

Examination and Comparison of the Handwriting Characteristics of Devanagari Script with Gurumukhi and Telugu Script

Sharma B¹, Sharma A² and Mahajan M²

¹Department of Forensic Science, Punjabi University Patiala, Punjab, India

²Regional Forensic Science Laboratory, Northern Range, Dharamshala, India

*Corresponding author: Sharma B, Department of Forensic Science, Punjabi University Patiala, Punjab, India, Tel: +919810711930, E-mail: bsharma.sharma8@gmail.com

Citation: Sharma B, Sharma A, Mahajan M (2019) Examination and Comparison of the Handwriting Characteristics of Devanagari Script with Gurumukhi and Telugu Script. J Forensic Sci Criminol 7(2): 208

Abstract

India has been acclaimed for the extent diversity especially in the context of cast, culture, languages, religion, and scripts. Brahmi script is the oldest writing system of ancient India, developed in 1st millennium BCE. Brahmi script eventually gave evolution to all the modern scripts of India including Devanagari, Gurumukhi, Telugu, Gujarati, Bengali, Oriya, Telugu, Tamil, Malayalam, Kannada, Sinhala and scripts found in south and central Asia. Hindi language written in Devanagari script and is one of the official languages of India. About forty five percentage of the Indian population use Hindi. Telugu language is one of the official languages of India with 6.93% native speakers, whereas Punjabi is the language of Punjab state and is the 5th most spoken language in European country which is written in Gurumukhi script. The similar origins, including the divergence among these scripts, are influential and critical. In forensic laboratory document examiners receive distinct handwritten scripts for proving the authentication/genuineness. Undeniably it is difficult for an examiner to know each and every script especially in a country like India where there is an enormous divergence in languages and their scripts. The present study describes the class and individual characteristics of Devanagari, Telugu and Gurumukhi scripts, those originated from the Brahmi script and there by forming a base for forensic examination of scripts unknown to forensic examiner.

Keywords: Scripts - Brahmi; Devanagari; Gurumukhi; Telugu; Examination

Introduction

Scripts are the writing system of a particular language. A script is a conventionally accepted graphic, i.e. written, representation of the alphabet used in a particular language. Each script can have various styles. It could be assimilated as the symbolic representation of the sounds of a particular language. India being a multi-linguistic country has twenty-two official languages and their scripts. Brahmi script is the oldest writing system of ancient India, attestations of which reach back into the 1st millennium BCE [1]. Brahmi script eventually gave evolution to most of the modern scripts of India including Devanagari, Gurumukhi, Telugu, Gujarati, Bengali, Oriya, Tamil, Malayalam, Kannada, Sinhala and a very high number of scripts of central and Southeast Asia [2].

Hindi is written in Devanagari script is one of the official languages of India. Around forty-five percentage of Indian population use Hindi language for communication. Hindi is the most prioritized language which is used officially for documentation in the northern and central region of India. The Dravidian languages consist of Telugu, Tamil, Malayalam, and Kannada languages makes it second largest language family [3]. Telugu is the official language of Andhra Pradesh and Telangana. Punjabi written in Gurumukhi script is 10th most spoken language of world [4].

Devanagari, Telugu and Gurumukhi scripts originated from Brahmi script are written from left to right, having strong preferences for symmetrical rounded shapes within squared outlines [5]. Devanagari and Gurumukhi script is recognized by a horizontal line that runs along the top of the letter and a puranviram ("|") is placed at the end of the sentences. Devanagari, Telugu and Gurumukhi scripts belongs to abugida writing system, where the consonant and vowels form a compound word. Devanagari script is composed of eleven vowels and thirty-three consonants, where as Telugu script consists of eighteen vowels, and thirty-five consonants, which combines to form syllables, on the other hand Gurumukhi script have thirty-five consonants, additional six consonants, nine vowels diacritics, two diacritics with nasal sound and one diacritic that germinates consonants, and three subscript characters.

Methods and Methodology

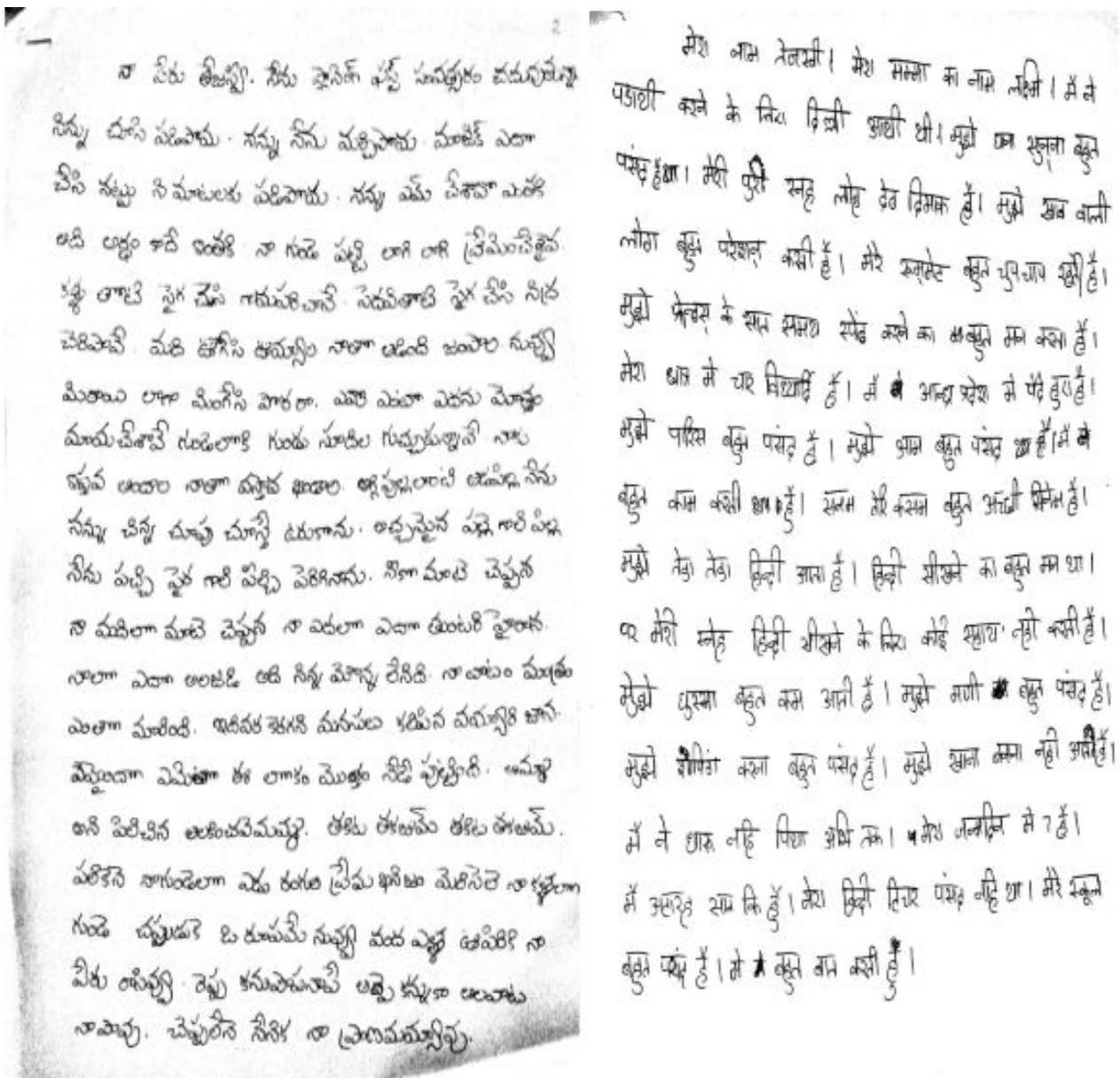
In the present study, 100 samples were collected from natives of Punjab and Andhra Pradesh between the age group of 18-25 years. All the samples were collected from individuals familiar with both the languages, i.e. Devanagari and Telugu followed by Devanagari and Gurumukhi. The fifty handwriting samples written each in Gurmukhi and Devanagari script were collected from the Punjab based population. Also, fifty handwriting samples written in each of Telugu script and Devanagari script were collected from Andhra Pradesh and Telangana based population (Figure 1). The writers were asked to write the content on white colour A4 size sheet using a blue ball point ink. In the samples handwriting characteristics were examined and compared to form a conclusion.

Instruments

The analysis was carried out using magnifying glass, camera, and a computer system.

Methodology

The writers were asked to write the content sitting in a comfortable position. Then the exemplars were dictated to the writers. The collected samples were examined in normal light using a magnifying glass. All the individual and class characteristics were studied for handwriting characteristics examination (Figure 2).



a. Telugu Script

b. Devanagari Script

Figure 1: a. Telugu script sample; b. Devanagari script sample, collected from same individual

पुस्तक - उत्तमोत्तम
 भाषा - यमुना

उमर - 20 वर्ष

यौग्यां ने अंग प्रिया बाय....

यही फलकी येंरा उरीं अं पिता उ मन् दिव वेंपी उरामी
 लीं मी। सिंटे अकमर उरा उं, अर रीगां अोरतां उ मन्
 दिव सिंटे 'अंगी अीन' एी नाम मी। एिउ सिंटे मनें
 गप्पी - गणांती एी वेंपी अोरतां अर एी रिंरी उं -
 'अर वेंपी ना कू उरामी ना अंटे, नेगी अारी अं अंगि
 एी अाउगा, अंगर अं अं अं' उंसी उंसी मरिगां
 रा मी नाक मन् अर अागा। अंटे अंटे अंटे एी नाम
 उरीं अं उंतां उ मन् दिव दिव एी अं अं अं उं उं
 उंटे उं अंटे अंटे अंटे अंटे अंटे एी अंटे एी मन्
 दिव ना अारी। उंटे अंटे अंटे अंटे अंटे एी अंटे एी मन्
 एी अंटे अंटे अंटे मी, अर उंतां उ मन् उंटे अंटे
 दिव नाम एी एी अंटे अंटे अंटे मी कि एिउ अंटे
 अं अंटे एी उंटेगा। अंटे अंटे अंटे येंरा उरीं अं अंटे
 नाक पिता कू एी उंटेगा अंटे अंटे। एी एि
 उंटे अंटे एी अंटे दिव दिव अंटे एि। अंटे अंटे
 उंटे अंटे दिव अंटे अंटे अंटे येंरा उंटे। अंटे अंटे
 एी अंटे उंटे अंटे अंटे एी अंटे अंटे अंटे।
 अर एी येंपी अंटे येंपी नाक अंटे अंटे अंटे अंटे
 मी। अंटे अंटे अंटे अंटे अंटे अंटे अंटे अंटे
 नाम अंटे अंटे उंटे अंटे अंटे अंटे अंटे।

नाम - अजित कौर
 भाषा - हिंदी

उमर - 20 वर्ष

बूँद-बूँद की कीमत

जल ही जीवन है, लेकिन जीवन देने वाले इस जल को
 क्या हम सहेज रहे हैं? शायद नहीं! हमने पानी इतना
 खर्चा कर दिया है कि अब पूरी दुनिया में जल संकट
 का खतरा मंडराता दिख रहा है। अंग्रेज सब नहीं जानते,
 तो वह दिन दूब नहीं जब लोग पानी-पानी के
 लिए तरसेंगें।

हम जब भी पर्यावरण और प्रकृति के संरक्षण
 की बात करते हैं, तो जल संरक्षण सबसे ऊपर
 आता है। अगर जल को सहेजना और संरक्षित
 करना है, तो उसके मर्म को समझना यानी
 समझना जरूरी है। इसी मर्म को समझने के लिए
 देश के जाने-माने पर्यावरणविद अंकिश खत्री पर
 'जल चित्र' नाम से फिल्म का मुख्य उद्देश्य भी
 यही है कि लोग पानी के बारे में जानें, उसे
 सहेजें। हम सब नै प्रकृति और पर्यावरण को
 समझते और सहेजने के मामले में सिर्फ लापरवाही
 ही बरती हैं। लेकिन अब संभ्रमता है। प्रकृति
 को बचाना है। इसके साथ-साथ पानी का
 संरक्षण बेहद जरूरी है।

c. Gurumukhi script d. Devanagari Script
Figure 2: c. Gurumukhi script sample; d. Devanagari script sample, collected by same individual

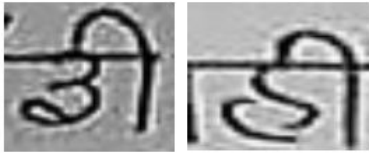
The handwriting characteristics studied include alignment, connections, initial and terminal strokes, pen pressure, punctuations, margins, size of letters, slant, and speed of writing, as shown in Table 1.

S. No.	Characteristics Observed	Sub Classification of Characteristics			
1.	Alignment	Uphill	Downhill	Vertical	-
2.	Connections between letters	Present	Absent	-	-
3.	Initial and terminal strokes	Blunt	Tampered	-	-
4.	Pen Pressure	High	Low	Graduated	-
5.	Punctuations	Present	Absent	-	-
6.	Margins	Top	Bottom	Left	Right
7.	Size of letters	1-3mm	4-6mm	7-9mm	-
8.	Slant of letters	Upward	Downward	Vertical	Mixed
9.	Speed of writing	Fast	Slow	Moderate	-

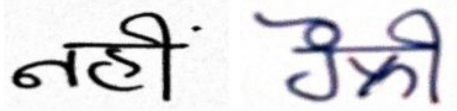
Table 1: Handwriting Characteristics studied are as above

Results

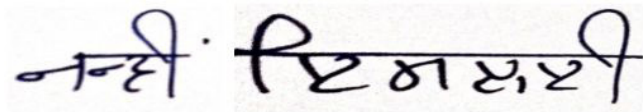
Numerous individual characteristics were found while comparing the scripts, showing the similar movement of forming a consonant and vowel, example of which is shown as following:



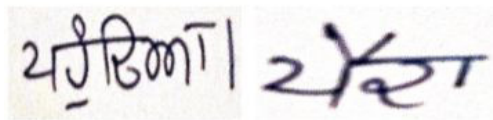
The formation of “ੀ” in “ही” in Devanagari script and “ੜੀ” in Gurumukhi script is similar.



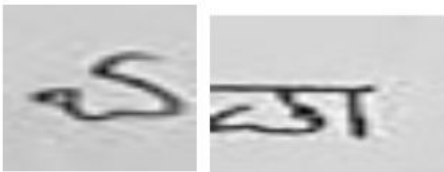
The formation of “ੀ” in the words of Devanagari and Gurumukhi script are similar.



The formation of “ੀ” in the words of Devanagari and Gurumukhi script are similar.



The formation of “य” in the words of Devanagari and Gurumukhi script are similar.



The formation of “ఱ” in Devanagari script and “ఱ” in Telugu script is similar.

The results for the observed characteristics were tabulated for Devanagari script and Gurmukhi Script, followed by Devanagari and Telugu script.

S. No	Characteristics	Devanagari Script	Gurmukhi Script	
1.	Alignment	Uphill	46.66%	44.64%
		Downhill	6.66%	10.36%
		Vertical	46.66%	45%
2.	Connections between letters	Present	6.66%	-
		Absent	93.33%	100%
3.	Initial and Terminal Strokes	Blunt	80%	86.66%
		Tapered	20%	13.33%
4.	Pen Pressure	High	13.33%	13.33%
		Medium	-	-
		Low	6.66%	6.66%
		Graduated	80%	80%
5.	Punctuation	Present	93.33%	93.33%
		Absent	6.66%	6.66%
6.	Margins	Top	6.66%	6.66%
		Bottom	33.33%	33.33%
		Left	33.33%	33.33%
		Right	20%	20%

7.	Size of Letters	1-3mm	46.66%	46.66%
		4-6mm	53.33%	53.33%
		7-9mm	-	-
8.	Slant of letters	Forward	33.33%	33.33%
		Backward	30.33%	30.33%
		Vertical	33.33%	33.33%
9.	Speed of writing	Fast	26.66%	26.66%
		Slow	13.33%	13.33%
		Moderate	60%	60%

Table 2: Results for Devanagari and Gurmukhi Script characteristics writing analysis

S. No	Characteristics	Devanagari Script	Gurmukhi Script	
1.	Alignment	Uphill	26.66%	20%
		Downhill	33.33%	27%
		Vertical	40%	45%
2.	Connections between letters	Present	-	-
		Absent	100%	100%
3.	Initial and Terminal Strokes	Blunt	90%	90%
		Tapered	10%	10%
4.	Pen Pressure	High	13.33%	13.33%
		Medium	-	-
		Low	6.66%	6.66%
		Graduated	80%	80%
5.	Punctuation	Present	93.33%	93.33%
		Absent	6.66%	6.66%
6.	Margins	Top	-	-
		Bottom	33.33%	33.33%
		Left	40%	40%
		Right	26.66%	26.66%
7.	Size of Letters	1-3mm	46.66%	46.66%
		4-6mm	53.33%	53.33%
		7-9mm	-	-
8.	Slant of letters	Forward	26.66%	26.66%
		Backward	26.66%	26.66%
		Vertical	46.66%	46.66%
9.	Speed of writing	Fast	33.33%	33.33%
		Slow	40%	40%
			26.66%	26.66%

Table 3: Results for Devanagari and Telugu Script characteristics writing analysis

The alignment in Devanagari script is (46.66%) uphill, (6.66%) downhill and (46.66%) vertical. In Gurmukhi script, it is (44.64%) uphill, (10.36%) downhill and (45%) vertical. The Connections in Devanagari script are present in (6.66%), while absent in (93.33%), whereas in Gurumukhi Script connections were not found. The initial and terminal strokes in Devanagari script were blunt in (80%) and are tapered in (20%), where as in Gurumukhi script, blunt in (86.66%) and are tapered in (13.33%). Pen pressure in Devanagari script and Gurumukhi script is high (13.33%), low (6.66%) and graduated in (80%). Punctuations in Devanagari and Gurumukhi script were present in (93.33%), while absent in (6.66%). Margins in Devanagari script and Gurumukhi script were (6.66%) at the top, (33.33%) at the bottom, (33.33%) at left and (20%) at right. Size of letters in Devanagari and Gurumukhi script is (46.66%) for 1-3mm, (53.33%) for 4-6mm. The slant of letters in Devanagari and Gurumukhi script were forward (33.33%), backward (30.33%) and vertical for (33.33%). The speed of writing in Devanagari and Gurumukhi script is fast (26.66%), slow (13.33%) and moderate (60%).

While comparing Devanagari and Telugu script, the alignment in Devanagari script is (26.66%) uphill, (33.33%) downhill and (40%) vertical, whereas Telugu script, it is (20%) uphill, (27%) downhill and (45%) vertical. The Connections in Devanagari and Telugu script were not present. The initial and terminal strokes in Devanagari and Telugu script were blunt in (90%) and were

tapered in (10%). Pen pressure in Devanagari script and Telugu script is high (13.33%), low (6.66%) and graduated in (80%). Punctuations in Devanagari and Telugu script were present in (93.33%), while absent in (6.66%). Margins in Devanagari and Telugu script were (6.66%) at the top, (33.33%) at the bottom, (40%) at left and (26.66%) at right. Size of letters in Devanagari and Telugu script is (46.66%) for 1-3mm, (53.33%) for 4-6mm. The slant of letters in Devanagari and Telugu script is forward (26.66%), backward (26.66%) and vertical for (46.66%). The speed of writing in Devanagari and Telugu script is fast (33.33%), slow (40%) and moderate (26.66%).

Discussion

The Devanagari, Telugu and Gurumukhi scripts were originated from the Brahmi script, written from left to right direction. The similarities and the differences at the same time generate an essential purpose to compare the handwriting samples of these scripts. Devanagari and Telugu being two of the official languages of India, and Gurumukhi being the official language of Punjab is eminent to be compared forensically. During forensic examination it is necessary to prove the authenticity/geniuses of document. Thus, this study up to an extend helps the examiner to compare two different scripts originated from same background so that the class and individual characteristics can be examined.

Conclusion

The aim of the study is to find the class and individual characteristics among the scripts originated from the same origin and forensically forming a base for the examination of scripts even if unknown to the forensic document examiner.

Based on numerous characteristics that have been carefully studied it could be concluded that in Devanagari and Gurumukhi script the characteristics including pen pressure, punctuation, margins, size of letters, slant and speed of writing were similar in the samples examined. While the characteristics including alignment, connections, and initial and terminal strokes show slight differences. Simultaneously, in Devanagari and Telugu script the characteristics including connections, pen pressure, punctuation, margins, and the size of letters, slant, and speed of writing. While the characteristics alignment shows slight divergence.

Individual characteristics that are present in Devanagari script of the writer were found in a great extent in the Gurumukhi script and to some extent in Telugu script. So it could be concluded that these characteristics of handwriting do not show much divergence in two different scripts originated from a similar background, and a lot of them are present in both the scripts. During a forensic examination, the expert undergoing examination for two distinct scripts that are unknown to him, can generate an idea about the genuineness of handwriting and prove the authenticity of the writer.

References

1. Sharma RS (2006) India's Ancient Past. Oxford University Press, UK.
2. Coningham RAE, Allchin FR, Batt CM, Lucy D (1996) Passage to India? Anuradhapura and the Early Use of the Brahmi Script. Cambridge Archaeol J 6: 73-97.
3. Krishnamurti B (2003) The Dravidian Languages. Cambridge University Press, UK.
4. Geeti S (1997) Crossing Boundaries. Orient Blackswan, India.
5. Jain D, George Cardona (2007) The Indo-Aryan Languages (1st Edn) Routledge, UK.
6. Fischer SR (2004) A history of writing, Reaktion Books, UK.
7. Deol, Dr. Harnik (2003) Religion and Nationalism in India: The Case of the Punjab. Routledge, London, UK.
8. Harrison WR (1978) Suspect Documents: Their Scientific Examination (2nd Edn) Sweet and Maxwell Limited, London, UK.
9. Hilton O (1982) Scientific Examination of Questioned Documents, Elsevier Science Publishing Co. Inc., New York, USA.
10. Osborn AS (1929) Questioned Documents (2nd Edn) Boyd Printing Co., Albany, New York, USA.

Submit your next manuscript to Annex Publishers and benefit from:

- ▶ Easy online submission process
- ▶ Rapid peer review process
- ▶ Online article availability soon after acceptance for Publication
- ▶ Open access: articles available free online
- ▶ More accessibility of the articles to the readers/researchers within the field
- ▶ Better discount on subsequent article submission

Submit your manuscript at

<http://www.annexpublishers.com/paper-submission.php>