



ORIGINAL RESEARCH PAPER

Health Science

SCREENING OF HANDWRITING PROBLEMS IN ELEMENTARY SCHOOL CHILDREN OF URBAN ENGLISH MEDIUM SCHOOLS

KEY WORDS: ETCH –M , Legibility , Speed , Dysgraphia .

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ABSTRACT

Aims- To screen 4th and 5th grade school children from urban English medium schools for handwriting legibility.
Objective - percentage of children affected with dysgraphia and warning signs of dysgraphia
Method – Children were assessed for handwriting skills using Evaluation Tool of Children's Handwriting-Manuscript (ETCH-M), ETCH-M was done in groups of 3 to 5. Handwriting features like legibility, letter formation, size, alignment, near point copying, far point copying and sentence composition , types of grasp, web space, thumb placement, finger position and in-hand manipulation were noted.
Results- ETCH-M was used as test measures. The 623 participating students ranged in ages from 7 to 15 years, with boys making up 52.48% of the study. The percentage of children with Dysgraphia was 12.81%. The speed of handwriting was not significantly different. Variables that predicted manuscript writing included Lower case, upper case, Numeral, near point copying, far point copying, dictation and sentence composition. This study identified the warning signs of Dysgraphia legibility.

INTRODUCTION

Handwriting is a complex human activity that encompasses cognitive, kinesthetic and perceptual –motor functions (Bonny 1992). School work entails handwriting proficiency failing which the child suffers educational and emotional development. Writing skills are the last to develop ontogenetically after comprehension, speech and reading. Hamstra-Bletz and Blote (1993) defined dysgraphia as a disturbance or difficulty in the production of written language that has to do with the mechanics of writing. Handwriting skill is an important part of the elementary school curricula, which helps the student to convey their knowledge to teachers about the extent to which they have mastered academics. Handwriting is a critical element of early childhood education. Far from teaching children to put words to the page, handwriting drives growth across several cognitive areas. Furthermore, writing builds motor skills. Children who fail to develop proficient handwriting skills i.e. below one expected for chronological age, intelligence and educational level are said to be "poor handwriters" or are said to be "dysgraphic" or having writing learning disability. Early detection of dysgraphia is most advantageous in planning appropriate intervention as this difficulty does not resolve by itself, and thus will go a long way in improving the academic success of the student.

In India the prevalence of dysgraphia is difficult to ascertain because very few studies have focused on this condition which is part of a heterogenous group of disorders i.e. Learning Disabilities.

METHODOLOGY

The study was conducted at English medium schools of CBSE and state board pattern of Nagpur city. These English medium schools mainly catered to students from the middle socioeconomic background. The schools were chosen randomly from East, West, North, South and Central Zones of Nagpur city. The principals from individual schools were met after taking prior appointment. Each principal was explained about the importance of handwriting survey and the time duration and the outcome of the study. Evaluation were scheduled during the school day. The students were evaluated inside the classroom at a classroom table typically used as a student work area. In this regard a power point presentation was also given. They were explained about how this study would help determine children with handwriting difficulties as well as plan for early intervention.

Sample size was calculated considering prevalence of dyagraphia reported in previous studies of 15% with relative precision of 20% and 95% confidence level, minimum sample size required for this

study was 590. Hence during my study period, i had included 623 childrens in the study.

$$Z^2_{1-\alpha/2} * p*(1-p) d^2$$

where, p = anticipated prevalence of dysgraphia
 d = Relative precision
 1-α/2 = confidence level
 Z = Standard Normal variate.

EXCLUSION CRITERIA

If known physical Disability prevented them from effectively holding a pencil to write, a cognitive disability affected their Ability to complete Reading or writing tasks, or they were unable to follow commands in English as well as Hindi language.

INCLUSION CRITERIA:-

Typically developing children of 4th and 5th grade of English medium schools

Elementary school Children were assessed for handwriting skills by Evaluation Tool of Children Handwriting –Manuscript (ETCH-M) These measures consist of 7 components which are as follows.

- The tasks to be performed by the child includes:
- 1) Alphabet writing by memory (lower case and upper case)
 - 2) Numerical writing by memory (from number 1 to 12)
 - 3) Near point copying (from a copying sheet kept 3 inches from the top of child response sheet)
 - 4) Far point copying (from a wall chart 6 to 8 ft from child's desk and 4 feet above the ground)
 - 5) Dictation (contains 10 letters and 5 numerals)
 - 6) Sentence Composition (sentence should contain at least 5 words)

Interrater Reliability

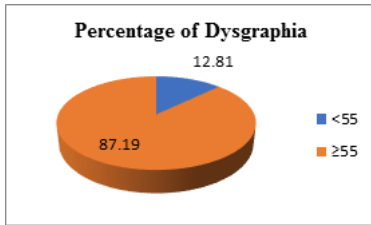
Total word legibility is more reliable than task scores.
 Experienced raters : high (ETCH -M, 85; ETCH-C. 90)
 Experienced and inexperienced raters : high (ETCH -M. 75; ETCH-C. 98)
 Total ETCH legibility score are calculated for word, letter and numeral writing

Statistical analysis

Collected data were entered into Microsoft Excel spreadsheet. Categorical data were expressed in frequency and percentages. Continuous variables were presented as Mean ± SD. Statistical software STATA version 14.0 was used for data analysis.

Table 1- The percentage of children having handwriting issue

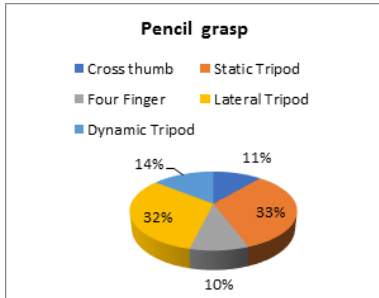
Handwriting ETCH score	Number of children	Percentage
<55	81	12.81
≥55	551	87.19
Total	623	100



GRAPH 1

Table 2: Pencil Grasp

	Number	Percentage
Cross thumb	69	11.22
Static Tripod	203	33.01
Four Finger	59	9.59
Lateral Tripod	196	31.37
Dynamic Tripod	88	14.31



GRAPH 2

Table 3: Comparison of Pencil grasp and Handwriting Legibility

Pencil Grasp	Handwriting ETCH					
	Word		Letter		Numeral	
	Mean	SD	Mean	SD	Mean	SD
Cross Thumb	70.53	21.51	69.14	22.15	69.19	23.50
Static Tripod	83.11	19.98	83.01	18.91	85.96	19.16
Four Finger	80.42	19.27	80.79	19.46	80.08	19.68
Lateral Tripod	89.35	14.79	88.76	12.65	93.25	12.50
Dynamic Tripod	93.25	10.0	90.65	10.22	97.53	5.80
F-value	20.96		21.53		36.74	
p-value	<0.0001, HS		<0.0001, HS		<0.0001, HS	

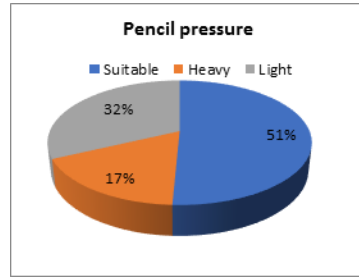
In table 3 One-way non-parametric ANOVA test i.e. (Kruskal – Wallis test) was performed to compare different type of grasps and Handwriting legibility. Results showed that there was highly significant difference in static, lateral and dynamic tripod grasps with p-value <0.0001.



GRAPH NO. 3

Table 4: Pencil pressure

	Number	Percentage
Suitable	312	50.73
Heavy	106	17.24
Light	197	32.03



Graph No. 4

Table 5: Correlation of Pencil pressure and handwriting speed

Pencil paper	Speed (letter/minute)		
	near pt	far point	Sentence composition
Suitable	48.94 ± 33.63	59.33 ± 25.15	29.08 ± 24.53
Heavy	42.66 ± 28.29	41.47 ± 25.39	19.34 ± 11.83
Light	66.98 ± 28.44	61.31 ± 22.00	25.52 ± 21.29
Chi 2-value	44.28	41.66	3.797
p-value	0.0001, HS	0.0001, HS	0.1498, NS

In table 5 One-way non-parametric ANOVA test i.e. (Kruskal – Wallis test) was performed to compare the pencil pressure with handwriting speed of near point and far point copying, which was found to be highly significant except sentence composition (0.1498, NS)

DISCUSSION

Most literacy studies focus on reading for e.g. phonological awareness and alphabetic principle rather than handwriting skills. This study was conducted in English medium schools of CBSE and State Board patterns with a sample size of 623 students, boys and girls were recruited from 4th and 5th grades. During this study, we found that the percentage of children having dysgraphia and handwriting problems was 12.81% as shown in table no 1 which is similar to that found in previous studies. Globally the prevalence of dysgraphia is at 5%. There are limited studies on dysgraphia in India. One such study is based in rural Jaipur where the rate was found to be 22.30% (Dhanda & Jagawat, 2013) while the other study was based in Belgaum where the rate was found to be 12.5%.

Table no 2 and 3 shows that the most frequently used pencil grip is the dynamic tripod, which is demonstrated when the pencil is held between the pads of index and thumb when it rests against the long finger. This position is considered the most efficient, in terms of speed and dexterity because pencil movement is controlled distally by the fingers and thumb, alternative pencil grips are considered efficient if the thumb and index finger form a circle or open web space, allowing for skillful distal manipulation (Functional Movement Development across lifespan by Donna J. Cech, Suzanne Tink Martin). In this study, we found that the most preferred grasp by the students of 4th and 5th grade was the static tripod followed by lateral and dynamic tripod, respectively more than the cross thumb and four fingers type of grasps. shows that Static tripod /lateral tripod / dynamic tripod are highly significantly correlated to handwriting legibility with p-value <0.0001. This is in coherence with previous study done by H. Schweltnus, H. Carnahan, A. Kushki, H. Polatajko, C. Missiuna and T. Chau, Writing Forces Associated With Four Pencil Grasp Patterns in Grade 4 Children, American Journal of Occupational Therapy, 67, 2, (218) which states that the dynamic tripod pencil grip has been promoted as the optimal grasp pattern because it allows for fine dexterous movements of the fingers to create letters (Elliot & Connolly, 1984). three other pencil grasp patterns namely the dynamic quadruped, lateral tripod and the lateral quadruped are suggested to be mature grasps that are functional in terms of speed or legibility for writing (Dennis & Swinsh; 2001; Koziatek & Powell, 2003),

In this study, we found that the percentage of children with suitable, heavy and light pencil pressure were found to be highly significant with handwriting speed(table 4 and 5). This indicated

that heavy type of pencil pressure decreases the speed of handwriting which is in coherence with an article named 'Pressing Too Hard When Writing Tips Proprioception' in the OT Toolbox on the web, which states that sometimes, children hold their pencil very tightly, this may take so much effort to write a single word, that handwriting is slow and difficult.

CONCLUSION

This study highlights the importance of handwriting skills in 4th and 5th grade students.

In summary, nearly 12.81% children of 4th and 5th grade in English medium schools of Nagpur city were affected with dysgraphia. The present study has important ramifications to simplify the identification approaches of handwriting legibility thus advocating the need for planning and developing public health interventions and explaining educational policies

A clearer understanding of the reasoning leading to handwriting problems may help with the efficiency and effectiveness of school based occupational therapy focused on handwriting. This understanding, in turn, may improve student's occupational performance in handwriting.

LIMITATIONS-

The limitations of this study was that it did not involve a cognitive aspect, children with hearing and vision problems, chronic diseases, children having intellectual disability as well as children with ADHD and other neurological deficits were also excluded from this study. Furthermore, in handwriting ETCH-M, scores are raised by writing skill and blurring and lowered by poor handwriting, misspelling and grammatical errors whereas ETCH-M scoring is time consuming, subjective and tends to be unreliable. Subjective handwriting evaluations suffer from limited accuracy, sensitivity, and reliability Moreover, the tester must make a serious effort to ensure that the testing material are organized and presented in a way that does not encumber the child, thereby disturbing his or her ability to write in a natural manner This research was carried out among a group of children whose mean age was 9.97 years. The results cannot be applied to older children because the relationship decreased with age as shown by Karlsodttir and Stefansson 2002.

FUTURE IMPLICATIONS-

The results can be used as an early stage screening methods to determine the children who possibly suffer from handwriting difficulty problem. The teacher and the therapist can work together, combining medical and educational knowledge, which can give positive results in achieving legible handwriting and services that go beyond the scope of a standard handwriting curriculum are needed if these children are to become proficient. Suggestions for further research are to examine the effectiveness of activities used more often in the remediation of handwriting problems, modify the survey item regarding primary sensory systems to specify the number of responses sought, and carry out a qualitative study that addresses clinical reasoning of school-based therapists. The present study has important ramifications to simplify the identification approaches to advocate the need for planning and developing public health interventions and explaining educational policies as well as appointing an Occupational Therapy professional for every school to intervene for the handwriting, visual-motor integration problems and other related issues.

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