

Standardization of Students Handwriting Speed in Grades 2-5 in Elementary Schools in Tehran and Factors That Influence it

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Abstract: *Background and aim:* Due to Importance of handwriting for students and lack of appropriate norms of Iranian students handwriting speed, aim of this study was record of handwriting speed norm. *Material and method:* This cross - sectional study was conducted on male and female students in second through fifth grade elementary school students in Tehran in 89-90. After check entry requirements, students in the study were tested by text in which all letters Persian alphabet is available. The statistical analysis of parametric statistical tests including T-Test two independent samples, Pearson correlation and nonparametric statistical tests including chi-square multidimensional independent, Cramer-FI connection coefficients, Spearman correlation, multiple regression analysis, path analysis were used. *Results:* The results of Pearson correlation ($P = 0.000 = P, r = 1$) testing confirmed the reliability of handwriting speed test. Also, in construct validity, the results confirm the validity of the test. There was a significant relationship between increasing grade and handwriting speed ($P = 0.000$). There wasn't significant difference between left-handed and right-handed handwriting speed ($P = 0.943$) and also between public and private schools ($P = 0.950$). Hand-Writing speed difference between boys and girls was significant ($P = 0.005$). *Conclusion:* The present study demonstrated adequate validity and reliability of the test to handwriting speed measurement second to fifth grade students in Tehran.

Key words: Handwriting speed • Writing • Slow writing • Transcription

INTRODUCTION

Despite the rapid advances in communications technology in recent years, writing is still one of the most important and the most necessary communication styles in daily living and important educational component in during the school year. Based on studies, students devoted 50% of their time to handwritten activities and about $\frac{1}{2}$ two $\frac{1}{4}$ of the class time to work with pencil and paper [1, 2]. Functional skills of writing help them to do their homework legibly and quality in determined time [3]. Otherwise, the educational outcomes of students with problems of handwriting influenced and resulted in the students' academic achievement problem and low self-esteem [1, 2]. Speed is one of the components of the writing skills. Smooth writing in writing tests requires writing with proper speed and remain at that speed with a

good level of readability. Therefore, one of the concerns of the students is lack the ability to transfer knowledge to the determined test time [4-6]. Since one of the biggest problems of students during the school year is slow-writing, the students for evaluation and treatment are referred to occupational therapy [6]. Although there are several tools to measure the speed of the handwriting, usually measured the rate by calculating the amount of time it takes to write a text transcript at the time [7].

According to MacArthur, students with disorders of handwriting skills, show its disorder in a small area of the writing [8]. So, the approach that commonly used to evaluate the speed of the handwriting is using a short-term test, which requires a duplicate copy of the example sentences frequently [8]. Several Studies have investigated the factors influencing the speed of writing, such as age [9, 10] and gender [5, 11], laterality [12], writing instruments [13], etc. Based on the above studies

and given the importance of handwriting for students and the lack of an appropriate norm of Iranian students handwriting speed, the purpose of this study was to record norm the speed of handwriting and factors affecting it in some age groups that have the most referrals to rehabilitation centers.

MATERIALS AND METHOD

This study was cross - sectional study. The population of the study consisted of male and female students in second through fifth grade elementary school in Tehran in the 2011-2012 school years. The total number was 379, 786 people. Inclusion criteria included absence of neurological problems such as cerebral palsy and neuropathy in the upper extremity, no congenital anomalies and upper limb disorders and lack of learning and attention disorders - ADHD, ADD. The 19 districts of Tehran were divided to 5 Cluster the North, South, East, West and Center and randomly selected from each cluster a region that includes parts of 3, 6, 8, 9 and 17 respectively. Then using systematic sampling from each region were selected two girls schools and two boys schools. A total of 20 schools were examined. The sample size of each school was calculated with regard to the sample size of each district. And in the schools based on the number of students in each grade the sample size that grade was determined, then, the names of students in each grade were listed. They were selected on the basis of systematic sampling and were examined 400 students with the consent of school administrators and teachers, parents. In this study, a researcher-made text was used in that there is the entire Persian alphabet. The text was evaluated and corrected by 30 teachers of the fourth and fifth grades in the proportion of difficult and easy words and easy suitability for transcription the students. And the criterion validity of the instrument was fixed. Time tested through pilot study on a small group of students from second to fifth was considered 5 minutes. The students were asked to transcribe the text was written the top of sheet test after it was read once by the examiner in the lines of text the bottom of sheet in 5 minutes and if they have extra time, they start writing from the beginning. Students should use only a soft black pencil and if wrong writing, the aimed word was determined by drawing a line on it and did not allow to use of the cleaner. After the end of the evaluation by examiner, the students kept up the pencil and were collected paper test. It should be noted that students not used of their time in any way –like shaving the pencil and speaking excluded. The papers

were examined and count letters including letters written and a line was drawn on the wrong word and punctuation. After counting, the average number of letters calculated per minute for each student and obtained for each grade. It should be noted that in order to prevent stress on the students the test conducted in class with the presence of the teacher. To prove the reliability inter-rater all papers were evaluated by two raters and was taken correlation between scores. To establish the construct validity of the teachers were asked to rate student's handwritten speed Based on slow writing, normal or the fast writing and then correlations were obtained between Rates given and scores of the test. Statistical analysis of parametric statistical tests include independent samples T-Test, Pearson correlation and non-parametric statistical tests such as chi-square independence multidimensional, Phi and Cramer's V coefficients, Spearman correlation, multiple regression analysis, path analysis were used.

RESULTS

Students (200 boys and 200 girls) from second grade through fifth grade (each grade 100 people) participated in this study that were enrolled 100 students in nonpublic schools and 300 students in public schools. 80 students or 20% of students were left-handed and 320 320 or 80% were right-handed .80 students were enrolled in District 3, 85 people in 6, 81 in district 8, 80 in District 9 and 74 in a 17 district17. As mentioned, in order to prove the inter-rater reliability hand-writing speed test, two rater check out 400 sample. According to Table 1 and the results of the Pearson correlation coefficient ($000/0 = P, 1 = r$) confirmed reliability the handwriting speed test.

The construct validity was evaluated according to Table 2, the results confirm the high validity of the test.

To evaluate the normal distribution of variables Kolmogrov-Smirnov test was employed. Given that the significance level of the writing speed is greater than 0.05 it can be said the distribution of data of this variable is not significantly different from a normal distribution. In the factors affecting the speed of handwriting, the Spearman correlation results showed that there is significant relationship between educational levels increase and the speed of writing ($p = 0.000, r = 0.542$). Namely, the higher the educational level and age of the students, the writing speed increases and the maximum velocity gradient handwriting speed was in fifth grade. Also, Considering the results of the t-test showed that there is no significant difference between speed writing the left-handed and right-hand ($t = 0.072, p = 0.943$) and also between writing

Table 1: Matrix of correlations between hand-writing speed

		Handwriting speed (2)	Handwriting speed (1)
Handwriting speed (1)	Correlation coefficient	1	1
	Significance level		0.00
	Number	400	400
Handwriting speed (2)	Correlation coefficient	1	1
	Significance level	0.00	
	Number	400	400

Table 2: Matrix of correlations between the examiner scores and scores of teacher evaluation

		Examiner score	Teacher score
Examiner score	Correlation coefficient	1	0.798
	Significance level		0.00
	Number	120	120
Teacher score	Correlation coefficient	0.798	1
	Significant level	0.00	
	Number	120	120

Table 3: Independent groups to examine the gender difference in terms of handwriting speed

	Gender	Means	S.D	t	df	Sig.
Handwriting speed	Girl	57.02	17.73	2.828	398	0.005
	Boy	52.13	16.83			

Table 4: The results of analysis of variance in relation to handwriting speed

		Writing speed analysis			
Significance level	F	Mean square	Freedom degree	Sum of square	
0.393	1.026	312.156	4	1248.625	Between groups
		304.134	395	120133.125	Within groups
			399	121381.750	Total

Table 5: Tukey test results in relation to handwriting speed

Handwriting speed		
Tukey test		
Mean comparison with alpha-0.05	Number	District
1		
52.64	85	6
53.50	74	17
54.06	80	3
54.94	80	9
57.74	81	8
0.347		Significance level

Table 6: Distribution of students according to the writing speed

	Range (letter in minutes)	Frequency	Speed
Grade 2	24-36(slow-writing)	37	37
	36-50(normal)	44	44
	51-63(fast- writing)	19	19
	Total sum	100	100
Grade 3	20-42(slow -writing)	29	29
	43-66(normal)	48	48
	67-90(fast-writing)	23	23
	Total sum	100	100
Grade 4	24-51(slow-writing)	30	30
	52-80(normal)	61	61
	81-108(fast-writing)	9	9
	Total sum	100	100
Grade 5	30-57(slow-writing)	36	36
	58-85(normal)	48	48
	86-113(fast-writing)	16	16
	Total sum	100	100

Table 7: Comparison of the rate of hand-writing students in various studies

Grade	Graham <i>et al</i>		Hamstra-Beltz and Bloot (1990)		Zebobani & Alkinz (1984)		Zebobani, Watson-Will (1998)		Javantash & Torkan (2007)		Javantash (2007)	
	Girl	Boy		Filips <i>et al.</i> (1984)			Girl	Boy	Girl	Boy	Girl	Boy
1	21	17		32								
2	37	31	24	35			39	35				
3	50	45	35	25	32		56	46			40.7	41.08
4	66	61	46	37	34		70	67	36.9	37.14	53.52	49.98
5	75	71	54	47	38		83	73			62.36	55.96
6	91	78	66	57	46		83	89			71.5	61.5
7	109	91		62	52		85	111				
8	118	112		72								
9	121	114										

speed the public and private school students ($t = 0.063$, $p = 0.950$). In the gender, according to Table 3, the results of t-test ($t = 2.828$, $p = 0.005$) showed there is significant differences between boys and girls in writing speed and the boy write faster than the girls that this difference is higher in fourth and fifth grade.

To investigate the effect of different areas of Tehran city ANOVA was used. According to Tables 4 and 5, significant difference wasn't observed in handwriting rate between students in different areas of Tehran.

To record the norms of the each grade based on slow-writing, normal and fast-writing used of spss17 software and two command compute and recode. The results are presented in Table 6.

DISCUSSION

Studies was carried out to determine the speed of hand writing of students in different grades and factors effecting on. Some used to write repeated words in determined time [14,7] and some was investigated free writing method [8]. But the most important study in Australia, the students were asked to transcribe the sentence in English alphabet in 3 minutes [11, 15]. In the presentstudy was used same method. In the age, several studies have reported and confirmed the results of this study and stated that speed of handwriting increases with age and educationlevel [10, 16, 17]. The research which conducted in China concluded that the highest rate in handwriting was in grade 2, 3, 4 (6) and in the study of Penny Alukwas seen in grade 7 to 9. The present study showed an increase in the maximum slope in fifth grade students. The studiethat examined the effect of general laterality expressed different results. Many studies such as present study concluded that handwriting

speed is equal among left-handed and right-handed [5, 12, 16, 18, 19] while others concluded that the right hand is quicker than left hand [5, 11, 16]. Various studies have been conducted in gender revealed that some believe that girls write faster than boys [5, 7, 11, 14, 20], but others showed that handwriting rate is equal for boys and girls [5, 19]. In present study, the type of schools and educational districts of Tehran had no effect on students' writing speed. However, comparing the speed of handwriting students in Tehran with other countries in Table 7, it is seen that students in Tehran have hand-writing speed lower than other countries. This could be due to differences in the alphabet, writing system and writing direction. It is worth mentioning the fact that other countries students go to school a year earlier, in this table, the students of Tehran compared with a higher educational level.

CONCLUSION

The present study demonstrated that test of handwriting speed have adequate reliability and validity to measure the speed of handwriting second through fifth grade students in the city of Tehran and can be used in clinical evaluations. Also of laterality, type of schools and districts of education in Tehran had no effect on the speed of hand-writing. However, girls write faster than boys as well as the with increase education level of students increase handwriting speed.

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