



**EFFECT OF TEMPERATURE ON THE HIEROGLYPHICS SUBSTANTIAL AND ITS ROLE IN FORENSIC INVESTIGATION**

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**ABSTRACT**

Hieroglyphics substantial are the deposition whose authenticity has several issues such as authenticity about genuineness, identity of author or about the age of the substantial. These types of averment are found in various forms such as handwritten, type-written, or in printed form. The handwritten documents are often affected by the several factors such as disease, age of author, writing surface, temperature and often left in form of questioned documents. This study was inherited to analyse the occurrence of change in the anonymous letters due to the temperature. We analyzed the different aspect of writing of an individual which were taken in distinguishable situation; low temperature, at high temperature and the disguise handwriting samples. The study signifies the changes present in various forms of same individual which were identical. The effect of temperature in an individual's writing is highly significant. Essence such as pen pressure, slant, spacing was most affected and were clearly noticeable. Individual essence such as presence of hiatus, letter formation, letter connectivity was seen in some of the samples. not every handwriting was affected but most of them were found to be affected due to the temperature. In the light of obtained results, this study of these essence can be concluded that the handwriting of an individual can be determined and the nature of handwriting i.e., whether it is disguised writing or the variations are caused due to the change in the temperature.

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**INTRODUCTION**

In this modern era of science and technology, we are dealing with bio-metric system for safety and security in every aspect of individualization. Although, some of the aspects are still have questions of authenticity. The absolute variety of such scientific castigations involved in forensic sciences that has potential emphasis of a coherent strategy for their use within the justice system. It is obvious a fact that the people who study the development of any script used by several peoples, used the various types of class characteristics for examination<sup>1</sup>. Sometimes, the application of these features shows their limitations to perform a task in court of law and still the authenticity remains in question. Anonymous letters are the type of probedsubstantial which deals with just the question on authenticity of a document<sup>2</sup>. Documents usually consists the communication between two groups or any valuable paper which may be present in form of will-papers, power of attorney etc. Handwriting is an acquired dexterity which an individual acquire at a very early age. It changes with time but their habitual configurations remain persistent even after so many years.

It can be similar but not identical in every detail even if prepared by the same person because of the presence of natural variations<sup>3</sup>.

The embellishments will persist same, but the tessellation might change like a single person can make same letter in different styles at different times and these different styles will be counted as a natural variation. Natural variations are studied in the dominant configuration formed by an individual which helps to determine the extent to which the natural variations can occur in an individual's handwriting that differs it from among the group of suspects/ authors<sup>4</sup>. Intrinsic dynamics which includes the physical as well as mental health of the author, the temporal status i.e., if the individual is under the influence of alcohol, drugs, etc is also considered during the examination of their writing<sup>5</sup>. Extrinsic factors which include the physical environment, physiological constraints, literacy, surface provided for writing, writing instrument used, etc. are also considered the elements which distract the inscription. The physiognomies of the handwriting of different individuals show effect of temperature in an individual's writing is highly significant and in case of disguised writing, there are various traces of appearances which help in the complete identification of the authenticity or origin of that writing<sup>6</sup>.

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Everyone has his own writing deviation which make it exclusive from the others. With the passage of time, the author develops some personal appearances such as letter formations, embellishments and abbreviations; that are considered the peculiarities of an individual. A few of the features are rooted within an individual which develop during the early age whereas as some are acquired for pictorial appearances or for style with time of maturation<sup>7</sup>. In a first appearance, the occurrence of similarities doesn't mean the identity is proved. The dexterities may be own created writing essences which could be developed either by parental role or during the learning phase.

As far as, it is concerned that fabrication is a splendid lightness of writings skills of others and may include the imitation of someone else hieroglyphics features and adoption of a few of extra-ordinary than his own with a perfection<sup>8</sup>. The objective of this study was to determine the anonymous letters and to study the features affected in handwriting due to the change in temperature or its disguised nature<sup>9</sup>. A few of hieroglyphic features such as, line quality, letter formations and natural variations are braided in a demeanor or the inter-connection provides a connection between the author and about their identity. It was carried out from this study that if someone try to disguise the features in the script either to hide their personality or deliberately, left their identity<sup>10</sup>. while the temperature effect was distinguished from the disguise writing of same suspect and provide the conclusive identity.

**METHODOLOGY**

In this pilot study, all the 25 samples including male and female were collected from Amity Institute of Forensic Sciences, Amity University, Noida. This study was carried out to identify the effect of temperature over the handwriting of an individual or disguised substantial. Therefore, all the samples were collected in the month of January in 2016 at morning time when the temperature was in between 3<sup>o</sup>-7<sup>o</sup> c. All the samples were collected on A4 size sheet with the help of blue ball point pen in reference of a standard reference line. All subjects were selected randomly and prior consent was taken from them.

Forthwith to examine the effect of temperature, all the subjects were requested to repeat the same procedure at the temperature 15<sup>o</sup>-20<sup>o</sup> c in 2016. To make a comparison between the effect of temperature and disguise substantial, all the subjects were requested to disguise their own handwriting in reference of the standard line<sup>11</sup>. All the samples were preserved in white A4 size envelope at room temperature separately. For the analysis of the samples, we used a scale, HB pencil and hand lens including 5X and 10X and stereomicroscope.

For the photography of samples, a camera of Samsung Galaxy mobile phone (Model J7) of 13 mega-pixels was used. For the statistical evaluation, SPSS software was used. The obtained results were divided into three different categories (Category-I, Category-II, Category-III), where Category I represents the moderate/ ascending/ high quality while Category-II gives the representation of normal writing/ changes or inconsistent in the writing of the subjects. In the third category; no changes/ lack of regularity and other features were observed.

**RESULT**

A emblem of forensic substantial exploration exists since so long and some of the advancement, which has been made by the researchers by enumerating new techniques. Several traditional forensic document examination techniques are applied to identify the individual/ author of the disputed one. In this study, we applied the traditional methods for identification the suspect. This establishment was made by comparing the class essences of handwriting and the effect of temperature which is known as the responsible cause for any occurrence in substantial. When the samples were analysed, it was observed that due to low temperature; writing skills of author are affected in various forms such as slow pen speed, more pen pressure, depth of indentation marks, high rate of tremors, etc. Form the study, it was detected that in category -I has more emblem of pen pressure (16 samples), line quality (12 samples), size (17 samples), and spacing (22samples) and the spacing between the lines (21 samples) were highly influenced the temperature. The influence of temperature is given in table n. 1 below-

When exemplar of normal temperature was comprised with the low temperature exemplar, it was observed that line quality, size of the letters, and spacing between the lines were likely to be similar the normal temperature. Whereas, some essences such as spacing between the lines, line quality and pen lifts were equitant of the writing of author. The effect of normal temperature and their calculative table -2 is given below-

A comprised table of essences taken at low temperature and normal temperature are given below in table no-3 below-

The distinctive essences of writing provide the support to identify the individual/ suspect of the substantial, which distinguish the features taken at peculiar conditions very strongly. The graphical representation of such essences are shown below in graph no.-1-

**Table 1** Effect on handwriting characteristics at low temperature

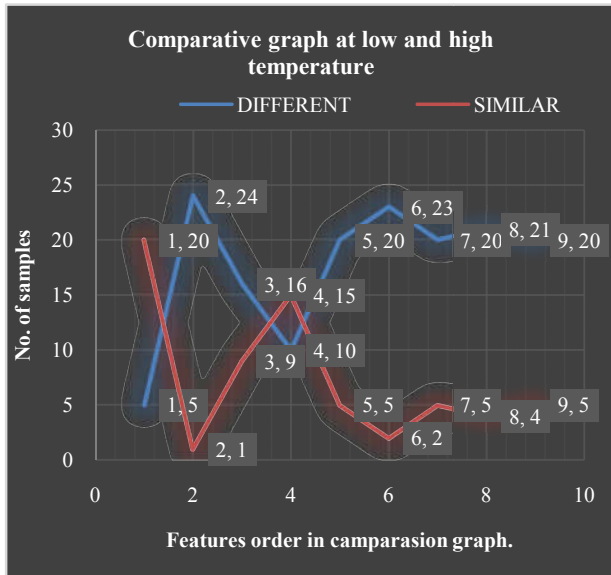
| Characteristics | Alignment | Pen Pressure | Pen lift | Line Quality | Size | Space | Terminal Stroke | Slant | Spacing Between lines |
|-----------------|-----------|--------------|----------|--------------|------|-------|-----------------|-------|-----------------------|
| Category-I      | 5         | 24           | 16       | 12           | 17   | 22    | 3               | 13    | 21                    |
| Category-II     | 7         | 0            | 9        | 13           | 7    | 3     | 17              | 6     | 0                     |
| Category-III    | 13        | 1            | 0        | 0            | 4    | 0     | 5               | 6     | 4                     |

**Table 2** Effect on handwriting characteristics at normal temperature

| Characteristics | Alignment | Pen Pressure | Pen Lift | Line Quality | Slant | Size | Space | Terminal stroke | Spacing between lines |
|-----------------|-----------|--------------|----------|--------------|-------|------|-------|-----------------|-----------------------|
| Category-I      | 9         | 24           | 16       | 12           | 0     | 22   | 20    | 4               | 1                     |
| Category-II     | 6         | 0            | 9        | 13           | 20    | 3    | 0     | 9               | 0                     |
| Category-III    | 10        | 1            | 0        | 0            | 5     | 0    | 5     | 12              | 24                    |

**Table 3** Comparative table of handwriting features at low and normal temperature.

| Characteristics       | Distinctive | Allied |
|-----------------------|-------------|--------|
| Alignment             | 5           | 20     |
| Pen pressure          | 24          | 1      |
| Pen lifts             | 16          | 9      |
| Line quality          | 10          | 15     |
| Slant                 | 20          | 5      |
| Size                  | 23          | 2      |
| Space                 | 20          | 5      |
| Terminal stroke       | 21          | 4      |
| Spacing between lines | 20          | 5      |

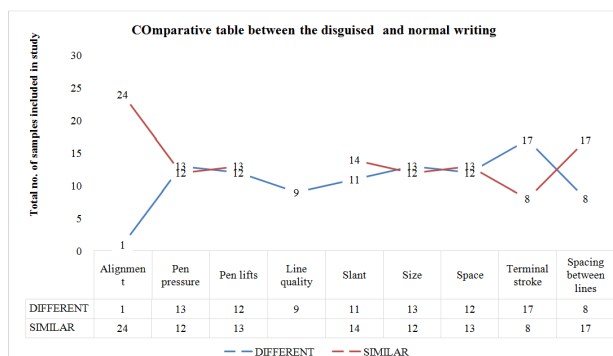


**Graph 1** Graphical representation of difference in features at low and high temperature

Since human is not a machine, who will work allied and outcomes are extracted in form of variations. But when any substantial is copied or disguised, some of essences can be changed but initial features are observed alike. Any suspect try to change the shape of the letters, formation, spacing between the lines or initial strokes, pen pressure and tremors are encountered frequently. The essences and observed samples are given below in table 4-

**Table 4** Features of Disguised samples as per their category.

| Serial number | Alignment | Pen Pressure | Pen Lift | Line Quality | Slant | Size | Space | Terminal stroke | Spacing between lines |
|---------------|-----------|--------------|----------|--------------|-------|------|-------|-----------------|-----------------------|
| Category-I    | 8         | 7            | 4        | 8            | 2     | 11   | 8     | 8               | 5                     |
| Category-II   | 6         | 16           | 13       | 16           | 15    | 12   | 0     | 11              | 2                     |
| Category-III  | 11        | 2            | 8        | 1            | 8     | 2    | 17    | 6               | 18                    |



**Graph 2** A comparative graph between the normal and disguised handwriting features.

If any person try to disguise his/ her own writing, some of the essences can be changed but it is not possible form anyone to make a complete change. Low temperature can signify the change but not completely. A comparative graph between the normal temperature writing and disguised handwriting below in graph-2-

From the conducted study, it was observed that to disguise any handwriting or make a forgery is not quite possible, but it can be a tool for incriminating a suspect. Even by this day, handwriting relies upon the consolidation of principles that are used successfully since last decade. The normal and disguised handwriting could be distinguished as the characteristics of individual handwriting greater diversified from each other. Eight categories of class characteristics were used to distinguish handwriting characteristics between normal and disguised handwriting. There is no similarity between disguised and normal handwritings except for the script types. The result of disguised handwriting is necessarily a compromise between fluency and accuracy. If the writing is speeded up in order to improve fluency. Common criminal charges involved in a document examination case include forgery, counterfeiting, identity theft, fraud or uttering a forged document, by careful examination of provided substantial no one could be left unidentified.

**CONCLUSION**

The effect of temperature in an individual’s writing is highly significant. Some hieroglyphics features such as, pen pressure, slant, unusual spacing was most affected and were distinctly spectacular. By now, it has been considered that such features may be cause of health issues or disguised scrawl. Some of individualistic features such as presence of hiatus, letter formation, letter connectivity was noticed during this study. It was also detected that; not every handwriting was affected but most of them were found to be affected due to the temperature. Aside from this, even if a suspect tries to disguise their writing, there are various traces of features which help in the complete identification of the authenticity or origin of that writing. Characteristics such as alignment and formation of some letters remain same as the person mainly focuses on changing the pictorial view, letter connectivity, and formation of few letters commonly. Some of the habitual features of an author happened unknowingly and left over in form of their identity. From this conducted study, it was looked at that temperature affect the writing of an individual but not upto the height and form of an unsolved question.

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