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Pilot Study: Norms for Visual Motor Integration Development in Egyptians Children through Cross-Sectional Study Design

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Abstract : Peabody developmental motor scale is considered one of the most commonly used tests to assess motor development in preschool children; the Peabody is regarded as providing useful and comprehensive information for early assessment. At the end of this study; the applied Peabody developmental motor scale-2nd edition can provide a general visual motor developmental framework for Egyptian children. **Objectives**: to establish norms for the Egyptian children in visual motor integration developmental skills through cross-sectional study design using PDMS-2 and comparing the results with the normative sample given in the PDMS-2 manual to find a method of evaluation that might be suitable for Egyptian children. **Methods**: Normal 110 children randomly collected to two groups in sequence according to age (group A (50 child): from 24 to 30 months and group B (60 child): from 30 to 36 months) after screening by Portage Scale through four nursery school in Giza area, Egypt and get at least 80% of scoring. Evaluation using PDMS-2 was applied once monthly to each group for successive six months in visual motor integration area of development in longitudinal pattern. **Results**: The present study revealed significant difference for almost measured subtest items of visual motor integration development for tested Egyptian children when comparing with the normative data using Z-scores. The significant differences were in favor of Egyptian children. **Conclusion**: the study reflects that Egyptians children are superior to normative sample of PDMS-2 in some visual motor integration areas of development. Detection of these differences between children from Egypt and children from other culture in visual motor integration development illustrates the importance to have norms for the other areas of motor development for the Egyptian children to be a national reference for all staff working in pediatric physical therapy.

Key Words: Egyptian children; Visual Motor integration development; portage scale; Peabody Developmental motor scale.

1- Introduction

The Peabody Developmental Motor Scales-2 (PDMS-2) is the most commonly used pediatric motor outcome assessment tool. The PDMS-2 was designed to assess motor development in children from birth to 72 months of age that measures fine motor and gross motor skills. The possible uses of the PDMS-2 include; "Determination of motor capacities relative to a normative peer sample, assessment of qualitative and quantitative abilities of individual gross and fine motor skills, evaluation of development over time and determination of efficacy of interventions in research [1].

The foundation of this assessment scale focuses on the concept that motor progress proceeds in an order sequence, contributed to the assessment protocol on the gross and fine motor scale in regards to motor development. Reliability of test measurements are key concepts involved in presenting practical usefulness of

an assessment. Three types of reliability measures were reported in the PDMS-2 manual in later studies: test-retest, inter-rater and standard error of measurement for total raw scores [1,2].

Qualitative and quantitative procedures were used to assess the components of skills and movement performance. As many occupational therapists use the PDMS scales to establish eligibility for determination of the need for occupational therapy services, and to determine motor development [1].

The initiating motor patterns are a principle for the motor skills development that appears later. Along with the perceptual capabilities, children can modulate, adapt and learn new motor skill that will "initiate" in their motor repertoire. Therefore, children' motor and perceptual capabilities prepared to adapt to their new world, in such way that the learned motor and perceptual capabilities found a basis that experience changes and, over time, that they incorporate into and more complex patterns of coordination that are better preferred to the environmental requirements [3,4].

Developmental skills are unique to each child. No two children will meet these milestones at exactly the same age. However, it is important to know what to look for during the development of child skills so that you can be on the lookout for serious developmental delays. Although normal child development is the concept on which the abnormal development is established, it does not follow that assessment should rely upon a strict nearest to normal developmental schedules [5].

Many motor developmental theoretical suggest that the early motor development periods are vital to latter skill acquisition. Yet, these theoretical models develop one of these periods as fundamental motor skills or patterns, suggesting that this period is "fundamental," as providing a basis, for attainment of new skills later in life [6,7].

The previous studies were shown positive effects of motor proficiency in early motor skills and enrolment in regular physical activities and in sport activities at adolescence. Therefore, promotion of motor skills, even in fundamental motor skills, should be emphasized and becoming a target goal, even in early ages [8,9].

In the early childhood years, children begin to learn a group of motor skills known as fundamental motor skills (FMS). FMS are composed of locomotor skills and object control skills. Locomotor skills involve moving the body through space and include skills such as running, galloping, skipping, hopping, sliding, and leaping. Object control skills consist of manipulating and projecting objects and include skills such as throwing, catching, bouncing, kicking, striking, and rolling. These skills form the basis for future movement and physical activity [10].

Visual motor integration development involves the child's ability to examine or track an object based on a number of items that require motor movement integration. Visual attention, visual discrimination, visual figure-ground perception, visual spatial relationships, visual perception and motor integration are all parts assessed. Visual motor integration subtest of the PDMS-2 allow testing of both gross and fine motor skill systems so it was considered the most important area of motor development [1].

Child's development is affected by multiple factors such as psychosocial and biological factors and genetic inheritance. Poverty and its attendant problems are major risk factors affecting the motor development. The first few years of life are particularly important because vital development occurs in all systems [11,12].

Therefore; it was very important to establish norms for the Egyptians children in visual motor integration developmental skills to find a way of assessment that might be standardized for Egyptians children.

2- Materials and Methods:

2.1. Materials

The study was designed as a cross-sectional study design. Normal 110 children collected to two groups in sequence according to age (group A: from 24 to 30 and group B: from 30 to 36 months) after screening by Portage Developmental Scale (translated into Arabic language) in Giza area, Egypt were included in the study

[13]. Evaluation using Peabody Developmental Motor Scale Second Edition (PDSM-2) was applied in visual motor integration areas of development [1].

2.2. Methods

All procedures were explained to the parents or care persons for children in nurseries and baby classes and taken the permission to fulfill. The selection procedure from 150 children in the three nursery schools and one baby class was conducted by Portage Scale (motor development checklist) screening then randomly select 110 from 135 children whose get at least 80% of scoring by portage through randomization list to be involved into two groups; group A (50 children, 15 boys and 35 girls aged from 24 to 30) and group B (60 children, 20 boys and 40 girls aged from 30 to 36 months). Although screening by portage taken a long period of time to collect the sample included in the study, the time required for evaluation of each child in each group was an average of 15 minutes using Peabody Developmental Motor Scale (2nd edition).

2.2.1. Selection procedure

Motor development checklist of portage scale that was asked to care person or performed by the child was as the following: 1- Can your child draw vertical straight line using pencil or color brush? 2- Can your child jump from at least 20 cm raised chair without falling? 3- Can your child jump by both feet from one place to another for at least 3 meters? 4-Can your child hold a paper by one hand and cut with the other? 5- Can your child jump forward for at least 1.5 meters by one foot? 6- Can your child descend and ascend stairs getting one foot on each step (but can use handrails)?

2.2.2. Evaluation procedure

Peabody Developmental Motor Scale (2nd edition)' visual motor integration subtest contain 72-items that can measures a child's ability to use his or her visual perceptual skills to perform complex eye-hand coordination tasks such as reaching and grasping for an object, building with blocks, and copying designs.

For repetitive evaluation session in each group (A, and B) during six months:- children participated in this study received visual motor integration subtest items of PDMS-2 according to their chronological ages (from 24 to 36 months), it was applied once monthly for all children, for a period of six successive months.

The measurable items in this pilot study were **12** items :**9 items for group A**; visual motor integration items tested were 45-V: removing top, 46-V: building tower (8 cubes), 47-V: snipping with scissor, 48-V: imitating horizontal strokes, 49-V: stringing beads (2 square beads) , 50-V: folding paper, 51-V: building train, 52-V: stringing beads (4 square beads) , and 53-V: building tower (10 cubes) and **3 items for group B**; 54-V: building bridge, 55-V: copying circle, and 56-V: building wall, With taken into consideration the basal and the ceiling level of scoring according to the Illustrated Guide for Administering and Scoring of the PDMS-2 Items [1].

2.2.3. Data Analysis

Descriptive statistics: the range, the mean and standard deviation of raw scores were calculated for each parameter, and inferential statistics as following the procedure outlined in PDMS manual, fine motor raw scores were converted to percentile ranks. The percentile ranks were then converted into standard score that is, Z- score that was used for comparing mean values of each parameter between Egyptians children and the normative sample according to PDMS-2 through SPSS (statistical package for social sciences) system.

3- Results

The range, mean, and standard deviations for the raw scores of selected items of visual motor integration subtest for both groups according to the child' chronological age (24 to 36 months) is presented in Table 1.

The Z-score and percentile rank comparison of the standard scores for the age groups of Egyptian children and normative sample in each subtest item is presented in Table 2 and represented graphically in figure 1.

According to the Peabody manual, if the child's Z- score is < + 1.0 or > -1.0 suggest that the performance is significant from the mean of the normative population. If the Z- score is < +1.5 or >-1.5, the difference is considered to be highly significant.

The comparisons vary from highly significant to significant difference. The difference between the Egyptians children's standard scores and the standardization sample was significant for the variables; 45-V, 46-V, 48-V, 49-V, 52-V, and 55-V while highly significance for the variables; 50-V, 51-V, 53-V, 54-V and 56 -V in favor of the Egyptian sample. There was significant difference for the variable; 47-V in favor of the normative sample of PDMS-2.

Table (1): the range, mean values and standard deviations for the raw scores of included items for Egyptians children (N= 110)

Variables	The range		The mean	S.D
	Minimum	Maximum		
45-V	90	95	92.10	1.282
46-V	92	96	94.24	1.238
47-V	94	99	96.30	1.298
48-V	96	101	97.94	1.391
49-V	98	103	100.50	1.182
50-V	100	104	101.52	.931
51-V	102	106	103.50	1.216
52-V	104	109	107.04	1.456
53-V	106	111	108.46	1.249
54-V	108	114	110.08	1.589
55-V	110	116	113.04	1.665
56-V	112	118	114.84	1.376

Table (2): the mean values of the Z-score and percentile rank for the age groups of Egyptians children (N=110) and normative sample

Variables	Age group (months)	Egyptian		European		Significance
		Z- score	P.R	Z- score	P.R	
45-V	25-26	-0.078	46.89	-0.53	30.00	Sig.
46-V	25-26	-.194	42.32	-0.40	35.00	Sig.
47-V	25-26	-0.772	3.82	-.40	35.00	Sig.
48-V	27-28	0.762	77.70	-.07	47.00	Sig.
49-V	27-28	0.423	66.38	0.07	53.00	Sig.
50-V	27-28	2.663	99.61	0.27	61.00	HS
51-V	29-30	2.055	98.01	0.40	65.00	HS
52-V	29-30	1.345	91.08	0.60	73.00	Sig.
53-V	29-30	2.033	97.90	0.73	77.00	HS
54-V	31-32	2.467	99.32	0.93	82.00	HS
55-V	33-34	1.176	88.04	1.00	84.00	Sig
56-V	35-36	2.297	98.92	1.20	89.00	HS

Note; **HS: highly significant, Sig.: significant.**

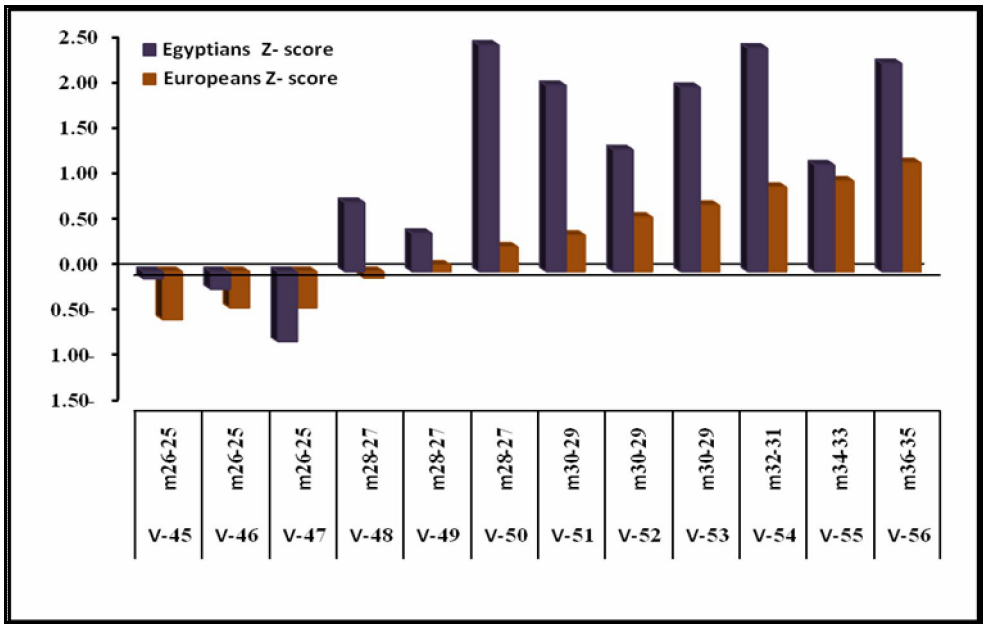

Fig.1. Comparison of mean of z-scores of subtest raw scores from the sample with the reference group data in manual of PDMS-2

4- Discussion

The primary concern for the pediatric clinician is not whether a child achieves the mean score, but whether the score falls within the range demonstrated by the children in the standardized sample or not [14].

Motor assessment scales designed for children of the same culture are not always appropriate for those from diverse ethnic backgrounds. This study was undertaken to compare the scores of children from one ethnic group with the scores of the children on whom the test was norm. It was observed that there were significant differences in the scores of the children from our sample, compared with the normative data given in the manual of PDMS-2 (Table 2). It indicates that cultural differences do significantly affect the scores of the children on the scale [15].

Comparing between both Egyptians and normative children' results of evaluation procedure in visual motor integration subtest revealed significant difference in favor of Egyptians children in some items. The most skills that were significant difference are imitating horizontal strokes, stringing beads, folding paper, building train, stringing beads, building tower, building bridge, copying circle, and building wall while there was significant difference for the variable 'snipping with scissor' in favor of the normative sample of PDMS-2 .

This could be attributed to the fact that children are not used to using scissors because of parental concern that they may harm themselves or cause damage to objects in the house [16]. Also there is lack of necessity of this skill for day to day activities when compared with western populations where the use of scissors, fork, and knife might be incorporated earlier in life as fine motor activities, such as the use of crayons, may not be encouraged as strongly in the boys and may not be culturally expected or practiced in younger children of either gender when compared with the culture in Egypt.

It was believed that there are significant differences in the way the brains of child develop. Environmental and socioeconomic differences include the age when certain developmental motor skills occur, differences in the sequence of development and where certain activities take place in the brain. These differences affect motor skill abilities of children [17].

Given the importance placed on parental expectations in theories of motor development and the significance of the attainment of motor skills in the evaluation of children, understanding the influence of

culture and its associated factor that was combine to shape a child' fine motor development within specific cultural context is of great practical value to pediatric clinicians [18].

In the end, developmental norms and life experiences differ from ethnic group to ethnic group especially for activities that children have not had the opportunity to practice such as using scissors, ball playing, or coloring.

This study has future implications for therapists wanting to administer any subscale or the whole of the PDMS-2 to any child, in that they should consider the cultural upbringing of the child which may influence the child's score. Also if research is conducted using PDMS-2 as an evaluative or outcome measure the authors should keep in mind the effect of cultural differences on the scores.

5- Conclusion

In general, the results showed several significant differences between the scores of children who ages from 24 to 36 months from Giza, Egypt, who are typically developing and the normative sample of the PDMS-2.

It is not possible to develop assessment tools which are culturally sensitive across the various regions and environments, but it is necessary to evaluate the cultural sensitivity difference of standardized tests for a particular region and ethnic group, especially when these instruments are being used to assess other areas of motor development of Egyptians children that being addressed at the end of the study.

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