Attitudes of Pakistani Undergraduate ESL Students toward Artificial Intelligence in Improving English Writing Skills

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Abstract

English writing proficiency is vital for educational, professional and personal development. With the rapid growth of Artificial Intelligence (AI) in academia, understanding its impact on language learning is essential. Students' attitudes toward AI influence their motivation, engagement, and learning outcomes. This mixed-method research aimed to explore the attitudes of Pakistani English as a Second Language (ESL) undergraduates toward AI in improving writing skills. Perceived usefulness, ease of use, and behavioral intentions of ESL undergraduates toward AI are examined through the integration of Technology Acceptance Model (TAM) and Constructivist Learning Theory (CLT). This study also investigated the influence of motivation, engagement, and societal expectations on AI adoption for improving writing skills along with the constructivist learning strategies used by students. Quantitative data were collected from 215 students through a Google survey and semi-structured interviews were used to gather qualitative data from 10 students. Descriptive statistics and percentages were used to analyze quantitative data; however, qualitative data were analyzed through thematic analysis. The findings highlight that ESL undergraduates' attitudes are strongly influenced by perceived usefulness and ease of use; however, attitudes and behavioral intentions received slightly lower scores. Furthermore, challenges related to over-dependency, ethical considerations, and subscription issues affect AI adoption. Motivation and societal expectations increase AI adoption; on the contrary, learner-centered and interactive approaches are needed to enhance engagement levels. Additionally, this study suggests the need for AI ethical guidelines, institutional support, and literacy training to fully benefit from AI tools in improving writing skills.

Keywords: attitudes, artificial intelligence, esl writing, constructivist learning, motivation, engagement, societal expectations

1. Introduction

Writing is a critical and complex skill that English as a Second Language (ESL) students must acquire, encompassing organization, grammar, vocabulary, mechanics, content development, and critical thinking (Dendup & Onthanee, 2020; Suvin, 2020). With the increasing expectations for higher-order academic writing in higher education, Pakistani undergraduate students face challenges in producing well-organized and grammatically correct texts. Attitude is a multidimensional phenomenon as individuals shape their attitudes based on their experiences and events in society (Prasetyo & Fatonah, 2014; Langat, 2015). Moreover, these attitudes are influenced by some external factors, for instance, motivation, societal expectations, engagement, and emotions. Popham (2011) believes that students' attitudes toward English language learning play an important role in shaping their future behaviours. Artificial Intelligence (AI) offers advanced solutions to these challenges.

AI-powered applications such as ChatGPT, QuillBot, Grammarly, Google Gemini, Meta AI, and Google Translate are gaining popularity for their ability to improve writing coherence, provide immediate feedback, and enhance grammatical accuracy (Barrot, 2023; Guo et al., 2022). These tools foster student engagement by offering personalized support and have the potential to transform traditional writing instruction (Baskara et al., 2023; Abd-Elsalam & Abdel-Momen, 2023; Jomaa et al., 2024). Language learning assisted AI tools have both positive and negative impacts in academic settings (Rahman & Watanobe, 2023). While AI tools can facilitate student learning and support effective education (Xia et al., 2022), they also raise concerns about learner overdependence and unethical practices (Straume & Anson, 2022). Nevertheless, previous studies have shown that AI tools can reduce anxiety and increase students' motivation in the writing process (Jyi-yeon & Youngsoo, 2023; Katsarou et al., 2023; Sulistyanto et al., 2023). For example, Grammarly is widely recognized for its grammar-checking accuracy and user-friendly interface; however, some students do not fully benefit from it due to the complexity of its system (Lailika, 2019; Faisal & Carabella, 2023).

The significance of AI features such as automated error detection and immediate feedback in supporting the writing process has been highlighted by numerous empirical studies (Zhang & Hyland, 2018; Barrot & Gabinete, 2021). However, there is comparatively less focus on AI in ESL education, although an increasing body of literature is emerging in developed countries (Rahmi et al., 2024; Polakova & Klimova, 2024). Students' attitudes toward the use of AI tools in enhancing the writing process for educational purposes are essential to explore (Sumakul et al., 2022). A willingness to accept and adopt these technologies can significantly improve academic writing (Grassini,

2023). On the contrary, a lack of credibility in AI tools may lead to ineffective outcomes and can also be unsuccessful when such tools are implemented (Hasanah & Nurcholis, 2024).

AI has emerged as a valuable resource that enhances the effectiveness of language learning (Aladini et al., 2024; Haristiani, 2019; Hieu 2024; Huang et al., 2023; Knox, 2020; Pikhart, 2020; Zheng et al., 2023). AI-based programs are designed to respond to human commands and serve as consultants by providing relevant feedback (Devi et al., 2022; Nemorin et al., 2023; Spector & Ma, 2019). ChatGPT is a famous example of AI that interacts with users and generates responses according to the input (Ali et al., 2023; Fitria, 2023; Özçelik & Ekşi, 2024; Slamet, 2024; Yan, 2023). Consequently, these tools are being increasingly adopted in language learning contexts to facilitate language correction and enhancement (Lu, 2018; Tafazoli et al., 2019).

Additionally, the impact of AI on increasing motivation, enhancing engagement, and managing social factors, particularly in improving writing skills among ESL students, has received limited attention. Examining the factors that impact students' positive acceptance and effective use of AI tools will further assist learners in attaining writing proficiency with AI (Fernández-Sánchez et al., 2022; Bahroun et al., 2023). This study sought to bridge these gaps by examining Pakistani ESL students' attitudes toward AI and its influence on their English writing skills. This study also strived to assist educators and administrators in better facilitating the integration of AI into languages education.

2. Literature Review

Numerous past studies have investigated the enhancement of English language skills through AI tool applications at various levels. Zheng et al. (2023), for instance, conducted a meta-analytic study on 24 studies to analyze the influence of AI on learning achievement and attitudes. They concluded that AI tools had a better influence than the perceptions of the learner which reflects actual effectiveness of AI on students' learning. In recent studies, there is enormous focus on the implementation of AI in English writing at the tertiary level, especially in enhancing proficiency, grammar, and feedback. The acceptance of AI to improve English language learning is determined by the attitudes of students who perceive its usefulness and ease of use in education.

Within a constructivist framework, Aladini et al. (2024) examined AI-based writing proficiency and autonomous learning in the context of English as a Foreign Language (EFL) and concluded that mindfulness, writing proficiency, and grammatical accuracy significantly improved when students used AI tools. Research based on constructivist theories and self-directed learning emphasizes reflective practices and autonomy, aligning with the ideology of Constructivist Learning Theory (CLT), which promotes meaningful knowledge construction, interactivity, and a learner-centered approach. Moreover, teachers' and students' perceptions of ChatGPT in improving language skills were investigated by Slamet (2024). Increased engagement, benefits of real-time feedback, and improved language proficiency were highlighted as advantages. On the other hand, some challenges like technical issues and over-dependency on AI were also identified. Personalized feedback during AI usage and engagement in learning English writing is promoted by the constructivist approach.

A case study was carried out by Özçelik and Ekşi (2024) on the efficiency of ChatGPT for enhancing students' register understanding for English writing tasks. Based on their research, AI-assisted learning improved formal writing skills and self-editing skills; however, it lacks neutral register and informal language. It emphasizes the idea that AI can help with the technical features of writing but still needs human intelligence for situational suitability. To investigate the learning efficiency of college students, Huang et al. (2024) examined the influence of ChatGPT from the constructivist perspective. They identified that ChatGPT improves students' learning proficiency and enhances the active learning process. Kim (2019) conducted an experimental study to evaluate the effectiveness of AI-assisted English grammar teaching at the university level. The study found that students who used AI for learning grammar performed better than those taught using traditional methods. Šumak et al. (2011) conducted a meta-analysis with TAM that confirms the role of attitude in students' acceptance of e-learning technologies. Similarly, Sánchez-Prieto et al. (2017) applied TAM to investigate the attitudes of students towards mobile learning. Moreover, Teo (2011) also integrated TAM to comprehend the attitudes of teachers towards technology.

Motivation is fundamental for engagement and achievement in language education (Boo et al., 2015; Jomaa et al., 2024). Furthermore, Ebadi and Amini (2022) revealed that AI-based learning tools had a considerable positive effect on learners' motivation and level of active engagement, indicating AI's role in generating active participation when learning language. In the context of AI-assisted learning, motivation has always played a vital role in language learning. Learning approaches powered by AI increased learners' motivation and were also associated with enhanced academic achievement (Cañada et al., 2015). Likewise, Ali et al. (2023) conducted a cross-sectional survey and explored the effects of ChatGPT on the motivational aspects of learners and teachers with respect to writing, reading, speaking, and listening skills. They found a neutral impact of ChatGPT on speaking and listening skills. However, there was a significant positive impact on reading and writing skills. Another study compared ProWritingAid and Grammarly with ChatGPT carried out by Schmidt-Fajlik (2023) to detect and improve grammatical errors among English EFL learners. ProWritingAid and Grammarly proved to be less effective than ChatGPT in detecting and improving grammatical errors to achieve better results.

Similarly, Hieu (2024) integrated CLT and Technology Acceptance Model (TAM) in their qualitative study to investigate Vietnamese EFL teachers' attitudes toward AI implementation in language learning and teaching. They identified concerns such as over-reliance on AI, cultural misalignment between AI systems and students, and ethical issues. However, they also recognized the potential benefits of personalized learning and increased engagement. These findings suggest that AI should be used appropriately and in a balanced manner to function as an assistant rather than completely replacing traditional teaching. Moreover, Huang and Mizumoto (2024) explored the

relationship between the L2 Motivational Self System and TAM in the use of ChatGPT for EFL learning. They found that perceived usefulness was a significant factor in actual AI usage, highlighting the role of motivation in adopting technology. This suggests that students' willingness to work with AI tools is closely linked to their perceived benefits for language learning.

Literature reflects several advantages of AI tools to language learners, for instance, ChatGPT can generate writing ideas, suggest new sentence structures, and improve overall writing skills (Ali et al., 2023; Baskara & Mukarto, 2023; Fitria, 2023; Hong, 2023; Kohnke et al., 2023; Özçelik & Ekşi, 2024; Schmidt-Fajlik, 2023; Su et al., 2023; Yan, 2023). Students are involved in language learning activities through these tools which provide a more convenient way for improving their expertise by transporting them to immersive and meaningful learning environments (Divekar et al., 2022). AI tools align with constructivist principles as they offer an environment of continuous learning and encourage students to actively participate in their writing improvement (Kim & Adlof, 2024). There are numerous studies focusing on the effects of the use of AI language learning tools on students' overall learning performance as well as on the students' specific language skills (Aladini et al., 2025; Hsu et al., 2023; Kim, 2019; Knox, 2020; Junaidi, 2020; Pikhart, 2020; Xu et al., 2022; Yan, 2023; Zheng et al., 2023). For instance, a significant influence of AI tools on learners' academic achievements was identified by Xu et al. (2022). Additionally, the students who used AI tools showed significant improvement in their vocabulary knowledge as explored by Hsu et al. (2023).

Despite these promising findings, previous research has not fully explored the impact of AI (ChatGPT, QuillBot, Grammarly, Google Gemini, Meta AI, and Google Translate) on ESL learners' writing skills (organization, grammar, vocabulary, mechanics, content development, and critical thinking) particularly within the framework of CLA and TAM in Pakistani universities. Addressing this gap, the present study provides empirical evidence about students' attitudes toward AI and how AI-assisted tools influence ESL learners' English language writing proficiency. This study aimed to investigate Pakistani ESL undergraduate students' attitudes toward implementing AI tools to enhance English writing skills, the perceived usefulness of AI tools, and the challenges they encounter in using AI tools for writing improvement.

2.1 Theoretical Framework

This study incorporates CLT and TAM as theoretical frameworks to explore the attitudes of students toward AI and how AI tools help them in improving their English writing skills. CLT is rooted in the works of Piaget (1973) and Vygotsky (1978), highlighting the learner's active role in knowledge building through authentic engagement (Elliott et al., 2000; Qiu, 2019). In social constructivist theory, Vygotsky (1984) emphasizes the Zone of Proximal Development (ZPD) which consists of two levels: the learners' existing abilities while working independently and their potential abilities when supported by a more knowledgeable collaborator (Vygotsky et al., 1997). CLT emphasizes active, self-directed learning, where students construct knowledge through interaction and collaborative practice (Adnan & Sayadi, 2021; Adigun et al., 2024).

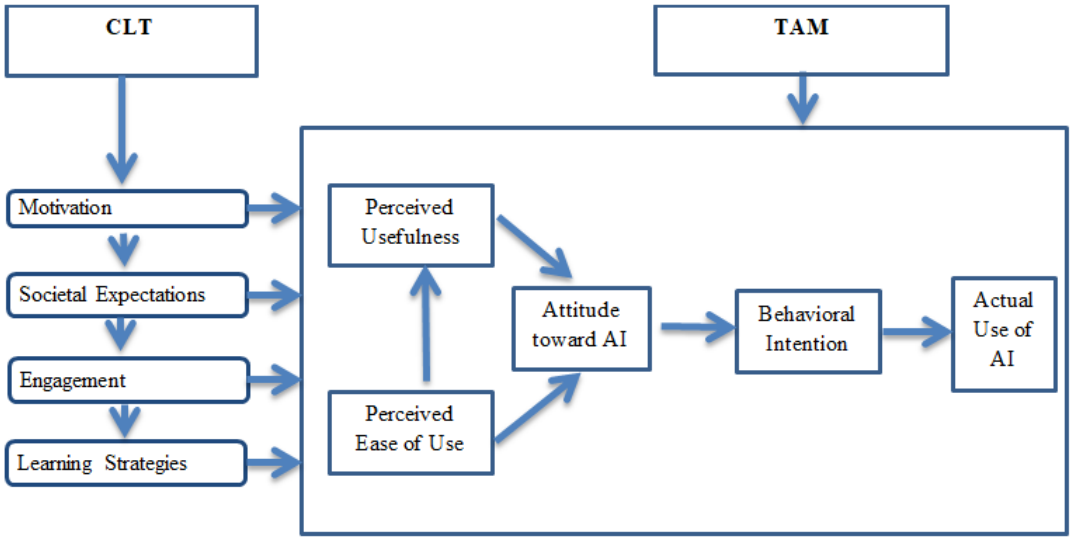

Figure 1. AI Constructivist Learning Model (AICLM)

Three constructs from CLT, namely motivation, societal expectations, and engagement, were selected to analyze the process of English language improvement with AI-assisted tools by the students. According to CLT, social interactions including community and societal expectations are vital in cognitive development. Knowledge is mediated through the tools provided by society, including language and cultural norms (Vygotsky, 1978). Vygotsky's ZPD (Vygotsky et al., 1997) illustrates how learners achieve deeper understanding through

guided support from more knowledgeable collaborators within societal contexts. These interactions are influenced by societal norms and expectations, which shape experiences through which learners construct knowledge (Chen et al., 2022; Palincsar, 1998). According to Wojciechowski and Cellary (2013), PU and PEOU are influenced by external factors. For instance, motivation plays a crucial role in learning, as it enhances engagement, problem-solving, and deep thinking (Sivan, 1986; Resnick & Klopfer, 1989). Factors such as students' views on intelligence (Dweck & Elliot, 1993) and parental involvement (Gonzalez-DeHass et al., 2005) significantly influence motivation, engagement, and learning outcomes of the learners. Constructivist Learning Strategies (CLTs) are the ways students actively engage (Bonwell & Eison, 1991) in learning through collaboration (Johnson & Johnson, 1999; Mansoor et al., 2025), exploration (Hmelo-Silver, 2004), critical thinking, and creativity (Krajcik & Blumenfeld, 2006).

TAM explains technology adoption (Davis, 1989; Venkatesh & Davis, 2000) and offers a well-established framework for understanding how technology enhances language learning (Chen, 2016; Peng et al., 2023). According to Davis (1989) and Wu and Chen (2017), individuals' Attitudes are shaped toward the Use (ATU) of technology which influence Behavioral Intention (BI) and Actual Usage (AU) through Perceived Ease of Use (PEU) and Perceived Usefulness (PU) in TAM. Actual use of technology by the users depends on societal expectations and influential people around the users (Davis, 2000; Fishbein & Ajzen, 1975). Students are more likely to adopt (Davis, 1989; Venkatesh & Davis, 2000) AI tools if they perceive them worthy and user-friendly in their learning process. This study explores how these perceptions influence the willingness of Pakistani undergraduate students to use AI in improving their English writing skills. By integrating the AI-Constructivist Learning Model (AICLM), the research provides a comprehensive framework for understanding both Pakistani students' attitudes toward AI in English writing instruction.

3. Method

This study adopted a descriptive survey design, utilizing a mixed-method approach that combined quantitative and qualitative techniques. The primary method was a quantitative survey (questionnaire), while qualitative interviews provided supplementary insights to explore Pakistani ESL undergraduate students' attitudes toward AI tools, their effectiveness, and the challenges associated with improving their English writing skills. According to Hafsa (2019), integrating both quantitative and qualitative methods enhances research reliability and ensures more comprehensive findings. Furthermore, interviews were conducted to validate the questionnaire results. The findings were analyzed in relation to theoretical and empirical literature, offering pedagogical implications and recommendations for future research on AI-assisted writing in higher education.

3.1 Participants

215 ESL undergraduates from the English departments of five universities in Punjab province, Pakistan participated in this study. Researchers did not use any specific criteria for participant selection, as all the students enrolled in undergraduate English Language and Literature courses at the time of the study were included. Primarily, data were collected through an online survey because questionnaires offer several advantages, such as saving time, effort, and financial resources (Dörnyei, 2010). All participants voluntarily consented to participate and they were ensured of the anonymity and confidentiality of their responses. The questionnaire was accessible for two weeks, with clear instructions provided to ensure consistency in responses.

3.2 Research Instruments

The research questionnaire was designed based on previous relevant literature (Davis, 1989; Fishbein & Ajzen, 1991; Huang & Mizumoto, 2024; Jomaa et al., 2024; Leong et al., 2024; Taguchi et al., 2009; Taylor & Todd, 1995; Slamet, 2024) to attain the objectives of the study. The questionnaire underwent an extensive development process with specific attention to its validity and reliability. Two Ph.D. experts in technology-enhanced language learning examined the questionnaire to provide suggestions for enhancing its clarity, relevance, and appropriateness with the research inquiry. Their comments contributed in refining and enhancing the clarity, relevance, and suitability of the 35 close-ended questions. The questionnaire was designed to explore participants' attitudes towards AI tools as an online writing assistant with respect to effectiveness, challenges, and implementation strategies. In Cronbach's alpha coefficients, the internal consistency of all items was ranged from 0.886 to 0.970. See questionnaire in Appendix A. Questionnaire details and Cronbach's alpha of each construct are given below.

Table 1. Reliability of Constructs

Theory/Model	Constructs	Items	Cronbach's alpha
Constructivist Learning Theory (CLT)	Motivation (M)	3	0.942
	Societal Expectations (SE)	3	0.943
	Engagement (E)	3	0.891
	Constructivist Learning Strategies (CLSs)	6	0.886
Technology Acceptance Model (TAM)	Perceived Ease of Use (PEOU)	4	0.897
	Perceived Usefulness (PU)	5	0.888
	Attitude Toward AI Use (ATU)	4	0.887
	Behavioral Intention (BI)	3	0.888
	Actual Use (AU)	4	0.970

The research survey was conducted during the first two weeks of February 2025. The questionnaire had thirty-five items and three sections related to different constructs of TAM and CLT. Demographic variables, such as age, gender, English proficiency level, and the frequency of

AI tool usage were identified in section one. Items regarding the constructs of TAM and CLT were placed in sections two and three. To collect accurate responses from participants, a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' was used in the questionnaire (Dörnyei, 2007). Participants were asked to complete the questionnaire via Google Forms and it took 8–10 minutes to complete the questionnaire. The interview phase included three key questions addressing students' challenges in using AI tools for writing improvement, the perceived usefulness of AI tools, and recommendations for maximizing their benefits. These questions were formulated based on the research objectives and initial survey findings.

Interview participants were selected through purposive sampling from those who had filled the questionnaire and expressed willingness to participate. Interview participants had different English proficiency levels, however they had good knowledge of and experience with AI tools in their English language learning. With voluntary participation and the option to withdraw at any time, participants were informed about the confidentiality, data usage and research objectives prior to the interview. Participants were ensured of privacy and gave their written consent (Creswell & Creswell, 2018). A semi-structured interview approach, which is flexible and allows collection of detailed perceptions through open-ended questions (Merriam & Tisdell, 2015) was adopted to ensure honest understanding. The interviews were conducted online via Zoom, considering participants' availability and logistical constraints. Each session lasted between 10 to 20 minutes, and responses were recorded to ensure accuracy in data capture. Through thematic analysis, data were recorded, transcribed, and analyzed (Braun & Clarke, 2006).

4. Results

This section presents the results of both quantitative and qualitative data collected from Pakistani ESL undergraduates to understand their attitudes about AI tools in developing their English writing skills. In the quantitative phase, SPSS 20 software was used to analyze the percentages and descriptive statistics, which highlight the significant findings related to three research questions.

4.1 Quantitative Data Analysis

In this phase, the participants' background information (e.g. age, gender, English proficiency level, and frequency of using AI tools) was analyzed, which helps in interpreting the findings related to other research questions.

Table 2. Demographics of Respondents

Characteristics	Type	Frequency (f)	Percentage (%)
Age	18-25	N=200	93%
	25-30	N=5	2.3%
	30-35	N=7	3.3%
	35-40	N=3	1.4%
Gender	Male	N=84	39.1%
	Female	N=131	60.9%
English Proficiency Level	Beginner	N=144	67%
	Intermediate	N=44	20.5%
	Advanced	N=27	12.6%
Frequency of AI Tool Usage	Daily	N=76	35.3%
	Weekly	N=24	11.2%
	Occasionally	N=112	52.1%
	Never	N=3	1.4%

Demographics provide information about respondents' age, gender, English language proficiency level, and frequency of AI usage. The target population of this research is ESL university undergraduates. Most participants (N=200) are between 18 and 25 years old; 2.3% fall in the 25-30 age range, 3.3% in the 30-35 range, and only 1.4% in the 35-40 age group. Female participants continue 60.9%, which is higher than male participants at 39.1%. Moreover, 67% of participants classify themselves as beginners in English language proficiency, followed by 20.5% at the intermediate level, and 12.6% consider themselves at an advanced level of language proficiency. It shows that the majority of undergraduates are still struggling with their English language learning. Furthermore, AI tools have been used by the majority of the respondents: 35.3% use AI every day, 11.2% every week, 52.1% occasionally, and only 1.4% do not use AI at all. Therefore, AI appears to play an important role in the overall learning of ESL undergraduates.

Research question 1: What are the attitudes of ESL students towards AI to improve writing skills from TAM's perspective?

Table 3. Attitudes towards AI

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
PEOU1	3.7%	2.3%	27.0%	34.9%	32.1%	3.89	1.006
PEOU2	1.9%	7.4%	32.6%	34.9%	23.3%	3.70	.969
PEOU3	4.7%	3.7%	16.3%	39.5%	35.8%	3.98	1.046
PEOU4	2.8%	6.0%	31.6%	39.1%	20.5%	3.68	.958
PU1	3.7%	7.4%	30.2%	34.4%	24.2%	3.68	1.039
PU2	4.2%	6.0%	28.4%	34.9%	26.5%	3.73	1.050
PU3	2.8%	7.4%	28.8%	35.3%	25.6%	3.73	1.014
PU4	2.8%	4.2%	32.6%	35.8%	24.7%	3.75	.967
PU5	1.9%	6.5%	29.8%	40.9%	20.9%	3.73	.929
ATU1	4.2%	3.3%	30.2%	39.1%	23.3%	3.74	.989
ATU2	3.7%	6.5%	32.6%	32.6%	24.7%	3.68	1.034
ATU3	3.7%	10.7%	35.3%	27.0%	23.3%	3.55	1.075
ATU4	3.7%	8.8%	26.0%	36.3%	25.1%	3.70	1.057
BI1	5.1%	9.8%	33.0%	33.5%	18.6%	3.51	1.063
BI2	4.7%	16.3%	31.6%	29.3%	18.1%	3.40	1.101
BI3	5.6%	14.4%	34.0%	28.8%	17.2%	3.38	1.099
AU1	3.3%	5.1%	28.4%	31.2%	32.1%	3.84	1.040
AU2	3.3%	5.1%	28.8%	37.7%	25.1%	3.76	.993
AU3	2.3%	6.5%	27.9%	32.6%	30.7%	3.83	1.015
AU4	3.3%	2.8%	29.8%	33.0%	31.2%	3.86	1.000

Descriptive statistics and percentage analysis of all the constructs of TAM highlight ESL undergraduates' responses signifying positive attitudes toward AI tools in English writing skills. PEOU3 has the highest mean of 3.98, highlighting that the majority of participants perceive using AI is to be simple. This is also confirmed by 75.3% agreement ('Agree' or 'Strongly Agree'). PEOU1, regarding the convenient use of AI, has a mean of 3.89 and only 6% disagree, reflecting the generally positive attitudes of ESL undergraduates. On the other hand, PEOU4, regarding straightforwardness of AI, received a mean of 3.68, while PEOU2, regarding the understanding of AI output, received a mean of 3.70; both are somewhat lower. PEOU2 and PEOU4 indicate that some ESL undergraduates may not perceive AI as intuitive for English writing learning as both received a higher percentage of neutrality. Overall, the mean scores of all PEOU items range from 3.68 to 3.98. The standard deviations of all PEOU items range from 0.958 to 1.046, indicating a moderately dispersed distribution among ESL undergraduates, although most perceive AI as easy to use.

The mean values of PU items range from 3.68 to 3.75 showing relative consistency. PU4 received a mean of 3.75 and the highest level of agreement, signifying that many ESL undergraduates acknowledge AI tools as beneficial for improving English writing skills. However, around 30% of participants remained neutral in PU1 (mean = 3.68) and PU2 (mean = 3.73) despite recognizing the benefits of AI. Neutral responses may be due to uncertainties regarding the long-term usefulness of AI tools or differences in expertise and intellectual skills among ESL undergraduates. Variation in expectations and experiences with AI in English writing improvement is indicated by the moderate standard deviations for PU items, ranging from 0.929 to 1.050.

The mean scores of ATU items, ranging from 3.55 to 3.74, show mostly positive but slightly mixed attitudes of undergraduates regarding the use of AI in improving English writing skills. ATU3 has the lowest mean score of 3.55, showing that excitement about using AI is not as strong as that for PEOU or PU. Moreover, 35.3% of respondents remained neutral and 10.7% disagreed in response to ATU3, as reflected in the percentage distribution. However, although ESL undergraduates find some AI tools attractive and believe it is a good idea for improving English, they may not be strongly enthusiastic, as the means of ATU1 (mean = 3.74) and ATU4 (mean = 3.70) suggest. The ATU data show more inconsistency in the attitudes of ESL undergraduates, possibly due to students' personal preferences or familiarity with AI tools, as revealed by the standard deviations, which range from 0.989 to 1.075.

The mean scores of BI toward AI range from 3.38 to 3.51, which is the lowest among all the constructs. BI1, regarding the willingness to spend time learning how to use AI tools better, received 52.1% agreement which is lower than that of other constructs; however, it received the highest mean of 3.51. BI2, with a mean of 3.40, and BI3, with a mean of 3.38, each received around 20% disagreement, while over 30% of participants responded neutrally. This indicates that ESL undergraduates are less dedicated to using AI consistently in their writing development, even though they acknowledge the effectiveness of AI. Inconsistent responses, as shown in the higher standard deviations, indicate different levels of motivation and potential barriers to the sustained adoption of AI tools.

AU1 with a mean score of 3.84 and AU4 with a mean score of 3.86 reflect the strongest agreement. Overall AU of AI for writing-related activities indicate moderately high mean scores. These mean scores and the percentage distribution, with over 60% of respondents' agreement; confirm that ESL undergraduates use AI frequently for proofreading, vocabulary building, and critical thinking to improve their English writing skills. Conversely, AU2, with a slightly lower mean score of 3.76, indicates that some students may not consider AI important for organizing their writing, although many students use it for structuring their writing. The findings indicate moderate inconsistency, which signifies that the degree of AI use differs among ESL undergraduates, although it is widely used, as suggested by standard deviations for all AU items, ranging from 0.993 to 1.040.

Data analysis of TAM signifies that Pakistani ESL undergraduates mostly recognize the usefulness of AI tools in improving English

writing skills; however, there is inconsistency in their enthusiasm, and the actual use varies. Furthermore, the comparatively high degree of neutral responses among all TAM items indicates that some ESL undergraduates are not confident about the role of AI.

Research question 2: How do ESL students' motivation, engagement, and societal expectations enhance writing skills using AI from CLT's perspective?

Table 4. Role of Motivation, Engagement, and Societal Expectations

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
M1	2.8%	4.2%	13.0%	27.9%	52.1%	4.22	1.012
M2	3.3%	6.5%	14.9%	24.7%	50.7%	4.13	1.094
M3	3.3%	7.0%	24.7%	29.8%	35.3%	3.87	1.077
SE1	3.7%	6.0%	25.6%	31.2%	33.5%	3.85	1.072
SE2	4.2%	5.1%	18.6%	27.0%	45.1%	4.04	1.106
SE3	5.6%	6.0%	25.6%	32.6%	30.2%	3.76	1.118
E1	3.3%	6.0%	36.7%	37.7%	16.3%	3.58	.943
E2	3.7%	6.0%	35.8%	32.1%	22.3%	3.63	1.014
E3	3.3%	9.8%	29.3%	37.7%	20.0%	3.61	1.016

According to the findings, motivation plays a vital role in shaping the attitudes of ESL undergraduates about the acceptance and use of AI in learning English writing skills. 80% of participants showed agreement with 'Agree' and 'Strongly Agree' for the M1 item about their hope to become proficient in English writing. M1 with a mean of 4.22 and an SD of 1.012 presents high intrinsic motivation among ESL undergraduates. Similarly, M2, about their future goals to be proficient in English received 75.4% agreement with a mean of 4.13 and an SD of 1.094. On the other hand, item M3 with a mean of 3.87 and an SD of 1.077 shows that participants were less confident in their English writing skills in academic and professional settings, as 24.7% remained neutral, while 29.8% agreed and 35.3% strongly agreed. It indicates that even with high motivation, some ESL undergraduates are still hesitant to use English writing in practical settings. Higher standard deviations in all items related to motivation reflect inconsistency in the responses of ESL undergraduates, as some students are less confident about their English writing skills while others are highly motivated.

Teachers and parents, through societal expectations, highly influence the attitudes of ESL undergraduates toward using AI to improve their English writing skills. SE1, regarding teachers' expectations to improve English writing skills, had a mean of 3.85 and an SD of 1.072, receiving 64.7% agreement; however, 25.6% neutral responses show that students may receive less support from teachers. SE2 responses regarding parents' expectations are more noticeable as 72.1% of participants agree that their parents believe learning English is essential, with a mean of 4.04 and an SD of 1.106. These findings support the idea of CLT regarding social interactions in learning new knowledge and experiences (Adnan & Sayadi, 2021; Adigun et al., 2024; Vygotsky, 1978). On the contrary, SE3, regarding studying English because people around them think it is important, received lower agreement compared to other societal expectation items. SE3, with a mean of 3.76 and an SD of 1.118, received 11.6% disagreement and 25.6% neutral responses. This reflects that ESL undergraduates are less influenced by people around them, while teachers' and parents' expectations directly influence their attitudes toward using AI to develop their English writing skills.

Engagement with AI-assisted English writing learning presented remarkable neutrality in responses with adequate levels of agreement. E1 regarding enjoyment in participating in English writing exercises using AI tools received 54% agreement with a mean of 3.58 and an SD of .943. Noticeable 36.7% neutral responses to E1 suggest that engagement is not commonly influential. Similarly, E2 (mean = 3.63, SD = 1.014) regarding whether AI tools are engaging for writing tasks and E3 (mean = 3.61, SD = 1.016) regarding the provision of effective learning atmosphere, received around 30% neutral responses and moderate agreement. Findings from engagement-related items, with comparatively higher standard deviations and lower means, indicate that AI experiences of ESL undergraduates may not be the same and are possibly affected by AI knowledge, accessibility, and teaching methods. The attitudes of ESL undergraduates are strongly influenced by motivation and societal expectations; however, further improvement is needed in engagement levels.

Research question 3: What are CLS used by ESL students in AI to develop writing skills?

Table 5. Constructivist Learning Strategies

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
CLS1	2.8%	6.5%	25.6%	42.3%	22.8%	3.76	.970
CLS2	6.0%	4.2%	17.7%	34.4%	37.7%	3.93	1.126
CLS3	1.9%	4.7%	26.0%	40.9%	26.5%	3.86	.929
CLS4	2.8%	5.6%	28.4%	35.3%	27.9%	3.80	1.001
CLS5	3.7%	5.1%	30.2%	36.7%	24.2%	3.73	1.007
CLS6	2.8%	8.4%	27.0%	35.3%	26.5%	3.74	1.030

Responses on CLSs demonstrate how Pakistani ESL undergraduates perceive CLSs while using AI to improve their English writing skills. Mean values of all six CLSs range between 3.73 and 3.93, which points out the positive tendency of ESL undergraduates towards CLSs while using AI. Mean scores above 3.50 on a five-point Likert scale indicate general agreement of participants on effectiveness of AI tools in enhancing their English writing skills. The strongest level of agreement is found in CLS2 with the highest mean score of 3.93 about using AI to review English writing for grammar, punctuation, and clarity. On the contrary, CLS5 presented the lowest mean of 3.73 about collaborating with peers using AI tools for English writing projects which shows that ESL students are not fully utilizing CLSs. SD values

of CLSs range between 0.929-1.126 which demonstrates some inconsistency in responses of the participants. CLS3 about using AI tools to explore sentence structures and improve English writing coherence has the lowest SD of 0.929. It signifies a general agreement among students as most of the participants gave the same responses which are close to the mean scores. On the other hand, CLS2, about using AI tools to review English writing for grammar, punctuation, and clarity, has the highest SD of 1.126 which shows differences among the responses of the students with even the highest mean score. This suggests that some students do not consider this strategy useful although numerous students favor it highly.

Similarly, CLS1 (65.1%) and CLS3 (67.4%) about brainstorming ideas and exploring sentence structures with AI tools are well-supported strategies as both received high agreement levels. Interestingly, CLS2 received the highest percentage of agreement with 72.1% 'Agree' and 'Strongly Agree', which indicates its strong validation among participants. The lowest agreement percentage (60.9%) was received by CLS5 about collaboration with peers using AI tools for English writing projects, and is not frequently used or favored among ESL undergraduates. Furthermore, the level of disagreement ('Disagree' and 'Strongly Disagree') between CLS3 (6.6%) about brainstorming ideas and exploring sentence structures with AI tools and CLS6 (11.2%) about using AI tools to generate the content based on prompts and enhancing creativity, is comparatively low. This proves that the majority of the ESL undergraduates perceive all CLSs useful and effective although there is some inconsistency in their responses and experiences.

These findings reflect that Pakistani ESL undergraduates have positive attitudes towards the integration of AI tools in constructive learning of English writing skills. Use of AI tools to review English writing grammar and clarity have shown the highest approval, on the contrary, collaboration with peers using AI tools for English writing projects receives the least endorsement. Students' perceptions may be influenced by their interaction with AI, preferences, and learning styles which are visible in their inconsistent responses. CLSs foster collaboration, engagement, and practical experiences which increase PEOU and PU to shape ESL undergraduates towards the use of AI in their English writing proficiency (Davis, 1989). AI acceptance may increase among students as they perceive the tangible benefits of AI in constructive English writing learning (Venkatesh & Davis, 2000).

4.2 Qualitative Data Analysis

For the qualitative phase, semi-structured interviews were conducted with ten ESL undergraduates to verify the results of the quantitative analysis. The qualitative data was analyzed using thematic analysis, which revealed key themes and relevant codes that provided valuable insights into participants' attitudes. To ensure the students' anonymity, 'S' is used to represent their responses.

Table 6. Themes, codes and number of responses

Themes	Codes	Responses (N)
Attitudes Toward AI Tools		
Effectiveness	Exposure to different writing styles	2
	Overall efficiency in writing (Davis, 1989)	6
	Reduce learning anxiety	4
	Self-regulated learning	5
Accessibility	Personalized learning	3
	Internet not always be available	1
	Instant feedback	8
	Complex to use all features (Venkatesh & Davis, 2000)	2
	Subscription issues	7
Challenges	No explanation of corrections (Benson & DeKeyser, 2018)	2
	Ambiguous answers	6
	Reduce creativity and critical thinking	2
	Over-dependency	4
	Misguide and spoil the original meaning	3
	Lack comprehensive feedback (Oxford, 1990)	1
	Unreliable because of server overloads	1
Expectations from teachers and administration	Free access to AI tools	3
	Curriculum based AI learning	1
	AI literacy training	4
	Guidance about the selection of AI tools	2
	Clear ethical instructions	3
	Provision of Internet and infrastructure	2
Motivation, Engagement, and Societal Expectations		
Self-efficacy	Interactive learning experiences	3
	More enjoyable than traditional learning	5
	Develop sense of achievement	2
	Makes more diligent in writing	4
Influence of surrounding people	Prefer learning from teachers	3
	Limited use of AI	2
	Excitement about AI	2

The usefulness of AI tools is confirmed by many participants. AI tools help them with exposure to different writing styles. Most of the students mentioned that AI tools help them with vocabulary, grammar and overall language proficiency (Davis, 1989). For example, S4 stated "*AI tools helped me expand my vocabulary knowledge and improved the flow of my writing. I learned how to organize my writing while expressing my ideas*." Four students mentioned that AI tools alleviated their learning anxiety and gave them confidence to write by giving them ideas when they are stuck. One student shared that AI tools also help in argumentative writing by generating ideas. S7 mentioned, "*I was always reluctant to do creative writing and argumentative writing. I was afraid that I would not write in correct grammar and spelling, so I always crammed. AI tools reduced my anxiety and made me feel confident in argumentative writing smoothly."* Moreover, five students expressed that AI tools in learning English writing empower them in independent learning. S3 stated in this regard, "*AI tools helped me become an autonomous student. They guided me on how to manage my learning pace and style*."

Eight out of ten ESL undergraduates appreciated the instant feedback quality of AI tools in improving their English writing. S1 confirmed, "*My writing skills have significantly improved by AI tools, especially because of the instant feedback provided by them. It helped me bring cohesion and coherence to my writing."* Three students mentioned AI as a personal guide that helps them as per their need. S8 stated, *"I really like the personalized feedback provided by AI. AI has the ability to address my personal needs and assist me in improving where required."* However, seven students expressed their frustration about the subscription fees of most AI tools. S1 commented, *"Sometimes I want to use AI for a longer time but its limited use and subscription fee disappoints me. I feel that subscriptions should be free or accessible through our university."* Inconsistent internet access was also mentioned as a barrier by one of the respondents. S4 stated, *"Although AI tools adjust to my style and pace, and I can access them anytime and anywhere, my English writing learning experiences are often interrupted by unreliable internet access. Sometimes AI tools provide unreliable feedback due to poor internet connectivity and server overloads."*

Regardless of the usefulness of AI tools reported by Pakistani ESL undergraduates, they also mentioned several challenges. Six students discussed the ambiguous answers provided by AI tools. Similarly, S1 and S8 commented on the incomplete answers by AI tools. As S1 remarked, "*Often I have to cross-check the answers provided by AI tools with other sources to understand the reason for my error as AI tools sometimes provide unclear suggestions and correct mistakes without explaining why."* Over-dependency is also a concern among students as mentioned by S5, *"No doubt, AI tools are great support in writing instruction but sometimes I am too lazy to do short assignments on my own, I rely too much on these tools which hinder my critical thinking and creativity. Then I remind myself to complete my assignments independently rather than using AI tools every time."* Moreover, three students commented on the irrelevant answers and misinterpretations of meaning by AI tools, S9 remarked, *"I really enjoy instant feedback by AI, however, it sometimes misinterprets the intended meaning, and changes the actual meaning of my writing. I end up spending double the time in reviewing its feedback critically. I believe teacher guidance is matchless."*

When students were asked about their expectations from teachers and university administration regarding the use of AI tools in improving English writing skills, they expressed a strong desire for free access to AI tools and AI literacy training. S3 stated, *"I am not proficient in using all the features of AI due to their complexity. Therefore, I need guidance to understand its strengths and limitations and training on how to use AI tools effectively."* Students' responses showed that ESL teachers do not always encourage the use of AI tools by students. As mentioned by S6, *"some of our teachers encourage us to use AI tools; on the other hand, some teachers believe using AI tools makes students dependent and hinders critical thinking. We should be given clear ethical guidelines to follow."* Only one student (S10) expressed the desire for curriculum-based AI learning as *"we should be taught by teachers about the selection and practical use of AI tools in class to make these tools more beneficial and structured."*

The use of AI tools has increased ESL undergraduates' motivation and engagement in constructing knowledge of English writing. AI tools make students more diligent and foster a sense of achievement through enjoyable interactive learning. For example, S7 remarked, *"Using AI to enhance my writing is fun! It's better than just listening to the lecture in class."* Another respondent stated, *"I'm more confident to see my progress in English writing. I'm more enthusiastic and engaged as it gives me a sense of achievement."* Some students expressed less belief in AI tools due to their experiences and the influence of the people around them. S9 mentioned, *"My teachers encourage me to improve English with limited use of AI tools. I also prefer learning from my teachers as their explanations are more logical and contextual."* S4 commented on their parents' view of AI in learning English, *"My parents think using AI will make me lazy as it is too advanced; however, they encourage me to learn English for future job opportunities."* Conversely, students show excitement and engagement when using AI in English assignments with peers. As S2 remarked, *"I use AI with my classmates to get help in our group assignments but some of them say using AI is cheating and it doesn't help improve English writing."*

The analysis of qualitative data highlights the attitudes of Pakistani ESL undergraduates toward AI in learning English writing skills. AI tools are perceived as effective, motivating and engaging tools for improving English writing. Some potential challenges are also identified through thematic analysis, for example, practical challenges, accessibility concerns, and ethical considerations faced by ESL students. AI tools foster self-regulated learning and efficiency; nevertheless, they may also reduce creativity and lead to dependency. Students expressed certain expectations from teachers and administration regarding ethical guidelines, AI training, and tool selection.

5. Discussion

This research strived to investigate the attitudes of Pakistani ESL undergraduates toward AI tools for improving their English writing skills. Based on AICLM, this study adopted a mixed methods approach to gain a thorough understanding of the attitudes of students. The

findings suggest that ESL undergraduates have overall positive attitudes towards the use of AI tools to enhance their writing skills. These findings support previous research conducted by Yan (2023) and Liu et al. (2021), which also found that AI tools assist EFL learners in improving their writing. Similarly, AI-assisted learning helps students choose better vocabulary, construct grammatically correct sentences, and generate ideas, leading to improved writing and greater involvement in writing activities. As a result, students became more involved in their writing tasks, which likely contributed to their overall improvement. However, some challenges regarding the accuracy of AI-generated responses, accessibility, and over-dependency were also identified. The findings are discussed with reference to theoretical frameworks and previous research in this section. Quantitative data analysis shows that AI tools are perceived as useful and easy to use in improving writing skills by most ESL undergraduates. This finding supports TAM, which suggests that if users perceive ease of use, it influences perceived usefulness and then leads to the adoption of technology (Davis, 1989; Venkatesh & Davis, 2000). Moreover, this claim is supported by qualitative data, where ESL undergraduates reported that AI tools enhanced vocabulary, provided exposure to various writing styles, and improved grammar.

The findings of this study align with Hwang et al. (2023), who also found that AI tools improved writing tasks by offering a personalized learning experience. In personalized learning, students can work at their own pace, receive instant feedback, and enhance their writing more efficiently. This type of learning increases motivation and helps address writing issues effectively (Huang et al., 2024). CLT by Vygotsky (1984) also supports this finding, as students gradually improve their writing skills through interaction with AI tools. The findings from quantitative and qualitative data support the idea that ESL undergraduates improve their creative, argumentative and overall academic writing skills. Previous studies conducted by Su et al. (2023) and Ippolito et al. (2022) also showed that argumentative writing is supported by AI tools through immediate feedback on content, grammar, and overall language use. Feedback provided by AI tools on multiple aspects of writing enhance students' writing coherence and organization. Moreover, interaction and immediate feedback help develop students' writing skills (Wang, 2022; Zhao, 2022; Barrot, 2023).

The mean scores of attitudes and behavioral intentions suggest that ESL undergraduates are not fully committed to using AI tools in their writing process, although they recognize the potential benefits of AI tools. Societal and student concerns about reduced creativity, critical thinking, and over-dependency may be reasons for its limited use. It is vital to maintain a balance in using AI tools to develop learners' critical thinking (Utami & Winarni, 2023). However, the risk of over-dependency on AI tools, which can limit critical thinking and creative writing, is mentioned as a main concern by ESL undergraduates; this idea aligns with the findings of Utami & Winarni (2023). Concerns regarding the accuracy of AI-generated feedback is also sometimes ambiguous and does not match the context and can distort the intended meaning of the writing (Utami & Winarni, 2023; Rahman et al., 2023). The mean scores of actual AI use indicate that ESL undergraduates use AI at a moderate level, primarily for sentence structuring, brainstorming ideas, and proofreading.

Societal expectations and students' motivation play a significant role in the adoption of AI. ESL undergraduates perceive English proficiency as important for their future careers, which increases their willingness to use AI tools in improving writing skills (Dörnyei, 2009). Previous studies by Huang et al. (2024), Utami and Winarni (2023) and Rahman et al. (2022) support the claim that AI-assisted learning increases students' motivation and engagement in English writing activities. Conversely, mixed perceptions are reported in societal expectations as some parents and teachers encourage the use of AI, while others view it as a possible barrier to autonomous learning. Mixed societal expectations highlight the need for guidelines and ethical instructions on the use of AI in education. Moreover, the analysis of engagement construct suggests that although AI enhances interactivity in learning, not all students become fully engaged in AI driven activities (Rad et al., 2023; Zimmerman, 2002). The integration of AI tools in learning English writing skills makes learning more enjoyable, engaging, while also increasing students' confidence through AI's interactive nature and immediate feedback (Huang & Tan, 2023; Su et al., 2023). Another important finding from the qualitative data is ESL undergraduates expect AI literacy training, free access to AI software, and its integration into the curriculum. In the light of findings, it is recommended that teachers should combine AI with learner-centered approaches, for example, using it to support feedback, vocabulary building, and grammar awareness while focusing on critical thinking and originality. Moreover, teachers should also encourage students to analyze, revise, and reflect on AI-generated content to make AI a support tool rather than a substitute for original thinking. To effectively support the integration of AI in improving English writing skills, all universities and education authorities in Pakistan should implement training programs and clear guidelines on responsible AI use to mitigate ethical risks such as plagiarism or loss of critical thinking by integrating AI literacy into the curriculum and promoting critical engagement with AI tools rather than passive reliance.

6. Conclusion

This study aimed to explore the attitudes of Pakistani ESL undergraduates toward the use of AI in enhancing English writing proficiency through mixed-method research. CLT was used to investigate constructivist learning strategies employed by ESL undergraduates and the influence of motivation, societal expectations, and engagement on the adoption of AI in improving writing skills. TAM was employed to examine the perceived ease of use, perceived usefulness, and attitudes toward actual use of AI. The research concluded that students recognize the potential of AI and generally hold a positive attitude toward it for improving their writing skills. However, attitudes and behavioral intentions received slightly lower scores indicating that although AI's effectiveness is acknowledged by ESL undergraduates, they do not fully integrate it into their writing tasks. According to CLT, motivation and societal expectations play an important role in AI adoption. Therefore, variations in behavioral intention highlighted different levels of motivation and engagement with AI tools for writing improvement. Furthermore, students integrate various CLSs with AI, such as collaborating with peers, feedback analysis, reviewing English writing for grammar, punctuation, coherence, and clarity to enhance their writing proficiency. However, some factors such as the

risk of over-dependency, ethical concerns, and subscription issues influence the adoption of AI. To ensure active student engagement with AI instead of its passive acceptance, the study suggests incorporating more learner-centered and interactive approaches, which support constructivist principles. This study also highlights the need for pedagogical strategies that integrate AI tools in ways that enhance traditional writing instruction rather than replacing it. The study underscores the significance of administrative and instructional support, ethical guidelines, and literacy training in optimizing AI's role in English writing improvement. Future studies may use AICLM and consider comparative or experimental studies to investigate the efficiency of AI tools in other English language skills.

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Authors' contributions

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this research.

Informed consent

Obtained.

Ethics approval

This study was conducted in strict adherence to ethical guidelines to ensure the confidentiality and respect of all participants involved. All participants were informed about the research aims, procedures, voluntary participation, anonymity, and their right to withdraw at any time before providing written consent to participate.

Provenance and peer review

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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