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Effect of integrated sensory- motor training on muscular strength in Educable Mental Retardation students

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Abstract

Today, in all human societies, exceptional people, especially people with intellectual disability are regarded. Students and children mentally retarded in physical skills such as strength have serious shortcomings. This study aimed town to investigate the effect of sensory-motor training on muscle strength in children with educable mental retardation.

A quasi-experimental study was conducted. Thirty mentally retarded girls from primary school were selected through purposive sampling. Then, they were homogenized based on their pretest scores and were divided into two groups: fifteen experimental & fifteen control. That because of the evaluating reduction, the number of the control group reached ten. In this research, A Dynamometer and vertical jump test- was used to test physical strength. Sensory stimulation and physical exercises were practiced by the experimental group during twenty-four sessions. Each session was forty-five minutes long and was held three times a week. The control group performed the class programs. After twenty-four sessions both groups were tested. To investigate the research hypothesis Paired T-test and ANOVA2 × 2 and by SPSS software (version 21) were used. There were no significant differences between the two groups with regard to improving the muscle strength ($p>0.05$).

Statistical results showed no significant differences between the two groups with regard to improving the muscle strength. Although applying the integrated sensory- motor is common among occupational therapists, it does not yield satisfactory results for muscle strength, according to the results of this study. Simultaneous utilization of other reference frames beside the sensory-motor Integration may result in better outcomes.

Keywords: Sensory- Motor Integration, muscular strength, educable Mental Retardation

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1. Introduction and preliminaries

Children with intellectual disability need to develop in terms of physical fitness, motor ability, and body mechanics. These people are generally in poor body condition and do not possess physical pleasure [1]. In comparative studies, compared to normal children, students with an intellectual disability always get lower scores in physical, motor and cognitive fields [2]. Muscular strength is vital for everyday activities of these individuals and a positive relation between muscular strength and their performance in the workplace has been proven [3]. Among various factors of physical fitness, physical strengths plays a pivotal role in social rehabilitation of people with disability, including individuals with mental retardation [4] and it is amongst factors which by having awareness of its principles and rules of development, instructor can be helped to design physical exercises for these people to develop biological activities and professional capacity in the future [5]. The effectiveness of an intervention program should be assessed through conditions and situations in which more opportunities are provided for children with intellectual disability to experience and learn different type's of perceptual-motor behaviors. Researchers in this field have often been conducted with this purpose. However, their result varies considering the practice program, intensity, and extent of children's problem and measured variables. For example, in a study by Ferguson et al, in order to compare the effectiveness of two intervention program (sensory-motor and exercises relative to the field of sport) on performance, isometric strength of children with developmental coordination disorder, they did not observe an improvement in isometric strength in both groups [6]. In addition, results of Kubilay et al, and Yilmaz et al revealed that sports exercises in children with mental retardation improve their strength [7,8]. Moreover, Westendorp et al reported that organized sports activity enhance the strength of children with intellectual disability [9]. Tsimaras et al described that principle and regular basketball exercises increase muscular strength level of children with mental retardation [10].

According to AbbaspourAniet al, findings it is indicated that one period of power-balance program improves static balance and isometric strength of trainable mental retarded girls [11]. The research by Moghanlou et al suggested that 24 sessions of Spark exercise significantly improves balance, coordination, and strength of children with intellectual disability. In another study, they concluded that 24 sessions of basketball exercise had no significant effect on coordination and strength of mentally retarded children [12]. Furthermore, Sayyadineg had et al in a study showed that progressive strength exercises in these children significantly enhance balance and muscular strength [13].

Mohammad Mashhadi et al determined that by having an active life, mentally retarded teenagers can improve their muscular strength like their normal peers [14]. Kosari et al explained that Spark motor program has a positive effect on the strength of children with intellectual disability [15]. Farhadi and Barati indicated that physical exercise has a positive effect on grip strength of both dominant and nondominant hands of mentally retarded girls. Kalahari confirmed the impact of physical activity on perceptual-motor performance [17]. Also, Rahbanfard showed that special motor programs do not have a significant effect on the accuracy and strength of trainable mental retarded children [18].

On the intervention methods for treatment of these children's problems, is sensory-motor integration method. Sensory integration theory was first initiated and developed by Ayres; she believed that the vital aspects of sensory integration are in lower levels of nervous system especially medulla oblongata and

thalamus and by increasing the efficiency in truncusencephali and thalamus, the efficiency of higher levels also increase. In fact, by using this theory and enhancing primary and basic functions such as postural tone and balance, a motor base is created for higher levels of performance and by creating opportunities to increase vestibular and proprioceptive senses information entry in the form of targeted activities, ability of nervous system in sensory process integration is modified and motor learning and other aspects of Cerebral Cortex function is increased [15].

Considering the importance of using sensory-motor integration exercises in the rehabilitation of this group and also by taking into account that motor behavior specialists emphasize on the importance of motor education and training in pre-primary and primary schools, design and performance of various exercises and evaluating their efficiency by motor behavior specialists of the country is considered essential. Therefore, in the present study, researcher intends to know whether sensory-motor integration exercises lead to muscular strength improvement for educable mentally retarded students.

2. Materials and Methods

The present study is semi-experimental study.

Population, sample and Sampling method: The statistical population of the study includes all girls mentally retarded students studying at the exceptional school of elementary school (7-13 years old) in Borujerd. The statistical population was recognized as a mentally retarded (Isofacter50-70) by using Wechsler's revised intelligence test.

According to the research objectives, among 70 students, 30 children were randomly selected as samples based on existing limitations such as: not having physical, sensory and motor disabilities and certain diseases such as epilepsy and...., and they were divided into two groups of with 15 individuals named experimental group and 15 individuals named control group, which due to the number of control group reduced to 10 individuals.

The criteria for entering the research were: the criteria for entry were: having an IQ of 50-70 (educable), having an age range of 7-13, attending an exceptional school, having no cardiovascular disease, not having any neurological disorder, not having Movement problems (walking without help) and parents satisfaction.

Exit criteria include: occurrence of orthopedic stroke during intervention period, unwillingness of cooperation between the child and parents despite the initial consent, absence in the post-test in due time and the number of absences of more than 3 sessions during the implementation of the practice protocol.

Measuring Tools

The tool for data collection in the current paper are dynamometer especially for determining grip strength and using Sargent vertical jump test. In order to measure the handgrip strength, a hand dynamometer (SH5001, South Korea) was used. During this measurement, the subjects were placed on a bed in a sitting position and a pillow was placed under their arm so that the elbow was in 90-degree flexion. Then the dynamometer was given to them and then subjects were asked to grasp it with maximum force for three times and eventually the highest score read, was recorded. In addition, for measuring explosive power, Sargent Jump (Vertical jump) test was used. In order to perform this test, the subjects chalk the end of

their fingertips and stand 15 cm away from wall such that the shoulder of the dominant hand (Right or Left) is toward the wall by reaching up and stretching the hand, the highest point of fingertips is marked by the examiner on the wall. Then the test taker jumps vertically and touches the wall by fingertips to mark the highest point. The difference in distance between these two points determines the vertical jump or record of the athlete in this test. This test is repeated three times and the best of three attempts is recorded as the main score.

Performance method

The chosen training program in this study is derived from the book on activities related to the Barbara Fink sensory motor integrity, which is mentioned in Table 1 (25).

Table 1.Thecontent of Training program in one session (45 minutes)

Sensory-Motor Integration Exercises
Using board of bolts and nuts, applying the instruction book, the child is asked to open and close the bolts and nuts. Fitting, stitching, painting, drawing, copying and writing, scissoring on different shapes and lines, drawing maze, tracking lines, copying shapes, cutting and pasting, point-to-point jiggles, puncturing designs, throwing balls to goal and playing Darts, Throwing the ball in the basket to strengthen and coordinate the big muscles, running or include a part of the body, such as arm or hand, such as throwing an object for a specific purpose. Activities such as catching, throwing or shooting balls, walking on a spiral line for coordination of eye- hand-foot and length jump, height jump, Hopscotch, and various skipping skills.

The program was arranged for 24 sessions and its duration was 45 minutes per day and 3 training sessions per week. Before performing the exercises, the subjects of both experimental and control groups were measured by a Dynamometer and vertical jump test in the pre-test. The role of pre-test in this plan was to control and compare. An independent variable was applied to the test group. After 24 sessions, the tests were run and scored by the test group in the post-test. In order to investigate the results of the research, to determine the nature of the data distribution, Shapiro-Wilktest was used for Levine test to homogenize the variance of the groups, and for independent homogeneity of the groups, independent t-test and for the significance or absence of hypotheses Analysis of variance 2 × 2 was done using SPSS software version 21.

3. Results

Results were presented in two descriptive and inferential sections.

Average and Standard deviation in two group Experimental and Experimental

	Control group(M±S)		Experimental group(M±S)	
Dependent variable	Pre-test	Post-test	Pre-test	Post-test
explosive power	20.50±11.59	19.18±8.14	18.07±10.53	19.93±10.02
Right hand power	9.60±3.37	9.20±3.29	9.67±4.03	13.13±4.01

Left hand power	7.80±2.61	8.50±2.27	9.67±4.57	12.20±5.10

In the inferential statistics, before analyzing the data, Shapiro–Wilk test was used to ensure that the data distribution was normal. the distribution of data was normal in both groups and in all stages of the test($p>0.05$), therefore parametric tests were used to analyze the data. Also, Levine test results showed a meaningful difference between the experimental and control groups in the pretest ($P = 0.614$). And the significance level of alpha was 0.025. In order to investigate the differences between the groups and the groups, the variance analysis with repeated measures of 2 × 2 (two groups with pre-test and post-test) was used. Also, to determine the effect of frequency of measurement from pre-test to post-test in experimental and control groups, t-test was used and independent t-test was used for comparison between experimental and control groups.

Results of analysis of variance analysis with repeated measures with 2 × 2 plot

		M±SD	F	DF	P
explosive power	The effect of the frequency of the measurement	4.083	0.824	(1,23)	0.373
	The effect of group	15.870	0.036	(1,23)	0.850
	The effect of group × The effect of the frequency of the measurement	19.763	3.990	(1,23)	0.058
right hand power	The effect of the frequency of the measurement	28.213	20.888	(1,23)	0.001
	The effect of group	48.000	1.775	(1,23)	0.196
	The effect of group × The effect of the frequency of the measurement	44.853	33.207	(1,23)	0.001
left hand power	The effect of the frequency of the measurement	31.363	9.502	(1,23)	0.005
	The effect of group	92.963	3.099	(1,23)	0.092
	The effect of group × The effect of the	10.083	3.055	(1,23)	0.094

	frequency of the measurement				

At the level of α = 0/025 is significant

The information in the table above indicates that the effect of the group was no significant (p >025) due to the frequency of the measurement and the interaction between the group and the frequency of the measurement of the effect of the group.

the results dependent t-test

	group	pretest	posttest	t	p
explosive power	experimental	18.07±10.53	19.93±10.02	3.690	0.002*
	control	20.50±11.59	19.80±8.14	0.503	0.627
right hand power	experimental	9.67±4.03	13.13±4.01	9.213	0.001*
	control	9.60±3.37	9.20±3.29	0.667	0.522
left hand power	experimental	9.67±4.57	12.20±5.10	3.355	0.005*
	control	7.80±2.61	8.50±2.27	1.172	0.271

The data obtained from T-test showed that there was a significant difference between the two groups in the experimental group. But these changes in the control group were not significant.

the results independent t-test

variable	test	group	M	t	p
explosive power	pretest	experimental	18.07±10.53	0.377	0.710
		control	20.50±11.59		
	posttest	experimental	19.93±10.02	0.024	0.981
		control	19.80±8.14		
right hand power	pretest	experimental	9.67±4.03	0.043	0.966
		control	9.60±3.37		
	posttest	experimental	13.13±4.01	2.570	0.017*
		control	9.20±3.29		
left hand power	pretest	experimental	9.67±4.57	1.164	0.256
		control	7.80±2.61		
	posttest	experimental	12.20±5.10	1.283	0.212
		control	8.50±2.27		

The results table above showed that there was no significant difference in (explosive power and left hand power) between the two experimental and control groups in the pretest and posttest, but in (right hand

power) was a significant difference between the two experimental and control groups in the post-test**.**

4. Discussion

The purpose of this study was to determine the impact of sensory-motor integration training on muscular strength of educable mentally retarded children. Results of this study indicated that scores of case group had a significant improvement compared to control group, but these results were not statistically significant. Among several factors of physical fitness, physical strength plays an important role in the social rehabilitation of individuals with a disability, especially mentally retarded people.

Moreover, there are many studies which reveal that subjects with mental retardation significantly enhance their muscular strengths after participating in the training programs. Findings of Kubilay, Yilmaz, Westendorp, Tsimaras, AbbaspourAni, Moghanlou, Sayyadineg had, Mashhadi, Kosari, Farhadi, Barati, and Allahiari showed that physical exercise can improve the strength of these individuals which are not consistent with the results of this study. The possible reasons for this issue can be due to their exercises or age conditions or the type of the mental retardation for the subjects.

Maybe this contradiction is related to the impact of other factors on muscular strength in case and control group since control group had slightly improved. As mentioned before, factors such as motivation, inability to understand the test or subject's intelligence have affected the results in which, it can be interpreted that other factors apart from the selected exercise influenced the muscular strength, that its effect is evident in control group. Considering the fact that muscular strength in case group almost increased after exercises, the difference in the progress, even though statistically it does not have a significant difference, can be due to passing a training period in the case group.

Furthermore, considering this increasing procedure, itis most probable that by an increase in weeks of exercise, a significant difference between training groups will be also created. The insignificance of muscular strength is consistent with the results of Ferguson, Rahbanfard, and Moghanlou. Ferguson reported that intervention program does not have a positive impact on the isometric strength of children with developmental disorder. According to him, weekly, monthly and yearly regular control of physical fitness factors is an important condition for doing scientific work with disabled children. Based on the results of the current study, although the progress for both groups in all week was not equal, the overall progress of weekly improvement of case group from pre-test to post-test was significant. Therefore, children with intellectual disability possess satisfying potential features in order to progress in their strength abilities if they have sufficient motor opportunities and proper non-teaching and educational methods. Design and implementation of such programs that are especially for strength improvement, is done by considering intelligence level, capabilities, and limitations of mentally retarded children. Assessment of its efficiency in the enhancement of everyday physical motor activities and sports skills requires further research in the future.

Due to several reasons such as the feeling to escape the classrooms and curriculums and serious activities that usually result in evaluation and criticism, Children and teenagers exhibit a particular interest toward playing and display their greatest potential and energy while playing. Considering this particular property, desirable use of delightful situations and opportunities of playing games to transfer educational message, directly or indirectly, by verbal or nonverbal means and progress of cognitive actions and development of motor skills and social responsibility are of great importance [20]. As a result, it is desirable that parents

and teachers always pay particular attention to this important issue [21]. What's more, based on the fact that physical characteristics play an effective role in daily activities [22] improvement of physical factors can play a more effective role in enhancing daily activities of afflicted people.

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