Comparison of Visual Motor Integration Skills in Between Pre-School Children with and without Disability

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ABSTRACT

Objective: The aim of this study was to compare the Visual- Motor Integration skills of 3 ½ years to 5 ½ years children with disability (CWD) and children without disability (CWOD). **Design:** A qualitative, cross-sectional observational design.
Methods: The study was conducted on a total of 60 children consisting of 30 children with disability and 30 children without disability groups. In the study, the Pre-school Visual Motor Integration Assessment (PVMIA), which was developed by Gertrude Deitchman and Cordelia Puttkammer (2001) was administered. It was found that the age creates a meaningful difference (p<0.004), (p<0.01) in the Visual Motor Integration skills of 42-65-months-old children without disability group. Whereas, in children with disability group it not significant. Study also emphasized that the performance of children without disability group are better than the performance of children with disability group. Whereas, gender and handedness dose not impact visual motor skills, as found in this study.

Keywords: Visual motor integration, children with disability, drawing subtest, block pattern subtest, Pre-school Visual Motor Integration Assessment

INTRODUCTION

Identifying children with developmental deficits or significant delays remains an important role of Occupational Therapist and others who provide early intervention services (Gesell and Amatruda). [1]

Occupational Therapists working with children often assess visual perceptual abilities, along with fine motor and visual motor integration skills to gather information for use in determining service needs or measuring progress.

VISUAL MOTOR INTEGRATION (VMI) is the 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 and designs. [2] Most people know VMI as hand-eye coordination, which is necessary for completion of tasks such as playing cricket, threading a needle, tracing a line, or putting a puzzle together. However, the significance and importance of visual-motor integration and its relationship to personal independence and academic success frequently goes unnoticed.

There are two types of VMI: i) Constructional VMI, which includes tasks such as using blocks to build a 3D shape, and ii) Graphomotor VMI, which includes paper and pencil tasks such as drawing a series of lines to form geometric shapes.

Failure in Visual Motor tests may be caused by underlying visual cognitive deficits, including visual discrimination, poor fine motor ability or inability to integrate visual- cognitive and motor process, or by a combination of these disabilities (Collen Schneck). [1]

Evaluating Visual- Motor skills may help pinpoint children who need close monitoring or specific interventions to prevent the development of the hand writing problems and hand function issues.

Therefore, the purpose of this study was to provide more definitive information on whether is there any difference in Visual Motor Skills in between children with and without disability.

MATERIAL AND METHODS

Hypothesis testing has been done on the basis of the performance in between CWD and CWOD group with respect to their age, genders, dominance and clinical condition. The data were analysed with STATA-13 statistical package.

To evaluate the performance between CWD and CWOD group for combine, Drawing and Block Pattern subtest, all assumption are checked with t-test. For equal variance "Levene test" is performed and found variance is equal. Hence, t-test was performed. Parametric test had been used since it is following normal distribution. Histogram had been plotted to check the distribution.

Descriptive statistics including mean, standard deviation, standard error mean, 't' and 'p' value were computed on the basis of performance of subjects on PVMIA. The data were analyzed with STATA-13 statistical package.

MATERIAL
Preschool Visual Motor Integration Assessment (PVMIA)
AGE: 31/2 – 51/2 years
Administration: 20-30 minutes, Individual.

The PVMIA was specially developed to identify perceptual abilities and visual-motor integration deficits of preschool children. Specific skills addressed by the PVMIA include perception of position in space, awareness of spatial relationships, color and shape discrimination, matching two attributes simultaneously, and the ability to reproduce what is seen and what is interpreted.

The PVMIA consists of two subtests, a Drawing subtest (8 items), which examines the ability to recognize and reproduce lines and shapes on paper, and a Block Pattern subtest (25 items), which examines the ability to recognize and reproduce pattern created by assembling the same blocks. In addition, there are two Behavioral Observation Checklists that assist in the interpretation of test results.
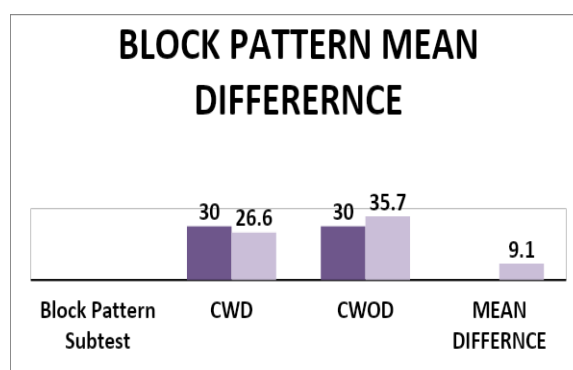PVMIA-
1 PVMIA Kit includes manual, 20 record Forms Test Plates, 14 Blocks, Scoring Tools. PVMIA- 2 Record Forms
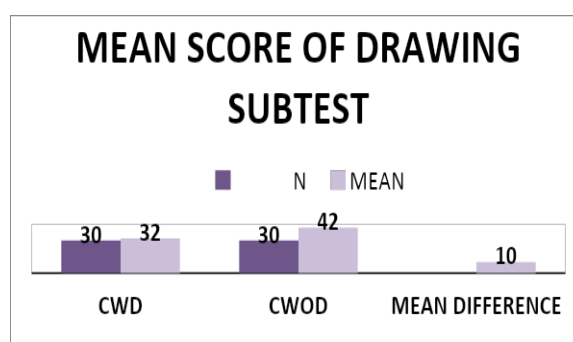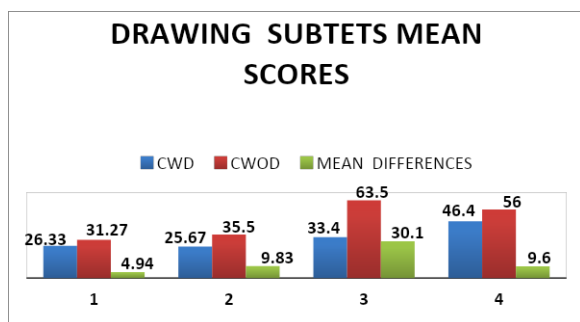
Graph (A)

Graph A indicating that total number of children (N) are 30 in each group (CWD /CWOD) and the mean differences between the two group is 10. Suggesting CWOD are better performer than CWD.
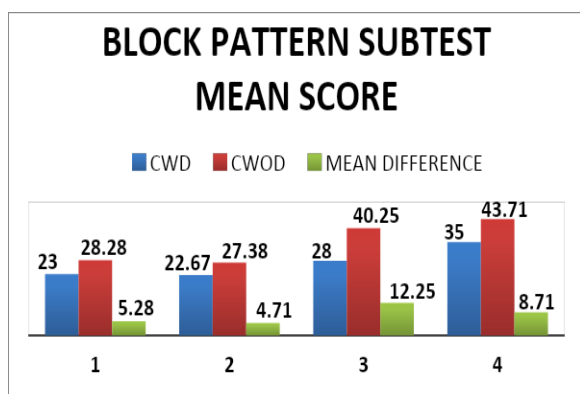
Graph (B)

Graph B indicating the mean differences between both the groups (CWD/CWOD). In series1 indicating number population and series2 indicating the mean score after calculating the raw score of Block Pattern Subtest of each group. Suggesting CWOD are better performer than CWD.

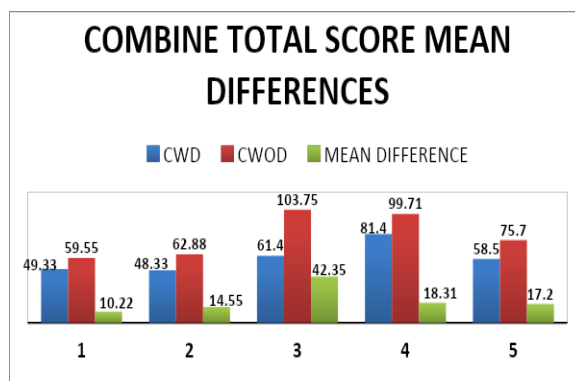**Graph (D) AGEWISE COMPARISION OF CWD AND CWOD**

Graph plot D showing that in each group CWOD children are higher performer than CWD group in Drawing Subtest. The mean difference between the two groups of each age group children increasing higher as the age increases. CWOD children of 54-60 months of age are Best performer than the other two groups of children.

Graph (E) AGEWISE COMPARISON OF CWD AND CWOD

Graph plot E showing that in each group CWOD children are higher performer than CWD group in Block Pattern Subtest. The mean difference between the two groups of each age group children increasing higher as the age increases. The differences between the mean score of first two groups (42-47 months & 48-53 months) are not very high on compare with other group.

Graph plot F showing that the mean difference increases as the age increased. This also suggesting that the children of 54-60 months in CWOD are the best performer in combine total score in comparison with the whole population.

Graph F: AGEWISE COMPARISON OF CWD AND CWOD

TABLE NO. 1 GENDERS WISE COMPARISON
INTERGROUP COMPARSON 1(a)

	N	Mean	Standard Error	t-value	Significance
Female	23	70.87	7.23	0.67	No
Male	37	64.76	5.61		

Table 1(a) indicating that there is no significant difference found in between the two genders. But the mean value of the female population is higher than the male.

INTRAGROUP COMPARISON 1(b)
CWD

N	Mean	Standard Error	t value	Significance
Female 11	69.45	10.69	1.2	No
Male 19	52.14	8.4		

Table 1(b) showing that mean value is higher in CWD female than the male. Although, statistically there is no significant differences had found.

INTRAGROUP COMPARISON 1(c)
CWOD

	N	Mean	Standard Error	t value	Significance
Female	12	72.16	10.26	-0.05	No
Male	18	78.05	6.18		

Table 1(c) showing that mean value is higher in CWOD male than the female. Although, statistically there is no significant differences had found.

TABLE 2(a) HAND DOMINANCE
CWD HAND DOMINANCE (intra group)

N	Mean	SE	SD	Confidence	Inter.
Lt . 9	74.22	13.04	39.14	44.13	104.31
Rt. 21	51.7	7.45	34.17	36.2	67.31

TABLE NO. 2(b)

t- value	DEGREE OF FREEDOM	Pr(T<t)
1.58	28	0.0626

Ho= There is no significant difference between mean score of the combine score between left and right-handed

CWD.

Ha= There is significant difference between right-handed and left-handed CWD by combined score.

Table 2(a) and (b) indicating that despite unequal distribution of the number of subjects in both the intra groups the MEAN value is higher of LEFT-HANDED CWD group compare to RIGHT-HANDED CWD group. Therefore, there is a significant difference between the mean combined scores of RIGHT-HANDED CWD and LEFT-HANDED CWD groups as Pr(T<t) = 0.0626.

TABLE NO. 2(c)
CWOD HAND DOMINACE (intra group)

	N	Mean	SE	SD	Confidence	Inter
Lt.	3	63.33	10.49	18.18	18.18	108.8
Rt.	27	77.07	5.92	30.78	64.89	89.24

Ho= There is no significant difference between mean score of the combine score between left and right handed CWOD.

Ha= There is significant difference between right handed and left handed CWOD by combined score.

TABLE NO. 2(d)

t-value	DEGREE OF FREEDOM	Pr(T<t)
-0.751	28	0.4588

Table 2© and (d) the number of subjects re unequally distributed and MEAN SCORE differences suggesting differences. This indicates RIGHT HANDED CWOD children are better scorer compare to LEFT HANDED CWOD children. Therefore, there is a significant difference between the mean combined scores of right handed and left-handed CHILDREN WITHOUT DISABILITY.

TABLE NO.2(e)
LEFT DOMINANCE PERFORMER (inter group)

Group	N	Mean	Std. Error	SD	Confidence	Interval
CWD (L)	9	74.22	13.04	39.17	44.13	104.31
CWOD (L)	3	63.33	10.49	18.17	18.18	108.48
Total	12	71.5	9.99	34.62	49.5	93.5

Ha: There is a significant difference between mean score for combined total of CWD and CWOD for left hand dominance. Ho: There is no significant difference.

TABLE NO. 2(f)

t- value	DEGREE OF FREEDOM	Pr(T<t)
0.454	10	0.6592

Table 2(e) indicating that in the hand dominance category there is an unequal distribution of the LEFT HANDED subjects whose MEAN SCORE are significantly different with one CWD group with other CWOD group children. Table 2(f) showing the descriptive statics of LEFT HANDED groups. Suggesting no significance differences in the performance.

DISCUSSION

From the above data analysis and results orientation, we have found significant differences in the performance between the Children with Disability and Children without Disability groups. Through the data analysis it is concluded that the mean score of CWOD in both the subtest i.e. Drawing Subtest and Block Pattern Subtest is significantly higher compared to the CWD group.

The study was design to compare the Visual Motor skills in pre-school Children with and without disability on Pre-School Visual Motor Integration Assessment.

For this study total 60 children were taken. Each group contained equal number of children i.e 30 in CWD group and other 30 in CWOD group. These children met the inclusion criteria of age that is between 3.6yrs to 5.6yrs, having no visual abnormality as reported by parents, children who can follow simple commands and Children who have experience in using pencil. The who had severe motor impairment were excluded.

The CWD group contains two categories of children:

Cerebral palsy (CP)

Non-cerebral palsy group (NCP)

In the CWD group the diagnosis was done by qualified concerned physician. . Based on their ages, children in both the groups were further sub-divided into four groups.

42-47 months children were considered as Low age group children.

48-53 months children were considered as Medium Low age group children.

54-59 months children were considered as Medium High age group children.

60-66 months children were considered as High age group children.

Total raw score was calculated on the basis of each child's performance. Percentile and the performance level in terms of Above, Normal, below decided on the basis of the norms of that particular age group of the child, mentioned in the manual of PVMIA scale.

This scale contains further four sections regarding the Behavioral Observation. These are as follows:

Drawing Behavioral Observation

Block Pattern Behavioral Observation

Pencil Grasps

Visual Perception

These observations were recorded in the PVMIA record form.

Beery states: "A child can have well developed visual and motor skills but be unable to coordinate the two." He said the figure in the Drawing Subtests designed to assess this kind of coordination. [3] For this reason, deep analysis had been done to find out the affected VMI components. After reviewing the master chart, the raw score of each drawing component is calculated. The result of the objectives founded that out of 30 children in CWD group 66.67% performed better in finding Similarity in drawing items, 63.33% had performed well in "finding number of parts "of each drawing items, 70% had performed good in Motor Accuracy, 76.67% had performed well in Position in Space component. Whereas, 50% children population of CWD group performed poor in Spatial Relationship and 86.67% children performed good in Shape Discrimination. This concluding that in CWD most of the children finding difficulties in establishing Spatial Relationship between more than one figures and also, they were faced difficulties in identifying Number of Parts and finding Similarities.

Whereas, in CWOD more that 80% of children had scored well in all the six components of the drawing subtest.

Similarly, in Block Pattern Subtest Children with Disability group 40% children experienced difficulty in Reproducing Pattern and 20% in Matching picture to picture section. Whereas, in Children without out Disability group 93.33% were perform good in Reproducing Pattern and 83.33% performed well in Matching Picture to Picture.

In Graph D on comparison of each age group of CWD children with the similar age group of CWOD group, it was found out that CWOD are better performers than CWD group on both the subtests. Also, the combine score was better in CWOD group. This could be due to the fact that: In India the school readiness is delayed in CWD because of their disability. Parents give priority in treating disability rather than focusing on their education. As reviewed by Josman (2006) when he compared the visual-perceptual and visual-motor skills between Palestinian and Israeli children it is clarified that the culture awareness creates a great impact in the school readiness of the children. He said that "These differences may influence children's school readiness and may have important practical consequences and far-reaching implications". "The absence of a stimulating environment, coupled with an idiosyncratic lifestyle and deficient schooling may thus impede perceptual, motor, and cognitive development. [4]

Secondly, in the CWD group, the second group i.e. Non-CP group comprised majority of children with autism. These children had behavioral issues and therefore could not perform to their optimum in every

subtest of PVMIA. It was observed that they were in a hurry to finish rather than concentrate on giving accurate performance.

Further in this study, Graph F also reveals that there is a significant effect of age on visual motor integration performance skills. Performance improved as age advanced from 42-66 months age group in CWOD group. Hence, higher the age higher was the performance in CWOD group. Whereas, in CWD group this effect is not seen. This is explained by the study in which normal Indian children have developed their VMI skills earlier these skills improved as their age increased. In the Reepa Sanghavi and Rajni Kelkar (2005) study it has proved that "normal Indian children aged 10 to 14 years attain mean raw score in DVMI at younger age than normal American Children". [5] In another study done Zülfiye Gül Ercan (2011) reported that the age creates a meaningful in the visual-motor integration, visual perception and motor integration skills. Along with this they also concluded that higher age with higher socio-economic background creates the meaningful differences in the VMI skills. [6]

On the other hand, the CWD group this age wise performance is not very obvious as seen in CWOD group because CWD group contains variety of different diagnostic children. In CWD group some children performed poor due to visual perceptual skills and some due to behavioral issues.

On observing Visual Perceptual Behavior ironically, in BPS both the group showed most in Shape Discrimination problem (confusion between two similar shape) 33% in CWD and 30% in CWOD group and Depth Perception problem (keeping block perpendicular on paper after showing 2D-patterns) 26% in CWD and 30% in CWOD group.

Whereas, in CWD group 10% children struggled in rotating single box which is square in shape, 16% placed the blocks in incorrect pattern, 6% keeping in reverse pattern but no one shows color confusion in between Yellow / Blue. On the other hand, in CWOD group it is 3%, 3%, 3% respectively.

The differences observed were very small in Visual Perception. It was observed that on tried trial and error methods in performing the Block Design CWOD may not repeat the errors (keeping blocks perpendicular on the table) in the next attempt but same observation may not be seen in CWD group.

On observing Pencil Grasp pattern in CWD group 56.66% children were showed Dynamic / Mature Tripod grasp, 26% were showed Static Tripod Grasp, 6% showed Modified Shovel / Digital Pronate Grasp, 3% were Dragger Palmer Supinated, others 5.34% were showed Cross Thumb Grasp. Whereas, in CWOD group 86.67% children showed Dynamic Mature Grasp and 10.3% population showed Static Tripod Grasp and 3% population were frequently changes their grasp pattern.

This concluded that Dynamic Mature Grasp Pattern and Static Grasp Pattern are two mostly used pattern in both the groups.

CONCLUSION

From the above result we concluded that: -

1. Both the subtests of PVMIA bring out effective outcome differences in testing of Visual- Motor Integration Skills in children with and without disability groups. Thus, proving the alternate hypothesis that "there is a difference in performance on Visual Motor Integration skills of CWD and CWOD".

2. Age has an impact on performance of Visual Motor Integration skills. In CWOD group it had seen that the VMI performance skill improved as age advanced from 42-66 months. Whereas, in CWD group this advancement is not very significant.

3. Hand dominance has an impact on performance of Visual Motor Integration skills in children CWD and CWOD group. In CWD group it had seen that left handers are better performer than the

right-hand dominance children. Whereas, in CWOD group right dominance is better than the left-hand dominance group.

4. Genders have not necessarily influence on the performance of VMI skills in CWD and CWOD.

5. Clinical condition like PDD and Meningomyelocele can affect performance on Visual Motor Integration Skills.

Limitations

The sample size was small, especially in CWD group there was predominance of one clinical condition and other conditions represented Poorly. However, despite these limitations, the results raise some questions that can be considered as stepping stones for further studies.

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