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**Forensic Stylistics and Digital Authorship Attribution in Informal
WhatsApp Communication: A Case Study of Abasyn University Peshawar
Pakistan**



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Abstract

Identifying authorship in digitally mediated communication has become an important concern in forensic linguistics. Moreover, identification of the author of a text becomes challenging in socially connected groups whose members share similar linguistic features. Using a qualitative approach, this study aims to explore the stylistic features used in WhatsApp group messages among university classmates. Furthermore, it examines how these features contribute to authorship attribution despite similarities and convergence in group communication. Using purposive sampling technique, the data for this study is collected from a shared WhatsApp group chat comprising nine students of Abasyn University of Peshawar. The data is analyzed qualitatively using McMenamin's (2002) Forensic Stylistic framework focusing on vocabulary, abbreviation, and punctuation. The analysis reveals that individual differences across the selected linguistic levels are distinct and exclusive to individuals despite shared group communication patterns, supporting the effectiveness of forensic stylistic analysis for authorship attribution.

Keywords: Authorship Attribution, Forensic Stylistics, Whatsapp Messages, University Students

INTRODUCTION

Language is not only a tool of communication but also a marker of an individual's identity. Each writer possesses distinctive linguistic patterns, which contains vocabulary choice, sentence structure, punctuation, etc. This idea creates the basis of authorship attribution, in which the evaluation of language highlights the identity of an author. According to Grant(2022),authorship attribution refers to the process of identifying the author of a text using linguistic features.Forensic linguistics treats language as evidence, which helps in stylistic analysis to find the main author and distinguish one individual from another. In the view of Coulthard (2004), forensic linguistics emphasizes that every individual exhibits unique linguistic habits that can assist in authorship attribution.This idea demonstrates that everyone has a unique writing style, and it can help in discovering the original author . It acts as a personal identity just like fingerprints.Similarly, Grant (2010) argues that “idiolect, or individual language variation, plays a crucial role in authorship attribution, although its identification is often complex in practice.” These perspectives define that although every individual has a unique writing style, it is still difficult to find the main author of the text.

Digital communication is growing rapidly. It changes the means of communication. These days, WhatsApp is the main tool of communication among university students. They use it for communication and interaction with each other. Communication of this platform is characterized with abbreviations, emojis, mostly informal , and non-standard spelling. Tagg (2012) states that computer-mediated communication is characterized by hybridity, blending spoken and written language features.This hybrid nature makes digital texts linguistically rich but analytically challenging.

Studies on authorship attribution examine digital texts such as emails, SMS, and other social media posts. These studies particularly analyze short texts and demonstrate

that stylistic features such as n-gram are used to identify the main author with proper validity; In the view of Ahmad (2023), electronic text analysis is reliable; however, informal communication still causes challenges. He suggests that although there are many methods exist for authorship attribution, their accuracy becomes limited in informal context. This problem becomes more serious in socially connected groups such as university classmates, where people interact on a regular basis. They often start imitating each other. Sometimes they use similar linguistic properties such as same words, abbreviation, jokes, slangs, or even similar sentence structure. The study by Silva (2021) on WhatsApp communication highlights that users within the same network employ similar stylistic features which may reduce individual distinctiveness. Precisely, although each person possesses a unique writing style, they often imitate each other in a socially connected group. Their styles become less distinctive, which create problems for researchers to identify the main author.

Authorship attribution in digital communication has gained importance in forensic investigation. It is easy to find the author of a formal text; however, its effectiveness decreases in informal texts due to linguistic inconsistency and lack of standardization. In WhatsApp communication, people use inconsistent patterns such as emojis, abbreviations, and mixed language forms. Moreover, people in the same social group often share the same linguistic patterns, so it is difficult to find the real author of a text. This lack of reliable authorship identification in such contexts can have practical consequences, particularly in forensic and investigative settings where digital messages are used as evidence. If stylistic analysis fails to distinguish between individuals accurately, it may lead to a misinterpretation or weak evidential value.

In spite of much research on digital authorship attribution, researchers have given a very limited attention to informal WhatsApp communication within a particular social group. This highlights a notable gap in existing research. It is still ambiguous whether forensic stylistics still works effectively in informal and socially connected environments where people share similar linguistic patterns. Therefore, this study focuses on analyzing informal WhatsApp communication among university classmates. This study examines whether it is possible to identify the author of a text even when there are strong similarities in the language use. These considerations invite further inquiries into the stylistic features (such as vocabulary, abbreviations, and punctuation) that are used in informal WhatsApp messages among university classmates and how reliable are these stylistic features in distinguishing authorship despite similarities in group communication. To answer these questions, the study aims to explore stylistic features (such as vocabulary, abbreviations, and punctuation) in informal WhatsApp messages among university classmate and likewise aims to analyze the reliability of these stylistic features in distinguishing authorship despite similarities in group communication.

By addressing these objectives, the study not only seeks to achieve its intended research purpose but also offers insights that are relevant to both theory and practice. Thus, the study has both theoretical and practical significance. Theoretically, it helps forensic linguistics by expanding the scope of authorship attribution to informal WhatsApp communication. When people live in a social group, they share the same linguistic properties. This study tries to understand how a person's own writing style works in such groups and whether we can still use their writing style to identify the person correctly. Practically, the findings of this study can help forensic linguists and investigators to analyze digital communication messages as evidence. This study may

help researchers and students by showing the analysis of casual and everyday language. Furthermore, it develops methods for authorship attribution in informal contexts.

LITERATURE REVIEW

This study examines the present literature related to the research title, Forensic Stylistic Analysis of Authorship Attribution in Informal WhatsApp Messages among University Classmates. The purpose of this review is to provide the main research domains, including theoretical foundations, empirical studies, and methodological debates. This review examines five interconnected themes: forensic stylistics and linguistic analysis, idiolect theory and its role in authorship attribution, authorship attribution in social media and digital forensics, WhatsApp and its stylistic features and authorship challenges, and linguistic accommodation and convergence in peer social groups. This process serves to review existing knowledge, contextualize the research problem, and reveal the critical gaps that the present study seeks to address. It also provides theoretical and methodological guidance of importance for the study.

Forensic Linguistics, Stylistic Analysis, and the Concept of Idiolect

Forensic linguistics is the branch of linguistics that applies linguistic knowledge, methods, and insights to the forensic contexts of law, crime, investigation, trial, and judicial procedure. In this domain, forensic stylistic analysis refers to a systematic examination of repeated linguistic patterns to find the author, which is known as authorship identification. The theoretical base of this discipline is the concept of idiolect, the idea that every individual possesses a unique writing style.

As Coulthard (2004) said, every individual possesses a unique writing style that can help in authorship attribution. He proposed the idea of linguistic fingerprint, the idea that every individual possesses a unique writing style, just like a physical fingerprint. This is the core idea of authorship attribution. Wright (2017) conducted a study to test authorship attribution. He collected data from 176 people. His focus was on a specific feature called an n-gram. N-grams refer to a group of two or more words that a person uses repeatedly. For instance, if a person always uses "to be honest," "I know it" in his writing, Wright entitled these words "Textbits" and called them linguistic fingerprints. His study confirmed that these word patterns can successfully identify the author of a text. This study is important for the present study because the same method will also apply here to find the author in WhatsApp messages.

Brendel (2022) examined authorship attribution from a broader perspective. Unlike other writers who focused only on vocabulary and words, he focused on style. He argued that style is much more comprehensive than vocabulary. According to Brendel, an author of a text can be identified by his style rather than just vocabulary. Every individual produces a unique writing style. Someone may use simple sentences, contractions, and unusual punctuation, while others may use compound sentences, formal words, or complete expressions. Brendel argues that these functional and pragmatic expressions are more important for identifying the author of a text. This study is relevant to the present study because it emphasizes that authorship attribution should not be limited to only vocabulary and words, but also to style. Style can also reveal the author of a text as vocabulary does.

Authorship Attribution in Social Media Forensics

The application of authorship attribution in social media and digital communication is very important for forensic investigation. Social media and digital channels are daily-use platforms. The linguistic traces left on these platforms have evidential value in legal and investigative contexts. Many students and scholars have contributed to this area, and each contributes valuable knowledge to the field.

In his famous work, "Authorship Attribution for Social Media Forensics", he presented a comprehensive study on authorship attribution in forensics. He argued that every individual possesses personal linguistic habits which influence their writing. Stylometric methods can be used to analyze these habits. This study highlighted the challenge of digital anonymity, as people can hide their identities while communicating on smartphones and online platforms. He further argued that stylometric analysis can help solve this problem because linguistic habits can reveal a person's identity even when they try to remain anonymous. He also stated that even small messages such as tweets can be analyzed for authorship identification. This study is important for the present study because it establishes the forensic relevance of stylometric analysis in digital communication and short messages. Similarly, WhatsApp messages can be used as evidence for authorship identification.

Puspitasari(2024) in authorship analysis in an electronic text using similarity comparison methods, conducted a study on 300 digital texts produced by 100 authors from personal WhatsApp messages. They used similarity comparison methods with n-gram to identify the author of each text. The result was 85% to 96% accurate. This shows that even short texts such as WhatsApp messages are reliable for authorship identification. This study is important for the present research because it uses the same platform and field. It proves that even small messages can be reliable indicators of authorship identification. Collectively, these studies prove that authorship attribution in short texts and messages is feasible and forensically valuable. They demonstrate that stylistic features such as n-grams, abbreviations, and punctuation are reliable markers even in small digital messages such as WhatsApp.

WhatsApp as a Linguistic Medium: Style, Disguise, and Imitation

It is crucial to understand the characteristics of WhatsApp communication before assessing the reliability of forensic authorship on this platform. WhatsApp has its own language features, and it differs from formal writing, which presents challenges for stylistic analysis. This section discusses the language and linguistic features of WhatsApp, particularly the specific forensic challenges related to style, disguise, and imitation.

The study of disguise and imitation of language, style, and WhatsApp messages was conducted by De Boer and colleagues and published in *Language and Law* in 2023. This experiment is directly relevant to my study. In this study, 120 students were asked to write WhatsApp messages under three conditions: first, in their own writing style; second, to disguise their style, meaning to try to hide who they are by changing writing style; third one was to imitate others, meaning copying someone else's writing. The study found that people can actually change their writing styles. The most practical event was when students had access to the messages of the person they were trying to imitate. This finding has a direct relation to my study, since my study is on my university classmates. Every member has access to the messages of others. This means the risk of intentional and even unconscious imitation is present. This

makes authorship attribution more difficult and challenging than in a context where authors are strangers to each other.

Allazawie (2022) In “The linguistic and situational feature of WhatsApp messages among high school and university Canadian students”, He studied the linguistic feature of WhatsApp messages written by high school and university students in Canada. He analyzed 100 WhatsApp messages and examined their styles and content. He found some of the characteristics of WhatsApp messages, such as clipped sentences, casual speech patterns, extensive slang, and non-standard abbreviations. The most particular finding was about punctuation. He found that punctuations are completely repurposed. Traditional punctuations are replaced with emojis and symbols. For instance, instead of using exclamation marks, a student might use emojis similar to exclamation marks. This habit is personal and can vary from person to person. This study supports the current study’s decision to treat punctuation as a reliable stylistic marker for authorship attribution in WhatsApp messages.

These studies explain the features of WhatsApp communication and highlight a critical challenge of imitating each other, making the identification of real authors significantly more difficult.

Challenges of Authorship Attribution in Short Informal Texts

Authorship attribution becomes difficult when analyzing very short and informal texts. WhatsApp messages are brief, casually written, and linguistically inconsistent. It means authorship attribution in formal texts is easy, but it becomes difficult in informal texts. This section focuses on the challenges which arise when conducting authorship attribution in short informal digital texts like WhatsApp messages.

Belvisi (2020) studied authorship attribution in short digital texts and produced very important findings about the limitation of the method. The study revealed a high accuracy rate between 92% and 98.5%, but there was also weakness. It also revealed one major point that when there is not enough data, the accuracy reduces. The accuracy dropped below 48% when 50 messages were taken from each author. When 100 messages were taken by each author, the accuracy went about 61%. This study is closely related to the present study because WhatsApp messages are short and the number of available messages from each classmate may be limited. Therefore, this study will carefully collect the data for reliable authorship attribution.

(Rocha 2017), They also examined the limitations of authorship attribution in digital context. They argued that stylometry analysis is useful but cannot provide accurate information like DNA testing. They argued that forensic stylometry can help in giving direction and can help investigators to narrow down the main suspect rather than providing absolute certainty about who wrote the text. It cannot be used alone as the only evidence in a legal case.

This is an important and honest evaluation of the method. This is closely related to the present study. The goal of the present study is to find whether stylistic features are reliable enough to distinguish authors within a social group such as university classmates. These studies show that authorship attribution in informal text is difficult but not impossible. The present study sets a realistic goal by evaluating the limitations of these studies and tries to test how reliable stylistic features are in finding the author within a socially connected group.

Linguistic Accommodation and Convergence Among University Classmates

Linguistic accommodation and convergence among university classmates is a significant challenge in the present study. Linguistic accommodation means adopting someone's style consciously or unconsciously due to frequent conversation. This means people adapt to each other and use similar words, abbreviations, sentences, etc. This makes it difficult to identify who wrote a specific text. This section examines the theoretical and empirical research that explains this phenomenon.

Giles (1973) developed Communication Accommodation Theory and was illustrated by Dragojevic, Gasiorek, and Giles (2025). They proposed one idea that when people communicate, they adjust their style according to that person unconsciously to show that they belong to the same group. For example, if a friend says "LMK", "let me know", another may adopt him because he wants to feel connected. Giles called this process convergence when two people start to get closer to each other. This study is relevant to the present study because university classmates live together, talk often in class and in person. The more they interact, the more they converge the more their writing style, the more it becomes difficult to find the main author.

Girveshiov 2024 conducted a study on university students' WhatsApp group. They found that students accommodate one another linguistically and develop specific jargons, words, and phrases. In simple words, the group creates its own private language that only they could understand. This study gives important findings for the present study. It argues that both shared group features and individual stylistic features exist at the same time, meaning when people adopt groups, they do not completely lose their own style. They still use their own style. This finding gives confidence to the present study, suggesting that even in a convergent university classmate group, individual authorship markers are still identifiable.

These studies confirm that linguistic accommodation and convergence are real and can cause challenges for authorship attribution in university-classmate group. However, the findings of Garvezio 2024 assure that individual stylistic features do not completely disappear within a socially connected group. It suggests that despite a socially connected group, it is still possible to identify the author of the text.

The previous studies have contributed to the field of forensic linguistics and authorship attribution. They confirm that linguistic features can identify individual writing style and WhatsApp messages have distinctive linguistic and stylistic features suitable for forensic analysis. They also confirm that authorship attribution in short digital texts is possible and can give highly accurate answers. However, it becomes difficult to find the author when people are socially connected or they create peer social groups where accommodation and convergence of style occur. Despite all these contributions, there is still a question which is not explored yet and the current study explores it. The present study directly fills this gap. It examines WhatsApp group messages exchanged between university classmates and investigates whether stylistic features such as vocabulary, abbreviations, and punctuation can still reliably distinguish one author from another despite the strong convergence that occurs in close one to one communication. By focusing on this specific and underexplored context, this study makes an original and valuable contribution to the field of forensic stylistic analysis.

This literature review has reviewed the existing studies related to the present study. It has confirmed that every individual has a unique writing style which can be identified through forensic stylistic analysis. It also confirmed that short digital messages such

as WhatsApp messages are still reliable for authorship identification and are also forensically reliable. This study also mentions some issues related to authorship attribution, such as accommodation and convergence in socially connected groups. The existing literature provides a strong theoretical foundation, clear methodological guidance, and sufficient empirical evidence to support the present study. Meanwhile, it also suggests that the specific context of WhatsApp group communication among university classmates remains an underexplored area of forensic stylistic research that deserves dedicated investigation.

METHODOLOGY

This study adopts a descriptive qualitative research design with the aim of finding out whether individual stylistic features in informal WhatsApp communication can facilitate the authorship attribution of socially connected university students. The qualitative design is suitable for this study because it aims at discovering and interpreting common stylistic elements rather than testing or experimenting controlled variables or assessing a study primarily by statistical data. This data set consists of around 200 natural WhatsApp messages generated by 9 classmates of Abasyn University, Peshawar, Pakistan who have been using the same WhatsApp group for a long time. Between the 20 messages, about 20 were chosen from each person. The messages were not specifically collected or produced for the purpose of the study, but were selected from the informal exchanges that took place in order to maintain the participants' natural digital writing processes. The data is multilingual with English, Urdu, and Pashto, as these are the languages used by the participants in digital informal chat. The participants were selected using purposive sampling method, which included: (i) students of Abasyn University, (ii) the same class and social group, (iii) active communication in the selected WhatsApp group and (iv) regular communication and consent to use the content of the group for the research. The analysis is based on those stylistic elements that may be discriminating – lexical choice, spelling conventions, punctuation, abbreviations, code switching, sentence structure, and other common individual writing habits. The features are analyzed comparatively between participants, looking for similarities and differences and evaluating the potential of distinguishing between writers. All participants had been informed about this study and gave their consent to participate in it; identifying information was deleted from the data set. Participants are identified by anonymized codes (P1–P9) only and no names, telephone numbers, profile pictures, or other personally identifying information is reported. The analysis focuses on whether there are recurring linguistic and stylistic features that mean there is still a strong distinction between the authorship of texts when the writers are from similar linguistic, social, and communicative backgrounds.

THEORETICAL FRAMEWORK

The analytical tool for the present study is Mcmenamin' s (2002) forensic stylistic framework. This tool is one of the important tools for authorship attribution in forensic linguistics. McMenamin' s (2002) argues that style markers are specific and recurring patterns in individual writing which are used consistently. They help in the identification of the author of a text. The present study focuses on three categories. First, vocabulary. It refers to the word choice. Each person possesses a distinctive vocabulary that is evident across his text. The distinction in vocabulary can help to find the author. Second, abbreviation means the short form of the words. For example,

many students use some abbreviations such as TBH, VG, etc. The analysis of abbreviations examines whether each student has consistent habits of abbreviation which differs from other students. Third, punctuation. This means how students use punctuation, emojis, and capitalization in other graphological features in their messages. These categories are selected because they are the most visible and recurring patterns in individual writing and they are also suitable markers for forensic stylistic authorship attribution in this context.

DATA ANALYSIS

Drawing on McMenamin's (2002) forensic stylistic framework, the researcher designed the following five-step data analysis procedure.

Step one: Data preparation. The data for this study consists of 200 messages collected from 9 students. Each participant contributed 20 messages to the dataset. To maintain confidentiality and ensure the students' privacy, their real names have been removed. Instead, they are assigned labels ranging from P1 to P9.

Step two: Identification of style markers. The collected data was studied carefully and systematically. The main focus was given to stylistic features such as vocabulary, abbreviation, and punctuation. The recurring features that appeared repeatedly were recorded as individual stylistic markers.

Step three: Comparison across the participants. The identified style markers of all students were compared to find convergence, shared linguistic features, as well as individual distinctive stylistic features, which can help in authorship attribution.

Step four: Evaluation of reliability. The reliability of identified style markers was examined by evaluating how each feature appeared consistently in a student's text and how it was distinguished from the features of other students. The features that were consistent in one student's messages but rarely used in other students' messages were considered reliable authorship markers.

Step five: Discussion of findings. The findings of this study revealed that individual stylistic features such as vocabulary choice, abbreviation habits, and punctuation markers remained distinctive despite shared linguistic patterns among university classmates. This is closely related to Puspitasari 2024 study, which demonstrated that whatsapp messages contain reliable authorship markers.

DELIMITATIONS OF THE STUDY

This study contains some limitations. The most notable limitation is the sample size of the study. Only 200 messages from 9 students is relatively small, as Belvisi (2020) argues that a low quantity of data may affect the reliability of authorship attribution. However, for a BS-level research project, this data is considered appropriate and manageable. Another delimitation of the study is that the identities of the participants have been kept confidential. Therefore, their real names are not disclosed in the research and are replaced with coded labels such as P1, P2, P3, and P4 to ensure anonymity and protect participants' privacy.

DATA ANALYSIS AND FINDINGS

This section offers the data analysis and findings of the present study. The data for this research is collected from WhatsApp messages of ten classmates of Abasyn University, Peshawar. The languages of messages are English, Pashto, and Urdu. It reflects multilingualism features among Pakistani university students. This analysis

uses McMenamin's (2002) forensic stylistic framework focusing on some stylistic features such as punctuation, abbreviation, and vocabulary. This chapter follows the following process. The first one is each participant's messages are analyzed across specific style markers. Second, the comparison is presented to show shared and distinctive features. Third, the findings are discussed in relation to the two research questions of the study.

Analysis Of individual participants

Vocabulary Analysis

Participant 1 uses proper and formal vocabulary, such as “consequences,” “impossible,” and “relaxed.” These words are less common in other participants’ messages. His vocabulary consists of agreement expressions, such as “exactly” and “absolutely right.” Similarly Participant 2's messages are a mixture of Pashto and English vocabulary. She uses casual and conversational English vocabulary, such as “I do believe” and “I usually study at night.” Her consistent vocabulary marker is “TBH.” Likewise, Participant 3's messages are mostly in the Pashto language. There is a limited use of English. Her English expressions are simple, such as “definitely” and “you r most welcome.” She also uses informal expressions, such as “boss” and “talent boss talent,” which are distinctive features and are not used by anyone else. Her messages are relatively short and often consist of single words, such as “yp,” “awky,” and “umm.” This is her consistent feature. Participant 4 uses a mix of English and Pashto vocabulary, including creative informal English expressions such as “watching reels,” “tbh,” “pink English,” and “full green.” He also uses both formal and informal Pashto expressions, making his language style distinctive. Another identifying feature is his use of “nahh” (with a double a) instead of the standard “no” or “nah.”

Moreover, Participant 5's messages are characterized by trilingualism. She uses English, Pashto, and Urdu. Her English expressions are polite, such as “seriously” and “you are right.” Her unique and distinctive feature is “brother” instead of “bro,” which is used by many other participants. Participant 6's vocabulary is characterized by trilingualism. Her distinctive vocabulary feature is humorous expressions throughout all languages, such as “Gulabi English,” “Shareef Bacha hie choro,” “Tu Rehne De Behen,” “Half Salam,” and “da paper Na yo shpa pela.” She also reflects her regional dialects in her Pashto expressions, such as “Zama hyal” instead of “Zama Khyal.” In addition, Participant 7 uses formal English vocabulary. He uses more formal words than other participants. His spellings are wrong; however, he uses sophisticated words such as “intengibility,” “awarness,” and “practical life.” His consistent feature is address terms such as “sis” and “bro,” which are repeated frequently. Moving to Participant 8 uses narrative and descriptive vocabulary. He also uses religious vocabulary and terms such as “zakat,” “Ramadan,” and “sawab,” which is a distinctive feature from others. Finally, Participant 9's vocabulary is characterized by trilingualism: English, Urdu, and Pashto. His recurring and distinctive vocabulary feature is “Ahahaha,” which appears many times in his writing and is not found in anyone else's messages. His consistent address term is “Jani,” meaning dear.

Abbreviations Analysis

There is no abbreviation in Participant 1's writing. This is itself a feature that distinguishes him from others who use abbreviations excessively. Similarly, P2 is a frequent user of abbreviations. Her most used abbreviations are "TBH" and "diffnc". She also uses elongated forms for emphasis, such as "OKKK" and "yess." These elongations help in distinguishing her writing from others, and "Yp" is P3's frequently used abbreviation. She also uses "r" instead of "are," as in "you r most welcome." She also uses a double dot (..) instead of the standard three-dot ellipsis (...). In addition, Participant 4 uses some distinctive and unique abbreviations such as "yall" for you all, and nah with double A are distinctive features. He also uses some shared abbreviations which show convergence with other participants, such as "TBH" is the participant 2 and "bro" used by most participants. Moreover, P5 uses many abbreviations in both Pashto and English. In Pashto, her distinctive abbreviations are "bs" instead of "bas," "r" instead of "or," and "snga" instead of "senga" and P6's most distinctive abbreviation features are elongation patterns, such as "Frrr" with three R's and "Bro" with two O's.

Likewise, P7 usage of abbreviation is low, but his distinctive and recurring abbreviations are "sis." He also uses "sis" in brackets as (sis), which is a unique feature and not found in any other participant's messages. He also uses "gonna" and "lol" as some distinctive abbreviations, and P8 uses no abbreviations. Finally, P9's most recurring and distinctive abbreviation is "Jani" with triple "i," which is in an elongated form. His another abbreviation is "boht" instead of "bohut" in Urdu abbreviated form.

Punctuation Analysis

Participant 1 uses proper punctuation. He uses commas, full stops, and capital letters appropriately in his English language writing. Comparatively, he uses various emojis, including a laughing emoji and a thumbs-up emoji. His awareness of these rules distinguishes him from other participants. P2 does not use proper punctuation. She does not use full stops or commas, and she uses inconsistent capital letters at the beginning of sentences.

Similarly, P3 is the most frequent user of emojis. She uses emojis in almost every message. She uses a wide variety of emojis and often ends messages with emojis rather than punctuation marks. This feature distinguishes her from others. Likewise, Participant 4 has some distinctive punctuation features. He uses a space before and after commas in almost every message, and most importantly, he has not used a single full stop. Most of his punctuation is replaced or repurposed with emojis. Moreover, P5's distinctive punctuation is that she uses question marks excessively. She also uses apostrophes, such as in "mam aneela's subject," which are not used by anyone else. She also uses three dots as a pause marker and P6 uses no full stop and not a single comma. Her distinctive punctuation feature is that she finishes her messages with emojis, moving to P7 uses two distinctive punctuation features. The first is the use of commas after address terms and transitional words, such as "offcourse, sis." The second is the use of parentheses, such as "(sis)." He also uses a few emojis. These are his distinctive features. In addition, P8 uses distinctive punctuation. He has two distinctions from others. First, he uses laughter emojis after humorous expressions and food emojis after food references, such as "bta Bas Khwarako wo." Finally, He does not use full stops; instead, he uses "Ahahaha" or

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emojis, especially laughter emojis, at the end of sentences, making his messages reliably identifiable.

Cross-Participant Comparison

Vocabulary Comparison

Participant s	Distinctive vocabulary markers	Shared features
participant 1	Formal English and sophisticated words “impossible”, “relaxed”	“Exactly”, “absolutely right”
Participant 2	“Tbh”, “bro”, casual and conversational vocabulary	“Bro”, “tbh”
Participant 3	Minimal responses such as “boss”, “yp”	None
Participant 4	Creative informal expressions such as “yall”, “pink English”, “naah”	“Bro”, “tbh”
Participant 5	Polite and considerate expressions such as “Brother”, “seriously”	“Ok” “right”
Participant 6	Creative and humorous expressions such as “gulabi English”, “half salam”	None
Participant 7	Formal vocabulary but misspelled, “;”, “intengibility”	“Bro”, “sis”
Participant 8	Religious vocabulary, narrative style, “yar”	Religious terms such as “qurbani”, “Ramzan”
Participant 9	“Jani”, “ahahaha”, philosophical terms	Religious terms such as “enshallah”, “sawabi”

Abbreviation Comparison

Participants	Individual abbreviation	Shared abbreviation
Participant 1	None	None
Participant 2	“Diffnc”	“Thb”, “bro”
Participant 3	“Yp”	None
Participant 4	“Yall”, “naah”	“Tbh”, “bro”

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Participant 5	“O”, “bs”	None
Participant 6	“Hmm”, “frrr”, “broo”	None
Participant 7	“(Sis)” in parenthesis, “bro”, “sis”	“Bro”
Participant 8	None	None
Participant 9	“Boht”	None

Punctuation Comparison

Participants	Distinctive features	Shared features
Participant 1	Formal punctuation, less emojis	☐ Once
Participant 2	☐ frequent, no full stops	☐
Participant 3	Heavy emoji use, ☐ , “..”	☐ , ☐
Participant 4	Comma spacing, ☐ green circle	☐
Participant 5	☐ exclusive use	☐ , ☐
Participant 6	☐ consistent, “... ☐ ” pattern	☐
Participant 7	“(sis)” pattern, minimal emojis	None
Participant 8	☐ after humor, ☐ after food	☐
Participant 9	“Ahahaha” six times, ☐	☐

DISCUSSION

The analysis of nine participants' WhatsApp messages using McMenamin's (2002) Forensic Stylistic Framework produces findings that directly address the two research questions of the present study. It is confirmed by this analysis that informal WhatsApp messages among university classmates at Abasyn University Peshawar contain various stylistic features across different categories. Such as

Vocabulary. Many of the participants use multilingual vocabulary, a mixture of English, Urdu, and Pashto. The participants also use some informal address terms such as “bro,” “jaani,” “yaar,” “sis,” and “brother.” They also use some specific creative expressions such as “Gulabi English” and “pink English.”

Abbreviation. Participants use various abbreviations such as “LOL,” “TBH,” “sis,” “bro,” “ha,” “bs,” “os,” and “yp,” etc. However, some participants avoid abbreviations, such as Participant 1 and Participant 8. On the other hand, other

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participants use them heavily, such as P2, P3, P4, and P5.

Punctuation. All participants have created highly personal emoji preferences and punctuation habits, which reflect individual communicative personalities, such as p4's distinctive comma spacing, p1's formal punctuation, p2's frequent laughter emojis and lack of full stops, p3's excessive use of stare emojis, p6's use of dots (double or triple) combined with sets of emojis, p8's laughter emojis after humor, food emojis after food references, and p9's repeated "ahahahaha."

Distinguishing of Authorship

The analysis highlights that stylistic features can help in distinguishing individual authorship in three specific ways.

First, through unique individual markers

Every participant possesses some specific stylistic features which are not possessed by any other participant, such as participant 9's "ahahahah" appearing six times in his messages and zero in others, participant 3's expressions such as "boss" and "yp" not used by any other, participant 5's use of "brother" apostrophe(s), participant 6's "gulabi English" and "half Salam" and "frrr", participant 8's "yar" and religious vocabulary, and participant 5's space before and after the comma as a distinctive feature. These individual features function as strong authorship markers and can directly help identify the author of a text.

Second, through patience of absence

an author can be identified not only by inclusion but also exclusion. In a group of all participants, when a participant avoids a feature, it is also a sign of his authorship. As participant 8 avoids abbreviations which distinguish them from others and help identify them.

Third, through a consistent combination of feature.

No single feature alone identifies a person, but it is the combination which helps to identify such as p8's laughter emojis after humor and religious vocabulary help identifying participant 8. If individual features are shared with others, the combination of features identifies participant.

These findings are consistent with McMenamin's (2002) framework which argues that style markers manifest as recurring and individual distinctive features.

CONCLUSION

This study examined authorship attribution through the analysis of informal WhatsApp messages produced by nine classmates from Abasyn University, Peshawar. The analysis of the participants' writing samples demonstrated that each individual exhibited unique patterns of vocabulary use, punctuation, and abbreviation, which functioned as distinctive markers of authorship. Conversely, the analysis also revealed evidence of linguistic convergence among the participants. Despite exhibiting distinctive individual writing styles, the group members shared certain linguistic features that were consistently observed across their WhatsApp messages. These shared patterns suggest that linguistic convergence influenced their communication practices, resulting in similarities in vocabulary use, punctuation, and abbreviation habits within the group. Such as "bro" "exactly", "right", "tbh" etc.

Despite the presence of linguistic convergence, the participants also demonstrated individuality and distinctiveness in their writing. Each participant exhibited unique linguistic markers that enabled their identification and facilitated authorship attribution. The findings of this forensic stylistic analysis suggest that each individual possesses a distinctive and unique writing style through which they can be identified. Despite evidence of linguistic convergence among group members, participants retained individual linguistic markers that enabled authorship attribution.

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