



Analysis of Master Disguised Writing with the Aid of Specific Individual Writing Characteristics

Bhoopesh Kumar Sharma¹, Kiran Kumar Yadava Vajje², Raeesa Bashir³ and S. Raghuraghavendra⁴

¹Associate Professor Forensic Science, Amity University Dubai, UAE.

²Masters of Forensic Science, Amity University Dubai, UAE.

³Assistant Professor, Department of Management Amity University Dubai, UAE.

⁴Manager, Forensic and Biometric Investigation Services, India.

(Corresponding author: Bhoopesh Kumar Sharma)

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ABSTRACT: In forensic investigations, disputed documents are usually encountered in various cases of forgery and disguise. The examination of disguised body writing deals with the analysis of documents for handwriting or script having a wilful modification of a person's original writing for the purpose of concealing his/her identity. The analysis of such cases of disguised writing involves the identification and examination of class and individual handwriting characteristics to establish the identity of the author and to determine the source of the handwriting. The objective of the present work was to study a few cases of master disguised handwriting and to compare them based on particular individual characteristics to establish the identity of the writer. After the proper analysis, it was found that even the cases of master disguise will possess some aspects through which the authenticity of the document and the identity of the writer can be scientifically established.

Keywords: Disputed documents, disguised handwriting, master disguise, individual characteristics, identity of the writer.

I. INTRODUCTION

Handwriting is an acquired skill and a neuro-muscular task, which is generally called brainwriting [1]. Handwriting analysis is an essential forensic practice that helps to find the identity of a person from written documents. To conceal the identity, an individual in disguised handwriting makes a deliberate alteration of his natural writing. Individuals can now be convicted of forgery alone on handwriting testimony, and this fact motivates many criminals to disguise their handwriting in an attempt to escape justice [2].

The primary principle of handwriting identification is based upon the 'law of individuality' according to which no two individuals write specifically alike within the same manner [3]. This principle allows document examiners to differentiate genuine and non-genuine writing and to identify the author of a sample of handwriting. The second fundamental scientific truth regarding handwriting is, all writing contains natural variation, so no two writing samples by the constant author are precisely the same written at two different times [4]. Many factors affect the handwriting of an individual like surroundings, emotion, writing material, age, posture, concentration, alcohol, drugs etc. [5].

Disguised handwriting, as mentioned above, is any deliberate arrange to alter one's handwriting to escape recognition. An anonymous letter, blackmail tries, ransom notes, threats, and similar documents are created by writers who feel their altered handwriting can not be linked to them [6]. It is typically straightforward to ascertain that handwriting is disguised due to stiffness or artificial look that characterizes it, however often it may be most challenging to identify the author of disguised writing. Studies show that a significant characteristic of disguised writing is that the modification in slant [7]. Hesitation, changes in the size of the letters, variations in slant, odd alignments and at times grotesque letter formations, patched up portions, and down strokes are typical features seen in disguised writing.

The prominent features, such as capital letters and slant, generally undergo the most marked change. A master disguise usually has distorted letters, adoption of alternative forms of letters, pen-printing, etc. [8]. Identification of disguised writing is feasible, providing the unnatural parts within the samples are recognized and adequately evaluated. Disguise may be accomplished by writing with the opposite hand from that habitually used, and it can be a very effective disguise in many forensic cases [9].

The careful comparison, analysis, and interpretation of the class and individual characteristics of questioned and known writings can often determine whether a questioned writing and known writing was written by the same person [10]. Class characteristics include the main features and shape of the letters, the relative dimension of the letter, connections between letters, capitalization, punctuation, etc. Individual characteristics are tough to duplicate; it helps to narrow down the evidence to a single, unique source [11]. The spacing, alignment, use of margins, spelling, phraseology, grammatical details, etc. are the common individual characteristics that a forensic investigator needs to concentrate on [12, 16].

II. MATERIALS AND METHODS

The primary objective of the present work was to evaluate an individual's unique handwriting characteristics through their disguised sample and then to compare them with their specimen writings. Total 25 samples of disguised and specimen handwritings were collected for the purpose of study. Subjects were asked to provide an application test and disguised handwriting on A4 size paper using ball point. The samples collected were then studied for three basic characteristic features i.e. initial strokes, connecting strokes and specific letter formation. The samples were analysed using t-test for single mean.

The hypothesis framed was there is no statistical significance between all the three variables of the study

(viz: initial strokes, connecting strokes and specific letter formation).

The specimens are examined using a magnifying glass, projectinalspec 8 and digital microscope to observe the minute details (Figs. 1-11). All the authors were not allowed to see their disguised samples, to keep the specimens uninfluenced by the disguised writing. The writers were given no chance to see the previous letter formations during disguise to avoid any biasedness in the specimen writings.

Disputed
 MY NAME IS KIRAN KUMAR. I STUDY IN
 MASTERS OF FORENSIC SCIENCE AT AMITY
 UNIVERSITY DUBAI. MY AIM IS TO BECOME
 A GREAT DOCUMENT EXAMINER.

Fig. 1. Disputed handwriting (disguised) from sample one.

Specimen
 My name is kiran kumar. I study in Masters of
 forensic science at Amity university Dubai. My
 aim is to become a great document examiner.

Fig. 2. Specimen handwriting collected for sample one.



Fig. 3. The similarities between the disputed and the specimen writing in the initial stroke of letter 'M'.



Fig. 4. The similarities between the disputed and the specimen writing in the letter formation 'I'.



Fig. 5. The similarities between the disputed and the specimen writing in the initial stroke and the letter formation 'F'.

Disputed
 HELLO, I AM KIRAN KUMAR, I DIDNT INVENT
 FORENSIC SCIENCE AND MEDICINE, IT JUST
 WAS ONE OF THE FIRST PEOPLE TO RECOGNISE
 HOW INTERESTING IT IS.

Fig. 6. Disputed handwriting (disguised) from sample two.

Hello, I am kiran kumar, I didnt invent forensic
 science and medicine, it just was one of the first
 people to recognise how interesting it is.

Fig. 7. Specimen handwriting collected for sample two.

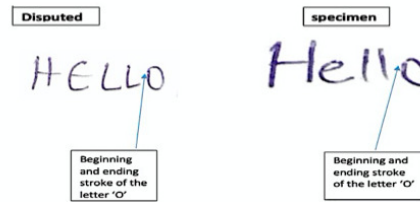


Fig. 8. The similarities between the disputed and the specimen writing in the initial stroke and the letter formation 'O'.

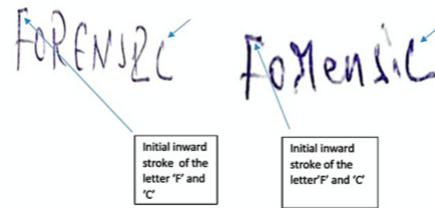


Fig. 9. The similarities between the disputed and the specimen writing in the initial stroke and the letter formation 'F' and 'C'.

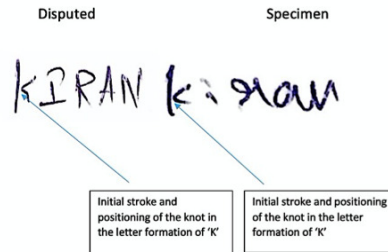


Fig. 10. The similarities between the disputed and the specimen writing in the initial stroke and the letter formation 'K'.

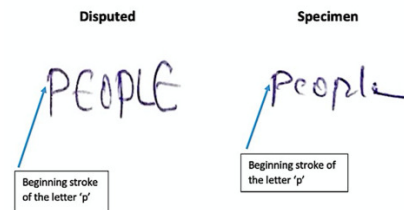


Fig. 11. The similarities between the disputed and the specimen writing in the initial stroke and the letter formation 'P'.

III. RESULTS AND DISCUSSION

The samples were studied for the three major characteristics features i.e. initial strokes, connecting strokes and individual letter formation to identify the author of the disguised writing on the basis of its comparison with the specimens collected from the same author. The variables (initial strokes, connecting strokes and individual letter formations) were analysed using t-test. The results are shown in the tables below (Table 1-3):

Table 1: The T-Test analysis for variable one (X1) i.e. Initial Stroke.

| Summary Values for X1 (Initial Strokes) | | |
|---|------------|---------|
| n | 25 | |
| Σx | 103 | |
| Σx^2 | 439 | |
| SS | 14.64 | |
| Variance (inferential) | 0.61 | |
| Standard Deviation (inferential) | 0.781 | |
| Standard Error | 0.1562 | |
| Sample Mean | 4.12 | |
| Hypothetical Population Mean | 5 | |
| Difference | -0.88 | |
| t-value | -5.6338 | |
| df | 24 | |
| P-value | One-tailed | <0.0001 |
| | Two-tailed | <0.0001 |

From the above data, it is observed that t-value is -5.6338 with twenty-four degrees of freedom and P-value is <0.0001 which is less than the level of significance 0.05; hence we reject our null hypothesis and conclude that initial stroke has a significant impact on the identification of a person through handwriting.

Table 2: The T-Test analysis for variable two (X2) i.e. Connecting Stroke.

| Summary Values for X2 (Connecting Strokes) | | |
|--|------------|---------|
| n | 25 | |
| Σx | 38 | |
| Σx^2 | 64 | |
| SS | 6.24 | |
| Variance (inferential) | 0.26 | |
| Standard Deviation (inferential) | 0.5099 | |
| Standard Error | 0.102 | |
| Sample Mean | 1.52 | |
| Hypothetical Population Mean | 2 | |
| Difference | -0.48 | |
| t-value | -4.7059 | |
| df | 24 | |
| P-value | One-tailed | <0.0001 |
| | Two-tailed | <0.0001 |

According to the table, the observed value of P is <0.0001, which is less than the level of significance with the t-test value as -4.7059, having twenty-four degrees of freedom. It reflects that there is a significant impact of connecting stroke in recognizing the person through his/her handwriting. Hence we reject our null hypothesis.

Table 3: The T-Test Analysis for Variable three (X3) i.e. Individual Letter Formation.

| Summary Values for X3 (Individual Letter Formation) | | |
|---|------------|-----------|
| n | 25 | |
| Σx | 110 | |
| Σx^2 | 496 | |
| SS | 612 | |
| Variance (inferential) | 0.5 | |
| Standard Deviation (inferential) | 0.7071 | |
| Standard Error | 0.1414 | |
| Sample Mean | 4.4 | |
| Hypothetical Population Mean | 5 | |
| Difference | -0.6 | |
| t-value | -4.2433 | |
| df | 24 | |
| P-value | One-tailed | <0.000142 |
| | Two-tailed | <0.000284 |

The inferences from this table support the analyses of the previous tables in the detection and recognition of

the person. From the data, it is seen that the P-value is <0.000142 which is less than 0.05, therefore, we reject our null hypothesis and conclude that individual letter formation too has a significant impact in identifying the person.

IV. CONCLUSION

According to the analysis it was observed that in all three variables of the study i.e. initial writing strokes, connecting strokes and the individual letter formation the p-value is less than the level of significance (0.05) which is the risk we assume to reject a null hypothesis when it is true. The hypothesis so considered is that there is no statistical significance between initial strokes, connecting strokes and specific letter formation. However, from the study, it is analysed that there is a significant impact of all the three factors. Therefore we reject our null hypothesis and conclude that the person can be identified from all the factors under study. The purpose of the study was either to prove or disprove master disguised handwriting was done by the same person by carefully examining individual characteristics found between the specimen and disputed body writings [13-15].

The individual who performs master disguised handwriting will concentrate mainly on slant, different letter form, letter size, speed alterations, upper and lower case extensions modification [17-18].

The present study provided a significant finding for the analysis and examination of the disguised handwriting on the basis of initial strokes, connecting strokes and individual letter formation. There are various methods applied in the identification of disguised handwriting by a forensic document examiner. Apart from this our study proves that a careful examination of the initial and connecting strokes in the disputed and the specimen script can lead to a positive author identification of the forensic cases up to a great extent. However, natural variations in handwriting can still be a limiting factor, which required further research on such cases.

V. FUTURE SCOPE

The study will be useful to study and analyse the cases of master disguise. More work with larger number of specimens is needed to observe the variations, individuality, and characteristic features in cases of master disguise.

Conflict of Interest. No conflicts of interest.

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