

Sustaining Effort in AI-Assisted Writing: Relationships Among Effort Regulation, Writing Strategies, and Perceptions of ChatGPT

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DOI: <https://doi.org/10.47772/IJRISS.2026.100800671>

Received: 26 August 2026; Accepted: 31 August 2026; Published: 15 September 2026

ABSTRACT

Academic writing requires learners to regulate their effort while employing appropriate strategies to manage complex cognitive and linguistic demands. The increasing use of ChatGPT has also introduced new forms of assistance into the writing process. This study examined students' effort regulation, writing strategies, and perceptions of ChatGPT, as well as differences according to field and level of study and relationships among the three variables. A quantitative survey design was employed with a convenience sample of 148 diploma and degree students from Science and Technology and Social Sciences and Humanities. Data were collected using a reliable 43-item, five-point Likert-scale questionnaire adapted from Raoofi et al. (2017) and Youssef et al. (2024). Descriptive statistics, independent-samples t-tests, and Pearson correlation analyses were conducted. The findings revealed no significant difference in the use of writing strategies according to field of study, although degree students reported greater strategy use than diploma students. Perceptions of ChatGPT differed significantly according to both field and level of study, with Social Sciences and Humanities and degree students reporting more positive perceptions. Learners demonstrated positive effort regulation, frequently employed writing strategies, and generally viewed ChatGPT positively. Strong positive relationships were found between effort regulation and writing strategies and between effort regulation and perceptions of ChatGPT. The findings highlight the importance of integrating training for effort regulation, explicit instruction of writing strategies, and guided use of ChatGPT to support strategic and independent writing development.

Keywords: ChatGPT; effort regulation; writing strategies; AI-assisted writing; academic writing

INTRODUCTION

Background of Study

Academic writing is a cognitively demanding activity that requires learners to generate and organise ideas, apply appropriate language, monitor their progress, and revise their work while managing limited working-memory resources (Sweller, 1988). To cope with these demands, learners employ metacognitive, cognitive, social, affective, and effort-regulation strategies (Raoofi et al., 2017). Effort regulation is particularly important because it enables learners to maintain concentration, persistence, and motivation when writing becomes difficult. Taib et al. (2025) found that effort regulation was closely connected with metacognitive strategies, suggesting that learners who effectively plan, monitor, and evaluate their writing are better able to sustain their

effort. Emotional regulation also supports self-regulated learning by helping learners manage the anxiety and frustration associated with challenging language tasks (Hasim et al., 2025).

The growing use of ChatGPT has introduced another form of support into the writing process. From a sociocultural perspective, ChatGPT can function as a digital scaffold by providing ideas, models, explanations, language assistance, and feedback that help learners perform writing activities beyond what they can accomplish independently (Vygotsky, 1978). Students have used ChatGPT for brainstorming, planning, proofreading, language refinement, information management, and revision (El Hosayny et al., 2026), while its feedback can encourage self-assessment and reflection when learners critically evaluate its suggestions (Tam, 2025). ChatGPT has also been associated with greater engagement, critical thinking, and perceived academic achievement (Youssef et al., 2024). Nevertheless, its contribution depends on purposeful pedagogical integration, as AI should scaffold students' writing rather than replace their strategic engagement, personal effort, and independent judgement (Hrdličková, 2025; Rahmat et al., 2026).

Statement of Problem

Although ChatGPT provides immediate assistance during writing, its availability does not necessarily ensure effective learning. Students may use it to improve grammar, generate ideas, or receive feedback, but they may also accept inaccurate information, rely on artificial language, or use generated content without adequate evaluation (El Hosayny et al., 2026; Tam, 2025). Hrdličková (2025) similarly identified substantial reliance on AI-generated and AI-paraphrased writing, raising concerns about plagiarism, authenticity, and the development of autonomous writing abilities. A systematic review by Rahmat et al. (2026) further showed that AI feedback is particularly useful for lower-level language concerns, whereas higher-order writing development continues to require reflection, instructional guidance, and human feedback. These concerns indicate that the effectiveness of ChatGPT may depend on learners' capacity to sustain effort and employ appropriate writing strategies.

Existing studies have largely examined these elements separately. Raoofi et al. (2017) established the major categories of writing strategies, while Taib et al. (2025) demonstrated relationships between metacognitive strategies and other writing strategies without considering ChatGPT-supported writing. Conversely, studies of ChatGPT have concentrated on its perceived influence on engagement, feedback, critical thinking, and academic achievement (Tam, 2025; Youssef et al., 2024), with less attention to how these perceptions relate to learners' effort regulation. Furthermore, evidence from particular disciplines, educational levels, and national contexts may not fully explain whether students from different fields and levels of study use writing strategies or perceive ChatGPT similarly. Therefore, the present study examines students' effort regulation, writing strategies, and perceptions of ChatGPT; differences according to field and level of study; and the relationships between effort regulation, use of writing strategies, and perceptions of ChatGPT.

Objective of the Study and Research Questions

This study is done to examine students' levels of effort regulation, use of writing strategies, and perceptions of ChatGPT. Specifically, this study is done to answer the following questions:

- RQ1: Are there significant differences in writing strategies according to field of study and level of study?
Ho₁: There are no statistically significant differences in writing strategies according to field of study and level of study.
- RQ2: Are there significant differences in students' perceptions of ChatGPT according to field of study and level of study?

Ho₂: There are no statistically significant differences in students' perceptions of ChatGPT according to field of study and level of study

- RQ3: How do learners perceive effort regulation in writing?
- RQ4: How do learners perceive their writing strategies?

- RQ5: How do learners perceive the use of ChatGPT in writing?
- RQ6: Is there a significant relationship between effort regulation and writing strategies?

Ho₃: There is no significant relationship between effort regulation and writing strategies.

- RQ7: Is there a significant relationship between effort regulation and students' perceptions of ChatGPT?

Ho₃: There is no significant relationship between effort regulation and ChatGPT.

LITERATURE REVIEW

Theoretical Framework of the Study

Cognitive Load Theory (Sweller, 1988) and Effort Regulation in Writing

Cognitive Load Theory explains that writing may strain learners' limited working memory because it requires them to manage ideas, organisation, vocabulary, grammar, and revision simultaneously (Sweller, 1988). Effort regulation enables writers to sustain concentration and persistence when facing these cognitive demands (Raoofi et al., 2017). Its strong relationship with metacognitive strategies indicates that planning, monitoring, and evaluating help learners allocate their mental effort more effectively throughout the writing process (Taib et al., 2025). Therefore, writing instruction should combine manageable tasks with explicit effort-regulation strategies to help learners persist without becoming cognitively overwhelmed.

Sociocultural Theory and Scaffolding (using ChatGPT) by Vygotsky (1978)

Sociocultural Theory views learning as a socially mediated process in which learners develop abilities through interaction, guidance, and cultural tools within the Zone of Proximal Development (Vygotsky, 1978). In writing, ChatGPT can function as a digital scaffold by providing models, prompts, explanations, language support, and feedback that learners may not yet generate independently (El Hosayny et al., 2026; Tam, 2025). Nevertheless, effective scaffolding requires teacher guidance, reflective engagement, and the gradual transfer of responsibility to learners so that AI support develops rather than replaces independent writing competence (Hrdličková, 2025; Rahmat et al., 2026).

Past Studies

Past Studies on Writing and ChatGPT

Past studies indicate that ChatGPT can support writing by assisting learners with brainstorming, text organisation, vocabulary development, language refinement, proofreading, and feedback. El Hosayny et al. (2026) found that postgraduate students used ChatGPT throughout the writing process for planning, monitoring, evaluating, managing information, and correcting problems. Similarly, Tam (2025) reported that ChatGPT helped L2 learners generate internal feedback through self-assessment and reflection. However, its effectiveness differed according to learners' proficiency and self-regulation, as more proficient students critically evaluated and modified its feedback, whereas less proficient students tended to accept it without sufficient judgement. More broadly, ChatGPT use has been associated with greater student engagement, critical thinking, and perceived academic achievement (Youssef et al., 2024).

Nevertheless, concerns have been raised about inaccurate information, artificial writing styles, plagiarism, reduced creativity, and excessive dependence on AI (El Hosayny et al., 2026; Hrdličková, 2025). Rahmat et al. (2026) concluded that AI is most effective as a scaffold within well-designed instruction, particularly for grammar and sentence-level improvement, while higher-order writing development continues to require reflection, teacher guidance, and human feedback. These findings suggest that writing strategies remain essential in AI-assisted writing. Metacognitive, cognitive, effort-regulation, social, and affective strategies enable learners to plan, sustain effort, manage emotions, seek assistance, and evaluate their work effectively (Raoofi et al., 2017; Taib et al., 2025).

Conceptual Framework of the Study

Figure 1 shows the conceptual framework of the study. This study examine students' levels of effort regulation, use of writing strategies, and perceptions of ChatGPT. This conceptual framework positions effort regulation as a critical self-regulatory mechanism that enables writers to persist, manage difficulty, and sustain engagement during cognitively demanding writing tasks. Grounded in Cognitive Load Theory, Sweller (1988) explains that academic writing imposes heavy intrinsic and extraneous cognitive load, requiring learners to regulate effort to avoid overload and disengagement. Effort regulation is therefore essential for maintaining focus during planning, drafting, and revision, particularly when tasks exceed learners' immediate cognitive capacity. This perspective aligns with the writing strategy taxonomy proposed by Raoofi et al. (2017), in which effort-regulation strategies interact with metacognitive, cognitive, social, and affective strategies to help writers monitor progress, control motivation, manage emotions, and seek support. Within this framework, ChatGPT is conceptualised as a mediational tool grounded in Vygotsky's (1978) sociocultural theory and scaffolding, functioning as digital support within learners' Zone of Proximal Development by reducing extraneous cognitive load and sustaining effort during challenging writing tasks. By offering immediate feedback, idea prompts, and revision support, ChatGPT lowers frustration and enables writers to allocate cognitive resources to higher-order thinking. Empirical support for this integration is provided by Youssef et al. (2024), who demonstrate that scaffolded ChatGPT use enhances learners' critical thinking abilities, academic achievement, and engagement. Overall, the framework illustrates how effort regulation operates at the intersection of cognitive load management, strategic writing behaviour, and AI-based scaffolding to support sustained and effective writing performance.



Figure 1- Conceptual Framework of the Study-Relationships among Effort Regulation, Writing Strategies, and Perceptions of ChatGPT

METHODOLOGY

This quantitative study is done to examine students' levels of effort regulation, use of writing strategies, and perceptions of ChatGPT. A convenient sample of 148 participants responded to the survey. The instrument used is a 5-point Likert-scale survey and is based on Raoofi et al. (2017) for writing strategies and Youssef et al. (2024) for perceptions of ChatGPT to reveal the variables in Table 3 below. Table 1 below shows the categories used for the Likert scale: 1 is for Never, 2 is for Rarely, 3 is for Sometimes, 4 is for Often and 5 is for Always.

Table 1- Likert Scale Use

1	Never
2	Rarely
3	Sometimes
4	Often
5	Always

Table 2- Distribution of Items in the Survey

SECTION	VARIABLE	CONSTRUCT	NO OF ITEMS/ INDICATORS	TOTAL	CA
B	WRITING STRATEGY Raooft et al. (2017)	Effort Regulation	4	23	.821 .938
		Metacognitive	10		
		Cognitive	6		
		Social	4		
		Affective	3		
C	CHATGPT Youssef et al. (2024)	Critical thinking abilities	4	16	.928
		Academic achievement	4		
		ChatGPT usage	5		
		Student engagement	3		
				43	.956

Table 2 presents the distribution of items used to measure effort regulation, writing strategies, and perceptions of ChatGPT. Section B, adapted from Raooft et al. (2017), consists of four writing-strategy constructs: metacognitive strategies, cognitive strategies, social strategies, and affective strategies. These constructs contain 10, 6, 4, and 3 items, respectively. Section C, adapted from Youssef et al. (2024), measures perceptions of ChatGPT through four constructs: critical-thinking abilities, academic achievement, ChatGPT usage, and student engagement, comprising 4, 4, 5, and 3 items, respectively. The Cronbach's alpha values indicate good to excellent internal consistency, with values of .821 and .938 for the effort regulation and writing-strategy measures, respectively, and .928 for the perceptions of ChatGPT measure. Overall, the 43-item instrument achieved a Cronbach's alpha of .956, demonstrating excellent reliability.

Table 3- Reliability Levels, Cronbach's Alpha Ranges, and Their Interpretations

Reliability Level	Cronbach's Alpha range	Interpretation
Excellent	0.9 and above	Indicates very high internal consistency
Good	0.80-0.89	Reflects strong internal consistency
Acceptable	0.70-0.79	Indicates acceptable internal consistency
Questionable	0.60-0.69	Reflects questionable internal consistency
Poor	Below 0.6	Indicates poor internal consistency

To determine the internal consistency reliability of the instrument, a reliability analysis was conducted. Table 3 presents the Cronbach's alpha ranges and their corresponding interpretations. According to Ahmad et al. (2024), Cronbach's alpha values ranging from .70 to .89 indicate acceptable to good internal consistency, while values of .90 and above indicate excellent internal consistency.

Table 2 presents the reliability results for the survey instrument. The analysis produced Cronbach's alpha values of .821 for effort regulation, .938 for writing strategies, and .928 for perceptions of ChatGPT, indicating good to excellent internal consistency. The overall Cronbach's alpha value for all 43 items was .956, demonstrating that the instrument had excellent internal consistency. Further statistical analyses were conducted using SPSS to address the research questions of the study.

FINDINGS

Demographic Analysis

According to Ziegenfuss, et al. (2021), demographic data are commonly reported using percentages to provide an overview of participants' characteristics and describe the composition of the sample. This information allows readers to assess the extent to which the sample represents the target population and to consider the potential generalisability of the findings.

Table 4- Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	44%
		Female	56%
2	Field	Science & Technology	36%
		Social Sciences & Humanities	64%
3	Level	Diploma	69%
		Degree	31%

Table 4 presents the demographic profile of the respondents according to gender, field of study, and level of study. Female respondents constituted a slightly larger proportion of the sample (56%) than male respondents (44%).

Regarding field of study, most respondents were from Social Sciences and Humanities (64%), while the remaining 36% were from Science and Technology. In terms of level of study, diploma students formed the majority of the sample (69%), whereas degree students accounted for 31%. Overall, the sample predominantly comprised female respondents, students from Social Sciences and Humanities, and diploma-level students.

Inferential Statistics (significant difference)

According to He (2024), a t-test is used to determine whether the difference between the mean scores of two groups is statistically significant rather than attributable to chance. In this study, independent-samples t-tests were conducted to examine whether respondents' scores differed significantly according to gender, field of study, and level of study.

A p-value below the predetermined significance level of .05 indicates a statistically significant difference between the two groups, whereas a p-value above .05 indicates that the difference is not statistically significant.

Findings for Writing Strategies according to Field of Study and Level of Study

This section presents data to answer research question 1: Are there significant differences in writing strategies according to field of study and level of study?

H_{01} : There are no statistically significant differences in writing strategies according to field of study and level of study.

Table 5- T-Test for Writing Strategies according to Field of Study and Level of Study

		MEAN	SD	T-Statistics <i>df</i>	p-value	OUTCOME
Field	Science & Technology	3.67	0.43	t(146)=1.968	0.051	H_0 Not Rejected
	Social Sciences & Humanities	3.83	0.53			
Level	Diploma	3.72	0.51	t(146)=2.044	0.043	H_0 Rejected
	Degree	3.89	0.44			

Table 5 presents the results of independent-samples t-tests conducted to examine differences in writing strategies according to field and level of study. The results revealed no statistically significant difference between students from Science and Technology and those from Social Sciences and Humanities, $t(146) = 1.968$, $p = .051$. Therefore, the null hypothesis for field of study was not rejected. However, a statistically significant difference was found between diploma and degree students, $t(146) = 2.044$, $p = .043$. Degree students reported a higher mean score for writing strategies ($M = 3.89$, $SD = 0.44$) than diploma students ($M = 3.72$, $SD = 0.51$). Therefore, **the null hypothesis for level of study was rejected.**

Findings for Students' Perceptions of ChatGPT according to Field of Study and Level of Study

This section presents data to answer research question 2: Are there significant differences in students' perceptions of ChatGPT according to field of study and level of study?

H_{02} : There are no statistically significant differences in students' perceptions of ChatGPT according to field of study and level of study.

Table 6- T-Test for Students' Perceptions of ChatGPT according to Field of Study and Level of Study

		MEAN	SD	T-Statistics df	p-value	OUTCOME
Field	Science & Technology	3.58	0.42	$t(146)=2.289$	0.023	H_0 Rejected
	Social Sciences & Humanities	3.76	0.47			
Level	Diploma	3.64	0.49	$t(146)=2.234$	0.027	H_0 Rejected
	Degree	3.82	0.35			

Table 6 presents the results of independent-samples t-tests conducted to examine differences in students' perceptions of ChatGPT according to field and level of study. The results revealed a statistically significant difference between students from Science and Technology and those from Social Sciences and Humanities, $t(146) = 2.289$, $p = .023$.

Students from Social Sciences and Humanities reported more positive perceptions of ChatGPT ($M = 3.76$, $SD = 0.47$) than students from Science and Technology ($M = 3.58$, $SD = 0.42$). A statistically significant difference was also found between diploma and degree students, $t(146) = 2.234$, $p = .027$. Degree students reported more positive perceptions ($M = 3.82$, $SD = 0.35$) than diploma students ($M = 3.64$, $SD = 0.49$). Therefore, the null hypotheses for both field and level of study were rejected.

Descriptive Statistics

According to Vetter (2017), the mean (M) represents the average value of a dataset, while the standard deviation (SD) indicates the extent to which individual observations vary from the mean. A low standard deviation indicates that the data points are clustered closely around the mean, whereas a high standard deviation indicates greater variability or dispersion. Reporting both statistics provides a clearer understanding of the central tendency and distribution of the data.

Findings for Effort Regulation

This section presents data to answer research question 3: How do learners perceive effort regulation in writing?

Table 7 – Mean (M) and Standard Deviation (SD) for EFFORT REGULATION (ERS)

ITEM	M	SD
ERSQ1 I write a lot to develop my writing skills.	3.42	0.84
ERSQ2 I often work hard to do well in my writing even if I don't like English writing tasks.	3.66	0.75
ERSQ3 Even if the writing activities are difficult, I don't give up but try to engage in them.	3.80	0.71
ERSQ4 I concentrate as hard as I can when doing a writing task.	3.84	0.74

Table 7 presents the mean scores and standard deviations for the four items measuring effort regulation in writing. The item “I concentrate as hard as I can when doing a writing task” recorded the highest mean ($M = 3.84$, $SD = 0.74$), followed by the item concerning persistence in difficult writing activities ($M = 3.80$, $SD = 0.71$). Respondents also indicated that they often worked hard to perform well in writing despite not liking English writing tasks ($M = 3.66$, $SD = 0.75$). In contrast, writing extensively to develop writing skills recorded the lowest mean ($M = 3.42$, $SD = 0.84$) and the greatest variation in responses.

Findings for Writing Strategies

This section presents data to answer research question 4: How do learners perceive their writing strategies? In this study, writing strategies were measured through four dimensions: (i) metacognitive, (ii) cognitive, (iii) social and (iv) affective.

Table 8 – Mean (M) and Standard Deviation (SD) for METACOGNITIVE (MWS)

ITEM	M	SD
MWSQ1 I organize my ideas prior to writing.	3.70	0.70
MWSQ2 I revise my writing to make sure that it includes everything I want to discuss in my writing.	3.87	0.70
MWSQ3 I check my spelling.	4.00	0.81
MWSQ4 I check my writing to make sure it is grammatically correct.	3.97	0.69
MWSQ5 I evaluate and re-evaluate the ideas in my essay.	3.86	0.68
MWSQ6 I monitor and evaluate my progress in writing.	3.83	0.75
MWSQ7 I revise and edit an essay two or more times before I hand it in to my teacher.	3.83	0.73
MWSQ8 I go through the planning stages in my writing.	3.76	0.73
MWSQ9 I go through the drafting stages in my writing.	3.84	0.73
MWSQ10 I go through the revising and editing stages in my writing.	3.78	0.74

Table 8 presents the mean scores and standard deviations for the ten items measuring learners’ use of metacognitive writing strategies. Checking spelling recorded the highest mean ($M = 4.00$, $SD = 0.81$), followed by checking writing for grammatical accuracy ($M = 3.97$, $SD = 0.69$). Revising writing to ensure that all intended ideas were included also received a relatively high mean ($M = 3.87$, $SD = 0.70$). In contrast, organising ideas before writing recorded the lowest mean ($M = 3.70$, $SD = 0.70$), followed by going through the planning stages of writing ($M = 3.76$, $SD = 0.73$).

Table 9 – Mean (M) and Standard Deviation (SD) for COGNITIVE (CWS)

ITEM	M	SD
CWSQ1 I use memorized grammatical elements such as singular and plural forms, verb tenses, prefixes and suffixes, etc, in my writing	3.70	0.76
CWSQ2 I put newly memorized vocabulary in my sentences.	3.65	0.77
CWSQ3 In order to generate ideas for my writing, I usually engage myself in brainstorming.	3.75	0.71
CWSQ4 I use different words that have the same meaning.	3.73	0.79
CWSQ5 I use my experiences and knowledge in my writing.	3.94	0.74
CWSQ6 I try to use effective linking words to ensure clear and logical relationship between sentences or paragraphs	3.81	0.71

Table 9 presents the mean scores and standard deviations for the six items measuring learners’ use of cognitive writing strategies. Using personal experience and knowledge in writing recorded the highest mean ($M = 3.94$, $SD = 0.74$), followed by using effective linking words to establish clear and logical relationships between sentences or paragraphs ($M = 3.81$, $SD = 0.71$). Brainstorming to generate ideas recorded a mean of 3.75 ($SD = 0.71$), while using words with similar meanings recorded a mean of 3.73 ($SD = 0.79$). The use of memorised grammatical elements recorded a mean of 3.70 ($SD = 0.76$). In contrast, using newly memorised vocabulary in sentences received the lowest mean ($M = 3.65$, $SD = 0.77$).

Table10 – Mean (M) and Standard Deviation (SD) for SOCIAL (SWS)

ITEM	M	SD
SWSQ1 In order to generate ideas for my writing, I usually discuss the writing topic with a friend or classmate.	3.68	0.81
SWSQ2 After revising and editing my essay thoroughly, I ask a friend or my classmate to read and comment on it.	3.52	0.93
SWSQ3 I try to identify friends or classmates whom I can ask for help in my writing.	3.64	0.87
SWSQ4 When I have trouble writing my essay, I try to do it with my classmates or friends.	3.72	0.87

Table 10 presents the mean scores and standard deviations for the four items measuring learners' use of social writing strategies. Collaborating with classmates or friends when experiencing difficulty in writing recorded the highest mean ($M = 3.72$, $SD = 0.87$), followed by discussing a writing topic with a friend or classmate to generate ideas ($M = 3.68$, $SD = 0.81$). Identifying friends or classmates who could provide writing assistance recorded a mean of 3.64 ($SD = 0.87$). In contrast, asking a friend or classmate to read and comment on a revised essay received the lowest mean ($M = 3.52$, $SD = 0.93$) and showed the greatest variation in responses.

Table 11 – Mean (M) and Standard Deviation (SD) for AFFECTIVE (AWS)

ITEM	M	SD
AWSQ1 I try to write an essay in class with confidence and ease	3.67	0.73
AWSQ2 I try to relax whenever I feel afraid of writing.	3.93	0.74
AWSQ3 I encourage myself to write even when I am afraid of making mistakes	3.87	0.79

Table 11 presents the mean scores and standard deviations for the three items measuring learners' use of affective writing strategies. Trying to relax when feeling afraid of writing recorded the highest mean ($M = 3.93$, $SD = 0.74$), followed by encouraging oneself to continue writing despite the fear of making mistakes ($M = 3.87$, $SD = 0.79$). In comparison, writing an essay in class with confidence and ease recorded the lowest mean ($M = 3.67$, $SD = 0.73$).

Findings for ChatGPT

This section presents data to answer research question 5: How do learners perceive the use of ChatGPT in writing? In this study, learners' perceptions of ChatGPT were examined through four dimensions (i) critical thinking abilities, (ii) academic achievement, (iii) ChatGPT usage, and (iv) student engagement.

Table 12 – Mean (M) and Standard Deviation (SD) for CRITICAL THINKING ABILITIES (CT)

ITEM	M	SD
CTQ1 I usually need clarification on the precision and reliability of information provided by ChatGPT, which enhances my critical thinking skills.	3.65	0.79
CTQ2 ChatGPT's responses made me doubt their validity, leading me to seek further clarification or evidence.	3.69	0.77
CTQ3 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.	3.72	0.76
CTQ4 I need clarification about the accuracy of ChatGPT's output, which often encourages me to evaluate the information and conduct additional research independently.	3.69	0.82

Table 12 presents the mean scores and standard deviations for the four items measuring learners' perceptions of how ChatGPT supports their critical-thinking abilities. Exploring alternative viewpoints or sources when using ChatGPT recorded the highest mean ($M = 3.72$, $SD = 0.76$). This was followed by questioning the validity of ChatGPT's responses ($M = 3.69$, $SD = 0.77$) and evaluating the accuracy of its output through additional independent research ($M = 3.69$, $SD = 0.82$). Seeking clarification regarding the precision and reliability of information provided by ChatGPT recorded the lowest mean ($M = 3.65$, $SD = 0.79$).

Table 13 – Mean (M) and Standard Deviation (SD) for ACADEMIC ACHIEVEMENTS (AA)

ITEM	M	SD
AAQ1 ChatGPT brings innovative ideas that are ready to be shared with student.	3.70	0.80
AAQ2 Students can anticipate robust writing guidance from ChatGPT.	3.74	0.78
AAQ3 ChatGPT has improved my academic performance.	3.55	0.67
AAQ4 ChatGPT has improved my learning pace.	3.66	0.76

Table 13 presents the mean scores and standard deviations for the four items measuring learners' perceptions of ChatGPT in relation to academic achievement. The expectation that ChatGPT provides effective writing guidance recorded the highest mean ($M = 3.74$, $SD = 0.78$), followed by the perception that ChatGPT provides innovative ideas that can be shared with students ($M = 3.70$, $SD = 0.80$). The respondents also indicated that ChatGPT had improved their learning pace ($M = 3.66$, $SD = 0.76$). In contrast, the perception that ChatGPT had improved academic performance recorded the lowest mean ($M = 3.55$, $SD = 0.67$).

Table 14 – Mean (M) and Standard Deviation (SD) for CHATGPT USAGE (CU)

ITEM	M	SD
CUQ1 ChatGPT is a state-of-the-art writing model that is favourably used today.	3.52	0.74
CUQ2 Students seek help from ChatGPT's assistance in composing essays and articles.	3.72	0.73
CUQ3 ChatGPT helps students in English language translation.	3.82	0.78
CUQ4 Employing ChatGPT significantly improves human productivity.	3.50	0.80
CUQ5 The use of ChatGPT marks a groundbreaking transformation in writers' capabilities.	3.51	0.76

Table 14 presents the mean scores and standard deviations for the five items measuring learners' perceptions of ChatGPT usage. The use of ChatGPT for English-language translation recorded the highest mean ($M = 3.82$, $SD = 0.78$), followed by seeking ChatGPT's assistance in composing essays and articles ($M = 3.72$, $SD = 0.73$). The perception that ChatGPT is an advanced writing tool commonly used today recorded a mean of 3.52 ($SD = 0.74$), while its perceived role in transforming writers' capabilities recorded a mean of 3.51 ($SD = 0.76$). In contrast, the perception that ChatGPT significantly improves human productivity received the lowest mean ($M = 3.50$, $SD = 0.80$).

Table 15– Mean (M) and Standard Deviation (SD) for STUDENT ENGAGEMENT (SE)

ITEM	M	SD
SEQ1 ChatGPT is more interactive, human-like, and engaging for the students.	3.52	0.89
SEQ2 ChatGPT increases confidence in my ability to conduct research/to search for materials	3.61	0.76
SEQ3 ChatGPT is easy to use and more engaging for me	3.82	0.81

Table 15 presents the mean scores and standard deviations for the three items measuring student engagement with ChatGPT. The perception that ChatGPT is easy to use and engaging recorded the highest mean ($M = 3.82$, $SD = 0.81$). This was followed by the perception that ChatGPT increases learners' confidence in conducting research and searching for relevant materials ($M = 3.61$, $SD = 0.76$). In contrast, the perception that ChatGPT is interactive, human-like, and engaging recorded the lowest mean ($M = 3.52$, $SD = 0.89$) and the greatest variation in responses.

Exploratory Statistics

According to He (2024), correlation analysis is a statistical technique used to examine the direction and strength of the relationship between two variables. A positive coefficient indicates that both variables tend to increase together, whereas a negative coefficient indicates that one variable tends to decrease as the other increases. However, correlation does not establish a cause-and-effect relationship. In this study, Pearson's correlation analysis was conducted using SPSS to examine the relationships between effort regulation, writing strategies, and perceptions of ChatGPT.

The statistical significance of each relationship was evaluated at the .05 level. A correlation was considered statistically significant when the p-value was below .05. The strength of the relationship was interpreted based on the absolute value of the correlation coefficient, with values of approximately .10, .30, and .50 representing weak, moderate, and strong relationships, respectively (He, 2024). The results of the correlation analyses are presented in Table 16.

Table 16 -Correlation between Effort Regulation, Writing and ChatGPT

		WRITING	CHATGPT
EFFORT REGULATION	Pearson Correlation	.815**	.727**
	Sig. (2-tailed)	<.001	<.001
	N	148	148
**. Correlation is significant at the 0.01 level (2-tailed).			

Findings for Relationship between Effort Regulation and Writing Strategies

This section presents data to answer research question 6: Is there a significant relationship between effort regulation and writing strategies?

H03: There is no significant relationship between effort regulation and writing.

Table 16 shows there is a relationship between effort regulation and writing strategies. Correlation analysis shows that there is a high significant association between effort regulation and writing ($r=.815^{**}$) and ($p<.001$). This means that there is also a strong positive relationship between effort regulation and writing.

Findings for Relationship between effort regulation and ChatGPT

This section presents data to answer research question 7: Is there a significant relationship between effort regulation and students' perceptions of ChatGPT?

H03: There is no significant relationship between effort regulation and students' perceptions of ChatGPT.

Table 16 also shows there is a relationship between effort regulation and students' perceptions of ChatGPT. Correlation analysis shows that there is a high significant association between effort regulation and ChatGPT ($r=.727^{**}$) and ($p<.001$). This means that there is also a strong positive relationship between effort regulation and ChatGPT.

CONCLUSION

Summary of Findings and Discussions

RQ1: Are there significant differences in writing strategies according to field of study and level of study?

The findings revealed no significant difference in the use of writing strategies between students from Science and Technology and those from Social Sciences and Humanities. However, a significant difference was found according to level of study, with degree students reporting greater use of writing strategies than diploma students.

The absence of significant differences between fields suggests that writing strategies are relevant across disciplines, as learners generally use metacognitive, cognitive, social, affective, and effort-regulation strategies to manage writing tasks (Raooft et al., 2017; Hrdličková, 2025). However, degree students' greater strategy use may reflect their increased experience with complex academic writing, which requires stronger planning, monitoring, persistence, and revision (Taib et al., 2025). This interpretation is consistent with findings that more advanced learners use writing strategies and feedback more critically and reflectively (El Hosayny et al., 2026; Tam, 2025).

RQ2: Are there significant differences in students' perceptions of ChatGPT according to field of study and level of study?

Students' perceptions of ChatGPT differed significantly according to both field and level of study. Students from Social Sciences and Humanities had more positive perceptions of ChatGPT than those from Science and Technology. Similarly, degree students perceived ChatGPT more positively than diploma students.

The more positive perceptions among Social Sciences and Humanities students may reflect their greater use of ChatGPT for writing-intensive activities such as idea generation, organisation, language refinement, and feedback (El Hosayny et al., 2026; Tam, 2025). Similarly, degree students may value ChatGPT more because their advanced academic tasks require greater research and writing support. These findings align with Youssef et al. (2024), who reported positive perceptions of ChatGPT's contributions to engagement, critical thinking, and academic achievement, although its usefulness depends on appropriate instructional support and responsible use (Rahmat et al., 2026).

RQ3: How do learners perceive effort regulation in writing?

Overall, learners demonstrated positive effort regulation in writing. They were particularly willing to concentrate and persist when completing difficult writing tasks, even when they did not enjoy writing in English. However, they were less inclined to write extensively for the purpose of developing their writing skills.

The learners' willingness to concentrate and persist supports Raoofi et al.'s (2017) view that effort regulation helps writers sustain motivation when facing difficult tasks. It also aligns with Taib et al. (2025), who found that learners generally persisted in completing challenging writing activities but practised writing less regularly. From the perspective of Cognitive Load Theory, such persistence helps learners cope with the cognitive demands of managing ideas, language, organisation, and revision (Sweller, 1988). However, their limited extensive writing suggests that task completion may receive greater attention than the sustained practice required for long-term writing development.

RQ4: How do learners perceive their writing strategies?

Learners generally reported frequent use of metacognitive, cognitive, social, and affective writing strategies. They commonly checked spelling and grammar, drew on their personal experiences and knowledge, collaborated with classmates when encountering difficulties, and attempted to manage writing anxiety. However, planning before writing, using newly learned vocabulary, requesting peer feedback on revised essays, and writing confidently in class were comparatively less practised.

The findings align with Taib et al. (2025), who found that learners focused more on spelling, grammar, prior knowledge, and idea generation than on deeper planning and regular practice. Learners' attempts to manage anxiety further reflect the importance of emotional regulation in supporting self-regulated language learning (Hasim et al., 2025). However, the less frequent use of planning, new vocabulary, peer feedback, and confident writing indicates the need for explicit instruction in process-oriented and collaborative writing strategies.

RQ5: How do learners perceive the use of ChatGPT in writing?

Learners generally held positive perceptions of ChatGPT as a writing and learning tool. They used it particularly for translation and assistance in composing essays and articles and considered it easy and engaging to use. They also recognised its value in providing writing guidance, generating ideas, and encouraging the evaluation of alternative viewpoints. Nevertheless, they were comparatively less convinced that ChatGPT improved their academic performance and productivity or provided a human-like interactive experience.

The positive perceptions align with El Hosayny et al. (2026) and Tam (2025), who found that learners valued ChatGPT for idea generation, language refinement, writing guidance, and feedback. Its perceived ease and engaging nature also supports Youssef et al. (2024), who associated ChatGPT use with greater engagement and

critical thinking. However, learners' uncertainty about its effects on performance and productivity suggests that ease of use does not automatically produce better learning outcomes. This supports Rahmat et al. (2026), who concluded that ChatGPT is most effective as a guided scaffold rather than an independent writing solution.

RQ6: Is there a relationship between effort regulation and writing strategies?

A significant and strong positive relationship was found between effort regulation and writing strategies. This indicates that learners who demonstrated greater concentration, persistence, and willingness to work hard in writing also tended to use writing strategies more frequently. Therefore, the null hypothesis was rejected.

The strong positive relationship supports Raoofi et al.'s (2017) view that effort regulation is interconnected with metacognitive, cognitive, social, and affective writing strategies. It is also consistent with Taib et al. (2025), who found that strategic awareness was positively related to learners' persistence, concentration, thinking processes, and emotional management. From the perspective of Cognitive Load Theory, sustained effort may help learners manage the cognitive demands of planning, drafting, and revising (Sweller, 1988). Thus, learners who regulate their effort effectively may be more likely to apply writing strategies consistently when facing challenging tasks.

RQ7: Is there a relationship between effort regulation and ChatGPT?

A significant and strong positive relationship was found between effort regulation and students' perceptions of ChatGPT. Learners with stronger effort regulation tended to have more positive perceptions of ChatGPT as a writing and learning tool. Therefore, the null hypothesis was rejected.

The strong positive relationship suggests that persistent and focused learners may be more willing to engage actively with ChatGPT during writing. This supports El Hosayny et al. (2026) and Tam (2025), who found that effective ChatGPT use depended on learners' self-regulation, personal effort, critical evaluation, and continued interaction with feedback. It also aligns with Youssef et al. (2024), who associated ChatGPT use with greater engagement, and Rahmat et al. (2026), who found that AI scaffolding can promote learner agency and motivation. However, the correlation does not establish that effort regulation causes positive perceptions of ChatGPT.

Implications and Suggestions for Future Research

Theoretical and Conceptual Implications

The findings support Cognitive Load Theory by showing that effort regulation is strongly associated with writing-strategy use. As writing requires learners to manage multiple cognitive demands simultaneously, concentration and persistence may help them sustain the mental effort needed to plan, draft, monitor, and revise their work (Sweller, 1988). The findings also support Sociocultural Theory by positioning ChatGPT as a digital scaffold that can provide guidance, ideas, language assistance, and feedback within learners' Zone of Proximal Development (Vygotsky, 1978). Conceptually, the strong relationship between effort regulation and perceptions of ChatGPT suggests that learners' engagement with AI-assisted writing is connected to their willingness to persist and regulate their learning. Thus, the study integrates effort regulation, writing strategies, and AI-based scaffolding within a single framework, while recognising that these correlational findings do not establish causal relationships.

Pedagogical Implications

Writing instruction should explicitly develop effort regulation alongside metacognitive, cognitive, social, and affective strategies. Lecturers can divide complex assignments into manageable stages and guide learners through planning, drafting, peer feedback, revision, and reflection. More attention should be given to the comparatively less-practised behaviours identified in this study, including pre-writing planning, using newly learned vocabulary, obtaining feedback on revised work, writing regularly, and developing confidence.

ChatGPT may be incorporated as a guided writing assistant for brainstorming, translation, language refinement, feedback, and revision, but students should be taught to formulate effective prompts, verify information, evaluate responses critically, and retain ownership of their writing (El Hosayny et al., 2026; Tam, 2025). Additional support may be particularly useful for diploma students and Science and Technology students, who reported lower use of writing strategies or less positive perceptions of ChatGPT than their counterparts.

Suggestions for Future Research

Future studies could analyse students' written work, revision histories, prompt logs, and actual ChatGPT interactions to complement self-reported perceptions. Researchers could also examine whether writing strategies mediate the relationship between effort regulation and effective ChatGPT use and compare learners across disciplines, educational levels, language-proficiency levels, and demographic groups. Qualitative interviews could also clarify why students from different fields and levels of study perceive ChatGPT differently.

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APPENDIX

Writing Strategies & ChatGPT

SECTION	VARIABLE	CONSTRUCT	NO OF ITEMS/ INDICATORS	TOTAL
B	WRITING STRATEGY Raoofi et al. (2017)	Metacognitive	10	27
		Effort Regulation	4	
		Cognitive	6	
		Social	4	
		Affective	3	
C	CHATGPT Youssef et al. (2024)	Critical thinking abilities	4	16
		Academic achievement	4	
		ChatGPT usage	5	
		Student engagement	3	
				43

Section B-Writing Strategies

Metacognitive (MWS)

ITEM	1	2	3	4	5
MWSQ 1 I organize my ideas prior to writing.					
MWSQ 2 I revise my writing to make sure that it includes everything I want to discuss in my writing.					
MWSQ 3 I check my spelling.					
MWSQ 4 I check my writing to make sure it is grammatically correct.					
MWSQ 5 I evaluate and re-evaluate the ideas in my essay.					
MWSQ 6 I monitor and evaluate my progress in writing.					
MWSQ 7 I revise and edit an essay two or more times before I hand it in to my teacher.					
MWSQ8 I go through the planning stages in my writing.					
MWSQ9 I go through the drafting stages in my writing.					
MWSQ10 I go through the revising and editing stages in my writing.					

Effort Regulation (ERS)

ITEM	1	2	3	4	5
ERSQ 1I write a lot to develop my writing skills.					
ERSQ 2I often work hard to do well in my writing even if I don't like English writing tasks.					
ERSQ 3Even if the writing activities are difficult, I don't give up but try to engage in them.					

ERSQ 4I concentrate as hard as I can when doing a writing task.

Cognitive (CWS)

ITEM	1	2	3	4	5
CWSQ1 I use memorized grammatical elements such as singular and plural forms, verb tenses, prefixes and suffixes, etc, in my writing					
CWSQ 2I put newly memorized vocabulary in my sentences.					
CWSQ 3In order to generate ideas for my writing, I usually engage myself in brainstorming.					
CWSQ 4I use different words that have the same meaning.					
CWSQ 5I use my experiences and knowledge in my writing.					
CWSQ 6I try to use effective linking words to ensure clear and logical relationship between sentences or paragraphs					

Social (SWS)

ITEM	1	2	3	4	5
SWSQ1 In order to generate ideas for my writing, I usually discuss the writing topic with a friend or classmate.					
SWSQ 2After revising and editing my essay thoroughly, I ask a friend or my classmate to read and comment on it.					
SWSQ 3I try to identify friends or classmates whom I can ask for help in my writing.					
SWSQ 4 When I have trouble writing my essay, I try to do it with my classmates or friends.					

Affective (AWS)

ITEM	1	2	3	4	5
AWSQ1I try to write an essay in class with confidence and ease					
AWSQ2I try to relax whenever I feel afraid of writing.					
AWSQ3I encourage myself to write even when I am afraid of making mistakes					

Section C-ChatGPT

Critical Thinking Abilities (CT)

ITEM	1	2	3	4	5
CTQ1 I usually need clarification on the precision and reliability of information provided by ChatGPT, which enhances my critical thinking skills.					
CTQ2 ChatGPT's responses made me doubt their validity, leading me to seek further clarification or evidence.					
CTQ3 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.					
CTQ4I need clarification about the accuracy of ChatGPT's output, which often encourages me to evaluate the information and conduct additional research independently.					

Academic Achievements (AA)

ITEM	1	2	3	4	5
AAQ1 ChatGPT brings innovative ideas that are ready to be shared with student.					
AAQ2 Students can anticipate robust writing guidance from ChatGPT.					
AAQ3 ChatGPT has improved my academic performance.					
AAQ4 ChatGPT has improved my learning pace.					

ChatGPT Usgae (CU)

ITEM	1	2	3	4	5
CUQ1 ChatGPT is a state-of-the-art writing model that is favorably used today.					
CUQ2 Students seek help from ChatGPT's assistance in composing essays and articles.					
CUQ3 ChatGPT helps students in English language translation.					
CUQ4 Employing ChatGPT significantly improves human productivity.					
CUQ5 The use of ChatGPT marks a groundbreaking transformation in writers' capabilities.					

Student Engagement (SE)

ITEM	1	2	3	4	5
SEQ1 ChatGPT is more interactive, human-like, and engaging for the students.					
SEQ2 ChatGPT increases confidence in my ability to conduct research/to search for materials					
SEQ3 ChatGPT is easy to use and more engaging for me					
SEQ4 ChatGPT helps and shares my educational burden in the best possible manner.					