ISSN: 2320-2882

## **IJCRT.ORG**



## INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# Evaluation of Visual Motor Integration skills in school going children, develop normative data for Indian population and its impact on Handwriting skills

Lalit Narayan<sup>1</sup>, Dr. Pramod Kumar Yadav<sup>2</sup>, Prof. (Dr.) Brajesh Kumar Mishra<sup>3</sup>

Maharaj Vinayak Global University, Jaipur Occupational Therapy College<sup>123</sup>

#### I. Abstract

Visual motor integration is conceptualized as the ability to integrate the visual image of letters or shapes with the appropriate motor response. Visual motor integration is often defined operationally as the ability to copy geometric shapes. The visual motor integration test is consisting of a series of shapes which progress from simple figures to more complex ones. The objectives of this study are to develop normative data for Indian population, to assess visual motor integration skills in school going children, to know the relationship between visual motor integration & handwriting skills. The methodology for the study is simple regression model and descriptive statistics has been used for finding the best results. this study may help school going children to improve their visual ability and handwriting skills. The results are: if visual-motor skills are a product of the interaction of multiple factors, then it would be reasonable to assume that only multifaceted intervention would produce results with positive outcomes in visual-motor skills, the importance of visual perception and visual-motor coordination in hand as a foundation of development of academic skills, etc. VMI, VMI and handwriting skills are not interrelated. Their contribution towards academic performance over the three years was found to be divergent in nature.

**Key words**: Handwriting skills, Motor coordination, Normative data, Visual perception, Visual-motor integration, VMI, Comparative.

### II. Introduction

Good academic performance is a key indicator to monitor children's education (Karande & Kulkarni, 2005). A child is expected to have quality performance in academics as it is mandatory to be competent in this competitive world (Rathore & Sangwan, 2014). If a child's performance in school is found to be below par, he/she is considered to be poor in academic performance. Poor performance at an elementary school level may lead to consequences such as repetition in grades, poor self-esteem, andimpaired relationships with peers, parents and teachers. In later life, these consequences may lead to juvenile delinquency and behavioral problems resulting in dropouts (Huffman, Mehlinger, & Kerivan, 2000; Karande & Kulkarni, 2005). The various factors influencing academic performance have been appraised in earlier studies. A positive relationship between environmental factors such as clean air, good light, less classroom noise, comfortable school environment and academic achievements is well supported by many studies (Habibullah & Ashraf, 2013; Mathee, Rollin, Levin, & Naik, 2007; Karande & Kulkarni, 2005; Kawada, 2004). Family factors such as parental education, parental occupations, economic status, ethnicity, and frequentmigration were found to be contributing to academic performance (Parcel, Dufur, & Cornell Zito, 2010; Tyler et al., 2008;

#### www.ijcrt.org

#### © 2022 IJCRT | Volume 10, Issue 11 November 2022 | ISSN: 2320-2882

Lopez, Gallimore, Garnier, & Reese, 2007; Engec, 2006). Various child related factors such as general medical aspects, psychological aspects, cognitive aspects, visual perception (VMI), visual motor integration (VMI) and handwriting were also found to be contributing to a child's academic performance (Afzal& Gortmaker, 2015; Titz & Karbach, 2014; Habibullah & Ashraf, 2013; Halfon, Larson, & Slusser, 2013; Li et al., 2013; Espelage, Hong, Rao, & Low, 2013; Grills-Taquechel, Fletcher, Vaughn, & Stuebing, 2012; Krawczuk-Rybak et al., 2012; Brockmann, Urschitz, Schlaud, & Poets, 2012; Matricciani, Olds, & Petkov, 2012; Polderman, Boomsma, Bartels, Verhulst, & Huizink, 2010; Siqueira & Gurge-Giannetti, 2011; Ong et al., 2010; Karande & Kulkarni, 2005; Carlson, Rowe, & Curby, 2013; Dhingra, Manhas, & Kohli, 2010; Pereira, Araujo, & Braccialli, 2011; Son & Meisels, 2006; Oche, 2014; Dinehart & Manfra, 2013). Education is an integral part of human life. It is a vital instrumentation for every human being to lead a successful life. Education is a lifelong process starting from home to school; and from school to community; and from community to nation and from nation to universe. All children, with or without disability, have a right to education (Mol & Jose, 2016). Universal and compulsory education for all children in the age group of 6-14 is a cherished dream of the new government of the Republic of India. This is a directive policy as stated in article 45 of the constitution. The government appears to have taken a serious note and has made primary education a Fundamental Right of every citizen of India.

#### III. Methodology

Academic Performance: the average scores obtained in mid-year and end of the academic year exams in English, Mathematics, Social sciences, Environmental Studies, Kannada/Hindi and scores obtained in teacher rating scale.

**Visual Perception:** ability of a child to perceive different forms from simple to complex and interpret them. **Visual Motor Integration:** Ability of a child to copy various geometric forms from simple to complex with paper and pencil.

Handwriting: Ability of a child to write letters, words, and numerals legibly.

Study design: Single group co-relational design

Study participants: The study participants were children aged (5-7) years studying in selected schools.

Sampling method: Convenience sampling method was used in the study to select schools. Information about the schools such as, the type of school, the medium of teaching, number of students.

#### Hypothesis:

**Experimental Hypothesis:** There is a positive relationship between visual motor integration & handwriting skills.

Null Hypothesis: There is no relationship between visual motor integration & handwriting skills.

#### **IV.** Objectives

- 1. To develop normative data for Indian population
- 2. To assess visual motor integration skills in school going children
- 3. To know the relationship between visual motor integration & handwriting skills.

#### Analysis

The primary objective of the study was to develop normative data for Indian Population. The secondary objective of the study was to assess the relationship of VMI and handwriting in school children. The results are explained under the following sections:

Descriptive statistics of demographic variables of study participants. Descriptive statistics of primary measures. Comparison of mean academic performances based on school marks record ofchildren in their UKG,1<sup>st</sup> and 2<sup>nd</sup> standard students among demographic variables.

Relationship of VMI and handwriting with academic performances based onschool marks record in UKG, 1st and 2<sup>nd</sup> standard students.

Developmental trend of mean VMI and handwriting scores among UKG, 1st and 2nd standard students.

#### Descriptive statistics of demographic variables of study participants

A total of 100 students were recruited for the study. Half of the students (50.5%) were females. The mean age (in months) of the study participants was 91 months with a SD of  $\pm 2.9$  months (minimum: 85 months) and maximum: 95 months).

Table 4.1 shows that almost three-fourth (76%) of students belonged to nuclear families. One-fourth (26%) of them were from government aided schools, 71.6 % of students had attended preschool and a majority (74%) were studying in English medium. It was reported that 81.7% of children participated in extracurricular activities, only 1% were irregular in attending class and almost two-third of the children were good with regards to interaction with peers. Based on their parents' education, occupation and earnings per month, the Kuppuswamy's socioeconomic status scale was used to determine their socioeconomic status. It has five categories such as upper, upper middle, lower middle, upper lower and lower. As seen in Table 4.1, the maximum percentage of children (32.7%) belonged to lower middle class, while the least number of children (3.4%) belonged to lower class families. The categories were clubbed and converted into three groups as upper (upper and upper-middle), middle (lower-middle) and lower (upper-lower and lower) classes for further analysis. This was done as the number of children were comparatively lesser in JCR few of the categories.

#### Table 3

Descriptive Statistics of Demographic Profile of Study Participants

Demographics of ParticipantsN= 100	N (%)
Gender	
Male	103 (49.5)
Female	105 (50.5)
Type of Family	
Nuclear Family	158 (76)
Joint Family	50 (24)
Type of School	
Government Aided	54 (26)
Private	154 (74)
Peer Interaction	
Poor	2(1)
Below Average	6 (2.9)
Average	39 (18.8)
Above Average	27 (13)
Good	134 (64.4)

www.ijcrt.org	$\textcircled{\sc c}$ 2022 IJCRT   Volume 10, Issue 11 November 2022   ISSN: 2320-2882
Extracurricular Activities Participat	ion
Yes	170 (81.7)
No	38 (18.3)
Preschool	
Attended	149 (71.6)
Not Attended	59 (28.4)
Medium of Teaching	
English	154 (74)
Hindi	54 (26)
Attendance	
Regular	206 (99)
Irregular	2 (1)
Socioeconomic Status	
Upper	18 (8.7)
Upper Middle	63 (30.3)
Lower Middle	68 (32.7)
Upper Lower	52 (25)
Lower	7 (3.4)

#### Descriptive statistics of primary measures

Descriptive statistics of primary outcome measures such as VMI, handwriting and academic performance are mentioned in this section. Table 4.2 gives the mean and SD along with the minimum and maximum scores for each independent variables (VMI and handwriting) and dependent variable (academic performance) in the UKG, 1st and 2nd standard students.

Table 4

Mean and SD's of VMI, VMI, Handwriting and Academic Performances in the UKG, 1st and 2nd standard students.

Variables	Standard	N	Mean (SD)	Minimum	Maximum
	UKG Standard	100	55.84 (21.70)	11	106
	2 <sup>nd</sup> Standard	191	69.56 (22.83)	10	119
	UKG Standard	100	110.53 (19.57)	56	147
VMI Standard Score	1 <sup>st</sup> Standard	198	112.22 (12.89)	73	135
	2 <sup>nd</sup> Standard	191	110.22 (10.59)	75	129
	UKG Standard	100	91.63 (10.37)	44	100
Handwriting Total Legibility Scores	1 <sup>st</sup> Standard	198	96.32 (4.83)	66	100
	2 <sup>nd</sup> Standard	191	97.42 (4.85)	73	100
Academic Performance Based on School Marks Record	UKG Standard	100	80.59 (15.58)	32	100

#### © 2022 IJCRT | Volume 10, Issue 11 November 2022 | ISSN: 2320-2882

Comparison of Mean Academic Performances of Children in the UKG, 1<sup>st</sup> and 2nStandard among Categories of VMI Total Scaled Score:

Primary Measures		Ν	M (SD)	A (SD) Minimum		F (df)	р
VMI Total	Low	63	74.06 (18.48)	32.11	99.33		
Scaled Score inUKG	Average	74	83.86 (12.49)	49	100	6.760 (2,128.81)	0.002
Standard	High	71	82.99 (14.04)	35	99		
VMI Total Scaled Score in <b>fi</b> Standard	Low	65	76.78 (18.88)	36	99		
	Average	65	76.96 (13.80)	29	99	0.195 (2,124.17)	0.823
	High	68	78.12 (11.43)	40	99		
VMI Total	Low	62	77.85 (17.46)	35	99		
Scaled Score in2 <sup>nd</sup>	Average	63	79.76 (14.24)	39	98	1.258 (2,188)	0.287
Standard	High	66	82.29 (15.80)	25	99		





#### $\ensuremath{\mathbb{C}}$ 2022 IJCRT | Volume 10, Issue 11 November 2022 | ISSN: 2320-2882

Comparison of Mean Academic Performances of Children in their Second, Third and Fourth Standard among Categories of VMI Standard Score

Pri	mary	Meas	sures	Ν	Mean (SD)	Minimum	Maximum	F(df)	р
VN	AI St	andar	dLow	64	75.64 (18.18)	32.11	99.33		
Sco Sta	ore in Indaro	n UKO d	GAverage	73	81.05 (14.10)	37	98.70	5.240 (2,131.42	0.006 )
			High	71	84.59 (13.30)	40.33	100		
VN	AI St	andar	dLow	64	75.61 (15.43)	36	98		
Sco Sta	ore i indaro	in 1 <sup>s</sup> d	TAverage	62	73.34 (16.56)	29	96	6.879 (2,121.20	0.001 )
			High	72	82.21 (11.40)	53	99		
VN	AI St	andar	dLow	53	76.96 (16.64)	25	99		
Sco Sta	ore ] indaro	In 2 <sup>n</sup> d	dverage	70	79.11 (16.50)	35	98	2.605 (2,188)	0.077
г			High	68	83.32 (14.22)	41	99		
		100 90	84.5	9		82.21		83.32	
	ance	80	81.0	)5		7561		79.11	
	forme	70							
	c Perl	60							
	demi	50						2	
	n Aca	40							
	Meal	30						-/	
	3	9	UKG	Standa	rd low av	1 <sup>st</sup> standard verage	2 <sup>nd</sup> high	Standard	B

Graph 2: Comparison of Mean Academic Performances of Children in their Ukg,1<sup>st</sup> standard and 2<sup>nd</sup> Standard among Categories of VMI

www.ijcrt.org

Graph 3

Pairwise Comparison of Mean Academic Performances of Children in their UKG,1<sup>st</sup> and 2<sup>nd</sup> Standard among Categories of VMI Standard Score

Primary Measures		Mean Difference (959 CI)	Power Test*	of	the	
	Low - Average	-5.41 (-12.08, 1.25)	0.135	0.543		
VMI Standard Score in						
UKG	Average - High	-3.53 (-8.94, 1.88)	0.272	0.285		
	High – Low	8.95 (2.38, 15.52)	0.005	0.925		
	Low - Average	2.27 (-3.83, 8.36)	0.655	0.142		
VMI Standard Score in						
1 <sup>st</sup> Standard	Average - High	-8.87 (-14.80, -2.94)	0.001	0.941		
	High – Low	6.60 (.72, 12.48)	0.024	0.753		
	Low - Average	-2.15 (-8.93, 4.63)	0.734	0.115		
VMI Standard Score in						
2 <sup>nd</sup> Standard	Average - High	-4.21 (-10.55, 2.13)	0.262	0.344		
	High – Low	6.36 (-0.46, 13.19)	0.073	0.590		

\*Power calculated using SAS 9.4 package

Developmental trend of VMI and handwriting scores among UKG,1<sup>st</sup> and 2<sup>nd</sup> standard.

The developmental trend of primary measures such as VMI and handwriting over a period of three years were analyzed using repeated measures of ANOVA. The comparison of mean VMI, mean VMI and mean handwriting total legibility scores among second, third and fourth standard using repeated measures ANOVA is explained below.

Comparison of mean VMI scores among UKG,1<sup>st</sup> and2nd standard

Mauchly's test indicated that the assumption of sphericity was significant (p<0.001). Using Greenhouse-Geisser estimates of sphericity, it was found that there was a significant difference in VMI between second, third and fourth standard children with p<0.001 as per Table 4.20 and Figure 4.7. Results of post hoc test using the Bonferroni correction has been shown in Table 4.21. There was an increase in VMI total scaled score from the second standard to the third standard which was statistically significant (p<0.001). However, total scaled score did not statistically differ from third to fourth standard with p=0.063.

Comparison of Mean	VMI Standard Scores	among UKG,1 <sup>st</sup>	and $2^{nd}$	and 3 <sup>rd</sup>	Standard

VMI Standard Score	Ν	Mean (SD)	Minimum	Maximum	F (df)	р
UKG Standard	191	110.53 (19.57)	56	147	1.538	0.219
1 <sup>st</sup> Standard	191	112.22 (12.89)	73	135	(1.578)	
2 <sup>nd</sup> Standard	191	110.22 (10.59)	75	129		





A three-year longitudinal study was carried out to explore the relationship of VMI and handwriting with academic performance in elementary school children. The study sample was selected using convenience sampling from Private school. A total of 100 students from 12 schools were recruited for the study and the dropout rate was observed to be 8.2%.

Screening was done to rule out MR, LD, visual defects, auditory defects, clinical syndromes such as Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social problems, Thought problems, Attention Deficit/Hyperactivity problems, Rule-Breaking Behavior, and Aggressive Behavior. Other variables such as gender, type of family, type of school, peer interaction, status of preschool and participation in extracurricular activities that affect children's academic performance were adjusted during analysis using multiple linear regression.

TVMIS-R, Beery VMI and ETCH-M were used to measure VMI and handwriting legibility skills respectively. Academic performance based on school marks record was chosen for further analysis. This was considered more reliable and quantifiable. The analysis of the study revealed that the children who scored lower in VMI and handwriting legibility were performing significantly lower Various demographic variables that were considered for the analysis were gender,type of family, peer interaction, type of school, participation in extracurricular activities, and exposure to preschool and socioeconomic status.

The results revealed that academic performance of girls was consistently higherinUKG,1<sup>st</sup> standard and 2<sup>nd</sup> standard than that of boys. A difference of five to eight markswas found, which was both statistically and clinically significant. Similar results were reported in other studies done in India, according to which girls scored better marks in academics than boys in primary school (Reddy & Reddy, 2016; Srinivas & Venkatkrishnan, 2016). This could be because of better behavior regulation in girls than boys which is similar to the results of the study conducted by Kuhl and Hannover (2012). According to this study, behavior regulation has a positive influence on achievements in German and mathematics. However, there was no significant gender difference in mathematical achievement when self-regulation variables (behavior regulation, problem oriented strategies and emotion oriented strategies) were entered into a model as mediator variables. In the current study, self-regulation strategies were not controlled andhence, analysis by controlling the self-regulation would have yielded reliable results.

Research has shown that having friends or being liked by classmates has positive effect on academic performance (Fantuzzo, Sekino & Cohen, 2004) whereas peer rejection led to academic difficulties (Wentzel & Caldwell, 1997). In the present study, positive peer relations were considered as good and peer

rejection was considered as poor "peer interaction". Academic performance was compared between the children with good and poor peer interaction. The results showed that children with good peer interaction scored 9 to 14 marks higher than their counterparts which was statistically significant.

Children who participated in extracurricular activities had higher mean academic performance score than their counterparts who did not. Statistically and clinically significant difference was found in the academic performance between children who did and whodid not participate in extracurricular activities. This could perhaps be due to extracurricular activities strengthening the skills required for academics such as enhancing psychological skills, cognitive skills, social networks, and peer cultures (Dumas, 2006). However, the exact relationship between higher extracurricular participation and higher academic achievement needs further study.

#### VI. Conclusion

The purpose of the study was to assess the relationship of VMI, VMI and handwriting with academic performance in children from UKG through 2<sup>nd</sup> standard. Tests to measure these skills were administered once in a year for three years among a cohort of 100 children who were studying in second standard. The academic performance of the children under study was obtained from school marks record. The children with physical defects, sensory defects, MR, LD and other clinical syndromes were excluded from the study to determine the sole contribution of the three factors to academic performance. The summary of the current study findings are as follows:

VMI, VMI and handwriting skills are not interrelated. Their contribution towards academic performance over the three years was found to be divergent in nature.

VMI was found to have significant influence on Handwriting skills and academic performance of children.

VMI was found to have significant influence Handwriting skills and academic performance in school children.

Handwriting was found to have significant influence on academic performance inall the children.

Predictability of variance in academic performance using VMI, VMI and handwriting was found to reduce gradually in all age groups.

changes happened in VMI in school kids and handwriting legibility increased overthe period of years.

Therefore, the VMI, VMI and handwriting may be important factors that influence the academic performance in early elementary school children. Including these factors in occupational therapy evaluation and intervention when children encounter problems in academics may be a useful strategy. 110

#### VII. References

Achenbach, T. M., & Rescorla, L. A. (2001). Manual for the Achenbach system of empirically based assessment school-age forms profiles. Burlington, VT: Aseba.

Adimora, D. E., Nwokenna, E. N., Omeje, J. C., & Eze, U. N. (2015). Influence of Socio-Economic Status

and Classroom Climate on Mathematics Anxiety of Primary School Pupils. Procedia-Social and

Behavioral Sciences, 205, 693-701.

Afzal, A. S., & Gortmaker, S. (2015). The Relationship between Obesity and Cognitive Performance in

Children: А Longitudinal Study. Childhood Obesity, 11(4), 466-474.

https://doi.org/10.1089/chi.2014.0129

American Occupational Therapy Association. (2002). Occupational therapy practice framework: Domain and process. American Journal of Occupational Therapy, 56, 609-639.

Amundson, S. J. (1995). *Evaluation Tool of Children's Handwriting: ETCH examiner's manual.* Homer, AK: OT KIDS.

Bailey, M. K., Zauszniewski, J. A., Heinzer, M. M., & Hemstrom-Krainess, M. (2007). Patterns of depressive symptoms in children. *Journal of Child and Adolescent Psychiatric Nursing*, 20(2), 86-95. http://doi.org/10.1111/j.1744- 6171.2007.00090.x

Barnhardt, C., Borsting, E., Deland, P., Pham, N., & Vu, T. (2005). Relationshipbetween visual-motor integration and spatial organization of written language andmath. *Optometry and Vision Science :* 

*Official Publication of the AmericanAcademy of Optometry*, 82(2), 138-43.

https://doi.org/10.1097/01.OPX.0000153266.50875.53

Barrouillet, P., & Lépine, R. (2005). Working memory and children's use of retrieval to solve addition problems. *Journal of Experimental Child Psychology*, *91*(3), 183- 204. https://doi.org/10.1016/j.jecp.2005.03.002

Barry, T. D., Lyman, R. D., & Klinger, L. G. (2002). Academic underachievement and attentiondeficit/hyperactivity disorder: The negative impact of symptom severityon school performance. *Journal of school psychology*, 40(3), 259-283.

Becker, D. R., Miao, A., Duncan, R., & McClelland, M. M. (2014). Behavioral self- regulation and executive function both predict visuomotor skills and early academic achievement. *Early Childhood Research Quarterly*, 29(4), 411-424.

Beckung, E., & Hagberg, G. (2002). Neuroimpairments, activity limitations, and participation restrictions in children with cerebral palsy. *Developmental Medicine & Child Neurology*, 44(5), 309-316.

Beery, K. E., & Beery, N. A. (2010). *Beery VMI.: The Beery-Buktenica Developmental Test of Visualmotor Integration with Supplemental Developmental Tests of Visual Perception and Motor Coordination: And, Stepping Stones Age Norms from Birth to Age Six. Administration, Scoring, and Teaching Manual.* PsychCorp.

Bibi, W., & Ali, A. (2012). The Impact of Pre-school Education on the AcademicAchievements of Primary School Students. *The Dialog*, 7(2), 51-58. Retrieved

from:http://search.ebscohost.com/login.aspx?direct=true&db=hlh&AN=7957298

2&lang=es&site=ehost-live

Blote, A. W., & Hamstra-Bletz, L. (1991). A longitudinal study on the structure of handwriting.

Perceptual and Motor Skills, 72(3), 983-994.

Brockmann, P. E., Urschitz, M. S., Schlaud, M., & Poets, C. F. (2012). Primary snoring in school children: Prevalence and neurocognitive impairments. *Sleep and Breathing*, *16*(1), 23-29. https://doi.org/10.1007/s11325-011-0480-6

Brossard-Racine, M., Mazer, B., Julien, M., & Majnemer, A. (2012). Validating the use of the Evaluation Tool of Children's Handwriting–Manuscript to identify handwriting difficulties and detect change in school-age children. *American Journal of Occupational Therapy*, 66(4), 414-421.

Brown, T., Unsworth, C., & Lyons, C. (2009). Internal consistency and concurrent validity of four instruments used to evaluate the visual-motor integration skills of school-aged children. *Journal of Occupational Therapy, Schools, & Early Intervention, 2*(1), 35-50.

Buhs, E. S., Ladd, G. W., & Herald, S. L. (2006). Peer exclusion and victimization: Processes that mediate the relation between peer group rejection and children's classroom engagement and achievement? *Journal of Educational Psychology*, 98(1), 1-13. https://doi.org/10.1037/0022-0663.98.1.1

Cahill, S. M. (2009). Where Does Handwriting Fit In?: Strategies to Support AcademicAchievement. *Intervention in School and Clinic*, 44(4), 223-228. https://doi.org/10.1177/1053451100328826

Carlson, A. G., Rowe, E., & Curby, T. W. (2013). Disentangling Fine Motor Skills' Relations to Academic Achievement: The Relative Contributions of Visual- Spatial Integration and Visual-Motor Coordination. *The Journal of Genetic Psychology*, *174*(5), 514-533. https://doi.org/10.1080/00221325.2012.717122

Case-Smith, J. (2002). Effectiveness of school-based occupational therapy intervention on handwriting. *American Journal of Occupational Therapy*, 56, 17–25.

Chen, A. H., Bleything, W., & Lim, Y. Y. (2011). Relating vision status to academic achievement among year-2 school children in Malaysia. *Optometry*, 82(5), 267-273. https://doi.org/10.1016/j.optm.2011.02.004

Dandona, R., Dandona, L., Srinivas, M., Sahare, P., Narsaiah, S., Munoz, S. R., ... & Ellwein, L. B. (2002). Refractive error in children in a rural population in India. *Investigative ophthalmology & visual science*, *43*(3), 615-622.

Dankert, H. L, Davies, P. L., & Gavin, W. J. (2003). Occupational Therapy effects on Visual-motor skills in preschool children. *American Journal of OccupationalTherapy*, 57, 542-549.

Denton, P. L., Cope, S., & Moser, C. (2006). The effects of sensorimotor-based intervention versus

therapeutic practice on improving handwriting performancein 6- to 11-year-old children. *American Journal of Occupational Therapy*, 60(1), 16-27. https://doi.org/10.5014/ajot.60.1.16

Dewald, J. F., Meijer, A. M., Oort, F. J., Kerkhof, G. A., & Bögels, S. M. (2010). The influence of sleep quality, sleep duration and sleepiness on school performance inchildren and adolescents: A meta-analytic review. *Sleep Medicine Reviews*, *14*(3),179-189. https://doi.org/10.1016/j.smrv.2009.10.004

Dhingra, R., Manhas, S., & Kohli, N. (2010). Relationship of perceptual abilities with academic performance of children. *Journal of Social Sciences*, *23*(2), 143–147. Retrieved from http://www.krepublishers.com/02-Journals/JSS/JSS-23-0-000-10- Web/JSS-23-2-000-10-Abst-PDF/JSS-23-2-143-10-575-Dhingra-R/JSS-23-2-

143-10-575-Dhingra-R-Tt.pdf

Diekema, S. M., Deitz, J., & Amundson, S. J. (1998). Test-retest reliability of the evaluation tool of children's handwriting-manuscript. *American Journal of Occupational Therapy*, 52(4), 248-255.

Dinehart, L., & Manfra, L. (2013). Associations Between Low-Income Children's FineMotor Skills in Preschool and Academic Performance in Second Grade. *EarlyEducation & Development*, 24(2), 138-161. https://doi.org/10.1080/10409289.2011.636729

Dumais, S. A. (2006). Elementary School Students' Extracurricular Activities: the Effects of Participation on Achievement and Teachers' Evaluations. *Sociological Spectrum*, 26(2), 117-147. https://doi.org/10.1080/02732170500444593

Duncan, G. J., & Magnuson, K. (2013). Investing in preschool programs. *Journal of Economic Perspectives*, 27(2), 109-132.

Emam, M., & Kazem, A. (2014). Visual Motor Integration in Children with and without Reading Disabilities in Oman. *Procedia - Social and Behavioral Sciences*, *112*(Iceepsy 2013), 548-556. https://doi.org/10.1016/j.sbspro.2014.01.1201

Engec, N. (2006). Relationship Between Mobility and Student Performance and Behavior. *The Journal of Educational Research*, *99*(3), 167-178. https://doi.org/10.3200/JOER.99.3.167-178

Espelage, D. L., Hong, J. S., Rao, M. A., & Low, S. (2013). Associations between peervictimization and academic performance. *Theory Into Practice*, *52*(4), 233-240.

Fantuzzo, J., Sekino, Y., & Cohen, H. L. (2004). An examination of the contributions of interactive peer play to salient classroom competencies for urban head startchildren. *Psychology in the Schools*, *41*(3), 323-336.

Feder, K. P., & Majnemer, A. (2007). Handwriting development, competency, and intervention. *Developmental Medicine and Child Neurology*, *49*(4), 312–317. https://doi.org/10.1111/j.1469-8749.2007.00312.x

Flook, L., Repetti, R. L., & Ullman, J. B. (2005). Classroom Social Experiences as Predictors of Academic Performance. *Developmental Psychology*, *41*(2), 319- 327. https://doi.org/10.1037/0012-1649.41.2.319 Floyd, R. G. (2003). Relations Between Measures of Cattell-Horn-Carroll (Chc)Cognitive Abilities and Mathematics Achievement Across the School-Age Years.*Psychology in the Schools*, *40*(2), 155. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=9173652&site =ehost-live&scope=site

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, *95*(1), 148- 162. https://doi.org/10.1037/0022-0663.95.1.148

Gardner, M. F. (1992). Test of Visual Perceptual Skills (non-motor): Upper levelmanual. Hydesville CA: Psychological and Educational Publications Incorporated.

Gardner, M. F. (1996). Test of Visual-Perceptual Skills (non-motor)-Revised Manual.

Novato, CA: Academy Therapy Publications.

Gayden-Hence, F. F. (2016). *The relationship between early childhood education and student success*. The University of Southern Mississippi.

Goldstand, S., Koslowe, K. C., & Parush, S. (2005). Vision, visual-information processing, and academic performance among seventh-grade schoolchildren: A more significant relationship than we thought? *American Journal of Occupational Therapy*, 59, 377-389

Grills-Taquechel, A. E., Fletcher, J. M., Vaughn, S. R., & Stuebing, K. K. (2012). Anxiety and reading difficulties in early elementary school: evidence for unidirectional- or bi-directional relations? *Child Psychiatry and Human Development*, *43*(1), 35-47. https://doi.org/10.1007/s10578-011-0246-1

Habibullah, S., & Ashraf, J. (2013). Factors Affecting Academic Performance of PrimarySchool Children. *Pakistan Journal of Medical Research Pak J Med Res*, 52(2), 47–53.

Hacker, B. (2010). The Importance of Handwriting Skills to Children, (January), 7-8.

Halfon, N., Larson, K., & Slusser, W. (2013). Associations between obesity and comorbid mental health, developmental, and physical health conditions in a nationally representative sample of US children aged 10 to 17. *Academic pediatrics*, *13*(1), 6-13.

Handwriting. *In oxford Dictionaries.com.* Retrieved from: https://en.oxforddictionaries .com/definition/handwriting.

Huddy, C. L. J., Johnson, A., & Hope, L.P. (2001). Educational and behavioural problems in babies of 32-35 weeks gestation. *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 85(1), 23F–28. https://doi.org/10.1136/fn.85.1.F23

Huffman, L. C., Mehlinger, S. L., & Kerivan, A. S. (2000). Risk Factors for Academic and Behavioral Problems at the Beginning of School. *CE-CREDIT.com* "Your Continuing Education Resource."

Hughes, A. A., Lourea-Waddell, B., & Kendall, P. C. (2008). Somatic complaints in children with anxiety disorders and their unique prediction of poorer academic performance. *Child Psychiatry and Human Development*, *39*(2), 211-220.

Jongmans, M. J., Linthorst-Bakker, E., Westenberg, Y., & Smits-Engelsman, B. C.(2003). Use of a taskoriented self-instruction method to support children inprimary school with poor handwriting quality and speed. *Human movement science*, 22(4), 549-566.

Joshi, P., Howat, H., & Bryan, C. (2011). Relationship between fitness levels and academic performance. *Journal of Physical Education and Sport*, *11*(4), 376-382.

Kapur, M., John, A., Rozario, J., & Oommen, A. (2002). NIMHANS Index of Specific Learning Disabilities. In: Hirisave U, Oommen A, Kapur, M. (Eds). *Psychological Assessment of Children in Clinical Setting*. Bangalore: NIMHANSPublications.

Karande, S., & Kulkarni, M. (2005). Poor school performance. *Indian Journal of Pediatrics*, 72(11), 961-967. https://doi.org/10.1007/BF02731673

Kawada, T. (2004). The effect of noise on the health of children. *Journal of Nippon Medical School*, 71(1), 5-10.