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The Effect of Perceptual- Motor training and Spark's Program on Mentally Retarded Children's Fine Motor Skills

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Keywords

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Abstract

Background & Objective: The aim of this study was to investigate the effect of motor-perceptual exercises and Spark's exercise as well as a combination of them (motor-perceptual exercises and Spark's exercises) on mentally retarded and educable girls' fine motor skills aged between 7 to 10.

Material &Methods: In order to do so 40 kids aged 7 to 10 were selected by cluster sampling method among Sanandaj special schools. Then pre-test was done and the kids were divided, based on pre-test scores and beer-making method, into four groups: perceptual-motor exercises (N=10), Spark's programming (N=10), combinational (N=10) and control group (N=10). Bruininks-Ozertesky's test was used to evaluate motor skills. Experimental groups participated the exercises for 24 sessions. At the end the subjects went through post-test. For the analysis of data, dependent t student Tests and one-sided analysis of variance were used.

Result: The results showed that the three groups of motor-perceptual program, Spark's program and combinational group had a better performance in fine motor skills compared to control group ($P<0.05$).

Conclusion: The used educational programs could be an appropriate motor experience for mentally retarded children.

1. Introduction

Mental retardation is one of the perceptual-motor disorders of growth age which occurs before teenage years and is specially attributed to children suffer from some deficiencies in cognitive activities and adaptive behaviors (1, 2). The growth period differs somehow in mentally retarded children, although these children undergo the main stages of physical growth, however, due to problem in cognitive and psychic-motor development they perform perceptual-motor skills weakly which necessitates the integration of environmental data and decision-making for doing a certain action (3, 4). The characteristics of children with perceptual-motor disorders is that most of them have

difficulties in doing motor skills, understanding special, temporal, physical, orientation and other motor skills (5). So it can be said that in mentally retarded children a proper connection has not been established between perception and movement in the growth process, especially in the vital periods. These problems cause mentally retarded children to suffer from motor poverty and perform awkwardly in dealing with most of the skills and to be weak physically (5). They face growth delay of motor skills which can affects many growth dimensions as well as their performance in daily activities (6). In normal condition these children are unable to use ordinary physical education properly, cannot socially adapt themselves with the environment and lack the ability of understanding bases and concepts, ability of judgment, and lack accuracy and learning capabilities at different levels. Also they score lower in basic motor skills compared to normal children and they perform these skills awkwardly and learn them more slowly (3). Westen Drop and his colleagues (2011) in their study, in which they compared motor skills of normal children with mentally retarded ones, concluded that normal children score higher in all motor skills in comparison with mentally retarded children (7).

According to the study conducted by Karmel and et al. (2005) mentally retarded children, due to sensory-motor integration disorder, scored lower than normal ones in perceptual-motor tests and their balance position is less stable than normal children (8). Mentally retarded children also lag behind normal ones in fine motor skills (9). According to most specialists, physical education programs for mentally retarded children who suffer from perceptual-motor deficiencies, should have an integrated structure and fit their needs and problems. In childhood learning motor skills has got priority over other skills, because it plays a vital role in the growth of children and improves eye and other members' harmony, increases their intelligence, social skills as well as emotional behaviors. Motor skills, especially in the case of mentally retarded children, has an important role in the health and movement of body in daily activities, educational programs, social relations and self-confidence (10).

Some like Kefart, Getman, Baresh, Gezel and Gean Piage believe that motor learning is the base of all intuitions (7). The proper performance of human's brain necessitates to be motivated by environmental drives. The significance of these drives for sensory-motor growth in childhood has been demonstrated well in these studies (7). So it can be said that motor exercises can motivate nervous system and enhance basic skills (6). Studies which have used intruding programs, such as Saprk, and perceptual-motor exercises for the improvement of physical preparation, cognitive activities and motor proficiency in mentally retarded children include: (9, 11-18). In most of these studies and others in the field of mentally retarded ones, fine motor skills and their role in different activities have been underestimated. Fine motor skills include oriented, disparate, accurate

and skillful movements whose performance requires using a group of small muscles. The importance of fine motor skills in the harmony of eye and foot, and more important than all, in one of the basic skills, that is handwork (harmony of eye and hand) is quite obvious. Also fine motor skills, compared to gross motor skills, have a more cognitive base (19). Environmental enrichment can be quite influential taking into account what was mentioned and also the point that motor games and activities can improve motor skills and performative function.

One of the environmental enrichment methods in relation to motor skills, is Spark's motor program and perceptual-motor exercises. Spark's motor program includes leisure activities, game and sports for children and has been used in many studies and is an inclusive program which has been designed to provide goals such as: increasing physical preparation and motor skills to enjoy physical activity at high levels. This program is an annual program in the U.S which is divided into two educational topics and each of its unit which is related to fine and gross motor skills, covers 12 sessions (20). In perceptual-motor programs the emphasis is on the perceptual-motor special elements, therefore motor activities are divided and grouped based on perceptual-motor qualities such as: physical awareness, special awareness, temporal awareness, orientation awareness and eye and hand harmony (21). Due to motor skills weakness in these children and their significance and considering the point that physical activities leads to physical health, rational performance improvement and one's intuitions and emotions as well as his/her personality, probably physical training can have many advantages for these children. By surveying these children's problems and reviewing the available studies, it seems that these children have to be studied more for their motor skills. Studies have shown that by enriching growth environment and providing proper exercise opportunities these children can get back to the ordinary course of life. According to what was mentioned and the main problems of mentally retarded children, the present study has been done to see the effect of perceptual-motor exercises and Spark's selected exercises on the fine motor skills of mentally retarded and educable girls aged 7 to 10.

2. Material & Method

2.1. Subjects

The present study is semi-experimental and the pre-test and post-test is with the control group. The statistical society of the study includes 76 mentally retarded female students aged 7 to 10 of Sanandaj. For conducting this study Sanandaj city was divided into four areas and out of each area one school was selected by means of cluster sampling and their motor skills which were measured by Bruininks-Oseretsky's proficiency test. Then the subjects were divided into four groups based on pretest scores and IQ: the first group perceptual-motor exercises (10 students), the second group Spark's exercise program (10 students), the third group combinational-exercise program

(perceptual-motor and Spark's program) and one control group (10 students). Then the subjects of the first, second and third group took the perceptual-motor exercises, a combination of perceptual-motor exercises and Spark's respectively for 8 weeks, three sessions each week and each session lasting 50 minutes.

2.2 Exercises protocol

Spark's exercises included: trotting, tiptoeing, jumping with turning, throwing the ball above head and receiving the ball, hit wall with ball at a certain point and at different distances, painting shapes on paper, playing with coin, drawing pencil between close paths on paper throwing the ball into a basket. Cognitive-motor exercises included: walking on straight lines, standing on one foot, jumping with two feet in a square, moving within circles in which places of left and right foot have been inserted, holding paper with the weaker hand and snipping with the superior hand, drawing pictures on the board and showing their direction by the subjects, counting the number of stooped fingers from left to right and vice versa, guessing the structure of shapes with closed eyes, opening and closing the bolt. After two months and conducting the programs, the four groups underwent post-test.

2.3 Measuring Tools

For measuring fine motor skills Bruininks-Ozertesky's proficiency motor test (BOTMP) was used. This test is a set of norm-based tests which measures children's motor performance aged 4.5 to 14.5. The complete version of this test is composed of eight sub-tests (including 46 separate parts) which measures fine and gross motor disorders. The summarized form of this test includes eight sub-tests and 14 separate parts. Bruininks prepared this test by revising Ozeretsky's motor proficiency test in 1978. The full conducting of this test takes 45 to 60 minutes. Four sub-tests of gross motor skills (running speed and agility, balance, two-sided harmony, strength), three sub-tests of fine motor skills (response speed, visual-motor control, speed and upper limbs agility) and one sub-test measures both skills. Bruininks (1978) standardized this test on a sample of 756 children based on age, sex, race, society's size and geographical area in 1970.

Reliability coefficient of this set is 0.87 and its validity coefficient is 0.84. Vaez Mousavi and Shojaee in a study titled "Describing physical and motor characteristics of guidance school's students in Tehran have reported the reliability and retest coefficient in the long form as %78 and in the short form %86 (22). In this study due to selecting parts of Bruininks-Ozeretsky's proficiency motor test and for determining its reliability coefficient in the cases of this study, Cronbach's alpha coefficient (0.83) and reliability coefficient (0.32) in-group was used, and this test is of high-reliability coefficient in this study. The way of scoring in this test is in this way: for each sub-test there are some special and standard tests which should be repeated twice by the subjects. The supervisor records the score of each test. At the end the score which is higher is considered as the person's score.

2.4 Statistical Method

The data was analyzed in two groups of descriptive and inferential statistics. Average, standard deviation and tables were done with descriptive statistics. In inferential statistics, for normal distribution of the data, Shapiro-Wilk's test was used which showed normal distribution (p=0.348). Also variances homogeneity was confirmed by means of Lon's test at the subscale of response speed (p=0.103), visual control subscale (p=0.109), and speed and agility of upper limbs subscale (p=0.104). Alongside to study changes within groups, dependent t-test and to study changes between groups, one-way analysis of variance test (ANOVA) was used. At the end to study significance place, Tukey's post hoc test was used. Significance level for all tests was considered less than 0.05. Analysis of data was done with SPSS software the 16th version.

3. Results

According to the results, average and standard deviation in different groups are as follows:

Table 1. Mean and Standard Deviation of IQ for the Homogeneity of the Four Groups at Pretest

Groups	N	Score (Mean ± SD)
Perceptual-Motor	10	64.5±2.5
Spark	10	65.5±2
Combinatory	10	64.4±3
Control	10	64.5±3.15

As seen from the results of correlated t, the difference between pretest and posttest in three groups of perceptual-motor exercises, Spark and combinatory in skills of response speed, visual-motor control and upper limbs agility and speed is significant. But it is not so for the control group.

Table 2. Mean and Standard Deviation of Pretest and Post-test Scores of the Four groups at Three Sub-tests.

Sub-Tests	Groups	Pre-Test	Post-Test
Response Speed	Perceptual-Motor	25.02±1.76	20.2±1.18
	Spark	25.1±2.61	22.2±1.02
	Combinatory	25.10±3.15	18.2±4.27
	Control	1.28±1.25	7.24±1.49
Visual-Motor Control	Perceptual-Motor	2.97±2.0	14.42±30
	Spark	31.40±2.0	51.45±6.0
	Combinatory	23.40±2.0	32.71±6.0
	Control	18.28±2.0	26.50±2.0
Upper Limbs Agility and Speed	Perceptual-Motor	69.27±2.0	25.70±5.0
	Spark	71.31±2.0	01.43±6.0
	Combinatory	68.30±2.0	67.39±6.0
	Control	67.25±2.0	83.32±2.0

Table3. Dependent T-test results about Comparing Pre-Post Tests Scores for the Groups in Three Subtests.

Sub-Tests	Groups	T Value	DOF	P
Response Speed	Perceptual-Motor	4.792	9	0.001
	Spark	3.444	9	0.007
	Combinatory	7.774	9	0.001
	Control	0.688	9	0.509
Visual-Motor Control	Perceptual-Motor	-6.639	9	0.001
	Spark	-11.124	9	0.001
	Combinatory	-11.652	9	0.001
	Control	-0.625	9	0.548
Upper Limbs Agility and Speed	Perceptual-Motor	-10.241	9	0.001
	Spark	-17.897	9	0.001
	Combinatory	-24.188	9	0.001
	Control	-1.290	9	0.299

For comparing the scores of the four groups at three subtests, one-way variance analysis test (ANOVA) was used.

Table4. One-way Variance Analysis Test (ANOVA) for Comparing the Scores of Four Groups at three Subtests.

Sub-Tests	Groups	SS	MS	DF	F	P
Response Speed	Between Groups	220.475	73.492	3	18.083	**0.001***
	Within Group	146.3	4.064	36		
Visual-Motor Control	Between Groups	56.215	18.738	3	68.637	**0.001***
	Within Group	9.813	0.273	36		
Upper Limbs Agility and Speed	Between Groups	84.36	28.12	3	122.32	**0.001***
	Within Group	8.276	0.23	36		

SS: Sum of Squares; DF: Degree of Freedom; MS: Mean of Squares; * indicates significant difference (P≤0.05).

As is shown in table 4, there was a significant difference among groups in three skills of response speed, visual-motor control and upper limbs agility and speed. Therefore, to compare means, Tukey's post hoc test was used.

Table5. Tukey's Post Hoc Tests for Determining Difference Location Among Four Groups in three Subtests.

Sub-Tests	Compares couples	Mean Difference
Response Speed	PS	-2
	PCB	1.7
	PC	**-4.6***
	SCB	**3.7***
	SC	**-2.6***
	CC	**-6.3***
Visual-Motor Control	PS	**-1.37***
	PCB	**-2.18***
	PC	**0.88***
	SCB	**-0.81***
	SC	**2.25***
	CC	**3.06***
Upper Limbs Agility and Speed	PS	**-0.76***
	PCB	**-1.42***
	PC	**-2.42***
	SCB	**-0.66***
	SC	**3.18***
	CC	**3.84***

PS: Perceptual-Motor Vs Spark Compare; PCB: Perceptual-Motor Vs Combinatory; PC: Perceptual-Motor Vs Control; SCB: Spark Vs Combinatory; SC: Spark Vs Control; CC: Combinatory Vs Control; * indicates Significant difference.

The results of post hoc test which have been summarized in table 5, show that there is a significant difference among the three groups of perceptual-motor exercises, Spark and combinatory with control group in response speed skill. The combinatory group shows the highest development in response speed. The mean difference among three groups of perceptual-motor exercises, Spark and combinatory with control group is significant in visual-motor control. Also there is a significant difference between perceptual-motor exercises, in a way that Spark has been more influential on this skill. The combinatory group was most influential of all in visual-motor control. At the end there was a significant mean difference among three groups of perceptual-motor exercises, Spark and combinatory with control group in speed and upper limbs agility skills. There is a significant difference between perceptual-motor exercises with Spark, and the Spark group shows more development in this skill. The combinatory group was most influential of all in speed and upper limbs agility.

4. Discussion

The aim of the present study was to see the effect of perceptual-motor exercise on the development of mentally retarded girls' fine motor skills aged 7 to 10. The results of the study showed that the participants in the educational programs of perceptual-motor exercises, Spark and combinatory achieved a better condition in fine skills. The conducted researches in this field, showed that children interacting with the environment develop motor skills. The integration of factors such as exercise opportunity, proper educational program and interaction with the environment develops motor skills (23). Generally, the

present study showed that environment is a very important factor in motor skills development. On the other hand, we know that different texts have referred to the overlapping of different aspects of motor development including: psychological, cognitive, social and motor aspects and growth specialists have explained the mutual effect of these factors (24).

One can understand the importance of various motor experiences for children's inclusive growth. One of the important reasons of the more effective of motor experiences and motor skills education compared to routine educational program is the opportunity of exercise. Children, for the development of their motor skills, need encouragement, exercise and training opportunity, rich environment, incentives and education quality in ecological environment. One of the influential factors is the duration of exercise. Observation of physical education classes, especially in special schools, shows a low level of physical activity (25). Observations show that only three minutes of these classes are devoted to average to severe physical activity. This is less than the time required by children to develop physical preparation and growth as well as motor skills and integrated activity.

The results of the study showed that using selected exercises can improve mentally retarded girls' fine motor skill. These results are in line with those of Alikhani (2011), Nasrabadi (2011), Kowsari (2011), Ghasempour (2012), Ghorbanzade (2014), Goodway and Bratna (2003) and Simon et al (2008) (14, 15, 23, 26-28). But the results contradict those of Kawal and Matson (2003) and Baghnede (2014) (2). Among the reasons for contradiction one can refer to the type and number of exercise programs sessions and the subjects' age range. The number of the present study is twice more than that of Kawal and Matson (2003). Also the subjects of this study have more IQ compared to those of Baghnede and et al (2014).

Broadly, concerning the perceptual-motor exercises in this study, it can be said that perceptual abilities are necessary for understanding and interpreting drives and equip children with necessary abilities for adaptation with the environment. Also perceptual-motor exercises enhance special awareness, physical image and activity and in this way facilitate cognitive abilities which are in direct relationship with fine motor skills (21). Concerning Spark's selected exercises one can refer to harmony improvement due to exercise opportunities, in a way that environmental conditions and equipment enhance harmony in different part of body, especially harmony among eye and hand and hand and foot, and this is in line with dynamic systems theory.

Dynamic systems theory is considered as an influential factor in motor skills development.

This theory believes influential elements on motor development including: the special needs of motor assignment in the interaction between individual and environment and the elements are influential in motor abilities development. Such an interactive model signifies that in systems accompanied by assignment elements individual and environment not only interact but also they can make changes by increasing motor quality and control (24). In the present study, the researcher has achieved considerable effects on fine skills development by manipulating environment on one hand and minimizing the growth and maturity element. Since mentally retarded children face social, cognitive, perceptual and motor growth limitations, so taking into account these children's needs and providing proper environment and exercise and experience opportunities can improve their growth. In fact, sufficient facilities, equipment, time and encouragement are vital for the development of motor skills especially in children; however, they cannot lead to motor development by themselves. Most of the children cannot improve their motor skills without proper programming (9).

According to the results of previous studies and the present study which took advantage of Spark and perceptual-motor exercises, one can say participating in sports activities for children with special needs is a must, and not only it improves motor skill but also it, as a rehabilitation method, leads to the development of body image, special awareness, transition skills improvement, activity and orientation, increasing body capacity, body control improvement and increasing social communication in these children and provides a foundation for their proper health growth. Therefore, this study emphasizes an active life for children with special needs. According to the results of the present study, these exercises can be used by rehabilitation and welfare centers, and those people who are engaged with these children in order to decrease the effects of disability in these children.

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