other physical educationprograms. This may be due to the fact that the activities program and the current movement games did not focus on sizes and shapes significantly.

Results are consistent with previous studies such as Bu Hamad and Al-Maliki (2020), Younis (2019), Rachman et al.(2018), El-maksoudet al.(2016), Ketchesonet al.(2016), Elena et al. (2014), which stated that motor activities and games help normal children in general to develop motor perception, including body parts, visual perception, spatial and temporal awareness. However, most of these studies were for ordinary children, Down syndrome and intellectual disability.Asfar as we know, studies in motor perception includevery few subjectswith disabilities. This indicates that motor activities and games have a great effectiveness in the development of motor perception.

The teamwork method (small groups) has an impact on the perception of children with ASD, in addition to the diversity in performance during the training session, which increases the motor perception of children. Giving instructions to the child to carry out the motor activity, and then the tasks on a regular basis, while adhering to the instructions helped in the development of motor perception of children with ASD.The reason for this result is the development of the ASD child's perception byrecognizing his physical environmentand showing the awareness of his body parts and the motor skills. Inaddition, performing motor tasks individually without interference from the supervisor allowed the development of skills. Children accepted the play with guidance, and the process of repeating the motor taskswith guidance and instructions to perform the motor task correctly helped them in the motor sense perception.They were able to understand the relationships withother children and the surrounding environment. Interestingly,the interaction between children during the performance was found todevelop the motor sense perception.

The absence of statistically significant differences (≤0.05) in the stability of the size of objects between the control and experimental groups may be due to the fact that the program focused on kinesthetic perception.Through movement, kinesthetic perception is more developed than visual perception of the stability of the size of objects.The center works on the development of this aspect through models and worksheets, and it allows progress in this regard.Even though, there was a noticeable development in the experimental group.

VI. Conclusions and recommendations :

Motor activities and games have significant positive effects on the development of kinesthetic perception in children with ASD, compared to other relevant programs.

- Diversity in motor activities and games breaks routinein children with ASD, which helps them to develop positive motor perception quickly. Except for the constancy of the size of objects.

- We recommend paying furtherattention to motor activities and games in programs for children with ASD, and more studies should be conducted on other areas of cognitive abilities (social and life skills) in order to identify the role of motor activities and games for children with ASD.

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