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Effectiveness of Strengthening Eye-Hand Coordination in Improving Hand Motor Growth in Infants Who Suffer from Cerebral Palsy and are Aged 8-12

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ABSTRACT

Long-term treatment and physiotherapy of infants who suffer from cerebral palsy by a specialized group will be very costly and it will take a huge human force for the infant's family and society and it will adversely influence family's function.the present research tries to determine the effectiveness of strengthening eye-hand coordination on improving manual motor growth in infants who suffer from cerebral palsy and are from 8-12. Research methodology is experimental and its design is pretest-posttest with control group. Therefore, 30 infants who suffered from cerebral palsy in hand performance were selected by means of simple random sampling from Tehran rehabilitation center and put into two test and evidence groups randomly (15 people in each group). Then, Lincoln oseretsky questionnaire was executed for both groups. Then strengthening eye-hand coordination was educated to test group for 16 sessions of 45 minute and finally, both groups were evaluated again by the questionnaire. Data obtained in this way were analyzed by multi-variate covariance. Results showed that strengthening eye-hand coordination is effective in fine and coarse motor growth of hands of infants suffering from cerebral palsy. Results showed that eye-hand coordination strengthening is an appropriate method for improving manual motor growth of infants who suffer from cerebral palsy.
KEYWORDS:cerebral palsy-motor growth-eye-hand coordination

1. INTRODUCTION

Cerebral palsy is a set of various syndromes which is displayed with motor and posture disorder of body resulted from non-progressive lesion in immature brain and it is one of the most famous permanent advanced disabilities with frequency of 1.5 to 3 in 1000 births (Gordon, Roopchand and Gregg, 2012). Identification and measurement of motor growth has been interesting for researchers due to its role in human life from childhood to adulthood. The relationship between motor growth with other personality aspects like self-concept and emotional behavior justifies the requirement of dealing with motor activities as a must in psychology. In fact, the first step for rehabilitation centers is achieving skills and competencies that make an individual independent and add meaning and direction to his/her life (Farrokhi and SeyyedZadeh, 2002).

Cerebral palsy includes Non-progressive abnormalities in a growing brain which results in a set of neurological, motor defects which are related to body posture that take place during an infant's ≪infantlike and childlike≫brain growth (Menkes,Sarnat& Maria, 2006). Infants who suffer from cerebral palsy may experience a wide range of motor-posture, coordination and sensory disorders during their lives. Such infants suffer from inconsistency in performance when they try to use several body systems and one of these performances is eye-hand coordination. Various treatment approaches have been propounded on rehabilitation of infants suffering from cerebral palsy and one of these effective medical methods is strengthening eye-hand coordination. This medical method allows you to match your understanding of objects shape which you are going to touch. Abbasi and Hadian (2011) believe that eye-hand coordination is the coordinated control of eye movement and hand movement and processing of eyesight input for reaching and touching along with hands for directing eyes. In simple words, eye-hand coordination involves coordinated eyesight and hand movements. Physical growth and evolution of infants with cerebral palsy is one of the most complex problems that is related to the restriction of a wide range of motor activities. Studies showed that motor disorders in infants who suffer from cerebral palsy will finally affect all growth aspects of them. An infant who suffers from cerebral palsy has motor growth but it is slower than usual and his/her growth is not only retarded but also abnormal. Growth will be stopped at the early stages. This is while growth-related movements are very obvious in natural motor pattern up to 5 years. These changes are very slower in cerebrally-paralyzed infants but these changes might be continued up to

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puberty age and even in adulthood (Gross, 2005). Proper movements involve different body systems coordination. Hand and eye are among organs that are mutually related. Generally, eye and hand activities will help with sensory awareness growth and motor skills growth. Lack of skill in doing movements is due to weakness in eye-hand coordination and can affect playing skills and doing daily works of life and therefore it can lead to motor and strengthening delay (Abbasi and Hadian, 2011).

One of the interventions and activities that have been conducted is the application of both hands and coordination with eye which is done in the form of bending activity, threading a bead and so on.In Latash opinion, ability of doing continuous movements is related to appropriate motor planning. This problem this issue is observable in activity of threading beads. In this activity, the individual does the activity with order and without stop. In general, this activity results in hand movement successions exercise and improvement of motor planning (Hadian, Abdolvahhab, Mortazavi, Bagheri, Jalili and Faghihzadeh, 2007). Abbasi and Hadian (2011), in a research titled "investigation of impact of eye-hand coordination activities on the manual skill of students with down syndrome who are 7 to 10 years old", showed that the average speed of movement of dominant and recessive hands, coordination of both hands and hand skill had significant difference before and after intervention. In spite of this, speed increase average of dominant and recessive hands, hands coordination and manual skill in girls and boys, left-hands and right-hands were not significant. This treatment method will improve motor performances in infants. Mollanorouzi, Halabi, Sheikh and Akbari (2011) showed that selected motor group had greater impact on manipulation skills growth in comparison with control group. Appropriate educational plan design can provide an exercise opportunity for infants motor skills growth. Verrel, Bekkering&Steenbergen(2008) conducted a research titled" eye-hand coordination influence on performance or performance reduction inHemiplegia cerebrally-paralyzed infants.They noticed that infants with cerebral palsy do coordinating movements in their eyes when they move their affected hand and in other words, eyesight concentration increases on target when doing movements. Hospers, Peters, Dirrks,Bos&Algra (2007) believe that quick interventions in improving motor and cognitive growth in infants with motor disorders will lead to better performance in motor skills and considerable progress in this skill. Smith (2000) investigated learning influence and exercising performance elements on pre-school child's fine motor skills and performance activities that suffered fine motor delay.Results showed that all participants had statistically-significant changes in all cases of evaluation at the end of academic year.Tabrizi (2010) showed that the selected physical activity which is extracted from Spark's motor program can be a cause for improving coarse motor skills in infants suffering from Hyperactivity. The present research therefore tries to determine effectiveness of educating eye-hand coordination on motor growth of infants suffering from cerebral palsy.

METHODOLOGY

Statistical population of the present research included all children who suffered from cerebral palsy and were aged 8 to 12 in Tehran, Iran and suffered from manual performance disorder and were studying at Occupational therapyclinics and exceptional children schools in 2012. 30 childrenwere chosen by simple random sampling method and were placed randomly in test and control groups (15 per each group). From among all centers, two centers named Pouya and Mohayyawere chosen. The list of all children who suffered from cerebral palsy and had disorders in hand performance included 48 people and 30 people were chosenby lottery. These people underwent 16 sessions of education, each lasting 45 minutes. But the control group did not receive any intervention in this field. Finally, motor skill of both groups (30 people) was investigated again by Lincoln oseretsky.

Measurement tool

Lincoln oseretskymotor skills measurement test (1950): this measurement scale has been designed for evaluating motor ability of those who are aged 5-14. This scale is implemented individually and has 36 items and investigates various motor skills like fingers skill, eye-hand coordination, and activities of large organs like hands, arms, legs and body. The 36 items have been ranked according to their difficulty. Reliability of this test has been verified by Chronbach's Alpha (0.73) and its validity have been verified by Subscalespoint correlation (0.82) (Anastazi, 1976; translated by Barahani, 1981).

In Iran, Fallah, Jafari and Vali (1991) found the norms of this test and reported its validity and reliability with acceptable numbers, 0.99 and 0.88 respectively (Ahmadi and Shahi, 2010).

RESEARCH RESULTS

Multivariate covariance analysis test (manova) was used considering the goal and question of this test. Table 1 shows the descriptive results of variables based on groups.

Table 1: statistical characteristics of both control and test groups

components	Test group		Control group	
	Mean	Standard deviation	mean	Standard deviation
Fine motor	42/67	13/14	33/53	11/13
Coarse motor	22/47	8/44	11/07	7/28

Results of table 1 show difference between control group mean and test group mean in dependent variables. These changes are to test group benefit in both variables.

Table 2: multivariate covariance analysis of F ratio for combinational variable size

Eta	Significance level	F(25،2)	Value	source
0/777	0/000	43/603	0/223	Combinational variable (movement)

Attention: multi-variate F ratio has been achieved by estimating Wilks' lambda

Squared Eta values that are listed in table 2 are shares of variance that are related to new combinational variable. General rule has it that if this value is larger than 0.14, then impact intensity is high. In table 2, this value is equal to 0.777 and this is indicative of high impact. The results of Wilks' lambda are significant for combinational variable. Significance of new combinationalvariable shows that participants in both groups are different from each other and the means of groups are significant under the influence of independent variable. The results of adjusted mean and dependent variables covariance have been provided in table 3.

The results of table 2 shows that there is significant difference between test group, which received strengthening of eye-hand coordination skill and control group, which did not receive any educational treatment (……..) and this difference is to the benefit of the group which received eye-hand coordination skill considering the adjusted means.

Table 3: adjusted mean of standard deviation and the results of covariance analysis for dependent variables

variable	Test group		Control group		covariance		
	mean	Standard error	mean	Standard error	F(28،1)	p	ETA
Fine motor skills	42/318[a]	1/135	33/882[a]	1/135	27/538	0/000	0/514
Coarse motor skills	22/038[a]	0/84	11/495[a]	0/842	78/301	0/000	0/75

As the results of covariance show in table 3, there is significant difference between adjusted means of the two groups of fine motor growth of hand (F(1,26)=27.538 , P=0.000, ETA=0/514). Furthermore, covariance analysis results show that there is significant difference between the two groups in coarse motor growth of hands variable (F(1,26)=78.301 , P=0.000, ETA=0/75).

Findings are indicative of the fact that education of effectiveness of eye-hand coordination skill is effective in fine and coarse and generally overall hand growth of children who suffer from cerebral palsy and improves these movements.

CONCLUSION AND DISCUSSION

As the results showed, strengthening eye-hand coordination skill is effective in infants' motor growth who suffers from cerebral palsy. In other words, strengthening eye-hand coordination skill affects motor growth of infants and improves infants' performance. Because we did not find any research completely similar to this research, we compare our results with partially-similar research results. Our results match the results of studies conducted by Abbasi and Hadian (2011), Hadian et al (2007), Sheikh et al (2003), Verrel et al (2008), Hasperz et al (2007). This can be explained in this way thateye-hand coordination is a method which gives attempt unwastefulness responsibility and spontaneous performance in predictable and unpredictable situations to an individual. Motor coordination level is affected by these skills. Strengthening of eye-hand coordination skill will increase motor skills of infants suffering from cerebral palsy. Findings of Storld and jonson (2010) showed that an infant dominates over simple activities and then he/she goes to complex activities. Development of motor patterns from simple to difficult will help to generalization of more complex motor activities. If eye-hand coordination activities are done systematically, they will lead to more complex skills improvement and growth in such infants. In eye-hand coordination method, infants divide activities into smaller activities and they learn smaller and simpler movements first and then, they will have positive changes in their motor skills. Furthermore, strengthening eye-hand coordination skill is effective in improving fine motor growth of hands in infants with cerebral palsy. This result matches that of Smith's (2000) and Farahbod (1998). Smith (2000) believes that eye-hand coordination is very important for successful performance which can be directional coordination between hand and eye movements. This result matches that of Pedretti's research (2002). He states

that each movement contracts a series of muscles and will facilitate moving other powerful muscles. Therefore, eye-hand coordination activities result in application of small hand muscles and repetition and exercising these conditions ill strengthen these muscles. Furthermore, one of the activities was use of both hands and their coordination in folding of a piece of paper and threading a bead. Ability of coordinating both hands is a skill that makes use of both hands. Repetition and exercise result in skills increase and infants ability improvement. This matches the results of Pedretti's results (2000),. He stated when an individual achieves former abilities and does muscle activities, he can do fine motor activities and exert appropriate force with appropriate domain and he can also increase both hands coordination. Eye-hand coordination skill strengthening is also effective in improving coarse motor growthof hands in infants with cerebral palsy. In other words, strengthening eye-hand coordination skill improves coarse motor growth. This result matches the results of Hadian and Abbasi (2011), Sheikh et al (2003). In many studies like those conducted by Arpino,Vescio, De Luca &Curatolo (2010), success of intervention programs has been attributed to programs intensiveness. Intensive treatment programs have better performance results in comparison with non-intensive programs. In the present study, repetition of program (more than 3 times a week) will result in better performance of strengthening program. A set of activities and exercises includes a wide range of performance skills and has been designed in order to achieve physical and motor needs. Infants first carry out activities in the form of finer activities. Each infant tries to improve his/her performance for succeeding in doing activities and complex exercises. In general, these strengthening programs lead to achieving new skills. Hiwood&Gechel, 2007(translated by Naseri, 2008) believe that displacement skills are coarse motor skills and more experience and exercise will result in better performance in displacement skills. These skills are bases for future motor skills which will result in better communication with surroundings and therefore better perception and cognition. Consequently, eye-hand coordination activities that cause repetition of activities, can improve infants coarse motor performance. Due to temporary form of the skills strengthening course, we must be careful in generalizing the results and their validity in the long run, because infants suffering from cerebral palsy need long-term rehabilitation programs. This research has been conducted on infants with cerebral palsy and care must be taken in generalizing the results to other individuals with motor disorders. Because the results showed that eye-hand coordination leads to hand performance motor growth improvement, it is recommended that eye-hand coordination strengthening methods be used as a suitable solution to motor disorders and improvement of sensory-motor problems. It is also advised that eye-hand coordination program be conducted in group form.

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