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Comparative Study of Handwriting Characteristics between Normal, Psychological and Physiological People

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Abstract. The aim of this study is to ascertain the features of handwriting characteristics in individuals suffering from psychiatric disorders (pressure, anxiety, and mental stress), To determine the handwriting traits of individuals suffering from medical illnesses like neuro issues or hand fractures. To determine the features of normal people's handwriting (those who do not have any medical issues, such as excellent physical or mental health) and to examine and compare these data to understand the differences in handwriting. The methodology of comparative study of variations of handwriting characteristics of the peoples under various criteria are Twenty participants in the age range will have their handwriting samples taken; these samples will be normal handwriting samples. For samples, consult the college students. Twenty participants in the 25–40 age range will have their handwriting samples gathered. To learn further about the psychological disorders, a Google form will be made. A sample will be taken for a stress level analysis once the Google form has been completed. twenty individuals in the 25–40 age range. Gather samples from hand fractures and neural disorders. The study reveals the writing characteristics of a person of normalized condition, and can identify the natural variations over a time of writing. It revealed the characteristics under various conditions and can also predict the nature of the writer at the time of writing. The outcomes revealed that the measurements of personality factors and handwriting features of each person may show variations in the current study.

Index Terms- Handwriting, Questioned Document Examination, psychology, physiology, natural variations, personality

I. Introduction

The brain creates characters depending on writing habits and because every neurologic brain pattern creates a unique neuromuscular action that is similar for persons with the same sort of personality, writing is a true depiction of a person’s brain. Handwriting is unique to every individual (R Plamondon, 2010). An individual is composed of three distinct components, which are also known as the physical, mental, and emotional: the physical body, mind, and the spirit. Each of these elements

are used when we pick up a pen to write anything. To communicate through written symbols, we require intelligence and the ability to grasp a pen with a portion of our body. Furthermore, our feelings dictate everything we do. Our handwriting discloses information about our identities, physical conditions, and the existence of alcohol, drugs, or other foreign substances in our systems. Because our handwriting is partially physiological, it not only reflects our intelligence and ability but also our current condition of health. Our thoughts, feelings, and behaviours—as well as our handwriting—also reflect our emotions. Our handwriting is an imprint of our physical gestures on paper (Meenakshi Bhardwaj). It is just gestures on paper, with all the same unintentional consequences. Our handwriting style is a result of our combined mental, emotional, and physical conditions. (Meenakshi Bhardwaj). Wertham's thesis states that violence is concealed in an environment that downplays how terrible things actually are. Every criminal must have a severe pathological disorder, and the degradation in their thought process and behaviour can only result from the presence of something or force that exists outside of them. Otherwise, they are not predisposed to cause harm. (F, 1962). Writing on a surface with a writing instrument powered by forearm movements is known as handwriting, and it is a neurophysiological way for us to communicate verbally and express our emotions. People's personalities and emotional states have long been inferred from their handwriting (Graphology) (Mutalib S, 2008). Writing involves several impulsive motions on our part. These motions are depicted on paper as our constantly shifting emotions. Handwriting is a registered movement that allows us to glimpse the whole landscape of a person's personality, much like an open window. Like expression, handwriting is intrinsically linked to our cognitive processes. It also has a keen sense of feelings like exhilaration and disappointment (Puja Singh, 2021). When we write, we project our feelings onto the page, and the words we come up with reflect those feelings (Qia E). In actuality, handwriting is so perceptive that it may serve as a barometer of emotion. Visible emotions include excitement, fear, worry, impatience, and fury (1905;31(1):18.).

II. Literature Review

(Bushnell, 1996; Eysenck & Gudjonsson, 1986; Furnham & Gunter, 1987; Nevo, 1989; Peeples, 1990). Studies have also been conducted that offer little support for the theory that handwriting's graphical features serve as an extension for personality.

(Keinan & Eilat-Greenberg, 1993; Rafaell & Drory, 1988; Van Rooij & Hazelzet, 1997; Wellingham-Jones, 1989) As of yet, a credible explanation explaining the correlations among handwriting and personality does not exist. The findings of research attempts to find a connection between personality and handwriting have been inconclusive. Numerous research results back up the notion that personality and writing are related.

Alecu (2004) The existence of specific features in each person's handwriting, which rely on the cerebral cortex's nerve activity, is the scientific basis for recognising a person by his handwriting, as concluded.

(Frățilă, 2013). The process of developing handwriting involves multiple stages: elementary handwriting, where the writer learns the fundamentals of graphic signs; correct letter and word writing, where the acquired graphic elements become a skill and a number of unique characteristics emerge; and fast handwriting, where the writer has mastered all signs of uniqueness. These stages in development can be used to classify handwriting as inferior (weakly coordinated), badly developed, or medium developed (simplified letters and many versions of the same character) and superior (equable, tidy). As a refined skill, handwriting is characterised by its uniqueness, stability, reactivity, and naturalness.

(Meulenbroek and Van Galen 1986). The finger system's increased anatomical complexity, which results in the need to simultaneously regulate a greater variety of joints and has occasionally been cited as an explanation for the finger system's worse effectiveness regarding movement duration and vertical stroke mobility.

(Bernstein 1967) Undoubtedly, one of the most notable instances of a work with an excellent level of motor equivalency is handwriting.

(Maarse et al. 1986; Merton 1972; Thomassen and Teulings 1983). An idea that is demonstrated by the discovery of letter form consistency along with writing slanted when writing activities are completed using various limbs and writing tools.

(Maarse 1987). Studies on the so-called primary axis of writing provide more evidence concerning the abstract character of very specific references in handwriting. Inconsistent patterns of strokes directions are discovered in polar vector plots created from a person's handwriting. It can be inferred that the act of writing is the visible result of distinct mental and physical, and physiological mechanisms. Possible handwriting process architecture is sketched based on an analysis of basic sensorimotor findings and conceptual questions about the cognitive framework of the skill.

Sassoon et al. (1986) discovered that whereas pen grips have a wide range of anatomical variations, writing ability is not significantly correlated with any particular grip. Furthermore, there does not seem to be much of an impact of handedness on writing efficiency. Meulenbroek and Van Galen (1989) examined the geographical and fluctuating properties writing by hand in three groups of subjects: male and female; right-handers; left-handers with an inverted (or "hooked") pen grip; and non-inverted left-handers. The function of pen grips is the subject of very few research, but the scant data also seems to back up the notion of motor equivalency with regard to this job.

Mojet (1989) According to Mojet's (1989) developmental study on writing pressure, there is a steady decline in pressure as one age. Writing pressure is tainted by contact that exists between the planar ground and the writing instrument, which complicates the understanding of these results (Wann and Nimmo-Smith, same issue).

Psychomotor handwriting studies often rely on time-dependent sampling techniques that involve determining the coordinates in space of the tip location of an electrically monitored writing tool used by the participant while they write on a digitizer tablet. It should be acknowledged that these data only provide a limited picture of the intricate art of writing. These statistics frequently do not include pen grips, head, arm, and body motions to assist the writing hand, or space-oriented activity above the tablet.

(Tett & Palmer, 1997) Graphological evaluation is employed in personal recruitment and selection processes; nonetheless, the scientific literature on handwriting analysis has produced conflicting findings (Tett & Palmer, 1997), which raises doubts about the validity of handwriting-based personality assessments. The study aims to dispel several myths and misconceptions regarding the potential to identify personality traits in handwriting. The described studies aimed to demonstrate a relationship between handwriting qualities and personality traits.

(Crépieux - Jamin, 1960), German (Klages, 1947; Wallner, 1971), Swiss (Pulver, 1953), and Italian schools of graphology (Torbodoni & Zanin, 1993). Graphological ideas have reinforced the notion that a person's handwriting reflects their personality. The French were the source of theories suggesting a connection between personality and handwriting. Theories about the relationship between personality and handwriting have their origins in the idea of the individualization of graphical movement, or gestures. This idea clarifies why each person's graphical motions are special, personalised, and identifiable. to confirm if there are any particular traits associated with writing that relate to personality traits.

(Keinan & Eilat-Greenberg, 1993; Rafaell & Drory, 1988; Van Rooij & Hazelzet, 1997; Wellingham-Jones, 1989) There are numerous numbers of studies showing proof that supports the theme of personality and writing. The findings of research attempts to find a connection between personality and handwriting have been inconclusive. There were no particular writing qualities associated with personality traits. There is no proof that personality can be determined by looking at someone's handwriting.

(Bushnell, 1996; Eysenck & Gudjonsson, 1986; Furnham & Gunter, 1987; Nevo, 1989; Peeples, 1990) Studies have also been conducted that offer little support for the theory that handwriting's graphical features serve as a vehicle for personality. These psychological research projects can be classified as comparative or correlational. The goal of the comparison studies is to evaluate the diagnosis made using personality questionnaires developed by psychologists and handwriting developed by graphologists.

Eysenck (1945) One example of a comparison study would be the research done in 1945 by Eysenck. It showed that whilst non-graphologists evaluated personality at a chance level based on handwriting, graphologists evaluated 50 patients' personality attributes at a level above chance. Therefore, it may or may not be prove that personality will affect the handwriting analysis.

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Netter and Ben-Shakhar (1989). The prognosis made by graphologists and non-graphologists did not differ, according to their findings (the authors asked graphologists to rate the occupation). The formulation of a career prediction based on any psychology technique is debatable, therefore this limitation may apply to a variety of psychological techniques in addition to graphological analysis. The goal of the correlational research is to determine how strongly handwriting characteristics and personality questionnaire responses are correlated. When it comes to handwriting, one of the most commonly examined personality traits is extra-introversion.

III. Methodology

The purpose of this study is to identify the handwriting characteristics of people with medical illness such as hand fractures or neuro problems, as well as the peculiarities of handwriting characteristics in people with psychological conditions (stress, anxiety, and mental stress). To identify the characteristics of the handwriting of normal people- those without any health problems, such as those in good physical or mental health- and to analyze and contrast this data in order to comprehend the variations in handwriting.

Objectives

- To identify the handwriting characteristics of people with psychological conditions (mental stress, anxiety, pressure).
- To identify the handwriting characteristics of people with physiological conditions such as fractures in hands, neuro problems.
- To identify the handwriting characteristics of normal people with (the people with no medical conditions such as good mental health and physical health.
- Comparing these data to analyze and interpret the handwriting features of various groups of people.

A standard writing instrument of Reynolds Brite pen is used for writing the handwriting samples. Also, the consent form is used for the collection of samples. To analyze the handwriting samples proper scaling and pencil are used.

There is a total of 60 sample size and only English written text sample is considered for sampling and analysis. The samples were collected only after getting the consent from the participants.

The methodology of comparative study of variations of handwriting characteristics of the peoples under various criteria are Twenty participants in the age range will have their handwriting samples taken; these samples will be normal handwriting samples. For samples, consult the college students. Twenty participants in the 25–40 age range will have their handwriting samples gathered. To learn further about the psychological disorders, a Google form will be made. A sample will be taken for a stress level analysis once the Google form has been completed. Twenty individuals in the 25–40 age range. Gather samples from hand fractures and neural disorders. Here the subject is asked to write 2 same paragraphs on the same paper.

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IV. Result and Discussion

In normal handwriting samples that collected, there are certain parameters used to identify the handwriting elements. For that the writer asked to write the handwriting samples for 2 times. They are baseline, spacing, tremors, rhythm, pen pressure, size consistency, connecting strokes and the complete letter formation. There are a total of 20 handwriting samples collected in case of normal handwriting purposes (the people without any medical conditions). The age groups range from 20-45. The handwritings are unique and the data's availed are exactly similar for the normal case people. For the first time, the writer followed, a pattern of writing on to the baseline or above the baseline and also follows an even spacing (most writers followed) of 1cm, 0.5cm and uneven spacing with a variation of 1.5, 0.1,0.7,0.8cm. There are no tremors for the majority people whereas medium tremors for less and low certain people. The writers followed a path of good rhythm of writing (even flow) of writing because the writers write on the above the baseline or else on the baseline. In all these cases the writer's followed medium pen pressure and only 1 writer follows a path of heavy pen pressure. The size consistency for these types of writers is equal weightage of small sized as well as big sized letters. Here the writers wrote their sample with high connecting strokes and also medium connecting strokes. The formation of complete letters in each writer writes with complete letter formation and only 2,3 writers have incomplete letter formation.

In the 2nd time writings, the parameters of baseline formation, tremors and flow of rhythm are above the baseline, and on the baseline, no tremors are found, and the flow of writing found to be uneven in most of the cases. The spacing becomes almost even and uneven in most cases. The even spacing is about 1 and 0.5cm, whereas in case of uneven spacing, the spacing is about 0.6,0.9,0.4,0.7,0.5cm. The pen pressure fluctuates in the 2nd time as its low, medium, and high. Low connecting strokes observed. Fully formed letters are present in the most cases and incomplete letter formation in 2 of the cases.

Illustrating the 2nd time handwriting sample of a psychologically stressed person

Same as to that of normal handwriting samples, there also a total of 20 handwriting samples ranges from 25-50 are collected. Before collecting the handwriting samples, collected a google form which consists of 10 questions (PSS test). After assessing their scores started collecting the samples. In case of first-time writings, the writers followed a writing habit of writing above the baseline. Only 3 persons wrote on the baseline and below the baseline. For psychological related issues the people having uneven spacing of 1, 0.7,0.8,1.1,0.3,0.6, and two of them only have the even spacing between each word. Here the psychologically stressed people having no tremors, as well as also high tremors. Many of them are having uneven flow of writing and some are having even flow of writing. They are having low pen pressure, and medium pen pressure. The writers normally maintained big sized letters while

other few will write in small letters. Medium connecting strokes were found in these writings. The stressed people have their writings in fully formed letters, while 3 of them were having incomplete letter formation or partial form of handwriting.

In 2nd time writing, the natural variations are more in the handwriting sample, the samples were written with respect to above the baseline, and on the baseline, only 1-2 people written the text below the baseline. The samples were written in such a way that it has uneven spacing of 0.2,0.6,0.5,0.6,0.5,0.3. usually seen a pattern of no such tremors present in the sample. But in few cases, it's said to be medium tremors. In 2nd time, the writers had medium, heavy pen pressure. There is small sized as big sized letter formation. High connecting strokes and medium, low connecting strokes observed. No missing letters are found (fully formed letters)
illustrating the handwriting sample of a physiological person (writing after 1 year of fracture)

In case of physiological samples, the physiological samples are collected from the persons who having hand problems like neuro problems, accident fractures, shivering hands. The samples are collected from the age group of 30-60. For the first time the samples were written on below the baseline, as well as above the baseline, only few written on to the baseline. Every writer wrote the sample with uneven spacing of 0.8,1,0.6,1.5,0.4,1.4. majority tremors are more in each sample, but in 2 cases, the tremors were very low. Most of the people has uneven flow (rhythm) of writing while some are having even flow. The pen pressure of these category of people having heavy pressure for most of the writer and others are with medium pressure. The big sized letters are frequently used. There are no connecting strokes found and complete letters are formed while writing the samples.

During the 2nd time writing, the writers showed their writing with respect to above the baseline while some of them depicted on below the baseline writing where few wrote on the baseline. 20 of the samples had uneven spacing of 0.8,0.5,1,0.9,1.3,0.6,0.8. tremors are high in same as that of the 1st time sample and only few were tended to be low tremors. Uneven flow of writing observed and, in some cases, found to be even flow of writing. Medium pen pressure and heavy pen pressure observed. Equal distribution of big sized letter consistency and small letter consistency. There are no connecting strokes present in the writing samples, while only few have medium connecting strokes. Complete letter formation observed in each of the cases.

V. Conclusions

When comparing the handwriting characteristics of three different categories of people it gives the natural variation. As we already know about the various handwriting characteristics and its features, also the natural variations, when these writers write the sample, they exhibit the natural variations beyond each of the characteristic feature. Natural variations are common for the writers where they have some variations in their own writing, no one can write exactly like the first writing of

a sample. By analysing a person's writing style, handwriting analysis might provide information about their mental and physical health. Three main categories can be compared: those who are normal (i.e., do not have any recognised medical illnesses), those who have psychological conditions, and those who have physiological conditions.Normal People: Letter and word spacing is usually uniform, and handwriting is generally constant in size and proportion. There may be noticeable size differences in handwriting, with larger or smaller letters signifying certain emotional states. Inconsistent spacing frequently denotes worry or other emotional problems.

Psychological Conditions: Slant may fluctuate a lot and be unpredictable. Inconsistent pressure, with some strokes being heavy and others being light, can indicate tension or emotional instability.

Physiological Conditions: Changes in slant may occur because bodily infirmities. Due to a difficulty with motor control, pressure might be unequal, resulting in variances that are more related to physical ability than emotional condition.

Line Smoothness and Quality: Normal Individuals: Good muscular control and coordination are indicated by lines that are fluid and smooth. Psychological Conditions: Uneven or wobbly lines may indicate mental health problems or emotional anguish. Physiological illnesses: Disorders like Parkinson's condition or other neuromuscular illnesses are frequently the cause of jagged or tremulous lines.

Writing a Letter
Normal People: Letters are symmetrical, readable, and have regular stroke patterns. Psychological Conditions: Distortions and irregular shapes in letter formation may indicate emotional or cognitive disorders.

Physiological Conditions: Motor issues can cause letters to form improperly, leading to missing or fragmented letters.

Physiological illnesses: Disorders like Parkinson's condition or other neuromuscular illnesses are frequently the cause of jagged or tremulous lines.

Characteristics of handwriting offer important insights about the distinctions between people who are physiologically well, those who have psychiatric disorders, and normal people. While the handwriting of people with psychological disorders frequently exhibits unstable emotions via irregular size, a slope, pressure, and speed, normal handwriting is characterised by consistency and control. Physiological problems, on the contrary, frequently interfere with the human performance of writing down, resulting in tremors, unequal pressure, and inconsistent line quality due to motor limitations. Knowing these variations can help when evaluating a person's physical and mental well-being depending on their writings.

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