COMPARING THE MOTOR SKILLS OF 4 AND 5-YEAR-OLD EDUCABLE MENTALLY RETARDED GIRLS WITH THEIR PEER GROUPS USING PEABODY DEVELOPMENTAL MOTOR SCALES

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Abstract. Objective: The development of motor skills in preschool children plays a fundamental role in subsequent learning, with some researchers believing that motor skill learning determines future learning, and superior mental processes result from the proper development of the perceptual-motor systems. Motor performance in children affects their learning skills, so the lack of proper motor activity is a hurdle involved in a child's explorative, playing and learning experiences. **Method** This descriptive, analytical study is cross-sectional in nature. The researcher described and analyzed the motor skill of two subject groups, one consisting of normal girls and the other consisting of educable mentally retarded girls, aged 4 to 5, across Tehran's kindergartens. Multistage randomization was performed to select a statistical population totaling 60 subjects. The test consisted of two parts; one assessed the gross motor skills and the other assessed the fine motor skills. **Results:** Data were analyzed by the analysis of variance and t-test. The results indicated that there was a statistically significant deference between 4 and 5-year old normal and educable mentally retarded girls. There was not a significant difference between 5-year old normal and educable mentally retarded girls in terms of the mean value of the fine and gross motor skills and their sub-categories. There was not a significant difference between 4 and 5-year old normal girls in the fine and gross skills based on the Peabody test. **Conclusion:** Mentally retarded girls had lower ability at gross and soft motor skills than normal girls, and the Peabody test was a proper method to examine this property.

Keywords: Motor skills, mentally retarded children, Peabody test

Introduction. The development of motor skills in preschool children plays a fundamental role in subsequent learning, with some researchers believing that motor skill learning determines future learning, and superior mental processes result from the proper development of the perceptual-motor systems as well as their reciprocal links. Motor performance in children affects their learning skills, so the lack of proper motor activity is a hurdle involved in a child's exploratory, playing and learning experiences (Barsch, 1968) (1). Motor, sensual and perceptual-motor development is as important to children with disability as normal children. A development-based plan employing the learning principles applied for children with disability assumes more significance than the one applied for normal children at the same age (2).

As a result of the disabling complications these children suffer, they may not acquire motor skills independently or fail to reach perceptual-motor integrity. Typically, the factors which affect the development of motor skills in these children and cause defects or retardation have already been identified. French and Jansma (1982) state that the more complicated a disabling complications, the greater need for motor development planning (3). Due to its important role in the human life, the motor skill measurement has raised academic interests; the importance of its examination is twofold: the role of motor skill in social and economic competency; and, the relationship of motor skill and other personality-related aspects such as self-concept and social and emotional behavior(4). A child's growth and development is a complex phenomenon; awareness of it can help practitioners in diagnosing and preventing disorders and diseases. Examination of children's motor development is of importance since it can help determine whether their skills are in proportion to their age. A medical rehabilitation group consisting of a pediatrician, psychiatrist, psychologist, occupational therapist and speech therapist should be employed to assess this phenomenon and determine any deviation from normal patterns(5). Assessment of motor patterns is an important criterion of early evaluation, diagnosis and treatment of children who are at high risk for disability(6). The importance of early diagnosis of developmental delay or early detection of children who are at risk of developmental delay has increased the need for assessment tools, by the help of which a precise measurement of motor development is made possible; finally, an appropriate strategy can be formulated for medical intervention, e.g. providing occupational therapy services(7). Developmental motor scales and tests answer an important question as a tool; that is,

whether motor skill development of a child is in proportion to his/her age? Examiners used to measure the motor development in two ways: 1- Sensory-motor or reflection test; 2- Assessment of the gradual developmental stages of growth. As the two methods were not comprehensive tools to assess motor skills of the children, the researchers made an effort to find comprehensive test in order to convert the qualitative properties of motion into the quantitative properties in addition to assessing all issues relevant to the motor development(8). Movement assessment of infant screening (infants 2-18 months of age) and Baley scale of infant developmental II (infants 1-24 months of age) are two of these tests. Using standardized tests in order to come to precise clinical conclusions, occupational therapists try to recognize children's developmental disorders to determine the exact needs of them for proper health care services(6).

Peabody developmental motor scale is one of the most commonly-used and comprehensive measurement tools; it assesses fine and gross motor skills applicable within a wide age range, spanning from birth to 72 months of age(9). This property gives the test higher priority than other tests of the same level. The test was first described by Ronda Folio(10) and Rebecca Fewell who hold a PhD in physical education and sociology respectively. Folio had been a physical education instructor and a member of a research group led by Fewell assessing motor problems of children with severe disability. Fewell also had many years of teaching experience to primary school children, children with learning disorders, blind children and children with severe disability(10). Unlike other tests, in which the motor skills are considered a part of the assessment, the Peabody test just measures motor skills, so it assesses a greater number of motor skills; these properties give the test higher priority than the tests of the same level(11). The purpose of this study was to assess motor skills of 4 and 5-year-old educable mentally retarded girls and normal girls at the same age in Tehran using Peabody motor developmental scale. Such research, therefore, sets the ground for research on the ability of motor skills of mentally retarded children. It also paves the way for comparative and statistical studies on these children regarding their motor problems and makes planning for them possible. Thus, it can be applied by occupational therapists and instructors at exceptional centers for planning, educating and rehabilitating these children.

Research method

Study design

This cross-sectional study was descriptive and analytical. The researcher described and analyzed motor skills of two subject groups; one group consisted of normal girls and the other group consisted of educable mentally retarded girls. The girls were 4 and 5-year old. The normal girls' group were 4 and 5-year-old girls who were attending kindergartens across Tehran in 2006. A total of 60 individuals were selected by multi-stage randomization (for multi-stage randomization, Tehran was divided into different district, some of which were randomly selected, where target centers were chosen, and then some centers were randomly selected). The selection criteria included (1) health records: Having no history of metabolic, neurological, orthopedic diseases and epilepsy, among other things; (2) intelligence: Having normal intelligence, assessed by Goodenough intelligence scales, which should be above 90; (3) Having no visual impairment that are not alleviated with glasses; (4) Having no auditory impairment that makes the subjects unable to understand instructions; and,
(5) Being 4 and 5-year old: Based on PDMS, this study included the girls who were 48-59-month old or 60-71-month old. The inclusion criteria of educable mentally retarded girls' group were the above one excluding the intelligence score, which should be 55-75 based on the Goodenough Scale.

Research tools

The test consisted of two parts; one assessed the gross motor skills and the other assessed the fine motor skills. To assess the gross motor skills, balls, chairs, ropes, balance boards, mats, meters and chronometers were used. To assess the fine motor skills, papers, pencils, rattles, Lego, scissors, cubes, bottles, thread, beads, spoons and cups were used.

Data collection method

Medical, diagnostic and educational information of the groups were collected through health and educational records provided by parents and teachers, and they were registered on questionnaires specially made for this purpose. Information relating to the Peabody test was collected through its standardized form and recorded on relevant sheets. In the stage in which the girls were being sampled, every efforts were made to remove interfering factors by choosing samples who were under similar conditions (in terms of economic and cultural conditions, involvement in no sporting activities, and weight).

Implementation

The test setting was arranged in such a way that the distraction of the children would be minimized. The room was made sound-proof as much as possible. If the children were reluctant to separate from their parents, the parents were allowed to stay at the room during the test. During the test, the examiner or someone else would embrace the child in the arms, if the tests were to be performed seated, or the child would be put on a feeding chair. Illumination was provided perpendicularly from above to prevent the formation of shadow during the time the child was performing the tasks. The table was large enough to let the examiner and the child sit next to or opposite each other.

Data analysis methods

Statistical methods were analytical and descriptive. Data were analyzed after the indicators were extracted with the analysis of variance and t-test and the use of SPSS.

Results:

As observed in table 1, the difference between the two groups of 4-year-old normal girls and mentally retarded girls was statistically significant regarding the p-value and the t-value. Confidence interval is included in the table, indicating a 95% confidence interval for the mean difference of each variable.

Table 1: T-test for mean difference of age-related fine motor scores and their sub-group of 4-year old normal girls and educable mentally retarded girls

Statistical index Variables	Group	Qty.	Mean	Standard deviation	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	Normal child	20	15.6	1.698	19.88	0.00	8.742	10.742
	Mentally retarded child	20	5.85	1.387				
Gripping skill	Normal child	20	5.65	0.489	12.46	0.00	2.597	3.603
	Mentally retarded child	20	2.55	0.999				
Eye–hand coordination skill	Normal child	20	9.95	1.731	14.04	0.00	5.692	7.608
	Mentally retarded child	20	3.3	1.218				

The difference between the two groups of 4-year-old normal girls and mentally retarded girls was statistically significant regarding the p-value and the t-value. Confidence interval is included in the table, indicating a 95% confidence interval for the mean difference of each variable.

Table 2: T-test for mean difference of age-related gross motor scores and their sub-group of 4-year old normal girls and educable mentally retarded girls

Statistical index Variables	Group	Qty.	Mean	Deviance Criterion	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	Normal child	20	52.1	8.0909	16.861	0.00	27.806	35.394
	Mentally retarded child	20	20.5	2.188				
static skills	Normal child	20	8.8	1.508	10.721	0.00	3.569	5.231
	Mentally retarded child	20	4.4	1.046				
locomotion skills	Normal child	20	29.95	4.651	18.468	0.00	18.208	22.691
	Mentally retarded child	20	9.5	1.701				
Gripping and thrusting skills	Normal child	20	13.35	2.277	11.147	0.00	5.524	7.975
	Mentally retarded child	20	6.6	1.465				

Table 3 shows a significant difference between the mean fine motor skills and their sub-sets in 5-year old normal and educable mentally retarded girls in Tehran. The difference between the two groups of 4-year-old normal girls and educable mentally retarded girls was statistically significant regarding the p-value and the t-value (Table 3).

Table 3: T-test for mean difference of age-related fine motor scores and their sub-group of 5-year old normal girls educable mentally retarded girls

Statistical index Variables	Group	Qty.	Mean	Standard deviation	t	P-value	95% Confidence Interval	
							Lower	Upper

							Limit	Limit
Fine motor skills	Normal child	20	16.3	1.031	28.786	0.00	9.203	10.596
	Mentally retarded child	20	6.4	1.142				
Gripping skill	Normal child	20	5.75	0.444	15.916	0.00	2.618	3.381
	Mentally retarded child	20	2.75	0.716				
Eye–hand coordination skill	Normal child	20	10.55	0.944	23.965	0.00	6.317	7.483
	Mentally retarded child	20	3.65	0.875				

No significant difference was found between these variables after examining the t-value and P-value (Table 4). Table 5 also shows that fine motor skills and their subsets are not significantly different in the 4 and 5-year old normal girls. The highest mean was attributed to the fine motor skills among 5-year old children (16.3) and the lowest mean was attributed to the gripping skill among 5-year old children (5.65).

Table 4 T-test for mean difference of age-related gross motor scores and their sub-groups of 5-year old normal girls and educable mentally retarded girls

Statistical index Variables	Group	Qty.	Mean	Standard deviation	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	Normal child	20	53.9	6.943	18.404	0.00	27.056	33.743
	Mentally retarded child	20	23.5	2.524				
static skills	Normal child	20	9.05	0.999	13.314	0.00	3.731	5.069
	Mentally retarded child	20	4.45	1.089				
locomotion skills	Normal child	20	31.05	4.11	20.047	0.00	17.81	21.799
	Mentally retarded child	20	11.25	1.618				
Gripping and thrusting skills	Normal child	20	13.8	2.067	11.739	0.00	5.131	7.269
	Mentally retarded child	20	7.6	1.142				

Table 5: T-test for mean difference of age-related fine motor scores and their sub-groups of 4 and 5-year old normal girls

Statistical index Variables	Group	Qty.	Mean	Standard deviation	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	4-Year old normal girl	20	15.6	1.698	-1.57	0.123	-1.599	0.199
	5-Year old normal girl	20	16.3	1.031				
Gripping skill	4-Year old normal girl	20	5.65	0.489	-0.67	0.503	-0.299	0.199
	5-Year old normal girl	20	5.75	0.444				
Eye–hand coordination skill	4-Year old normal girl	20	9.95	1.731	-1.36	0.182	-1.492	0.292
	5-Year old normal girl	20	10.55	0.944				

Table 6 shows the mean of the gross motor skills and their sub-groups in 4 and 5-year old normal girls. The t-value and p-value shows that the difference between 4 and 5-year old girls is statistically significant. Confidence interval is included in

the table, indicating a 95% confidence interval for the mean difference of each variable. Table 7 shows the mean of the fine motor skills and their sub-groups in 4 and 5-year old mentally retarded girls. The results show that the difference between 4 and 5-year old educable mentally retarded girls is not statistically significant.

Table 6: T-test for mean difference of age-related gross motor scores and their sub-groups of 4 and 5-year old normal girls

Statistical index Variables	Group	Qty.	Mean	Standard deviation	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	4-Year old normal girl	20	52.1	8.091	-0.755	0.455	-6.626	3.026
	5-Year old normal girl	20	53.9	6.943				
static skills	4-Year old normal girl	20	8.8	1.508	-0.618	0.540	-1.068	0.568
	5-Year old normal girl	20	9.05	0.999				
locomotion skills	4-Year old normal girl	20	29.95	4.651	-0.793	0.433	-3.909	1.709
	5-Year old normal girl	20	31.05	4.11				
Gripping and thrusting skills	4-Year old normal girl	20	13.35	2.277	-0.654	0.517	-1.842	0.942
	5-Year old normal girl	20	13.8	2.067				

Table 7: T-test for mean difference of age-related fine motor scores and their sub-groups of 4 and 5-year old educable mentally retarded girls

Statistical index Variables	Group	Qty.	Mean	Deviation Criterion	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	4 year old retarded girl	20	5.85	1.387	-0.179	0.179	-1.363	0.263
	5 year old retarded girl	20	6.4	1.142				
Gripping skill	4 year old retarded girl	20	2.55	0.999	-0.728	0.471	-0.756	0.356
	5 year old retarded girl	20	2.75	0.716				
Eye–hand coordination skill	4 year old retarded girl	20	3.3	1.218	-1.043	0.303	-1.029	0.329
	5 year old retarded girl	20	3.65	0.175				

As observed in table 8, the difference between the two groups of 4-year-old educable mentally retarded girls is not statistically significant regarding the p-value and the t statistics. Confidence interval is included in the table, indicating a 95% confidence interval for the mean difference of each variable.

Table 8 T-test for mean difference of age-related gross motor scores and their sub-groups of 4 and 5-year old educable mentally retarded girls

Statistical index Variables	Group	Qty.	Mean	Standard deviation	t	P-value	95% Confidence Interval	
							Lower Limit	Upper Limit
Fine motor skills	4 year old retarded girl	20	20.5	2.188	-4.016	00.00	-4.512	-1.487

	5 year old retarded girl	20	23.5	2.524				
static skills	4 year old retarded girl	20	4.4	1.046	-0.740	0.464	-0.933	0.433
	5 year old retarded girl	20	4.65	1.089				
locomotion skills	4 year old retarded girl	20	9.5	1.071	-3.333	0.002	-2.812	-0.687
	5 year old retarded girl	20	11.25	1.618				
Gripping and thrusting skills	4 year old retarded girl	20	6.6	1. 465	-2. 407	0.021	-1.841	-0.158
	5 year old retarded girl	20	7.6	1.142				

Discussion and Conclusion. Eight hypotheses were examined in this research to compare motor skills of 4 and 5-year-old educable mentally retarded girls with the girls of the same age in Tehran using the Peabody developmental scale. This section concludes the discussion and interprets the results. Based on the first hypothesis, there is a significant difference between 4-year-old normal girls and mentally retarded girls in fine motor skills based on the Peabody test. The results are consistent with the study of Stock and Deitz (1993), who found significant differences between the fine motor skills of 32 normally developed and retarded girls aged 4 and 5 based on the Peabody test(12). Case-Smith et al. (1995) studied the relationship between the sensory-motor components of the fine motor skills and the performance in self-caring, movement and social interaction in 30 preschool children with motor delays. Consistent with our results, they found significant correlation between sensory-motor components and the fine motor skills, including gripping patterns, hand-eye coordination, two-hand coordination and manual dexterity(13).

A significant difference was found between 4-year-old normal girls and educable mentally retarded girls in gross motor skills based on the Peabody test. It was consistent with the study carried out by Palison and Kolob (1998) on children with cerebral palsy and motor delays using the Peabody gross motor tests and gross motor performance measurement. A total of 42 girls with an average age of 13.9 were studied over a period of six months. The findings showed that children with motor delay experience more developmental motor changes compared with children with cerebral palsy(14). Margo (1997) made use of this test to compare the gross motor ability of 13 children who had otitis media with that of 12 healthy children, observing a significant decrease in the scores of the pediatric patients compared with the normal children. The test indicated that these children suffer balance and motor development disorders(15).

In the hypothesis comparing 5-year-old normal girls with mentally retarded girls in fine motor skills based on the Peabody test, a significant difference was observed. Sommerfelt et al. (2002) concluded that mentally retarded girls outperform boys in fine skills such as sewing, knitting and typing(16). However, this should not be generalized, as girls are often seen to get involved in vigorous games or boys are often seen to be more interested in fine activities(16). In the study, the gross motor skills of 5-year-old normal girls and mentally retarded girls were found to be significantly different based on the Peabody test. The results were consistent with those of Ghasemi (1995) who examined the functioning of normal children with Down syndrome in Bruininks-Oseretsky test of motor proficiency. Results suggest that there is a difference between the two groups in terms of motor skills, ocular motor control, agility of upper limb and fine motor skills(17). Babapur (1994) used the Lincoln-Ozertexi test to compare normal students with dyslexic students, concluding that there is a significant differences between these two groups regarding general motor skills and the fine motor skills. Inconsistent with our results, however, no significant difference was observed in terms of gross motor skills(18).

In this study, no significant difference was observed between 4-year-old and 5-year-old girls in performing fine and gross motor skills based on the Peabody test. Derekhsanrad (2004) studied the standardization of Peabody motor developmental test in preschool girls in Shiraz, finding that the performance of motor skills is significantly different among different age groups; but, inconsistent with our study, no difference between girls and boys was found (19). Crowe (1999) studied the cultural characteristics of the Peabody test in 2-year-old native Americans with certain developmental conditions, finding significantly different scores in the fine motor skills and no significantly different scores in the gross motor skills(20), a part of which was consistent with our results. In this study, no significant difference was observed between 4-year-old and 5-year-old educable mentally retarded girls in performing fine and gross motor skills based on the Peabody test, which was inconsistent with the results of Case-Smith et al. (1995) studying the relationship between the sensory-motor components of the fine motor skills and the performance in self-caring, movement and social interaction in 30 preschool children with motor delays. The results showed a significant relationship between sensory-motor components

and the fine motor skills, including gripping patterns, hand-eye coordination, two-hand coordination and manual dexterity (13).

In this research, the motor skills of two groups of normal and mentally retarded girls were examined. Therefore, further research studying these problems in other mentally retarded groups (protected classes, rearing) seems necessary, and attention should be paid to the training of them and their parents in the area of motor skills to prevent more acute problems. The findings of this study suggest that the design of rhythmic motor programs and inclusion of them in physical education curriculums of exceptional children (especially mentally retarded children) can reduce the problems encountered by these children in preforming perceptional-motor skills. Although the research addressed some questions about the subject, it had limitations too, including the lack of questioners filled by the children (due to the inability of mentally retarded girls and their age limit) and poor cooperation of personnel of some kindergartens.

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