

STUDY OF NATURAL VARIATIONS IN NATURAL AND ORIGINAL HANDWRITING SAMPLES: A REVIEW

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ABSTRACT:

The brain, muscles, and nerves must work together in unison to write by hand. The fundamental features of a person's handwriting are their natural differences because the human brain is not a computer and cannot replicate the same thing repeatedly in the different conditions. In all the studies each subject providing two samples- one of natural writing by copying a given text, and another one of original writing by writing the same text as dictated. The analysis focused on comparing variation in class characteristic like (writing style, size, spacing, slant, line quality, pen pressure, unusual letter formation, alignment, embellishment, connecting strokes, pen lift, margin, tremors), and individual characteristic like (pen movement, extension of staff, strokes, bar, loops) between both natural and original handwriting samples.

The study reveals the significant variation in class and individual characteristics btw two writing conditions. Characteristics like tremors, line quality, and connecting strokes showed complete unique variation. However, some characteristics like unusual letter formation, writing style, and pen lift reveal similarities. This study concludes that while variability exists, it is possible to identify the authorship by carefully examining both the Characteristic variations.

KEYWORDS: Handwriting, Natural, Original, Embellishment, Authorship, individual, class.

1.1 History of handwriting

Before writing, there was only oral communication, and cultural norms, rituals and stories were passed down orally from generation to generation. As language and cultures developed, the need for communication grew. Simple drawings became pictorial materials and images became standard in every culture when the history of handwriting began. Simple pictographs were used to represent people, places and things. As communication needs expanded, different pictographs were combined to represent ideas, and knowledge was needed to interpret new symbols. These became ideographs: abstract symbols that evolved beyond the original drawings.

1.2 General introduction of handwriting

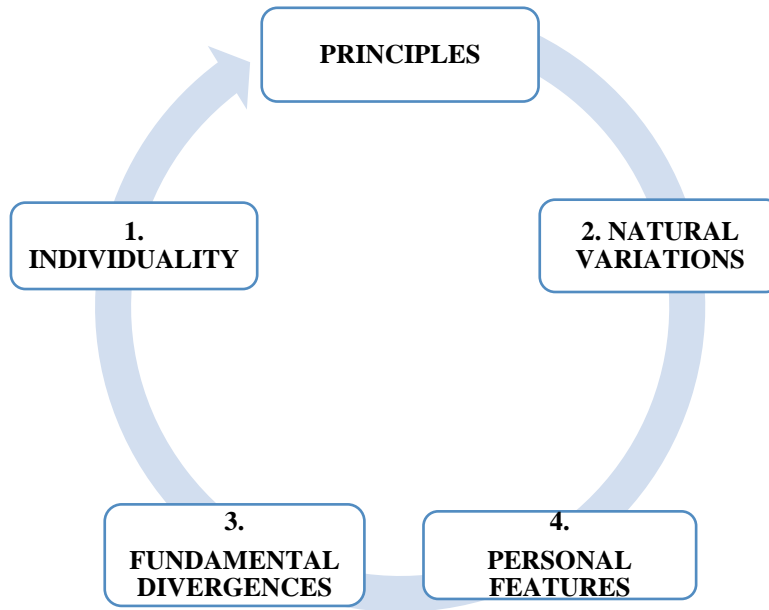
Handwriting is a neuromuscular activity and a human way of writing that is done with a specific instrument, such as a pen or pencil. Handwriting includes both roman style and cursive styles are separate forms of calligraphy or typeface. Handwriting may be used to confirm the authorship of a document because each person's handwriting is distinct and diverse. Everyone has their own unique handwriting style, whether it is everyday handwriting or a personal signature. Even identical twins with similar appearance and genetics do not have the same handwriting. Place of education and first language learned combine with power distribution and different forms of articulation to create a unique handwriting style for each person.

Each time we write our handwriting is slightly different, it can be a little bigger, a little smaller, and a little more angular, and it can be faster or slower and so on. These variations need to be studied closely and carefully by the examiner to determine if the writer of two different content is the same person. Natural variations are those variations in an individual's handwriting in ideal condition that occurs consciously as the writer continues with his/her writing because of the habits he/she has built up. Original variations are when a writer deviates from their uncomfortable and subconsciously writing conditions, or writes under unideal conditions such as soft, rough, lap, moving condition, different instruments, etc. original variation it is a person's unique style, features and patterns made by hand. It includes the characteristics of an

individual's handwriting, including the shape, size, slope, spacing, pressure and rhythm of handwritten letters, words and sentences. These variations are very likely to occur in your handwriting, but they are within a certain limit. As a forensic document examiner you should be able to tell the difference between natural variations and an attempt to disguise your handwriting by deviating from normal characteristics.

To form a proper opinion about the writer, the examiner must know the degree of variation in the handwriting characteristics under specific conditions. The examiner must also know the reliable characteristics that can help to identify the author, even if the exhibits are written in different conditions. The correct approach to such examinations is to begin with the general or class characteristics, such as the speed, dexterity, movement, pressure of the pen, etc. and then move on to the individual characteristics, and stylistic characteristics. Some handwriting characteristics vary with the condition. Some characteristics change with age, posture, etc. Some characteristics are resistant to changes in condition. Even in block writings, the principle of handwriting identification can be applied carefully. By adhering to these principles, the examiner can fix the author. The examiner may also opine on the possibility under which the content was written based on certain surface or condition characteristics.

There are different types of basic principles of handwriting which are used to comparison.



1. **INDIVIDUALITY:** Each person's handwriting is unique like fingerprinting. An individual's handwriting possesses a distinct personality that sets it apart from others. Writing is a conscious act but repetition makes it a habit and then writing becomes a subconscious act. It is influenced by changes in life, no two persons can have same experience in life and, therefore, their writing will always varies.

2. **NATURAL VARIATION:** Natural variation are due to the fact that our brain does not work like a computer. It gets distracted easily both by the external and internal influences. Handwriting of a person shows some variations due to:

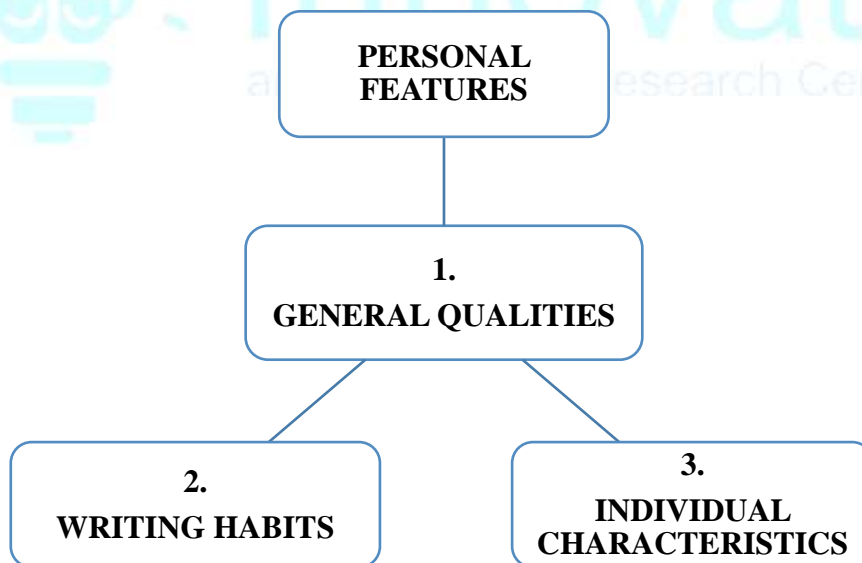
- Writing with the hand other than the one normally used.
- Illness.
- Age.
- Emotional disturbance.
- Writing material.
- Writing position.

- Physical disturbance.
 - Lack of concentration during the writing period.
 - Influence of drinking or drugs.
3. **FUNDAMENTAL DIVERGENCES:** The identification of common source of two handwriting of common source of two handwriting can be established only if in addition to similarities observed, there are no fundamental divergences.

General similarities are found in person having been to same school or their being the Member of the same family.

When the writing is closely examined, many basic differences which allow individualization of the handwriting are discovered.

4. **PERSONAL FEATURES:** The handwriting refers to the characteristics of an individual's writing style that reflect their personality, emotions, and psychological state. These features are includes :-



1.3 Characteristics of handwriting

The handwriting comparison is categorized into two characteristics i.e. class characteristics and individual characteristics. **Class Characteristics** are written features common to a group, i.e. common handwriting, letters, their shape, which are limited by group, age or language. Simply put, it is nothing but a copybook format, i.e. model that we are taught in learning the process of writing, which is almost similar to a class of people (schoolchildren from a particular area). **Individual Characteristics**, on the other hand, appear when the letter deviates from the conventional copybook form.

These writing elements form the basis of all handwriting. Those specific aspects or characteristics of writing that are characteristic of a particular writer.

Handwriting analysis has often been used as a technique in forensic investigations. In order to compare a suspect's handwriting with samples of other written material, such as diaries or papers, handwriting samples are gathered. Since no two persons have precisely the same handwriting style, identifying someone's handwriting from handwriting samples is a difficult operation. This research paper's goal is to compare various handwriting samples in order to comprehend the methods used to recognize handwriting and assess how successful these methods are at identifying certain people. The technique of assessing handwriting samples, along with the key characteristics that set one person's handwriting apart from another, will be examined in this study. This study work seeks to further forensic analysis and, in turn, enhance the precision and dependability of handwriting identification in the judicial system. One may identify someone by the handwriting style that they employ when writing with a pen or pencil. This alludes to the way that our muscles and nerves work together to enable us to pick up new abilities by the use of lines, strokes, characters, numerals, symbols, and other visual components. When investigating a crime scene, handwriting might provide important evidence. As a branch of forensic science, handwriting analysis examines handwriting, signatures, and other handwritten documents to establish authorship, provenance, and authenticity. Graphology proponents contend that a person's handwriting discloses their innermost feelings, ideas etc.

Analyzing a writer's handwriting might provide crucial details about their identity, mental health, age, gender, and line of work. Experts in handwriting analysis can identify whether a sample of handwriting was created by a certain person by examining its features, including size, form, slant, spacing, and pressure.

Evidence of handwriting can be utilized in many types of criminal investigations, such as ransom notes, fraud, and forgeries. For instance, handwriting analysis can be done to compare the handwriting of the suspect and the genuine document in the event that a counterfeit document is suspected.

It's crucial to remember, though, that handwriting analysis is interpreted and not always definitive. In order to determine a suspect's involvement in a crime, handwriting analysis should be used in conjunction with other forms of evidence, as handwriting can be easily manipulated or concealed.

The field of forensic document inspection is interested in the comparative study of handwriting samples with the purpose of identifying individual handwriting. In this kind of research study, the application of handwriting analysis to identify a document's author is usually examined. Two or more handwriting samples are compared to determine whether they were written by the same person.

In order to perform a comparative analysis of handwriting samples, researchers usually acquire a set of handwriting samples from each individual. Usually, two samples—one of original writing and the other of natural writing—are gathered from each subject. The comparisons were made between the sample class and individual characteristics. The side-by-side comparison method used for the sample analysis.

In general, forensic document examination research on the comparative analysis of handwriting samples for individual handwriting identification is significant and can offer insightful information on the application of handwriting analysis as a tool for identifying suspects and solving crimes.

1.4 Discussion

Shruti Rajwar, Varsha singh; Issue: 4th April 2021. We observed from the article that how different conditions affects an individual's writing characteristics and its significance for authorship identification. A critical area of study on forensic questioned documents analysis.

The writer provides a detail explanation of the age, writing instrument, posture, and other elements that naturally generated variation in writing. They correctly point out that distinguishing between modifications that happen organically (intra-writer) and variations that happen between different writers (inter-writer) presents a significant challenge for document examiners. The research methodology is explained in detail. Ten authors were invited to submit samples of their handwriting in eight distinct writing settings, including moving autos, uneven surfaces, and flat surfaces. The writers were able to collect a great deal of data as a result. They also looked at the distinctive qualities of each writer.

Individual characteristics, such as T-bars missing, position of eyelets, incomplete loops, endings strokes, slanting of the bar, tremors etc., showed very little variance for a specific writer under various writing conditions. These "habits" appear to be robust to alteration.

With the exception of pen pressure, which varied more on rough/soft surfaces, general class criteria like size and alignment did not change considerably. It was discovered that some features, such as paper degradation, incorrect ink deposition, and tremors/glitches, were very "surface/condition-specific. The research specify that some habits and features, which are considered as specific norms in handwriting identification, can help an expert determine the changes in authorship disputes based on variations in writing conditions. Overall, by carefully testing and determining the data and examining important issues in forensic handwriting identification, this study significantly advances the field.

T.S. Kapoor, M. Kapoor, and G. P. Sharma; Issue: (2016). Investigates the nature and extent of natural variation in handwriting over a period of 10 years. The study was conducted on 50 individuals aged between 30 and 55 years, whose handwritings were analyzed for the years 1970-71 and 1979-80. The authors explain that handwriting goes through three stages of development: pre-mature, mature, and deformities. The study focused on the mature stage, from 21 to 60 years

of age, when handwriting characteristics are generally considered to be fixed. However, the authors hypothesized that even during this stable period, the range of natural variation in handwriting might change over time. The methodology involved a detailed analysis of each individual's handwriting, letter by letter, to determine the master pattern and the range of natural variation for each letter. The findings revealed that in nearly all writers, the nature of the normal variation remained largely unchanged after 10 years. However, the extent of natural variation changed in 19 out of 50 writers. In 14 writers, the change in the extent of variation was superficial and did not significantly alter the basic structure of the handwriting characteristics. These variations were typically seen in 3 or 4 letters and included changes in curved or uncurved start or finish, size of the body, simplifications, and different habits of joining letters. In 5 out of the 19 writers, the changes in the extent of variation were more substantial, with some characteristics being lost, necessitating the use of contemporary admitted writings for comparison. The study also found that the tendency for simplifications and new variations was less marked in writers after attaining the age of 45 years, suggesting that their handwriting became more fixed with age. The authors conclude that while the master patterns of letters remain unchanged, imparting individuality to the handwriting, the natural variations in terms of their form and extent may change over time, justifying the necessity for contemporary writings in handwriting comparison, even though handwriting characteristics remain more or less permanent.

Mebin. W. Thomas, Santhosh. K. Rajan; Issue: (2019). Research that looks at how much genuine handwriting characteristics change over a ten-year span. One confessed handwriting sample written ten years ago and three current exemplar samples were among the 100 handwriting samples that the researchers collected from 25 people (aged 30-55). Among the individual and class characteristics that were looked at were letter sizes, slant, i-dot, T-bar, humped of letters (m, n, h), and the structure of curved or rounded letters (o, a, d, b, g, p, q). The result shows a significant agreement btw admitted and exemplar in characteristics such as slant, curved letter, i-dot, T-bar, and humped letter, indicating that these characteristics remain stable over time. However there was disagreement in the letter size. Suggesting that across the age size may varying. This study conclude that while certain handwriting characteristics remains unchanged once an adult acquires a particular pattern, the letter size can vary across time span. The author recommend further

research with a large sample size and additional handwriting characteristics to be obtain more accurate results

.Amitabh verma; Issue: (January 2020). This paper presents a forensic method to verify the genuineness of a disputed signature. The genuineness of a signature can be established by analyzing the characteristics that point towards natural, unconscious writing habits rather than signs of forgery like drawn, hesitating strokes or signs that the writer was focused on the details of the writing. Writing that is authentic is distinguished by its ability to fly, its intermediate strokes, its incomplete or unintelligible shapes, its style shading changes, and its difficulty to be corrected. All of these components make references to intuitive and natural writing processes. This study discusses the important of relevant, authenticate signature samples for comparison, ideally the samples should be of a similar kind and collected shortly after date of the contested signature. This means that five to fifteen authentic samples are typically appropriate. Part of the assessment of genuineness involves comparing characteristics like line quality, pen lifts, tremors, etc. between the signatures that are questioned and those that are known. The report lists a plethora of further document analysis procedures, such as examining the paper, ink, typing, and other elements to look for any potential alterations or irregularities. Generally speaking.

Shruti Gupta, Rakesh. K. Garg, Surinder Nath; Issue: (2017). This paper analysis natural variation in letter formation in handwriting over time spam. Incorporating the concept of a master pattern. This master pattern refers to the range of writing habits and characteristics that an individual uses when writing. the research analyzed 540 handwriting samples collected from 9 different age group ranging from 20- 25 years old to over 60 years old group. This handwriting samples were collected from each individuals two present handwriting samples written around 5- 10 min, and one older past handwriting samples with a time span ranging from 2- 33 years from the present samples. The letter formation were analyzed for variation by comparing the past, present-1 and present-2 samples. Some variation were observed in the style, appearance and formation of certain letters were comparing older and newer handwriting from the same individual. The letter showing maximum variation were 'f' (15 samples). The author conclude that a part from intrinsic and extrinsic factors, age and time gape played a crucial role in inducing natural

handwriting variations. they recommend avoiding heavy reliance on the letter 'f', 'y', 'r' and 'i' for handwriting comparisons, as they are prone to substantial natural variation over time.

Juie S. Deshmukh, Mr. Vikram k. Hankare, Amisha R. Ramtek; Issue: (April 2023). The main objective of the research paper is to identify people's handwriting by comparing handwriting samples. The study's main goals are to investigate the individual and class characteristics of handwriting, investigate the shared characteristics of a category and its members, validate and certify the accuracy of handwriting analysis in determining document authorship, and pinpoint the precise characteristics and features of handwriting that are helpful for individual identification. The process examining a handwriting characteristics, including, baseline, pressure, stroke, slant, size, word spacing, and pressure, in addition to individual handwriting features. Taking handwriting samples from a variety of peoples- male and female alike- entails having them pen brief phrases or paragraphs are being recorded during the sample process. To compare individual's handwriting and determine personality traits and behavior, the assessment focuses on both individual and general factors. The study takes into account constraints and possible sources mistake the analysis process in order to reach result on the validity and reliability of handwriting analysis as a method of recognizing individual handwriting.

1.5 Conclusion

This study aimed to identify the variation in handwriting characteristics btw natural writing and original writing conditions from the similar individual or subject. This research gives the significant importance in the field of forensic handwriting analysis, as it provides important role into the impact on writing conditioned on handwriting characteristics and its implication for authorship determination.

This study examined class and individual characteristics and this research revealed significant variation in these characteristics when comparing natural writing and original writing samples from each individual/subject.

The class and individual characteristics shows a notable changes btw both the writing conditions, and structure also varies considerably between both the writing conditions samples.

This research study will highly important to the field of forensic document and handwriting examination by providing insights into the effect of writing conditions on handwriting characteristics.

This research study put importance on the need for forensic document examiners to explanation for the potential effect of writing conditions on handwriting characteristics. Variation observed in characteristics like spacing, size, slant, and pen movement may be recognized to the writing conditions rather than an attempt to disguise or forged the handwriting. By considering the writing conditions, examines can make more informed decisions and avoid the errors in authorship determinations. Further, the research provides insights into which handwriting characteristics are more resistant to variations due to writing conditions, (ex- stroke type, and pen movement pattern) and which characteristics are more liable to change (ex- size spacing, slant). This research can provide help to forensic document examination in focusing on the most reliable and stable characteristics for authorship determination, and also increasing the accuracy and reliability of their analyses.

This study conclude, that research contributes valuable statically representation to reveals the significant variation in class characteristics and individual characteristics btw the two writing conditions. Characteristics like tremors, line quality, and connecting strokes showed complete unique variation. However, some characteristics like unusual letter formation, writing style, and pen lift revel similarities. This study conclude that while variability exists, it is possible to identify the authorship by carefully examining both the characteristics variations, and enabling forensic document examiners to improve their methodologies, interpret variations more accurately and ultimately enhance the robustness and reliability of handwriting analysis in forensic applications.

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