I don't have bad Hand-Writing: To Measure the Level of Dysgraphia Among School Children

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Abstract: The purpose of this study was to study to measure the level of dysgraphia among school children. Dysgraphia is actually an inability to write properly within the given margins and space. Many other tests were used in previous research to assess the dysgraphia. Dysgraphia questionnaire was used. It is 22 items scales which is divided into 3 subscales (difficulty in cognition, disorganized motor ability and difficulty in problem solving). Subscale named difficulty in cognition contains 9 items, subscale named disorganized motor ability contains 7 items and subscale named difficulty in problem solving contain 6 items. This study is based on survey method. The sample of (N=100) students both male and female was selected from Muslims Girls High school and nearby available students of class 6th to 10th and age range from 8 to 16 years by convenient sampling method. There is a significant positive relationship between DIC (Difficulty in Cognition) and DMA (Disorganized Motor Ability) that mean students having disorganized cognitions having disorganized motor abilities as well. There is significant positive relationship between DIC and PS as well that mean problem solving, and cognitions are strongly related to each other and have strong impact. There is a significant positive difference problem solving and age which mean problem solving ability varies with age. There is a significant positive difference between DMA and age as well. There exists a significant difference between PS and family system. A significant difference exits between PS and class of the participant.

Keywords: Dysgraphia; Difficulty in Cognition; Disorganized Motor Ability; Difficulty in Problem Solving.

1. INTRODUCTION

Dysgraphia is a brain related problem, actually it is a deficiency in the ability to write, primarily handwriting that affects the fine muscles resultantly causes the immobility of fine muscles like finger muscles. Dysgraphia can be differentiated from dyslexia as dyslexia is characterized by ambiguous, disorganized, and irregular handwritings with inconsistent spacing between letter/alphabets, upper and lower case at wrong places, different shapes of alphabets and different unusual style of writing (Hen-Herbst, L., & Rosenblum, S. 2019).

Dysgraphia is an issue related to our nervous system characterized by affected coordination between small muscles, which we call fine motor skills. These skills are required to write. Disturbed fine motor skills affect the written assignment and tasks. Wellbeing facilitators and utmost clinicians term this disorder "written issue and expression disability" (Crouch, A. L., & Jakubecy, J. J. 2007). Dysgraphia should not be misunderstood with dyslexia as dyslexia include struggling with reading and it can also affect writing, spellings and speaking. When a child cannot read properly how can he write effectively. But in case of dysgraphia child can read properly but has slow & labored writing (Safran, J. S. 2002).

Explaining the origin of dysgraphia according to University of Delaware's Online Asperger Syndrome Information and Support has been unclear, depending on how you look at it. There are two subtypes: specific and nonspecific dysgraphia. The specific form of the disease refers more to neurological problems that impact motor skills. Nonspecific dysgraphia points to external impacts as the root cause, such as psychosocial problems or absenteeism in school (Samodro, P. W., & Sihwi, S. W. 2019).

To classify dysgraphia in international conference on children the implementation of the back propagation. This study produced Accuracy of 94.71%, while conducted research on the characteristics that can be used for writing skills in dysgraphia children. The Identification and rating of developmental dysgraphia by handwriting analysis, the developmental dysgraphia is a disturbance or difficulty in the production of written language that has to do with the mechanics of writing (Rosenblum, S. 2016).

European conduct the analysis of Parkinson's disease on dysgraphia based optimized fractional order derivative features. According to that study the majority of Parkinson's disease patients is associated with handwriting abnormalities called Parkinson's disease dysgraphia, which is linked with rigidity and bradykinesia of muscles involved in the handwriting process (Lopez-de-Ipina, K. 2019).

According to the Biomedical and Health Informatics, addressing dysgraphia with a mobile, web-based software with interactive feedback. Dysgraphia has a non-indifferent role since it undermines the writing communication abilities of the students, with side effects on their self-esteem and a great risk of overcome school performance and more difficult relationships with classmates (Giordano, D., & Maiorana, F. 2014).

According to research, the generality of Dysgraphia is more in males rather than in females and typically is diagnosed at the 2 or 3 level when writing is more meaningful. Treatment varies for dysgraphia and could consist of the treatment for fine motor skills and how to write effectively. Other treatments could label diminished memory or other nervous problems (Tankard Carnock, J., & Silva, E. 2019). Roughly physicians propose that people with dysgraphia use computer to avoid handwriting. Some individuals refine their writing ability with dysgraphia, but for others, the disorder continue (Molinari, M. 1997).

2. LITERATURE REVIEW

According to research, the prevalence of Dysgraphia is higher in boys than in girls and typically is diagnosed at the 2nd or 3rd grade level when writing is more substantial (Leach,M. 2009) ("History - The Chronicles of Dysgraphia", 2019). nervous system issue that controls the delicate motor skills want to write. Mark as solid for a child to do handwriting tasks and tasks. Health facilitators and most doctors define this condition "in written form, expression and incapacity"(Cold et al., 2019)

Studies appeared spelling and dysgraphia classified in operational memory is related to handwriting and is often a problem in dysgraphia. The spelling classification discusses the skill to store written words in the working memory while spelling the word expression or the ability to create continuous memory of written words associated with their meaning, articulation and word are examined. Children do not have a primary growing motor disorder, another problem of poor handwriting look, but they may have difficulty planning consecutive finger movements with dysgraphia such as the impression of the thumb on following fingers on the same hand without a visible reaction. Children may have difficulty with spelling organization and preparation for consecutive finger movements with dysgraphia ("Understanding handwriting", 2019).

Harm in even one aspect of the creative writing cycle can weaken a person's capacity to produce an age-fitting item. Despite the fact that analysts have estimated that diverse subtypes of dysgraphia might be connected to various components, fresher investigations have exhibited interrelations between cerebrum regions liable for automaticity, language, and engine coordination. The apparent difference between hypotheses of dysgraphia may not be pretty much as extraordinary as when suspected. For instance, youngsters with dyslexia have additionally been noted to be at expanded danger for other gentle engine shortages in errands like finger tapping, riding a bicycle, and tying shoelaces (Chung, Patel and Nizami, 2020).

Large numbers of the speculations in regards to components of dysgraphia have been gotten from investigations of people with gained dysgraphia. Composing has been demonstrated to be a perplexing cycle that requires the higher request insight (language, verbal working memory and association) facilitated with engine arranging and execution to comprise the practical composing framework (Chung, Patel and Nizami, 2020).

Despite education exposure, 5% to 10% of children never reach a sufficient level of automation in handwriting. These handwriting difficulties, termed dysgraphia, affect legibility and/or speed and can seriously impact both children's behavioral and academical development (Gargot et al., 2020).

3. RATIONALE

The rationale of the study is to uncover the association between domains of dysgraphia as many children has difficulty in cognition of

different things if this is corrected dysgraphia can be corrected. Similarly problem solving ability is also affected by difficulty in cognition. So problem solving skills are improved by improving the cognition only if we know how they are related to each other.

4. OBJECTIVE

The objective of the study to measure the level of dysgraphia among school children.

5. HYPOTHESIS

It is hypothesized that there is significant relationship between Difficulty in cognition and disorganized motor ability

It is hypothesized that there is significant relationship between difficulty in cognition and Difficulty in problem solving.

It is hypothesized that there is significant relationship between disorganised motor ability and difficulty in problem solving.

It is hypothesized that there is significant difference between demographic variables and domains of Dysgraphia Questionnaire.

6. METHODOLOGY

The population of the study was school level children. The sample selected for the study was students of class 4th to 10th. We selected 100 students from different school both private and government. We selected the sample by convenient sampling technique.

Dysgraphia questionnaire developed by Yaqoob, N., Ejaz, M & Sattar, I (2019) was used in this study. It is in 5-point likert format ranging from strongly disagree to strongly agree. It has 22 items, divided into 3 domains. First domain named "Difficulty in Cognition" has nine items. Second domain named "Disorganized Motor Ability" has 7 items. Third domain named "Problem Solving" has 6 items. This questionnaire was selected because of measurement of these three domains of dysgraphia.

This study is based on survey method. The independent variables were mentioned that age, gender, socioeconomic status, family system, class and institute. Dependent variables were dysgraphia and its domains (cognition, motor ability and problem solving). The extraneous variable was the teaching method. There was no control variable in the study.

A bundle containing inform consent, demographic sheet and dysgraphia questionnaire was given to subjects. Firstly, the purpose of the study was elaborated to the subjects. Then, their consent was taken. The subjects were instructed as; according to guidance using the scale, it indicates how much you agree or disagree by placing the X in appropriate place with the following statement. Subjects completed the questionnaire according to their level of difficulty they face in writing. The results were calculated according to the scoring of the questionnaire. All the data and demographic variables were entered to SPSS for statistical analysis.

7. RESULTS

Table 1 indicates the frequencies and percentage of demographic variable of the participants. The table indicates that 29% of the participants are of age 8-12 and 71% are from age 13-16. There are 53% boys and 47% girls.52% of the participants are from govt. sectors and rest 48% are from private sector schools.27% participants having trouble to write English while 39% have trouble in Urdu and 34% population having trouble in writing both languages.

The Dysgraphia Questionnaire having three domains. The first one DIC consists of 9 items in it and having reliability. 691.The second domain DMA consists of 7 items in it having reliability .335. Third domains have 6 items in it and have .467 Cronbach's alpha value.

There is a significant positive relationship between DIC and DMA that mean students having disorganized cognitions having disorganized motor abilities as well. There is significant positive relationship between DIC and PS as well that mean problem solving, and cognitions are strongly related to each other and have strong impact.

There is a significant positive difference problem solving and age which mean problem solving ability varies with age. There is a significant positive difference between DMA and age as well. There exists a significant difference between PS and family system. A significant difference exits between PS and class of the participant.

Table 1: Demographic Variables of the Study (N=100)

Variables		**f**	**%**
Age	08-12	29	29.0
	13-16	71	71.0
Gender	Boy	53	53.0
	Girl	47	47.0
SES	Low	7	7.0
	Middle	87	87.0
	High	6	6.0
Family	Nuclear	53	53.0
	High	47	47.0
Class of Participant	Four to seven	42	42.0
	Eight to ten	58	58.0
Residence	Village	29	29.0
	City	71	71.0
Writing Problem of the Participant	English	27	27.0
	Urdu	39	39.0
Institute of the Participant	Both	34	34.0
	Govt.	52	52.0
	Private	48	48.0

Table 2: Mean and Standard Deviations of Demographic Variable of the Participants

Variables	**N**	**M**	**SD**
Age	100	1.71	.456
Gender	100	1.47	.502
SES	100	1.99	.362
Family	100	1.47	.502
Class of Participant	100	1.58	.496
Residence	100	1.71	.456
Writing Problem of the Participant	100	2.07	.782
Institute of the Participant	100	1.48	.502

Key: SES=socio economic status

Table 3: Reliability Index, Item Details, Number of Items, Mean and Cronbach's Alpha of Dysgraphia Questionnaire (DQ)

Scale	**Item Numbers in scales**	**Numbers of Items**	**Mean**	**SD**	**Cronbach's Alpha**
DQ	1-22	22	64.59	10.670	.710

Key: DQ= dysgraphia questionnaire

Table 4: Correlations Between Three Domains of the Scale

Variables	**DIC**	**DMA**	**PS**
DIC	1	.324**	.373**
DMA		1	.176
PS			1

Key: **P<0.01, DIC=difficulty in cognition, DMA=disorganized motor ability, PS=problem solving

Table 5: Independent Sample T Test of DQ and Demographic Variables

Variables		N	Mean	SD	t	P	Cohen's d
DIC	8-12	29	25.1379	6.1454	-.528	.599	0.117
	13-16	71	25.8873	6.5542			
DMA	8-12	29	22.8966	2.8074	2.064	.042	0.484
	13-16	71	21.2535	3.8866			
PS	8-12	29	19.7241	4.2501	2.437	.017	0.523
	13-16	71	17.6197	3.7772			
DIC	Boy	53	25.8679	6.0638	.326	.745	0.065
	Girl	47	25.4468	6.8518			
DMA	Boy	53	21.6604	3.5352	-.200	.842	0.040
	Girl	47	21.8085	3.8540			
PS	Boy	53	17.9623	3.7001	-.706	.842	0.140
	Girl	47	18.5319	4.3631			
DIC	Nuclear	53	26.0337	6.4359	.607	.545	0.120
	Joint	47	25.2553	6.4385			
DMA	Nuclear	53	22.0000	3.3569	.780	.437	0.156
	Joint	47	21.4225	4.0094			
PS	Nuclear	53	18.8811	3.9975	2.017	.046	0.379
	Joint	47	17.3830	3.9040			
DIC	Class 4-7	42	26.1667	6.7060	.657	.513	0.132
	Class8-10	58	25.3103	6.2329			
DMA	Class 4-7	42	22.9048	2.8094	2.817	.006	0.586
	Class8-10	58	20.8793	3.9959			
PS	Class 4-7	42	19.4048	3.7158	2.559	.012	0.523
	Class8-10	58	17.3739	4.0385			
DIC	village	29	24.5517	5.0609	-1.115	.267	0.260
	City	71	26.1268	6.8742			
DMA	Village	29	20.9655	4.4839	-1.336	.185	0.274
	City	71	22.0423	3.2664			
PS	Village	29	17.9310	3.0929	-.474	.637	0.112
	City	71	18.3521	4.3493			
DIC	Govt.	52	25.8462	6.7078	.284	.777	0.057
	Private	48	25.4792	6.1505			
DMA	Govt.	52	22.0962	3.4937	1.039	.301	0.207
	Private	48	21.3333	3.8500			
PS	Govt.	52	17.8269	4.0811	-1.045	.298	0.216
	Private	48	18.6667	3.9937			

Key: **P<0.01, *p<0.05, DIC=difficulty in cognition, DMA=disorganized motor ability, PS=problem solving

8. DISCUSSION

To ensure the level of dysgraphia among the school children, Dysgraphia scale which has three domains as Difficulty in cognition, disorganized motor ability and problem solving is used to assess its level. Mean value of this scale is (64.59) and SD is (10.670). There is a significant positive relationship between DIC and DMA that mean students having disorganized cognitions having disorganized motor abilities as well. There is significant positive relationship between DIC and PS as well that mean problem solving, and cognitions are strongly related to each other and have strong impact.

A previous research was mentioned below to be conducted to find the comparison between handwriting performance and organizational abilities among children with and without dysgraphia. The result showed that significant correlation was found in dysgraphia group between Handwriting spatial planning and the organizational ability. At also showed that significant differences were found in between handwriting spatial arrangement and the organizational ability (Elsevier 2009).

Another research was mentioned to be conducted on Handwriting development in level 2 and level 3 primary school children with normal, abnormal, or dysgraphia characteristics. In this longitudinal and cross-sectional study, children in grade 2 (age 7–8 years) and grade 3 (8–9 years) took handwriting and disorganized motor ability and also problem solving tests within one school year.

Dysgraphia decreased strongly from 37% to 17% in grade 2 and reduced further to a low and stable rate of 6% in grade 3. Stability in handwriting quality only happened in the children whose scores were within the normal range and dysgraphic children sustained to show significant and substantial improvement during grades 2 and 3. (Elsevier 2010)

A study was conducted to find the relationship between perceptual motor skill and handwriting in dysgraphia ham-fisted and normal children. The finding of the study reveals a significant correlation among handwriting and perceptual motor skills. (MAELAND 1992)

9. CONCLUSION

There is a significant positive relationship between DIC and DMA that mean students having disorganized cognitions having disorganized motor abilities as well. There is significant positive relationship between DIC and PS as well that mean problem solving, and cognitions are strongly related to each other and have strong impact.

There is a significant positive difference problem solving and age which mean problem solving ability varies with age. There is a significant positive difference between DMA and age as well. There exists a significant difference between PS and family system. A significant difference exits between PS and class of the participant.

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AUTHOR'S CONTRIBUTION

Conception, design, data collection, literature review and data entry has been done by Muneeza Muneer. Conception, Data collection, scale author, data entry and methodology has been done by Maryum Ejaz. Conception, Data collection, scale author, data entry, analysis and results has been done by Iqra Sattar. Conception, Data collection, data entry, discussion and conclusion has been done by Amna Karim and Amna Amjad. Drafting the article or revising it critically for important intellectual content; and final approval of the version to be published has been done by Hafiza Saba Javaid.

DISCLOSURES ABOUT POTENTIAL CONFLICT OF INTERESTS

None

FURTHER INFORMATION (E.G., FUNDING, CONFERENCE PRESENTATION

None

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APPENDICES

Informed Consent Form

The purpose of this research is to measure the level of Dysgraphia among School children. In this research, your personal information will be asked and you'll be provided a questionnaire to fill. Your participation in this research will be completely voluntary. It is ensured that there is no risk associated with this research. All of yours provided personal information would be kept confidential. You have the right to decline the participation in this research. During data collection, you will have right to ask questions and can withdraw at any point, if you feel uncomfortable.

Researcher's Sign: _____

Date: _____

I am a student and have agreed to voluntary participate in this research. I verify that the researcher have completely informed me about this research. The researcher has ensured me that there is no risk associated with this research. All of mine personal information will be kept confidential. However, research data could be discussed with supervisor. I will have the right to task questions and can withdraw at any point, if feel uncomfortable.

Participant's Sign: _____

Date: _____

Difficulty in Cognition	**1**	**2**	**3**	**4**	**5**
Most of the time it feels like I cannot move my Pencil					
I am confused between letters/alphabets					
I feel difficulty in writing alphabets.					
I often get confused among upper- and lower-case letters.					
Most of the time I feel difficulty in organizing the words in line					
I have a messy handwriting.					
I cannot tap my finger speedily on table.					
I can't connect dots from one point to another to form a picture					
I forget the spellings of previously learned vocabulary words while writing.					

Dysgraphia Questionnaire

Instructions: using the scale provided as guide, indicates how much you agree or disagree with the following statement by placing X in appropriate place. Give only one answer for each statement: (1) strongly disagree, (2) disagree, (3) uncertain, (4) agree, (5) strongly agree

Disorganized motor ability	**1**	**2**	**3**	**4**	**5**
I feel pain in my hand while writing					
Sometimes I know correct answers in my tests but I lose marks because I can't write properly.					
I don't have to struggle a lot while expressing my thoughts into paper					
Sometimes I have bad grip on pencil.					
My teacher points out a lot of mistakes on my notebook					
Sometimes I omit words in my writing.					
I can complete my written work on time.					

Problem solving	**1**	**2**	**3**	**4**	**5**
I erase a lot while writing.					
I can colour inside the lines.					
Most of the time I can't retrieve words while writing.					
I cannot write extended response questions					
Sometimes I am unable to solve arithmetic Problem.					
Most of the time I face spelling problems					

Demographic Form

Age: 04-09____ 10-14____

Gender: Boy ____ Girl ____

Socioeconomic status: Low____ Middle____ High____

Family system: Nuclear____ Joint____

Class: _____

Residence: Village____ City____

Writing problem: English____ Urdu____ Both____

Institute: Govt_____ Private_____

Name of the Institute: _____