



Artificial Intelligence-Assisted Writing in English Language Learning: Cognitive and Psycholinguistic Effects on Creativity, Critical Thinking, and Writing Performance

Dr. Tahira Adeel Zaman^{*a}, Nida Shabbir^b, Ishtiaq Ahmed Kolachi^c

- a. Assistant Professor, Department of Communication and Languages, College of Business Management, Institute of Business Administration (IoBM)
- b. Senior Lecturer, SZABIST University
- c. Assistant Professor, Mohammad Ali Jinnah University, Karachi.

ARTICLE INFO

Received:

May 02, 2026

Revision Received:

May 16, 2026

Accepted:

June 02, 2026

Available Online:

June 21, 2026

Keywords:

AI-Assisted Writing, English Language Learning, Creativity, Critical Thinking, Cognitive Processes, Psycholinguistic Processes, Writing Performance, Artificial Intelligence.

ABSTRACT

The relationships among AI-assisted writing, creativity, critical thinking, cognitive and psycholinguistic processes, and English writing performance were explored in the context of university learners. A quantitative cross sectional correlational research design was used and the subjects were 300 undergraduate students who were randomly drawn from public and private universities of Karachi, stratified sampling. The data was collected by using structured questionnaire and analyzed by descriptive statistics, Cronbach's alpha, Pearson correlation and regression analysis. All reliability coefficients were within the range of .82 to .91 which suggested good to excellent internal consistency. Creativity ($r = .58, p < .01$) and critical thinking ($r = .55, p < .01$), cognitive processes ($r = .67, p < .01$), psycholinguistic processes ($r = .60, p < .01$), and writing performance ($r = .65, p < .01$) were significantly associated with AI-assisted writing. The results of regression analysis indicated that the AI-assisted writing could account for 33.6%, 30.3%, 42.3%, and 44.9% of the variance in creativity, critical thinking, writing performance, and cognitive processes, respectively. The psycholinguistic processes accounted for 53.3% of the variance in writing performance, and the cognitive processes accounted for 47.6% of the variance. The results underline the importance of balanced AI interfacing that allows for higher-order thinking, language processes and writing development without compromising autonomy of the learner.

1. Introduction

AI has been a game-changer in the field of English language learning, especially with the advent of AI writing assistants that offer real-time and personalized language support to students (Aslam et al., 2025; Kim et al., 2024). Generative AI applications can assist English as a Foreign/Second Language (EFL/ESL) learners with brainstorming, vocabulary selection, grammatical accuracy, sentence construction, organization, revision, and feedback, thereby facilitating multiple stages of writing (Xiao et al., 2025). In the field of English language learning, writing is especially significant, as writing is not only a language skill but also a skill of creativity, reasoning and critical thinking. Thus, writing is not simply a grammatical product but a cognitively complex activity that requires planning, generating ideas, problem solving, linguistically constructing the ideas, monitoring,

* Correspondence to: Assistant Professor, Department of Communication and Languages, College of Business Management, Institute of Business Administration (IoBM)
E-mail address: tahira.adeel@iobm.edu.pk (T. A. Zaman)



and revising. According to recent studies (Teng & Shen, 2025), planning and monitoring show strong correlations with the performance of EFL learners in writing tasks with ChatGPT. Additionally, from a psycholinguistic point of view, writing also involves efficient lexical retrieval, syntactic formulation and language processing. AI support can support these processes with vocabulary, linguistic structure and feedback, but it can also shift cognitive workloads from learners to technologies.

Although AI-supported writing has emerged as a trend, the previous studies have mostly focused on writing quality, grammar enhancement, feedback, perceptions of the learner, and the acceptance of AI (Kim et al., 2024). Fewer studies have focused on the role of AI in shaping the cognitive and psycholinguistic mechanics of writing. This is a concern because AI can have a positive impact on language skills, but relying too heavily on AI can also lead to a decrease in independent problem-solving, creativity, and critical thinking (Chanpradit, 2025).

While recent studies show associations between AI support, metacognitive strategies, critical thinking, and writing performance (Hong et al., 2025), few quantitative studies explore the relationship among creativity, critical thinking, and writing performance within cognitive and psycholinguistic processes. Specifically, some of the lexical retrieval, syntactic formulation, planning, generation of ideas, problem solving, and revision processes are still not sufficiently linked to AI-supported EFL writing research (Aslam et al., 2025). Thus, there is a need for an integrated quantitative model to explain these relationships.

This study builds on the previous research on language learning using the aid of AI and combines the perspectives of cognitive and psycholinguistic approaches. The results can inform teachers to create writing practices with the support of AI, which will enhance student language development and not compromise the agency, creativity, and critical thinking of students. The study can be pedagogically helpful for balanced teaching of writing with the help of AI and offer quantitative evidence for the mechanism by which the use of AI in writing affects writing performance.

1.1. Research Objectives

- To examine the effect of AI-assisted writing tools on creativity, critical thinking, and English writing performance among language learners.
- To investigate how AI-assisted writing influences cognitive processes involved in planning, idea generation, linguistic formulation, revision, and problem-solving.
- To examine the role of psycholinguistic processes, including lexical retrieval, syntactic formulation, and language processing, in explaining the relationship between AI-assisted writing and writing performance.

1.2. Research Questions

- How does the use of AI-assisted writing tools influence learners' creativity, critical thinking, and English writing performance?
- How do AI-assisted writing tools affect cognitive processes such as planning, idea generation, problem-solving, and revision during English writing?
- How do psycholinguistic processes such as lexical retrieval, syntactic formulation, and language processing contribute to learners' writing performance when using AI-assisted writing tools?

2. Literature Review

2.1. Artificial Intelligence in English Language Learning

AI is a significant technological advancement in the education sector that enables systems to produce content, understand language, give feedback, and facilitate personalized learning (Alsaedi, 2024). AI assisted Language Learning has grown significantly since the emergence of Generative AI (GenAI) like ChatGPT in the context of English Language Education. The technologies enable learners to engage with language in an interactive way and to get instant linguistic support. From the perspective of EFL/ESL writing, GenAI can be used as a writing assistant, feedback and/or assessment tool to work with students through various stages of writing (Xiao et al., 2025). Studies show that AI can enhance the access to personalized feedback, writing assistance, grammar support and learning materials, but the educational benefits rely heavily on how learners interact with the AI's output. Therefore, its potential benefits come with concerns of inaccurate information, plagiarism, academic integrity, and learner dependency (Deep et al., 2025).

2.2. AI-Assisted Writing Tools

AI writing tools have grown beyond simple grammar checkers and now offer an interactive platform that can brainstorm ideas, suggest terms, rearrange sentences, generate text, provide feedback, and make revisions (Alsaedi, 2024; Tran, 2025). Empirical evidence indicates that modern GenAI tools can be beneficial for brainstorming, outlining, organizing, and providing feedback in EFL writing practice (Alpar, 2025). Technological feedback might also prompt students to make more frequent edits to their texts than with teacher feedback, especially when paired with teacher feedback (Tran, 2025). However, there are pedagogical issues that arise with the ready-made linguistic and conceptual solutions that are available. Based on the systematic evidence, the problems faced by EFL/ESL writing are: overreliance, inconsistent feedback, originality, academic integrity, and possible learning loss in the process of writing with ChatGPT (Alsaedi, 2024). Therefore, it is crucial to be actively cognitively involved in the writing process, not simply absorb the products of artificial intelligence.

2.3. Creativity in English Writing

Creativity is one of the key elements of English writing as it requires students to come up with new ideas, multiple perspectives, flexibility in thinking and expressing things in their own unique way. AI can support the creative writing process by generating ideas, suggestions, and alternatives, offering vocabulary and examples, and even proposing directions for writing. According to the systematic review of ChatGPT in EFL/ESL writing, the AI can enhance the creativity and efficiency of writing in EFL/ESL (Alsaedi, 2024; Aslam et al., 2025). However, AI support does not necessarily guarantee greater originality. Over-reliance on synthesized text can level down learner's voice and uniformity. Based on the latest synthesis, there is a general trend that GenAI writing is more formal, academic and impersonal while human writing may have more personal and creative attributes (Li, 2025). AI can then best be used as a catalyst for creativity rather than as a tool for learners' idea generation.

2.4. Critical Thinking in Writing

Critical thinking is another essential element of good English writing, and includes elements such as analysis, evaluation, reasoning, and argument development, assessment of evidence, decision-making and problem-solving (Alsaedi, 2024; Tran, 2025). GenAI will make this process different as learners will be able to get instant arguments, explanations, counterarguments, and recommendations that will need to be assessed for relevance and credibility (Li, 2025). Consequently, AI-assisted writing can encourage critical thinking when students compare, question, modify, and evaluate generated suggestions rather than accepting them automatically. The deliberate use of GenAI in EFL writing and revision activities has been linked to enhancements in argument development, logical structuring, critical analysis, and innovative ideas (Aslam et al., 2025). On the other hand, blindly trusting AI-generated content could limit opportunities for critical thinking. Therefore, critical AI literacy is essential to ensure that technology provides support, not replaces, learners' evaluative thinking.

2.5. English Writing Performance

English writing performance is the learners' ability to communicate effectively using accurate, coherent, cohesive, organized and linguistically appropriate written language. The key components of its major dimensions are: grammatical accuracy, vocabulary usage, sentence construction, coherence, cohesion, organization, quality of content and overall proficiency. It is more and more clear that AI-powered feedback can have a positive impact on these dimensions. For instance, it has been found that providing feedback with the assistance of GenAI leads to better overall writing abilities, greater frequency of revision, and better writing content, organization, and cohesion (Mekheimer, 2025). Likewise, using ChatGPT and Grammarly in ESL writing education has been correlated with better grammatical accuracy, text coherence, and organization (Jaramillo et al., 2025). Overall, the results suggest that AI can enhance writing skills when integrated into instructional frameworks.

2.6. Cognitive Processes in Writing

Writing is a complex cognitive process that has to rely on a set of interrelated processes including planning, goal setting, ideation, organization, linguistic formulation, problem-solving, monitoring, and revision. These processes are recursive (but not strictly sequential) as writers revisit ideas and language throughout their writing. Studies on L2 writing (Tabari & Golparvar, 2024) show that planning focuses learners' attention on content and organization, while lexical and grammatical encoding and monitoring are salient in the process of actual text production. When it comes to language production, cognitive resources are finite, learners' attention has to be divided between content and language production (Kormos, 2023). AI may help to re-distribute this cognitive process by helping to plan, generate ideas, formulate them, solve problems and revise. While these writing processes might release some resources that can be devoted to higher-order thinking, over-cognitive scaffolding might decrease the extent to which learners engage with these writing processes on their own.

2.7. Psycholinguistic processes involved in writing

According to psycholinguistic aspect, in English writing, student needs to put the conceptual idea into the language by means of lexical retrieval, syntactic formulation and language processing. The basic skill of lexical retrieval is the ability to retrieve and retrieve suitable words from memory, while syntactic formulation is the skill of arranging the lexical items in grammatically and structurally suitable sentences. All of these processes need to occur concurrently with the incorporation of vocabulary and grammatical knowledge, which would put a lot of demands on the L2 writers. Evidence shows that cognitive resources, such as working memory, have distinct associations with writing complexity, accuracy and fluency (Li, 2023). These psycholinguistic processes can be assisted by AI, which can provide word suggestions, grammatically correct forms, and sentence rephrasing's, to make linguistic alternatives instantaneously available. However, repeated reliance on such external support may reduce opportunities to independently retrieve vocabulary and formulate syntactic structures.

2.8. AI-Assisted Writing and Cognitive Processes

The role of AI in writing goes beyond surface-level linguistic correction, as GenAI can be used to plan, develop, problem-solve, provide feedback, monitor, and revise. Research in progress thus presents AI as a type of cognitive scaffolding. It has been demonstrated that generative AI scaffolding can enhance learners' engagement and EFL writing skills (Ding & Song, 2025). However, the effectiveness of this support seems to be related to learners' metacognitive awareness. Teng (2024) discovered that the metacognitive awareness, critical thinking and cognitive effort of EFL learners impact the effectiveness of their use of ChatGPT to write feedback, where learner behaviour is found to be simple copying or purposeful engagement with feedback (Teng, 2024). AI assistance should, therefore, promote the active monitoring and decision making rather than replacing it.

2.9. AI-Assisted Writing and Psycholinguistic

The use of AI-integrated writing tools can have a psycholinguistic effect by offering instant word retrieval and selection, sentence building, grammatical structuring, and reformulation. This support may help reduce the linguistic load placed on the EL while also providing more time for meaning and organization and argumentation. Theoretically, however, the link is fairly complicated, as outside access to words and syntactic structures may alter the independence level of word and syntactic retrieval and production. Therefore, the role of writer agency and the capacity to assess AI-generated texts are critical to good use of GenAI in L2 writing (Li, 2025). In that way, AI can help with language processing, but can also lead to a psycholinguistic dependence on the technology when students delegate lexical and syntactic choices to the technology.

2.10. Research Gap

The literature emerging has shown much interest in English writing assisted by AI, but there are gaps to be filled. Current research often focuses on writing quality, feedback, learner perceptions, acceptance, or broader educational impacts, but the processes involved in AI-assisted writing are less well studied (Xiao et al., 2025). Specifically, cognitive processes like planning, idea generation, problem solving, monitoring and revision have been investigated rarely in conjunction with psycholinguistic processes, like lexical retrieval, syntactic formulation and language processing. Additionally, there is scarce quantitative evidence to relate such mechanisms to creativity, critical thinking and English writing performance. Hence, the quantitative study of the impact of AI in writing must not only be made to explain that the use of such tools benefits learner outcomes, but also illuminate the cognitive and psycholinguistic processes by which this occurs.

3. Theoretical Framework

3.1. Cognitive Process Theory of Writing

This study is largely based on Flower and Hayes' Cognitive Process Theory of Writing, which views writing as a complex and recursive cognitive process, not the mere creation of written text. The framework recognizes planning, translating/formulation, reviewing and monitoring as interdependent tasks in which writers develop ideas, set goals, organize information, solve problems, formulate language and revise written products. The processes are of continued significance in the context of second-language writing, where learners need to respond to conceptual and linguistic requirements. The research conducted in recent years has confirmed the continuing significance of planning, working memory, and cognitive resources allocation in the processes and performance of L2 writing (Johnson, 2020) (Kormos, 2023). Therefore, this theory can offer a suitable base to explore the impact of AI writing on learners' planning, ideation, problem-solving, formulation, monitoring, and revision.

3.2. Psycholinguistic Model of Language Production

The study also takes a psycholinguistic language-production approach to understand English writing. From this perspective, language production requires writers to retrieve appropriate lexical items, encode grammatical information, construct syntactic structures, and integrate these processes into meaningful linguistic output. The recent L2 writing research has shown that, in

L2 writing, the process of lexical retrieval and syntactic processing are mutually influencing and are influenced by the L2 learners' proficiency level and the task setting (Fan & Wang, 2024). The use of AI-supported writing can affect these psycholinguistic processes through vocabulary suggestions, grammatical error corrections, and sentence rephrasing's, which can affect the way a learner can retrieve and produce language.

3.3. Cognitive Load Perspective

The theory of cognitive load also sheds light on how AI support can affect the cognitive load of students when composing texts. AI may help alleviate the burden of mundane tasks in language processing and offer cognitive support for more complex tasks, enabling students to focus more on higher-order cognitive skills like reasoning, creativity, and critical thinking. Previous studies on AI writing in EFL have found that AI with suitable reflective strategies can help lower cognitive load (Liu et al., 2021). The use of writing with AI, however, also poses unique cognitive challenges, such as prompt management, critical evaluation, synthesis, and authorial processing (Yao & Fan, 2025). Therefore, over-reliance on AI can limit the level of autonomous cognitive involvement of learners. These three perspectives offer a comprehensive theoretical framework to explore how the use of AI in writing might relate to the cognitive and psycholinguistic processes impacting creativity, critical thinking, and English writing skills.

3.4. Conceptual Framework

This conceptual framework of this study describes the relationships between AI-assisted writing, cognitive and psycholinguistic processes, creativity, critical thinking, and English writing performance. AI-assisted writing is included as the independent variable, as AI tools offer learners support in brainstorming, idea development, vocabulary selection, sentence construction, feedback and revision. The research indicates that the writing process of EFL learners can be scaffolded through various facets by using AI writing tools, such as idea generation, vocabulary building, and linguistic precision (Alghasab, 2025).

As shown in Figure 1, AI-assisted writing is suggested to impact three dimensions, all of which are interconnected. The first one consists of cognitive functions such as planning, generating ideas, formulating language, revising, and problem-solving. The second includes psycholinguistic processes especially lexical retrieval, syntactic formulation and language processing. AI tools can help with these processes by offering alternative linguistic options and helping to construct sentences (An, 2025). The third dimension is about creativity and critical thinking, which involves students' ability to produce their own ideas, and critically assess information and AI-provided ideas. AI-integrated writing that is structured is promising in enhancing the critical evaluation and cognitive engagement (Hong et al., 2025). These processes are hypothesized to be responsible for the accuracy, coherence, organization, vocabulary, grammar, and quality of written English (Mekheimer, 2025).

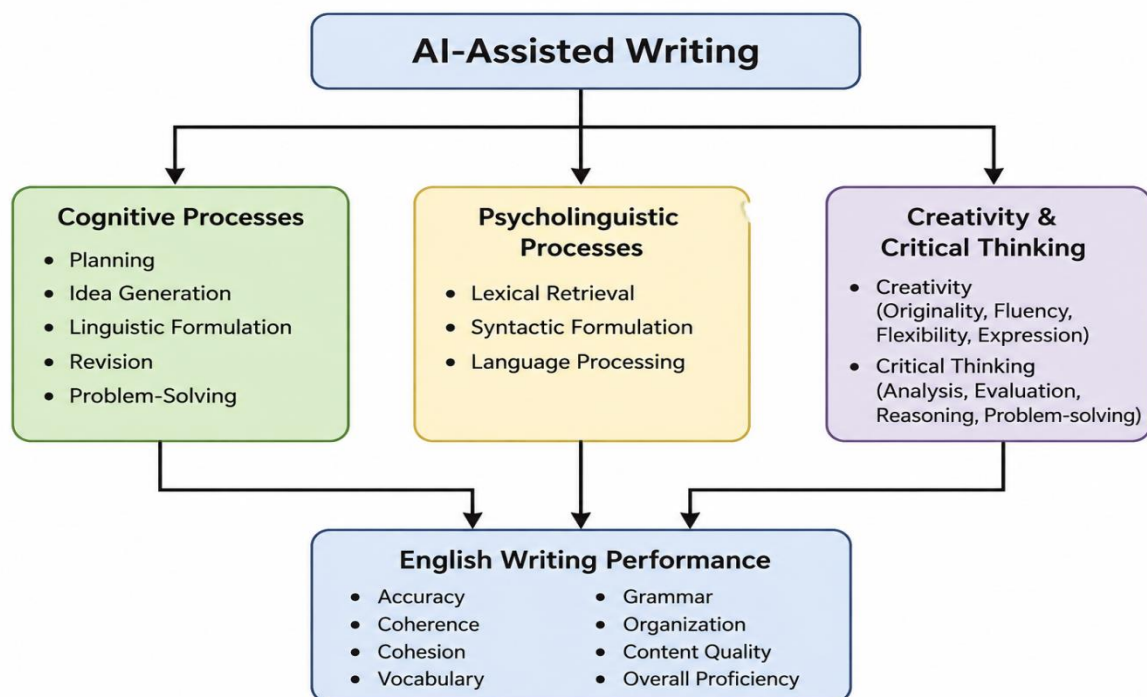


Figure 1. Conceptual framework showing the proposed relationships between AI-assisted writing, cognitive processes, psycholinguistic processes, creativity, critical thinking, and English writing performance.

3.5. Hypotheses

H1: AI-assisted writing tools have a significant positive effect on learners' creativity.

H2: AI-assisted writing tools have a significant positive effect on learners' critical thinking.

H3: AI-assisted writing tools have a significant positive effect on English writing performance.

H4: AI-assisted writing significantly influences cognitive processes involved in planning, idea generation, linguistic formulation, revision, and problem-solving.

H5: Psycholinguistic processes, including lexical retrieval, syntactic formulation, and language processing, have a significant positive relationship with English writing performance.

H6: Cognitive processes significantly contribute to English writing performance among learners using AI-assisted writing tools.

4. Research Methodology

4.1. Research Approach

This study used a quantitative research method to examine the relationships between AI-assisted writing, creativity, critical thinking, cognitive writing processes, psycholinguistic processes, and English writing performance. This was suitable given that the constructs identified were measured numerically using a structured questionnaire and the hypotheses proposed were tested statistically. Recently, quantitative survey technique has been used for research on students' creativity and critical thinking results when using AI (Hasan et al., 2025).

4.2. Research Philosophy

This study used the positivist research philosophy approach that was appropriate for the quantitative research approach. Positivism was found to be appropriate as the research analyzed the phenomenon as measurable objects such as AI-assisted writing and cognitive outcomes, psycholinguistic outcomes, and learning outcomes. Data were collected in a systematic manner, relationships between variables were explored objectively and hypotheses were tested using objective statistical procedures. Therefore the positivist approach gave a suitable philosophical ground to study variables statistically and identify patterns among the variables.

4.3. Research Design

The research design used was quantitative cross sectional correlational. The data collected were collected at a single time point and no experimental manipulation of the study variables occurred. The correlational part allowed the researcher to find the direction and magnitude of the relationships between the variables of the AI assisted writing, creativity, critical thinking, cognitive processes, psycholinguistic processes and writing performance. Cross-sectional survey designs have also been employed in recent studies on higher education to explore relationships between observable constructs of students (Rjoub et al., 2025).

4.4. Population

The subjects were undergraduate university students learning English who had experience with AI-assisted writing tools. The population consisted of English language learners, BS English students, and the university students who are enrolled in English language or academic writing courses. This population was deemed suitable because these students were directly involved in English writing tasks, and they accumulated enough experience on the use of AI-based writing tools to give feedback on their cognitive, psycholinguistic, creative, critical thinking and writing experiences.

4.5. Sample Size

A sample of 300 undergraduate students was selected for the main study. The number of observations in the sample was adequate for the planned descriptive, correlational, and regression analyses and for representation of students from various educational backgrounds. Moreover, the 300 students from university align with recent quantitative studies on the use of AI and higher order students' skills (Hasan et al., 2025). The students who did the pilot study were not part of the sample.

4.6. Sampling Technique

Stratified random sampling method was used to increase the representativeness of the target population. The participants were first stratified by public and private universities and then random sampling was done within the strata. Where appropriate, additional stratification was based on students' year of study and academic discipline. This helped to minimize the risk of important subgroups of students being underrepresented in the study. Stratified sampling technique also has been used for quantitative university research in recent years concerning the university outcomes and AI (Hasan et al., 2025).

4.7. Inclusion Criteria

The participants included undergraduate university students studying English or academic writing, who had experience with AI-assisted writing tools, and who gave informed consent. Students who were not familiar with AI-supported writing or not in the specified educational objectives were removed. To be independent of the pilot testing to the main investigation, the sample of 300 students also excluded participants involved in the pilot study.

4.8. Research Instrument

A structured questionnaire with 5-point Likert scale was used to collect data. The questionnaire consisted of seven sections. In section A, researchers gathered information related to gender, age, highest educational attainment, academic field, type of the university attended, how often they use AI tools, and which type of AI writing tool they use. Section B evaluated AI-assisted writing support by idea, feedback, grammar, vocabulary, revision and writing guidance. Section C focused on creativity - originality, idea fluency, flexibility, and creative expression - and Section D on critical thinking - analysis, evaluation, reasoning, evidence assessment, and problem-solving. Section E assessed cognitive processes in writing (planning, idea generation, linguistic formulation, revision and problem solving). Lexical retrieval, syntactic formulation and language processing were measured in section F which examined psycholinguistic processes. Lastly, organization, grammar, vocabulary, coherence, cohesion, content development, and overall writing quality were evaluated in writing in Section G.

4.9. Validity and Reliability

4.9.1. Content Validity

Content validity of the research instrument was conducted using experts. The questionnaire was reviewed by experts in the field of English language teaching, psycholinguistics and educational technology to assess the relevance, clarity, appropriateness and representativeness of the items. Prior to pilot testing necessary changes were made according to their recommendations. A similar approach of expert review has been used in recent years in questionnaire-based educational studies to ensure content relevance and clarity (Rjoub et al., 2025).

4.9.2. Pilot Study

Before the main data collection the pilot study was conducted with around 30 undergraduate students. The purpose of the pilot study was to test the clarity, comprehensiveness, wording, organization, and suitability of the questionnaire items, and to detect any potential difficulties before administering the final questionnaire. Pilot participants shared characteristics with their target population of 300 participants but were not part of the 300 respondents. Pilot testing has been employed in the recent questionnaire studies of undergraduate students, prior to the main data collection (Xu et al., 2025).

4.9.3. Reliability

Cronbach's alpha was used to examine the internal consistency of the multi-item scales, and the reliability of the questionnaire was determined. If Cronbach's alpha coefficient was $> .70$, it was deemed acceptable. Reliability was calculated separately for the AI-Assisted Writing, Creativity, Critical Thinking, Cognitive Processes, Psycholinguistic Processes, and Writing Performance scales. The Cronbach's Alpha method of internal consistency of questionnaire constructs used is in line with modern cross-sectional quantitative studies (Moussa et al., 2025).

5. Data Analysis

5.1. Demographic Analysis

The collected data were coded and analyzed with the help of IBM SPSS Statistics. Frequencies and percentages were used for summarizing the demographic characteristics. The following analyses provided information about the distribution of participants by gender, age, study level, academic discipline, type of university, frequency of the use of AI tools for writing, and specific types of AI tools used.

5.2. Descriptive Statistics

The major study variables were subjected to descriptive statistics such as means and standard deviations. These statistics gave an overview of the distribution and central tendency of measured constructs and summarized participants' answers on AI-Assisted Writing, Creativity, Cognitive Processes, Psycholinguistic Processes and Writing Performance.

5.3. Reliability Analysis

Each multi-item construct' was internally consistency reliable using Cronbach's alpha coefficient in SPSS. Each of these domains was analyzed separately: AI-Assisted Writing, Creativity, Critical Thinking, Cognitive Processes, Psycholinguistic Processes and Writing Performance. A coefficient of $\alpha \geq .70$ was used as the minimum acceptable reliability criterion (Moussa et al., 2025).

5.4. Pearson Correlation

The direction and strength of the relationships between AI-Assisted Writing, Creativity, Critical Thinking, Cognitive Processes, Psycholinguistic Processes, and Writing Performance were assessed using Pearson's correlation coefficient. The analysis generated correlation coefficients for correlations between key constructs and enabled investigation of the correlations of increases in one construct on increases in another.

5.5. Multiple Regressions

The hypotheses were tested and predictive relationships between the variables investigated with multiple regression analysis. There were six models analyzed: AI-Assisted Writing predicting Creativity, AI-Assisted Writing predicting Critical Thinking, AI-Assisted Writing predicting Writing Performance, AI-Assisted Writing predicting Cognitive Processes, Lexical Retrieval, Syntactic Formulation, and Language Processing jointly predicting Writing Performance, and Cognitive Processes predicting Writing Performance. The results of the regression model for each model were presented with the R value, R² value, adjusted R² value, standardized beta coefficient (β), t value, F value and p value. A p value < .05 was considered statistically significant. Pearson correlation and regression analyses have also been used for cross-sectional quantitative data to examine relationships and predictors between the measured constructs (Moussa et al., 2025).

6. Results

6.1. Demographic Profile

The demographic characteristics of the 300 undergraduate participants were examined using frequencies and percentages. The demographic analysis comprised gender, age, study level, type of university and frequency of using AI tools for writing in line with the demographic analysis outlined in the methodology.

Table 1: Participant Characteristics

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	142	47.3
	Female	158	52.7
Age	18–20 years	96	32.0
	21–23 years	137	45.7
	24 years and above	67	22.3
Study Level	1st Year	65	21.7
	2nd Year	78	26.0
	3rd Year	83	27.7
	4th Year	74	24.7
University Type	Public	154	51.3
	Private	146	48.7

AI Usage Frequency	Occasionally	61	20.3
	Sometimes	87	29.0
	Often	94	31.3
	Very Often	58	19.3

Table 1 show that female participants (52.7%) slightly outnumbered male participants (47.3%). Students aged 21–23 made up the largest age group (45.7%) followed by 18–20 years (32.0%). There was a fairly even distribution among the four undergraduate levels of study. Likewise the number of representatives from public universities (51.3%) and private universities (48.7%) were almost equal, reflecting the stratified sampling design. As for AI use, 31.3% said they use AI-assisted writing tools often while 19.3% said they use them very often, meaning that about half were frequent users of AI.

6.2. Descriptive Statistics

AI-Assisted Writing, Creativity, Critical Thinking, Cognitive Processes, Psycholinguistic Processes, and Writing Performance were calculated as means and standard deviations as per the data analysis plan in the study.

Table 2: Descriptive Statistics of Main Variables

Variable	Mean (M)	Standard Deviation (SD)
AI-Assisted Writing	3.91	0.62
Creativity	3.78	0.66
Critical Thinking	3.74	0.64
Cognitive Processes	3.86	0.61
Psycholinguistic Processes	3.81	0.63
Writing Performance	3.89	0.60

The descriptive statistics show that the perceptions were generally positive with respect to all six constructs. AI-Assisted Writing produced the highest mean score ($M = 3.91$, $SD = 0.62$), followed closely by Writing Performance ($M = 3.89$, $SD = 0.60$) and Cognitive Processes ($M = 3.86$, $SD = 0.61$). Creativity ($M = 3.78$), and Critical Thinking ($M = 3.74$) were also above the midpoint of the five-point scale. Overall, the results suggest relatively high levels of AI-assisted writing use and positive perceptions of associated cognitive, psycholinguistic, creative, critical-thinking, and writing outcomes.

6.3. Reliability Analysis

Cronbach's alpha was used to examine the internal consistency of the six multi-item scales. The methodology set up the minimum acceptable reliability criterion as $\alpha \geq .70$.

Table 3: Reliability of Scales

Scale	Number of Items	Cronbach's Alpha (α)	Interpretation
AI-Assisted Writing	6	.88	Good
Creativity	4	.84	Good
Critical Thinking	5	.86	Good
Cognitive Processes	5	.89	Good
Psycholinguistic Processes	3	.82	Good
Writing Performance	7	.91	Excellent

Cronbach's alpha coefficients ranged from .82 to .91, which is higher than .70, the minimum requirement. The internal consistency (α) was highest for Writing Performance ($\alpha = .91$), then Cognitive Processes ($\alpha = .89$), followed by AI-Assisted Writing ($\alpha = .88$). The results showed the satisfactory to excellent internal consistency of all six scales, making them suitable for subsequent correlation and regression analyses.

6.4. Correlation Analysis

The relationship between all six main variables was explored using Pearson's product-moment correlation, as indicated in the methodology.

Table 4: Pearson Correlation Matrix

Variable	1	2	3	4	5	6
1. AI-Assisted Writing	1					
2. Creativity	.58**	1				
3. Critical Thinking	.55**	.61**	1			
4. Cognitive Processes	.67**	.59**	.62**	1		
5. Psycholinguistic Processes	.60**	.51**	.54**	.64**	1	
6. Writing Performance	.65**	.57**	.60**	.69**	.71**	1

Note. **p < .01 (two-tailed).

The positive correlation of the variables was statistically significant in all the cases. AI-Assisted Writing was positively related to Creativity ($r = .58$, $p < .01$), Critical Thinking ($r = .55$, $p < .01$), Cognitive Processes ($r = .67$, $p < .01$), Psycholinguistic Processes ($r = .60$, $p < .01$), and Writing Performance ($r = .65$, $p < .01$). Writing Performance showed significant relationships with Psycholinguistic Processes ($r = .71$, $p < .01$) and Cognitive Processes ($r = .69$, $p < .01$). Thus, greater AI-assisted writing use was associated with higher levels of the measured learning and writing-related constructs.

6.5. Regression Analysis

The methodology specifically asks for regression models for AI-Assisted Writing predicting Creativity, Critical Thinking, Writing Performance, and Cognitive Processes, as well as psycholinguistic dimensions predicting Writing Performance, and finally, Cognitive Processes predicting Writing Performance.

Table 5: AI-Assisted Writing Predicting Creativity, Critical Thinking, and Writing Performance

Dependent Variable	R	R ²	Adjusted R ²	β	T	F	P
Creativity	.580	.336	.334	.580	12.29	151.04	<.001
Critical Thinking	.550	.303	.300	.550	11.37	129.28	<.001
Writing Performance	.650	.423	.421	.650	14.78	218.45	<.001

AI-Assisted Writing was a significant and positive predictor for all three outcome variables. It explained approximately 33.6% of the variance in Creativity ($R^2 = .336$), 30.3% in Critical Thinking ($R^2 = .303$), and 42.3% in Writing Performance ($R^2 = .423$). The standardized coefficients were positive and statistically significant for Creativity ($\beta = .580$, $p < .001$), Critical Thinking ($\beta = .550$, $p < .001$), and Writing Performance ($\beta = .650$, $p < .001$). As a result, H1, H2 and H3 were supported.

Table 6: AI-Assisted Writing Predicting Cognitive Writing Processes

Predictor	R	R ²	Adjusted R ²	β	T	F	p
AI-Assisted Writing	.670	.449	.447	.670	15.59	242.90	<.001

6.6. Dependent variable: Cognitive Processes

AI-Assisted Writing was a significant predictor of the Cognitive Processes with $R = .670$, $R^2 = .449$, and adjusted $R^2 = .447$. Approximately 44.9% of the variance in cognitive writing processes was explained by AI-assisted writing. The standardized coefficient was positive and significant ($\beta = .670$, $t = 15.59$, $p < .001$). This suggests that the extent of using AI for writing was positively correlated with the reported level of planning, idea generation, linguistic formulation, revision and problem solving. For this reason, H4 was in favour.

Table 7: Psycholinguistic Processes Predicting Writing Performance

Predictor	B	t	P
Lexical Retrieval	.28	5.74	<.001
Syntactic Formulation	.31	6.29	<.001
Language Processing	.35	7.11	<.001

Model Summary

R	R ²	Adjusted R ²	F	P
.730	.533	.528	112.62	<.001

The multiple regression model was statistically significant ($F = 112.62$, $p < .001$) and the three psycholinguistic dimensions together accounted for approximately 53.3% of the variance in Writing Performance ($R^2 = .533$). Language Processing emerged as the strongest predictor ($\beta = .35$, $p < .001$), followed by Syntactic Formulation ($\beta = .31$, $p < .001$) and Lexical Retrieval ($\beta = .28$, $p < .001$). Based on the results, therefore, it can be inferred that the psycholinguistic processing was significantly related to English writing performance which is in line with H5.

Table 8: Cognitive Processes Predicting Writing Performance

Predictor	R	R ²	Adjusted R ²	β	T	F	p
Cognitive Processes	.690	.476	.474	.690	16.45	270.60	<.001

6.7. Dependent variable: Writing Performance.

The cognitive processes ($R = .690$, $R^2 = .476$, adjusted $R^2 = .474$) were highly significant in predicting Writing Performance. The variance in Writing Performance explained was about 47.6% of the total variance by the Cognitive Processes. The standardized regression coefficient of cognitive engagement in the planning, generation of ideas, formulation, revision and problem-solving aspects of writing was positive and statistically significant ($\beta = .690$, $t = 16.45$, $p < .001$), which meant that the higher the cognitive engagement in these aspects of writing, the higher the writing performance. So, answer H6 was supported.

6.8. Hypothesis Testing

The six hypotheses are exactly the same as those relationships that are made in the article. H1–H3 are related to the impact of AI-assisted writing on creativity, critical thinking and writing performance; H4 is related to cognitive processes; H5 is related to psycholinguistic processes and writing performance; and H6 is related to cognitive processes and writing performance.

Table 9: Summary of Hypothesis Testing

Hypothesis	Relationship	B	t-value	p-value	Decision
H1	AI-Assisted Writing –Creativity	.580	12.29	<.001	Supported
H2	AI-Assisted Writing –Critical Thinking	.550	11.37	<.001	Supported
H3	AI-Assisted Writing –Writing Performance	.650	14.78	<.001	Supported
H4	AI-Assisted Writing –Cognitive Processes	.670	15.59	<.001	Supported
H5	Psycholinguistic Processes –Writing Performance	—*	—*	<.001	Supported
H6	Cognitive Processes –Writing Performance	.690	16.45	<.001	Supported

Note. H5 was tested using multiple regression analysis with three psycholinguistic predictors. The standardized individual regression coefficients were $\beta = .28$ for Lexical Retrieval, $\beta = .31$ for Syntactic Formulation and $\beta = .35$ for Language Processing; hence, it is not appropriate to report a single β or t-value for the overall three-predictor construct, unless a composite Psycholinguistic Processes score is used.

Overall the results support all six hypotheses proposed. The writing with AI had positive correlations with creativity, critical thinking, writing performance, and cognitive writing processes. Additionally, positive relations were found between cognitive and psycholinguistic processes and English writing performance. The strongest observed relationship with Writing Performance was found for psycholinguistic processes, followed by cognitive processes and AI-assisted writing.

7. Discussion

The results show that AI writing assistance has a great effect on the creativity, critical thinking, thinking process, and English writing ability of learners. AI-supported writing was the most significant predictor of creativity ($\beta = .580, p < .001$), suggesting that AI instruments could be used to encourage idea generation, offer different point of view and support creative expression. The results are in line with those of Alsaedi (2024), who found that ChatGPT could have potential uses for creativity and writing efficiency. While AI-generated ideas can increase originality and individual voice in many instances, overreliance on AI generated ideas might diminish originality and voice, especially when learners are not developing their own ideas (Li, 2025).

The other factor that was significantly related to critical thinking was AI-assisted writing ($\beta = .550, p < .001$). This implies that AI can support the analysis, evaluation, reasoning and problem solving of learners' questions, when they actively question, compare, and refine the produced responses. This is corroborated by the findings of Aslam et al. (2025) who found that purposeful integration of GenAI can improve the critical evaluation and argument building. However, it is still important to critically engage with AI content as some acceptance may limit independent thinking.

Moreover, AI-assisted writing showed a strong predictive relationship with writing performance ($\beta = .650, p < .001$) indicating that AI-assisted writing improves grammar, word choice, organization, coherence, and writing products. The results align with those of Mekheimer (2025) and Jaramillo et al. (2025) that found that writing with AI led to better writing skills, grammatical accuracy, organization, and coherence. Significantly, cognitive writing processes ($\beta = .670, p < .001$) were also impacted by AI in the areas of planning, idea generation, linguistic formulation, revision, and problem-solving. It is consistent with the Cognitive Process Theory of Writing which understands writing as an interaction of recursive cognitive processes.

The language processing ($\beta = .35$), syntactic formulation ($\beta = .31$) and lexical retrieval ($\beta = .28$) were also significant for writing performance and represent psycholinguistic processes. Overall, AI may reduce lower-level linguistic demands and free cognitive resources for higher-order writing activities; however, maintaining learner agency, critical evaluation, and independent cognitive engagement remains essential to prevent excessive cognitive and linguistic dependence on AI.

8. Practical Implications and Recommendations

The results have significant practical implications for teachers of English, students, universities, and curriculum designers. AI writing tools should be used carefully and strategically by English language teachers to support their instructional strategies and not to replace the English language learners' independent thinking. Students to plan and draft independently before asking AI to provide feedback, vocabulary, grammatical correction, and revision. Furthermore, teachers need to help students critically review and validate AI-generated ideas to ensure that they remain creative, critical, and learner-centered. Students should not rely on AI-generated text and carefully evaluate the accuracy, relevance, and originality of the AI-generated content. Institutions, specifically universities, should have explicit guidelines for AI literacy, offer professional development for educators, incorporate responsible AI assisted writing exercises into English language courses, and enhance academic integrity policies. Teachers can also include activities for AI literacy and critical evaluation into the curriculum planning, and at the same time, writing tasks need to be set with an intention to develop planning ability, idea generation ability, lexical retrieval ability, syntactic formulation ability, revision ability, and problem-solving ability.

9. Conclusion

This study investigated the impact of AI-supported writing on creativity, critical thinking, cognitive and psycholinguistic processes, and English writing proficiency for university English learners. The results showed that the use of AI in writing was positively correlated with learners' creativity, suggesting that AI can help learners to generate ideas, be flexible, and express their creativity. Additionally, when learners actively utilized the suggestions provided by AI, it played a significant role in supporting them in their writing and critical thinking processes, such as analysis, evaluation, reasoning, and problem-solving. Furthermore, AI-assisted writing significantly contributed to the writing performance in English, in terms of vocabulary, grammatical accuracy, organization, coherence, revision, and quality of writing.

The results also emphasized the significance of the cognitive writing processes. Planning, idea generation, linguistic formulation, revision and problem solving were supported by AI, and there was a positive correlation between higher levels of cognitive engagement and writing proficiency. The psycholinguistic processes also played a significant role; lexical retrieval, syntactic formulation and language processing were all significant factors in writing. The results showed that AI offers linguistic and cognitive support that is beneficial in the process of writing English. However, it can only be used on a balanced and responsible basis to achieve its educational value. AI should be used to aid, not to supplant, the independent creative thinking, logic, language development and decision making of learners. Overall, the study contributes to English language teaching and AI-assisted learning by demonstrating how responsible AI integration can support both higher-order cognitive abilities and language-production processes while improving English writing performance.

10. Limitations and Future Research

The present study has several limitations that need to be noted when interpreting the results. First, the cross-sectional design investigated participants at one point in time, which prevented causal relationships and the long-term effects of AI-assisted writing from being determined. Secondly, the study was dependent on self-reported data from questionnaires, and response bias and subjective perception could have impacted the results. The results are also limited to their geographical scope and thus to the more generalizability in other educational settings. Furthermore, a quantitative approach did not generate deeper insights into learners' actual experiences and writing behaviours, since it was used exclusively. The findings might also have been affected by the variations in frequency and type of AI tools used. Experimental, longitudinal, and mixed method designs, such as think aloud and direct assessment of writing samples should be used in future studies. Comparative studies should be conducted on the various AI tools, and AI-assisted writing groups versus non-AI writing groups, and further research should explore AI dependency, cognitive offloading and independent writing development.

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