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An Analysis of Quantifiable Handwriting Indicators in Relation to the Five Personality Traits Among College Students in Bangalore

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Abstract
The present investigation adopts a correlational approach to explore the association between measurable handwriting characteristics and personality traits based on the Five-Factor Model. A sample of 140 college students from different colleges in Bangalore, India, will participate in the study.The central aim of this research is to determine whether objectively identified handwriting features demonstrate consistent relationships with personality dimensions assessed using the NEO Five-Factor Inventory (NEO-FFI), thereby empirically examining selected assumptions within graphological theory. The handwriting variables examined in this study are based on principles outlined in The Romantic Secrets Hidden in Our Handwriting by Paula Roberts. Data collection will involve obtaining completed NEO-FFI questionnaires along with samples of participants' natural handwriting. These handwriting samples will be evaluated through a systematic and standardized scoring framework to identify specific indicators, including baseline movement reflecting introversion or extroversion; the relative emphasis on ideals, emotions, and material concerns; degree of interpersonal attachment; emotional steadiness versus fluctuation; tendencies toward disclosure or concealment; and preference for analytical or intuitive cognitive processing. Correlation techniques were used to ascertain the connections between the identified handwriting characteristics and the five fundamental personality dimensions of neuroticism, extraversion, openness to new experiences, agreeableness, and conscientiousness.The results showed that informative content of handwriting and personality correlations were weak and non-significant in the vast majority. However, the Openness to Experience had statistically different negative correlation with the H7 handwriting dimension ($r = -.284$, $p < .01$). Overall, the evidence presents only a few empirical findings on the existence of predictable correlations between the indicators of handwriting and the Big Five personality traits. The study advances the current academic debate of scientific validity of graphology and the need to conduct studies with more rigorous methodologies and larger sample responses. The study aims to improve the empirical and methodological validity of graphological research by using handwritten analysis, in combination with a standardized personality test instrument.

Keywords: *Handwriting Indicators, Personality Dimensions, NEO-FFI, Graphology, College Students.*

1. Introduction

We are living in a time when computers can find patterns that people cannot see. This has made people think more about whether our handwriting says something about who we're. This question has been around for a time but now it is becoming a new area of study. People have been interested in how our handwriting's connected to our personality for over a hundred years. Graphology is called the study of handwriting to learn more about someone's personality. It has been used in fields like solving crimes helping people with problems and hiring employees. Graphology is based on the idea that our handwriting's a complex thing that is affected by our brain and personality. The handwriting of every individual is special due to the manner in which the brain and the body collaborate. There are those who believe that a lot can be inferred about a person by their handwriting. As an example, in 2024, Pandey and Ansari stated that handwriting is what is produced as a result of the collaboration of our brain and body to create something special. It means that our identities can be indicated in our handwriting.

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Although a large number of individuals have been relying on graphology the scientists are still not certain whether it is effective or not. They are still disputing on whether it is possible to learn something, the personality of someone through his/her handwriting. A tension has existed over several decades between the passionate practice and critical inquiry, where academics have urged rigorous and methodologically well-grounded studies to be able to separate claims that are and are not substantiated by empirical data. It is not a new development in scientific research to study the connection between personality and handwriting. As Mailhos et al. (2016) reported, the results of early empirical investigations, such as the 1919 study by Hull and Montgomery, revealed little evidence of a connection between handwriting and personality traits. When Crider (1941) examined the validity and reliability of graphologists' judgments, he found little evidence that graphological judgments are valid and reliable. Similarly, Fluckinger, Tripp, and Weinberg (1961) conducted a thorough review of nearly three decades of experimental graphology and concluded that the data did not provide compelling arguments for graphological validity. Most significant and methodologically sound criticisms of graphology emerged in the late twentieth century. A major meta-analysis of the predictive validity of graphological findings was conducted by a large meta-analytic study by Neter and Ben-Shakhar (1989), which examined seventeen studies in which professional graphologists and non-experts attempted to assess personality from over a thousand handwriting samples. When evaluations were done by skilled graphologists, results showed an incredibly small effect size and correlations close to zero. Most importantly, however, the validity of graphologists approached zero when neutral scripts, where writings were devoid of any meaningful content, were used as handwriting samples. The results suggested that any small degree of validity found in graphological evaluations might be a function of the semantic content of writings rather than graphological characteristics per se. Moreover, psychologists without any experience in graphology scored better than graphologists on all aspects, casting a big question on the special value of graphological expertise. The same results were found by Ben-Shakhar et al. (1986) in two empirical studies on graphology's ability to predict occupational success, where they called it "methodological ruminations" on the defects of handwriting analysis. Klimoski and Rafaeli's study (1983) also examined the possibility of predicting human traits by means of handwriting analysis, but no support for graphological conclusions was found. Theoretical bases have been developed to explain the possible relationship between handwriting and personality, though this relationship remains a subject of skepticism. According to modern researchers, handwriting illustrates the integration of physical, emotional, and cognitive processes. Gawda (2014) concluded that there are few reasons why handwriting analysis should be used to determine a personality trait, despite finding minimal significant correlations between handwriting dimensions and personality traits as determined by NEO-FFI and EPQ-R. Though the prediction of personality traits from handwriting remains difficult, a network model of the relationship between graphical expression, mental self-image, and emotions, which suggests that handwriting reflects stable individual differences in psychomotor expression, was presented in a later work by Gawda (2019). From the perspective of the brain underpinnings of handwriting, the correlation between personality traits and handwriting could be explained. The motor cortex, basal ganglia, cerebellum, and association areas are only a small number of the brain areas involved in the intricate motor skill of handwriting. Personality traits might influence fine motor skills underlying graphic production through the aforementioned brain systems, which are also affected by limbic and cortical structures involved in emotional processing and self-representation. "Features such as baseline, slant, size, spacing, margin, and pressure can be indicative of psychological characteristics." This is based on the study by Pandey and Ansari (2024) on the disclosure of personality, behavior, and even psychiatric symptoms through the study of the characteristics of handwriting. This study is a contribution to the ongoing pursuit of scientifically

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validated correlations between the characteristics of handwriting and personality traits, as it gives an overview of forensic graphology and a review of the literature. There has been a renewed interest in the scientific study of the correlation between personality and handwriting in the twenty-first century. Čálková's study, published in 2025, is a quantitative study on the correlation between the personality factors in the NEO Big Five model and geographical characters such as size, slant, and width of the handwriting. The study used descriptive statistics, correlation coefficients, and linear regression analysis to examine the articles of 31 master's students in order to find the significant correlations. This study contributed to the advancement of the knowledge of the potential use of graphology in the evaluation of personality traits in the HRM environment, even though the number of participants was small. Even though graphological theory states that various handwriting stroke qualities can be used as an indicator of different psychological characteristics, a comprehensive survey on decoding personality through graph analysis by Chaudhari and Desai (2024) emphasized that previous research has only focused on a limited number of characteristics of handwriting. The survey by Chaudhari and Desai emphasizes the need for bridging gaps between personality psychology and graphology by exploring different approaches for feature extraction for predicting personality through handwriting analysis. Computer-based graphology is a method for predicting personality, as stated by Chaudhari and Desai, as it is supported by psychological characteristics of handwriting qualities for predicting personality. The effectiveness of handwriting analysis for evaluating Big Five Personality traits is found to be unsupported by an empirical investigation by Dazzi and Pedrabissi (2009) on the relationship between Big Five Questionnaire and graphological analysis. The investigation is a part of a growing list of data showing that graphological claims are unsupported by empirical data. Recent trends in research have sought to incorporate computer-based methods and algorithms, including deep learning, for a more objective assessment of handwriting patterns. A detailed review of this paradigm shift, from conventional graphology to the recent trend of computer-based methods and algorithms, including deep learning, has been provided by Ahirwar and associates (2026). This review, which critically examines the evolution of the method of personality prediction by investigating handwriting, also highlights the growing competence of computer-based methods in comparison to conventional methods. The conventional graphological methods have a number of drawbacks, which have been addressed by recent trends in computer-based methods and algorithms, including deep learning. The ability of machine learning algorithms to examine hundreds of features at a time, which may be imperceptible to the naked eye, is a notable advantage of computer-based methods and algorithms, including deep learning, for the prediction of personality by investigating handwriting. The availability of large datasets, whose ground truth has already been proven, enables machine learning algorithms, including deep learning, to develop a predictive model of measurable accuracy.Some of the key issues that this multidisciplinary field has to tackle have been enumerated by Ahirwar et al. (2026) and include unbalanced data, interpretability, computational needs and issues of using these technologies in actual contexts. It has demonstrated that these issues need to be solved by research and the study has also brought forward the need to create reliable, egalitarian and helpful diagnostic technologies. Shevchenko and Shevchenko (2025) have suggested four categories with emphasis placed on the benefits and drawbacks of each method, touching upon some of the issues related to the creation of a handwriting analysis system, which include wrongly extracted features, overfitting, underfitting, wrong training samples, and selection of the model to be applied during the evaluation of the personality type. In addition to the traditional techniques applied in the performance assessment and database selection, the techniques applied in reliable offline writer identification has also been discussed in the review as well as the techniques applied in prediction of the human personality which is a subset of the state of art in handwriting analysis systems. Trying to connect the

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areas of graphology and machine learning, Singh and Rani (2025) studied the idea of the combination of the two spheres to give predictions about personality traits using a heterogeneous data set of 1108 handwriting picture samples. The accuracy of prediction of the data according to the experimental results of the research performed by them was significantly better with the help of the stacking ensemble method, and they obtained more than 90 percent of accuracy with the help of this method in the case of personality traits, like Agreeableness or Openness to Experience. This research established the possibility of interdisciplinary methods to enhance prediction accuracy of personality traits through the employment of both traditional and innovative methods. The possibilities of identifying relations between graphical features and personality traits using automated methods were also confirmed by Gavrilescu and Vizireanu (2018) who created a Big Five Personality traits prediction system based on machine learning methods. The convolutional neural network techniques were employed by Fatimah and colleagues to forecast personality traits with handwriting, but Joshi and colleagues employed machine learning techniques to assess employability with handwriting analysis. Signatures have a particular psychological importance as a special means of self-expression, although a great deal of scientific research on handwriting has focused on general handwriting. Signatures, unlike general handwriting, tend to be produced deliberately and repeatedly over time, as opposed to usual handwriting, which is normally performed for communicative purposes but to varying degrees of detail. Signatures may be of particular interest for personality and self-concept prediction because of their intentionality and repetition. In an intensive study of a sample of students of a university in Uruguay, Mailhos et al. (2016) explored the correlation between the size of signatures and personality traits of intrasexual competitiveness, irritable and social dominance, narcissism, and self-esteem. The research methodologically scaled the current research as it utilized three different measures of signature size, as well as took into consideration the potential confounding variables, which included the number of characters of the printed name, the average character area of the printed name as a measure of overall writing size, and signature style. Following the adjustment of these possible confounding factors, the findings revealed that sociable dominance and signature size were significantly related in both sexes, but narcissism was significantly related only in females. The psychological effects of signatures are also confirmed by the use of experimental studies. Kettle and Haeubl (2011) demonstrated that due to the very process of signing, the future choices in the sphere of self-identification can be influenced. Shu et al. (2012) demonstrated that one of the methods that inhibit dishonest self-reporting is writing down in the front rather than the back of a paper, which likely attracts attention to self and foregrounds moral concept. Chou (2015) extrapolated these results by finding that a handwritten signature and not an e-signature produces this effect as e-signatures suggest a lack of self-presence. The magnitude of a signature was provoked regarding a negative influencing control condition following a positive affect priming activity, which Rawal et al. (2014) presents, which suggests that the role of affective states might be in the signature development . The present research will be relying on the use of the NEO Five Factor Inventory (NEO-FFI) as a standardised model in the measurement of personality traits. This will help one conduct systematic research on the relationship between the features of handwriting, with a focus on signature features, and the personality traits of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. The present research seeks to contribute to the growing body of literature on the research on the relationship between graphology and personality psychology with the use of computational analysis. This review seeks to bring together the different threads of exploration. It starts with the historical and empirical background of graphology, where it is involved in the discussion of the legitimacy of the discipline. It continues by discussing the development of graphology as a reliance on the traditional analysis of handwriting to the newer approach of computational analysis and its ramifications on the analysis of personality. Lastly, it

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looks at the signature as a unique entity in the exploration of the relationship that exists between personality and handwriting. This review aims at providing the comprehensive picture of the field by filling the long-standing gap between the psychological theory, existing empirical data, and emerging technological practice.

1.1.Research Gap

The biggest gap in the current research on the topic of handwriting and personality is the fundamental disconnect between the level of popular acceptance and the overall lack of scientific evidence to validate the claims made by graphology. The reason is that the present status of the research is defective, and the greatest issue is that there is no standardized system of analysis that will be universally acceptable in the study of the features of handwriting. This renders the repetition of the research hard and achievement of comparison of findings. It is also an issue with the older studies, where the tests of personality were not tested, and the newer ones, where the notion of inter-rater reliability was not determined until after the study, in even the graphologists themselves. In addition, the biggest problem is the complete lack of a theoretical mechanism by which the stable personality trait would be manifested in the motor skills involved in writing, especially in a situation in which the motor skills involved in the writing process are heavily affected by states such as fatigue and mood. While modern technology can provide a way forward through the use of digitizing tablets to collect dynamic kinematic information such as pressure and acceleration, research has still not capitalized on this technology to move forward. The key issue is still a lack of research showing incremental and predictive validity—namely, that handwriting analysis provides unique information regarding personality that is not more accessible through already established psychometric tools, and can be done so in an ethical and cost-effective manner.

2. Method

2.1.Participants

Convenience sampling will be used to collect data from 140 college students in Bengaluru. The number of participants required for the research is determined by the objectives of the research. To be eligible to participate in the research, the participant has to be between the ages of 18 and 26 years old and a university student in Bengaluru. The participant is also expected to have[1 – 7] the ability to write in cursive or print script naturally without any aid, as their handwriting will be used as primary data. Any person with any condition that affects their ability to write normally will be excluded from the study. This condition would include upper limb injuries, neurological disorders, fine motor skill disorders, and learning disabilities. The learning disabilities would include dysgraphia. Participants whose information is incomplete on the questionnaires and handwriting samples would be excluded from the study[8 – 16].

2.2.Procedure

The research was conducted on college students in Bengaluru to find out the relationship between handwriting and personality traits. The participants were collected through purposive sampling of different colleges and universities in Bengaluru. Overall, 140 people were contacted, and they were willing to take part in the study on a voluntary basis. Each participant was given a form packet containing an informed consent form, a demographic details form, a NEO-FFI self-report questionnaire developed by Costa and McCrae in 1992, and a form to collect the participants' handwriting samples. Each participant was asked to write a set of text in their normal handwriting using a standard pen on plain white paper. Before the analysis, the data was screened to identify missing values and extreme values[17 -20]. Analysis of the participants' handwriting samples was done based on standard graphological features, and the inter-rater reliability was established before correlation analysis. Out of the total participants, i.e., 140 participants, after the data cleaning process, it was found that 117 participants were eligible to participate in the study. For data analysis, IBM SPSS 20 was used for conducting the statistical analysis. Descriptive analysis and Spearman's rank correlation test were used for testing the hypothesis.

2.3.Instruments

NEO-FFI

Neuroticism, extraversion, agreeableness, conscientiousness, and openness to new experiences

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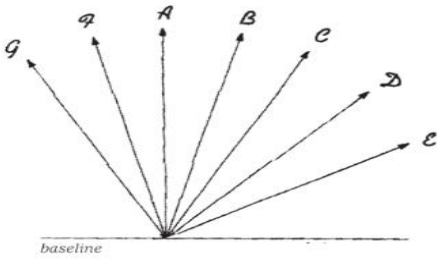
are five basic personality traits that are assessed using the 60-item NEO-FFI self-report questionnaire (Costa and McCrae, 1992). A 5-point Likert scale is used for all domains, with twelve items on the scale ranging from strongly disagree to strongly agree. NEO-FFI has good psychometric properties, with high internal consistency from .74 to .89 for the domains, and test-retest reliability above.

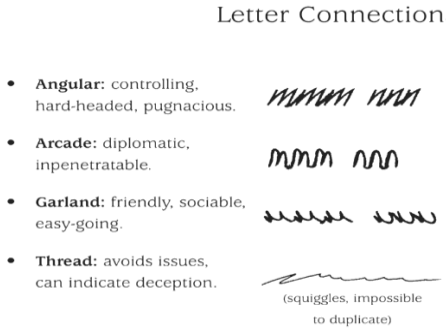
2.4.Protocol for Handwriting Collection

A prepared form and a standard blue or black ballpoint pen will be given to each participant. A standardized pangram, which is a sentence made up of every letter in the alphabet, will be printed at the top of the form. Participants will be able to copy the passage in their own handwriting in the blank space below. In order to replicate their everyday handwriting[21], participants will be instructed to copy the pangram organically, without paying particular attention to neatness or stylistic embellishment. Each handwriting sample will be given a unique code to guarantee anonymity during analysis. This approach captures the variability of natural handwriting while guaranteeing consistency among participants.Shows Table 1 Handwriting Coding Scheme with examples.

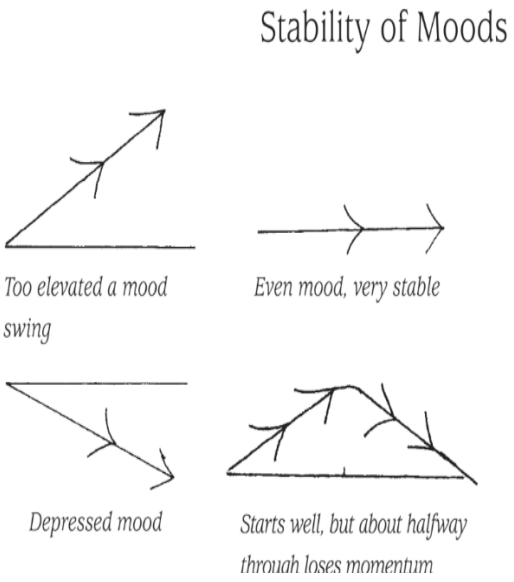
Table 1 Handwriting Coding Scheme with examples



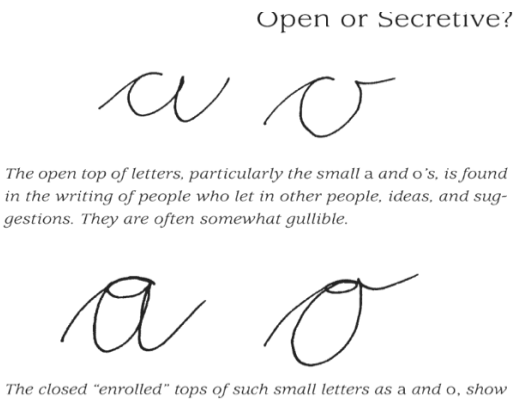
= H1



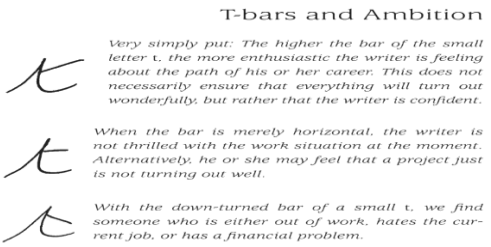
=H2



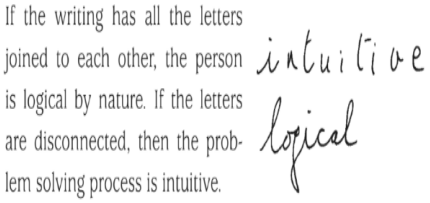
=H3



The closed "enrolled" tops of such small letters as a and o, show **=H4**



=H5



=H6

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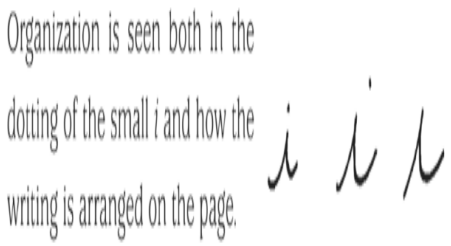

=H7

Results

The research aimed at examining the relationship between the seven quantified variables of handwriting and the five dimensions of personality, as per the Five-Factor Model of personality, which are Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C), among a sample of 140 college students who are residing in the city of Bengaluru. The correlation was done using Pearson correlation, and the correlation coefficient was calculated for all of them, as presented in Table 1. The correlations were calculated for all pairs of variables, i.e., 35 correlations, and it was observed that most of their correlation coefficients were insignificant, i.e., not significant at even 1%. The correlation coefficient for the insignificant correlations[22] was ranging from r =.167 to r =.165, which again proved the fact that the relationship was linear, i.e., almost negligible. The significant difference was observed for the correlation coefficient for the correlation between Openness to Experience and the handwriting dimension, which was represented as H7. This correlation was statistically significant, i.e., r =.284, p =.01, which means that people who are more open to experience are likely to have a low value for H7. As an illustration, the results for Extraversion indicated weak non-significant correlations with the handwriting variables, with the strongest correlation being negative for Extraversion and H6 (r = .167, p = Broadly Speeding), and for Extraversion and H5 (r = .165, p = Broadly Speeding). In addition, the measurement[23] of Neuroticism, Agreeableness, and Conscientiousness indicated no significant or consistent relationship with the seven dimensions of handwritings[24].

Table 1
Correlations Between Handwriting Indicators (H1–H7) and Big Five Personality Traits (N, E, O, A, C)

	H1	H2	H3	H4	H5	H6	H7
N	-0.027	-0.092	-0.038	-0.068	0.025	0.115	-0.06
E	-0.065	0.034	-0.143	0.041	0.165	-0.167	0.026
O	0.007	-0.081	-0.011	0.068	0.153	0.029	-.284**
A	-0.034	0.081	0.07	-0.097	-0.051	0.034	-0.093
C	-0.012	-0.028	0.008	-0.01	0.077	0.093	-0.127

**Correlation is significant at the 0.01 level (2-tailed).

Discussion

This research has attempted to assess empirically the basic assumptions underlying graphology by assessing the correlation of the prescribed handwriting indicators and their relationship with the Five-Factor Model of personality in college students at Bangalore. In general, the results provide not much empirical evidence on the validity of handwriting analysis in the determination of personality characteristics. The fact that all statistically nonsignificant and mostly weak correlations were

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found indicates that the particular handwriting characteristics that were examined in this study do not adequately predict self-reported personality dimensions based on the NEO-FFI. However, the only significant result was for finding, which showed a negative correlation between Openness to Experience and the H7 handwriting indicator. It is necessary to be careful with this result, as Openness, which is not only intellectually curious and creative, but also aesthetic and prefers novelty and variety, is only insignificantly correlated with the H7 indicator (r -0.284), which accounts for only 8% of the variance in Openness scores. This could be a Type I error, and given that there is no clear theoretical explanation for the relationship between the H7 indicator and Openness, this result should be treated with a lot of caution, especially since this is only one result among a great number of correlations that were computed. The inability to significantly correlate the remaining personality traits- especially Extraversion, Neuroticism, Agreeableness and Conscientiousness- would diminish the assumption that personality can be decoded reliably by the way people write including baseline movements, focus on material issues or tendencies to be interpersonally attached. These are null findings that are in line with the large body of scientific literature that has cast doubt on the empirical soundness of the graphological tests. Meta-analytic data have always shown that when taken through careful empirical scrutiny, graphological inferences always attain effect sizes close to zero when handwriting samples do not contain semantic content. The findings of the current study are thus in line with the general scientific opinion. There are some methodological aspects that may explain the obtained results. To begin with, the proposed handwriting factors were measured on the basis of the instructions given in the widely read handbook, rather than on the basis of the standardized and empirically tested model of graphology, which may have resulted in the measurement error and reduced the levels of reliability. Secondly, the subjectiveness of the measurement of the handwriting factors, even in the standardized model, may have resulted in the increased variability, which may have obscured the possible relationship between the factors. Finally, the use of the self-report method of measuring personality, although traditional in the field of personality research, may have been subject to the possible common method variance as well as social desirability effect. Alternately, the null results could correspond to a more root cause, however; personality traits in Five-Factor Model conceptualization are highly down to complex psychological constructs based on genetic, cognitive, and behavioral orientations that are unlikely to be encoded in the motor habits like the handwriting level to any meaningful extent asserted by the graphological theory. Although handwriting is certainly a highly individualized motor behavior, its effectiveness as a projective measure of personality is yet to be proven empirically.

Theoretical Implications

The findings contribute to the ongoing discourse regarding the scientific credibility of graphology. The weak and predominantly non-significant correlations observed in this study are consistent with the position that graphological analysis lacks the empirical foundation required for use in psychological assessment contexts. The results lend support to the view that any apparent associations between handwriting and personality may stem from semantic content, observer bias, or chance rather than from stable relationships between graphical features and underlying psychological traits.

Limitations

Several limitations of this study should be acknowledged. First, the sample was restricted to college students in Bangalore, which limits the generalizability of findings to other age groups, educational backgrounds, and cultural contexts. Secondly, the handwriting assessment was based on only one source of interpretation. In addition, the inter-rater reliability for the handwriting assessment was not established. This therefore poses a question of objectivity and replicability of the assessment. Thirdly, the correlational design does not allow for the determination of the direction of the relationship between handwriting features and personality traits. Fourthly, the study only assessed a limited number of handwriting features; other graphical features may show a different relationship.

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Future Directions

Future research should address these limitations by employing larger and more diverse samples, utilizing multiple independent raters to establish inter-rater reliability, and incorporating standardized, empirically validated handwriting scoring systems. The adoption of digital tablets and computerized handwriting analysis tools may provide more objective, continuous measures of graphical features (e.g., pressure, velocity, acceleration) and reduce measurement error. Additionally, researchers should consider examining handwriting indicators in conjunction with other behavioral and psychophysiological measures to better understand the mechanisms that may—or may not—link motor expression to personality. Replication studies are essential to determine whether the single significant finding observed in this study represents a reliable effect or a chance occurrence.

Conclusion

The current research was to be conducted to empirically test the underlying assumptions of graphology by exploring the correlations between seven measurable handwriting variables and five dimensions of personality of Five-Factor Model (Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) of a sample population of college students in Bangalore, India. The main objective was to seek whether the objectively detected handwriting characteristics can prove consistent correlation to personality traits measured by the NEO-FFI thus providing empirical evidence to the decades long debate on scientific validity of graphology. The results do not give a lot of empirical evidence to the basic premises of graphological analysis. Of the 35 calculated correlations, all but a handful of them were weak with a non-significant value, indicating that the particular handwriting measures that were measured i.e. the baseline movement, letter connections and i-dot placement are not dependable to be related to the self-reported personality dimensions. The only exception was a small negative relationship between Openness to Experience and the H7 handwriting marker (i-dot placement). Nevertheless, due to its low effect size, large number of correlations run, and the fact that there is no strong theoretical framework that could be used to explain this particular association, this result should be taken with much caution and could be explained by chance. These null results are consistent with a large literature of scientific research such as groundbreaking meta-analyses that have repeatedly shown that effect sizes of graphological inferences are near zero when subjected to rigorous empirical scrutiny. The findings are a challenge to the assumption, that the personality traits are meaningfully captured in motor habits like handwriting to the extent that graphological theory suggests. The research lacks limitations. The dependence on one source to interpret handwriting without any reporting of inter-rater reliability, the application of a common manual instead of an empirically validated, standardized scoring system and the small number of college students in Bangalore also limit the generalizability and reproducibility of the results. To sum up, this study contributes to the mounting literature that confounds the correctness of graphology as a personality assessment instrument. Although the use of handwriting as a tool to identify the individual differences in the motor behavior can be regarded as a highly fruitful field of research, the possibility of using handwriting as the tool to determine complex psychological traits should be viewed with a high degree of skepticism. The next generation of studies needs to be focused on methodological rigor through the use of larger, more heterogeneous samples, inter-rater reliability, and computational tools of handwriting analysis that give continuous measurements of graphical aspects in an objective way. It is only by this kind of strict, repeatable research that the science can get out of the long-standing disparity between belief and fact.

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