

An Assessment of Ambidextrous Handwriting Characters: A Future Prospect for Forensic Document Examiners

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Abstract

Handwriting Analysis is a tedious and methodical process that relies on extensive knowledge and skill of individuals in letter formation having unique characteristics. In the present study, handwritings were collected from the 30 students of age group 10-16 years containing about 1800 characters of lower-case alphabets that were well acquainted with ambidextrous writings for An Assessment of Ambidextrous handwriting characters: A Future Prospect for Forensic Document Examiners. The study was carried out at Central Forensic Science Laboratory, Bhopal. Ambidextrous handwritings i.e. left-handed writings and right-handed writings were identified on the basis of handwriting characteristics of size & shape of characters and hypothesis considered that there is significant similarities in both left-hand and right hand writings (LH/RH) within the range of natural variation of the Ambidextrous writer, it means that there were no fundamental divergences amongst the writings written with both left and right hand of Ambidextrous writer.

Keywords: Ambidextrous • Handwriting characteristics • Forensic document examiners • Left hand • Right hand

Introduction

The study of handwriting constitutes a complex neuromuscular activity controlled by the brain which guides the formation of letter and each vibration of movement of strokes which unconsciously affect the writer [1]. The individual's appearance of handwriting is determined by in born talents, primer models and influence of other people graphic models [2]. The individuals develop their skill to execute the writings with both hands who are termed as Ambidextrous writers [3]. About 90 percent of people are right-handed, says "Corballis". The remaining 10% are either left-handed or some degree of ambidextrous, though people with "true" ambidexterity—i.e., no dominant hand at all—only make up about 1% of the population [4]. The individual exhibits the ability of persons who were sinistral (left-handed) in their early years, but who were persuaded to change to dextral (right-handed) in handwriting during the course of their schooling. In most cases the execution by both hands will be similar in many aspects but divergences between them will be found in fluency, or writing quality which falls under general handwriting characteristics [5,6]. In this study, an assessment of the writing characters of ambidextrous writers which is an emerging notion is propounded for future interests of Forensic Document Examiner. This study is carried out with nature formation of lower-case letters of 'h', 'm' and 'n' with respect to size (length, width) and shape (rounded, pointed, flat). The role of probability of similarities in handwriting characteristics of ambidextrous writer shows relative result as expected by both left-hand and right-hand in many aspects.

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Methodology

The research was conducted on the handwriting of ambidextrous writer on age group of 10-16 years which were collected from the students of 'Veena Vadini School', Singrauli of Madhya Pradesh. The total of 30 handwriting samples comprising of about 5000 thousand letters. After preliminary analysis the linear lower-case letters (known as Minuscles) i.e. 'm', 'n' and 'h' Supralinear lower-case letters (Known as Majuscles) [5] were selected for study. The selected 1800 handwriting characters were examined by the scientific instruments such as stereomicroscope & Projectina Docucenter NIRVIS available in the Laboratory. In general class characteristics length and width of letters and the shape of the shoulder (Rounded, Pointed and Flat) were calculated with respect to the base line using Annotations and Measurement tool availability in Projectina Docucenter NIRVIS (High-Resolution Spectral Comparator). The probability of hypothesis study shows that there are no significant differences in the ambidextrous when statistically calculated by F-test (Figures 1 and 2).

Results and Discussion

Hypothesis was tested by statistical method F-test for equality of variances. The results are shown in the Tables 1-5 and Figures 3-5 respectively. The outcome of this study reveals that the handwriting of ambidextrous writers from the age group 10-16 has the significant similarities in both the Dextrality and Sinistrality. The handwriting characteristics found to be similar in the formation of letters 'h', 'm' and 'n' with respect to size when executed by ambidextrous writer with both hands. The calculated F-values for length and width, lies within the statistical range 0.476 to 2.101 which are considered accepted values hence, the expected null hypothesis is not rejected. Further percentages are also calculated by shape of letters as: (a) round shape body shoulders letters 'h', 'm', and 'n' have 67.22% in left hand writing and 67% in right hand writing (b) pointed shape body shoulders have 20.22% in left hand and 19.55% in right hand and (c) flat shape body shoulders 12.55% in left hand and 12.33% in right hand reveals again significant similarities in the ambidextrous.

Table 1. Statistical Analysis of Length of shoulder of letters.

Character observed	Sample	No. of letters	Length of letters								F-Value
			Left Hand				Right Hand				
			Mean	SD	Variance	RSD	Mean	SD	Variance	RSD	
h	30	300	3.25	0.39	0.15	12%	3.22	0.34	0.11	10.56%	1.31
m	30	300	3.37	0.45	0.20	13.35%	3.45	0.57	0.32	16.5%	0.62
n	30	300	3.43	0.38	0.14	11%	3.47	0.43	0.18	12.3%	0.778

Table 2. Statistical Analysis Width of shoulder of letters.

Character observed	Sample	No. of letters	Left Hand				Right Hand				SD
			Mean	SD	Variance	RSD	Mean	SD	Variance	RSD	
h	30	300	3.10	0.44	0.19	14.34%	3.08	0.44	0.19	14.35%	1.00
m	30	300	3.15	0.48	0.23	15.48%	3.32	0.68	0.46	20.71%	0.49
n	30	300	3.43	0.39	0.15	12.06%	3.34	0.41	0.16	12.54%	0.90

Table 3. Result percentage (%) of various shapes of Shoulders of Left hand of ambidextrous.

SD	SD	Shape of letters					
		Rounded	%	Pointed	%	Flat	%
h	300	190	63.33	70	23.33	40	13.33
m	300	260	86.66	30	10	10	3.33
n	300	155	51.66	82	27.33	63	21

Table 4. Result percentage (%) of various shapes of Shoulders of Right hand of ambidextrous.

Character observed	No. of letters	Shape of letters					
		Rounded	%	Pointed	%	Flat	%
h	300	185	61.66	90	30	25	8.33
m	300	249	83	31	10.33	20	6.66
n	300	179	59.66	55	18.33	66	22

Table 5. Comparative result of shapes of the shoulders.

Shape of Shoulder	No. of letters	Shape of letters					
		Left Hand			Right Hand		
		Mean	SD	RSD	Mean	SD	RSD
Round	300	201	53.46	26.51%	204.33	38.79	18.99%
Pointed	300	60.66	27.22	44.88%	58.66	29.67	50.57%
Flat	300	37.66	26.57	70.56%	37.0	25.23	68.21%

**Figure 1.** Sample of ambidextrous writer.

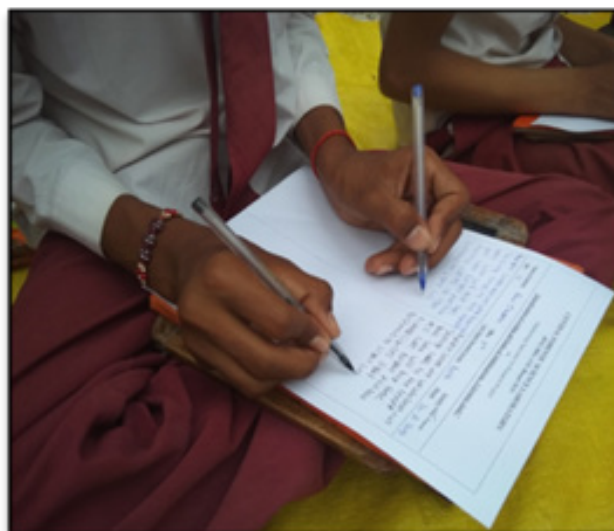


Figure 2. Sample of ambidextrous writer.

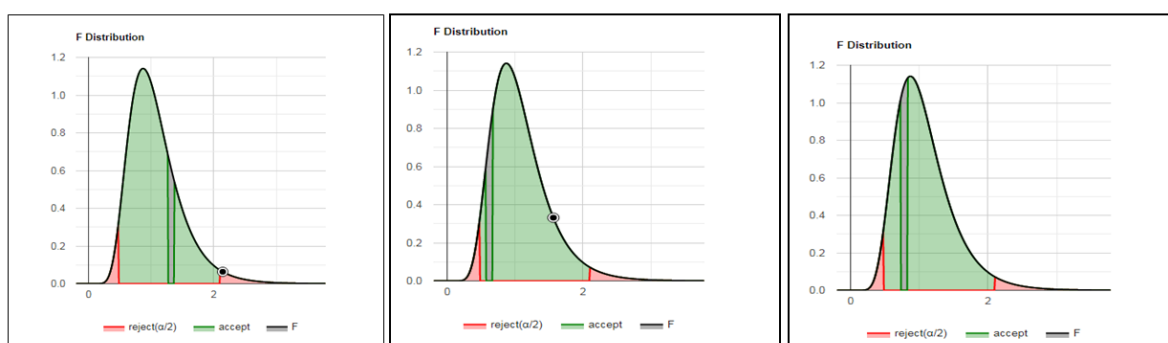


Figure 3. (a-c) Comparative statistical result of length of the letters. Graphical representation of Standard Deviation (SD) of F-test of Length of vertical structure of alphabets 'm', 'n' and 'h' of LH and RH of ambidextrous subjects were tabulated.

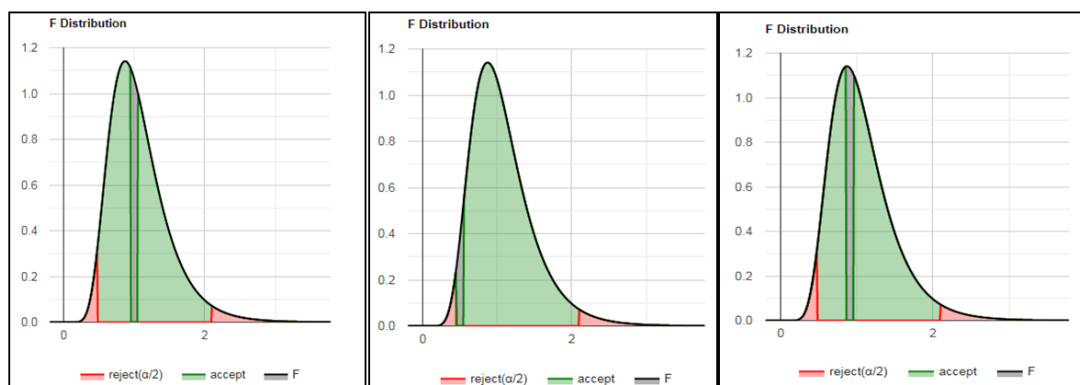


Figure 4. (a-c) Comparative statistical result of width of the letters. Graphical representation of Standard Deviation (SD) of F-test of width of body part of alphabets 'm', 'n' and 'h' of LH and RH of ambidextrous subjects were tabulated.

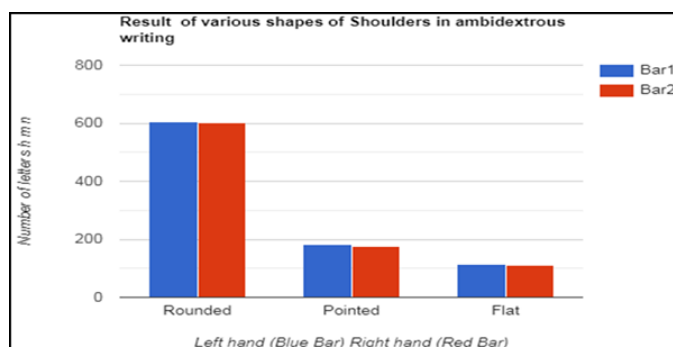


Figure 5. Comparative result of shape of the Shoulders in letter 'h', 'm', and 'n' in both hands.

Conclusion

The individual appearance of handwriting is determined by born talents, primer models and influence of other people graphic models. The individuals develop their skill to execute the writings with both hands that are termed as ambidextrous writers. So we concluded that this study, an assessment of the writing characters of ambidextrous writers which is an emerging notion is propounded for future interests of Forensic Document Examiner.

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