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Task Complexity and Discourse Features of Academic Writing Performance: The Role of Language Proficiency, Self-Regulated Writing Strategies, and Self-Efficacy

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Abstract: Recent studies on task-based approaches have explored how variations in task demands influence linguistic features such as fluency, accuracy, and syntactic or lexical complexity (Johnson, 2017). However, the studies on task complexity and discourse features have received scant attention. In response to this limited attention, this study examined how Iranian EFL learners employed discourse features across tasks of varying complexity levels. Furthermore, the study investigated the influence of strategic self-regulation in writing, overall language proficiency, and writers' confidence on students' academic writing performance. To this aim, 108 intermediate EFL writers participated in an English Proficiency Test (PET) and writing tasks with varying degrees of difficulty. They also completed self-regulated writing strategies and self-efficacy questionnaires. To examine how different levels of task complexity shaped EFL writers' performance in cohesion, coherence, and organizational patterns, along with the role of learner-related factors (language proficiency, self-regulated writing strategies, and self-efficacy), a range of measures was employed. The results revealed that increasing task demands contributed to improved student performance with respect to discourse-related aspects of writing. In addition, learner-related variables showed meaningful predictive power for academic writing performance, explaining 31% of the variance in low-complexity tasks, 58% in medium-complexity tasks, and 64% in high-complexity tasks. Findings highlight pedagogical and assessment implications, emphasizing scaffolded instructional support and task-sensitive evaluation in academic writing

***Keywords*:** Academic Writing, Language Proficiency, Self- Efficacy, Self-Regulated Writing Strategies, Task Complexity

Introduction

Writing plays a pivotal role in language learning, serving both to develop learners' composing skills and to deepen their understanding of linguistic and genre-related conventions (Hyland, 2003). Moreover, engaging learners in writing tasks has been found to promote the advancement of writing skills and enhance learning via writing (Gilabert et al., 2016; Manchón, 2011; Rahimi & Zhang, 2017; Zhang, 2013). Consequently, significant efforts have been undertaken to mitigate the influence of task design characteristics on L2 writing outcomes (Frear & Bitchener, 2015; Kormos, 2011; Kuiken & Vedder, 2007, 2008, 2011, 2012; Ong & Zhang, 2013; Rahimi & Zhang, 2018; Ruiz-Funes, 2015). The previous studies were grounded on two theoretical frameworks: Robinson's Cognition Hypothesis (CH) (2001, 2011) and Skehan's Limited Attentional Capacity Model (LACM) (2014, 2016).

Robinson's CH relies on Wicken's (2007) multiple resource model, which posits that attention is distributed across distinct resource pools. As the cognitive requirements of a task rise, learners are compelled to engage in different pools concurrently and allocate attention to diverse production features.

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(Robinson 2005). According to Robinson's approach, task complexity (TC) influences language acquisition and suggests the necessity to adjust TC through two aspects: resource dispersing and resource directing. Resource-dispersing cognitive factors (e.g., differences in planning duration, existing knowledge, and single-task requirements) redirect attention from the formal aspects of L2 task execution toward processes external to linguistic performance. In contrast, factors that direct resources (e.g., task immediacy, element complexity, and cognitive demands) channel learners' attention toward linguistic forms, as task requirements encourage deeper processing of complex language structures. Conversely, Skehan's LACM, which is founded on VanPatten's (2007) single-resource model of attention, posits that TC influences how learners distribute their attentional resources and produce output in the target language. The concept assumes that all cognitive processing draws on a unified pool of cognitive resources. Writing, therefore, poses a challenge in balancing attention between linguistic form and content because of the limited capacity of attentional resources. Addressing both language and content aspects of a task strains competing resources. As a result, attentional resources are contested among aspects of language production, leading to dimensional trade-offs.

Building on Robinson's (2011) view that affective dimensions of individual differences become more influential as cognitive demands rise, two learner-related factors are particularly relevant to writing performance. The first is self-efficacy (SE), which reflects writers' confidence in meeting task requirements. Prior research has consistently shown that stronger SE is associated with higher writing achievement, largely because confident learners engage more actively with writing tasks (Knog & Teng, 2023; Locke & Johnson, 2016; Pajares, 2003; Singer & Alexander, 2017; Teng, Sun, & Xu, 2018). The second factor is self-regulated writing strategies (SRWS), which involve the metacognitive component that support independent text production. According to Teng and Yue (2023), these strategies mediate writing performance, as students with higher metacognitive awareness are better able to think critically, thereby improving their academic writing performance (AWP).

Although numerous task design features, including task complexity, task type, and planning time, have been analyzed for their effects on learners' linguistic output (e.g., Robinson, 2001, 2011; Skehan, 2014; Ellis, 2003), few empirical studies have investigated how these features influence students' academic writing in L2 contexts. Prior research has largely focused on general performance measures such as fluency, lexical complexity, and grammatical accuracy (Kormos, 2011; Kuiken & Vedder, 2007, 2012), while aspects like argumentation, idea integration, and genre-specific writing skills remain underexplored. This study seeks to fill this gap by examining how TC, as a key aspect of task design, influences the quality of academic writing with respect to discourse features. Furthermore, although learner variables influence writing outcomes (McCutchen, 2006), examining these outcomes through learner characteristics can offer valuable insights into effective task design; nevertheless, empirical research exploring writing TC and how it is mediated by individual learner differences remains scarce. Schunk and Zimmerman (2007) assert that cognitive and motivational factors are essential to writing performance. To date, however, only a few individual difference (ID) variables—such as aptitude, working memory, IQ, and anxiety—have been examined in relation to one another (Niwa, 2000; Robinson, 2007). Robinson (2007) investigated how TC influences speech production and opportunities for interaction-driven language learning, as well as its relationship with ID factors such as anxiety. Further research is needed to clarify and confirm the degree and characteristics of the interplay among learner-specific factors and TC manipulation. This study aims to expand previous research by investigating three learner-related variables—LP, SRWS, and SE—and exploring how individual differences may modulate the influence of TC on AWP. Accordingly, the researcher developed the following research questions for this study.:

Research Question One: Does variation in TC lead to statistically significant between-group differences in discourse-level writing performance?

Research Question Two: To what extent do learner-related variables (i.e., LP, SRWS, and SE) predict AWP across different levels of TC?

Literature Review

Academic Writing and Discourse-Level Challenges in EFL Contexts

Academic writing in EFL contexts has been widely characterized as a cognitively demanding activity that requires learners to integrate linguistic knowledge with higher-order discourse skills. Beyond grammatical accuracy, effective academic writing entails the ability to establish coherence, maintain cohesion, and organize ideas logically across extended texts (Hyland, 2015; Kellogg, 2008). Empirical research has consistently shown that EFL learners experience persistent difficulties in producing cohesive and coherent academic texts, often resulting from limited strategic control, writing anxiety, and insufficient management of cognitive resources during text production (Cheng, 2004; Teng & Wang, 2023). These challenges highlight the importance of examining not only linguistic outcomes but also discourse-level features when investigating academic writing performance.

TC and Discourse Features of L2 Writing

Within task-based approaches to second language acquisition, TC has been identified as a critical factor influencing learners' written performance. Robinson (2001, 2022) conceptualizes TC as the cognitive, functional, and linguistic demands inherent in task design, emphasizing that complexity arises from intrinsic task characteristics rather than external conditions. In contrast, Skehan's (2009, 2014, 2016) LACM and trade-off hypotheses propose that increasing task demands may lead learners to prioritize certain aspects of performance at the expense of others.

Empirical studies examining TC in writing contexts have produced mixed findings, particularly with respect to discourse-level outcomes. Kormos (2011) reported that while increased task demands influenced overall writing quality, indices of cohesion remained relatively stable across task conditions. Similarly, Yildiz and Yeşilyurt (2021) found that although more complex tasks elicited a wider range of cohesive markers—particularly causal and intentional connectors—the overall degree of textual cohesion did not differ significantly between simple and complex tasks. Golparvar and Rashidi (2021) further observed that task manipulation had limited effects on most types of cohesive devices, apart from causal connectives, which showed measurable improvement under increased task demands.

From a cognitive perspective, these findings can be explained by the way TC reallocates attentional and working memory resources during writing. Ong and Zhang (2010) demonstrated that task condition manipulation influences how L2 writers distribute attentional resources across planning, formulation, and monitoring processes. Revesz et al. (2017) argued that the formulation stage imposes particularly heavy attentional demands, often leaving insufficient resources for monitoring and revision when task complexity increases. In line with Skehan's (2014, 2016) trade-off hypothesis, these studies suggest that heightened TC may redirect learners' attention toward higher order meaning construction while constraining attention to other discourse cues.

In contrast to cohesion, evidence suggests that TC may exert a more pronounced effect on coherence and organizational aspects of academic writing. Connor (1984), Leki et al. (2008), and Tapper (2005) noted that novice L2 writers often rely heavily on coordinating conjunctions and surface-level connectors, particularly in less demanding writing tasks. More recent studies, however, indicate that increased task demands may encourage deeper semantic processing and more structured organization of ideas. Rahimi (2018) and Rahimi and Zhang (2018), for instance, reported that cognitively demanding tasks prompted learners to generate more elaborate ideas and engage in higher-level planning, resulting in improved organization and coherence. Similarly, Abdi Tabari et al. (2023) also found that increased TC

positively influenced the coherence of learners' written products, suggesting that complex tasks may stimulate greater attention to discourse-level meaning relations. These findings align with Kellogg's (1996, 2013) cognitive model of writing, which posits that heightened task demands can activate more intensive planning and semantic encoding processes, thereby enhancing the structural quality of written texts.

Learner-Related Factors: SRWS and SE

While TC shapes the demands placed on learners, individual differences play a crucial role in determining how these demands are managed. Self-regulation, grounded in self-regulated learning theory, refers to learners' ability to plan, monitor, and control their cognitive, motivational, and behavioral processes during task engagement (Zimmerman, 2001; Pintrich, 2000). In writing contexts, SRWS have been shown to facilitate effective management of cognitive load by enabling learners to allocate attentional resources more efficiently across planning, drafting, and revising stages (Zabihi, 2018). This enhanced regulation of cognitive and attentional resources may explain why self-regulated writing strategies have been shown to predict students' writing performance (Rezaei, Amirian, & Tavakoli, 2024).

SE, defined as learners' beliefs in their capability to perform specific tasks successfully (Bandura, 1997), has been identified as a strong predictor of writing performance, and has been shown to improve learners' writing outcomes (Mousapour Negari, 2023). Research indicates that learners with higher writing-related SE demonstrate greater persistence, strategic engagement, and resilience when confronted with demanding writing tasks (Schunk & Pajares, 2010; Schunk & Usher, 2012). Teng and Zhang (2020) further suggested that the effects of TC on writing performance may be mediated by learners' SE beliefs and self-regulatory capacities, underscoring the interactive nature of task-related and learner-related factors.

Research Gap and Focus of the Present Study

Although previous research has extensively examined the effects of TC, SRWS, and SE on general L2 performance, little is known about how these learner-related variables interact with varying levels of task complexity to shape discourse-level features of academic writing. In particular, limited empirical evidence exists regarding the extent to which language proficiency, SRWS, and SE predict academic writing performance under different TC conditions, and whether their contributions vary as task demands increase. Addressing these gaps is essential for advancing a more comprehensive understanding of how cognitive task demands and learner characteristics jointly shape academic writing outcomes in EFL contexts. Accordingly, the present study investigates the impact of TC on the discourse features of Iranian EFL learners' academic writing and examines the predictive and modulatory roles of learner-related factors across different task conditions.

Theoretical rational for predictions: CH and analytic complexity

Grounded in Robinson's CH, the present study formulates its predictions by focusing specifically on analytic complexity as a core dimension of TC. According to the CH, increasing the cognitive and reasoning demands of tasks—particularly through the inclusion of elements that require greater conceptual analysis, comparison, and integration—directs learners' attentional resources toward meaning construction and higher-order conceptual processing (Robinson, 2001, 2011, 2022). Analytic complexity, which involves reasoning demands, causal relationships, and the integration of multiple sources of information, is therefore expected to promote deeper semantic processing during task performance.

From this perspective, tasks with higher analytic complexity are hypothesized to encourage L2 writers to engage more intensively in global planning and conceptual organization, leading to improvements in discourse-level features such as coherence and overall text organization. As Robinson (2011) argues, increased reasoning demands can facilitate greater conceptual elaboration, thereby enhancing the quality of propositional content and the logical relationships among ideas. In writing contexts, this enhanced

conceptual engagement is likely to result in clearer thematic progression and more coherent argument development.

However, the CH also predicts that the effects of increased analytic complexity may not be uniform across all dimensions of writing performance. Given learners limited attentional capacity, heightened analytic demands may prioritize meaning-related processes over surface-level linguistic encoding (Robinson, 2001; Skehan, 2014). Consequently, while coherence and organization are expected to benefit from increased analytic complexity, cohesion—particularly the frequency and variety of cohesive devices—may show more limited or inconsistent variation across task conditions. This prediction aligns with previous empirical findings indicating that cohesion indices are less sensitive to task manipulation than higher-order discourse features (Kormos, 2011; Yildiz & Yeşilyurt, 2021).

Furthermore, the CH posits that the facilitative effects of analytic complexity are contingent upon learners' ability to manage increased cognitive demands. Accordingly, learner-related factors such as SRWS and SE are expected to moderate the relationship between analytic task complexity and academic writing performance. Learners with stronger self-regulatory capacities and higher SE are more likely to allocate attentional resources effectively, thereby capitalizing on the cognitive affordances of analytically complex tasks.

Method

Design of the Study

The present research employed a quasi-experimental pretest–posttest design to investigate the effects of TC and learner-related variables (LP, SRWS, and SE) on the academic writing of Iranian EFL learners. Three argumentative tasks with varying cognitive demands were administered, and participants' performance in coherence, cohesion, and organization was assessed following Plakans and Gebril's (2017) framework.

Participants

Ninety-eight intermediate learners of English from Iran, recruited from Islamic Azad university in Rasht and Lahijan, voluntarily took part in the research. All participants were registered in a course titled Advanced Academic Writing. There were 41 male and 57 female pupils, aged between 17 and 37 years. The relatively wide age range of the participants in this study was deliberately selected, as research in second language acquisition suggests that once learners' language proficiency is systematically controlled and homogenized, chronological age alone provides limited explanatory power for variation in adult L2 performance (DeKeyser, 2012). Previous studies have consistently demonstrated that age-related differences among adult learners exert a more constrained influence on language outcomes than proficiency-related factors (Birdsong, 2006; Muñoz, 2010; DeKeyser, 2012). Accordingly, by rigorously controlling participants' language proficiency, the potential confounding effect of age was minimized in the present study.

All participants had previously completed the Basic English Writing course, which was a prerequisite for enrollment in the Advanced Academic Writing course. The researcher selected intermediate learners, following Kuiken and Vedder's (2008) argument that learners need to reach a certain proficiency threshold to perform tasks of varying complexity meaningfully. The participants were randomly assigned to each task condition. The course instructs students in two major academic genres (descriptive and argumentative) and fundamental skills pertinent to academic writing.

Instruments and Materials

English Language Proficiency Test

The homogeneity of the participants was evaluated using Preliminary English Test (PET) (2020) developed by Cambridge English Language Assessment. The reading section of this examination comprises three components: multiple-choice items, matching, and cloze tests. The composition was composed of a single component: the reading of a brief story and the subsequent responses to the associated inquiries. One component of the listening section necessitated that students listen to a recorded text and respond to questions that were pertinent to the material. The attendance of the speaking and listening sections was not mandatory for the participants. The test's reliability was estimated through the KR-21 formula, yielding a reliability coefficient of 0.81.

Tasks

Following Teng and Zhan (2023), three writing tasks differing in complexity were designed, categorized as low (Task 1), moderate (Task 2), and high (Task 3) complexity. The three tasks were analogous regarding topic and readability.; however, they differed in terms of reasoning and elements, which are the key features for increasing the cognitive complexity (Ellis, 2003; Halford, Cowan, & Andrews, 2007; Prabhu, 1987; Robinson, 2001, 2005).

In task 1, the participants read only one text and were supposed to answer some questions based on the reading. In task 2, the students were supposed to read two texts and analyze and integrate two dietary habits and compose a commentary essay. In task 3, the students were supposed to compare the three dietary habits, integrate their arguments to write a commentary article. To validate the three tasks, the researcher asked three experienced teachers to evaluate task difficulty using two 5-point Likert scales (Robinson, 2001). Then, the researcher piloted the tasks on 20 students. The results of repeated-measures ANOVA showed significant differrences regarding TC, $F(2, 38)=8.12$, $p. < .001$.

Self-Regulated Writing Strategy Questionnaire

The questionnaire developed by Teng and Zhan (2023) comprised 18 items aimed at measuring how frequently participants applied learning strategies in integrated writing tasks. The instrument measured learners' planning, monitoring, and self-evaluation behaviors using a seven-point Likert scale from 1 (never) to 7 (always). Teng and Zhan reported a Cronbach's alpha of 0.82, indicating high reliability.

Self-Efficacy Questionnaire

Teng et al. (2018) devised and validated this 20-item Likert-scale questionnaire, which groups items into three dimensions: linguistic SE (7), self-regulatory efficacy (6), and performance SE (7). Linguistic SE is a critical component of effective writing, as it refers to the self-perceived competence of learners in language and discourse. A sample statement representing this dimension reads: "I am able to produce a text with clear and logical organization." The second dimension, self-regulatory efficacy, reflects learners' perceived ability to plan and critically review their own writing processes. A sample item for this dimension is "I can contemplate my objectives prior to writing." The third factor, performance self-efficacy, refers to students' perceived ability to successfully complete writing tasks and assignments. A sample item for this factor is: "I am confident in performing exceptionally well on assignments in writing courses.". The

instrument employed a seven-point Likert scale, ranging from 1 ("not at all true of me") to 7 ("very true of me").

Writing Production Measures

The holistic scoring rubric applied in this study was adapted from Plakans and Gebril's (2017) framework, which assesses coherence and organizational structure in writing. These scales range from 1 (low) to 5 (high). Following Flower et al. (1990), organizational structures were categorized into seven distinct types, encompassing summarizing, commenting or reviewing, presenting isolated main points, framing information, providing free responses, synthesizing ideas, and offering interpretive summaries. To evaluate the effectiveness of the applied patterns, an overall organizational quality scale was employed. Since the writers may suffer from inappropriate selection of organization patterns or incomplete patterns (Kantz 1990), the present researcher employed the scale developed by Plakan and Gebril (2017) which considered these two measures as the main concern of the study. Measuring coherence in the written text is difficult because it is largely related to the reader's interpretation. In this regard, the raters were instructed to evaluate coherence quality with particular attention to the logical progression of ideas within the text. The five-level rating scale designed by Plakans and Gebril (2017) considered the flow of ideas as the main concern to assess coherence.

Due to the lack of holistic scoring for cohesive markers, a five-level scale for cohesion was develpoed based on six cohesion devices which have been introduced as significant variables in previous investigations (Crossley & McNamara 2008, 2009, 2012; Crossley et al. 2007; Guo & Crossley 2013; Hinkel 2001). The variables comprised connectives, logical operators, semantic similarity, anaphoric reference, argument overlap, and stem overlap. Subsequently, two raters evaluated 370 essays using the scale, yielding an inter-rater reliability of 0.83 ($p < 0.001$).

Data Collection Procedure

Primarily, a version of PET (2020) designed by Cambridge English Language Assessment was administered to confirm that the participants selected for the study were homogeneous with respect to LP (i.e., intermediate level). From an initial pool of 233 language learners, 190 participants were excluded due to PET scores below the designated proficiency level. As a result, a cohort of 98 participants was retained for the study, after which they were randomly divided into three task conditions and instructed to complete an academic writing task during class time. The time span for all three groups was 60 minutes. Subsequently, the participants were asked to complete a SE questionnaire. The main purpose behind the SE scale was to assess the student's efficacy level. Then, they were supposed to take another questionnaire on self-regulatory writing strategy to gauge their strategy use. The survey was conducted in both Persian and English. The test and the questionnaires were in the form of paper-and-pencil format.

Two experienced TEFL professionals with doctoral degrees and at least 10 years of expertise in evaluating student essays assessed the writings. A training session was held for the two evaluators to review the task specifications and scoring criteria. Furthermore, the evaluators were instructed to meticulously examine the two source texts to comprehend their content and the connections between them. They then independently assessed all written texts, assigning scores on a 0–5 scale according to coherence, organizational patterns, and cohesion. For each essay, the average rating provided by the two evaluators was considered the final score. The Spearman rank-order correlation (ρ) was calculated to examine the degree of inter-rater reliability, demonstrating inter-rater agreements of .83, .77, and .81 for coherence, organization patterns, and cohesion, respectively. Instructions for both questionnaires were read to the participants, underscoring that there were no correct or incorrect answers and that questions could be addressed by raising a hand. While no strict time limit was set, learners completed the questionnaires within

approximately 20 minutes. Prior to participation, all learners were assured of the confidentiality of their responses and were informed of their right to withdraw at any time.

Data Analysis

Descriptive and inferential statistical methods were used to analyze the data. Means and standard deviations were computed to summarize performance across TC levels. One-way ANOVAs examined the effects of TC on discourse features, while multiple regression analyses explored the predictive power of SRWS, SE, and LP on writing performance. Assumptions of normality and homogeneity were checked prior to analysis, and inter-rater reliability was confirmed using the Spearman correlation coefficient. All analyses were performed in SPSS (version 26).

Results

Descriptive Statistics

Descriptive statistics were computed to summarize the general patterns of AWP across varying TC levels and across SRWS and SE levels. Table 1 summarizes the descriptive results of writing performance under varying TC conditions in both the pretest and posttest phases.

Table 1

Descriptive Statistics of AWP Across Varying TC Levels

Task conditions		N	M	SD	Skewness	Kurtosis	Min.	Max.
Low Complexity	Coherence 1	33	2.21	.73	-.36	-1.03	1	3
	Coherence 2	33	2.27	.76	-.51	-1.05	1	3
	Organization 1	33	2.54	.75	1.00	-.44	2	4
	Organization 2	33	2.63	.89	1.09	-.05	2	5
	Cohesion 1	33	2.24	1.06	.48	-.20	1	5
	Cohesion 2	33	2.27	1.03	.47	-.07	1	5
	pretest	33	7.00	2.17	.03	-1.32	4	11
	posttest	33	7.18	2.33	.26	-.55	4	13
Medium Complexity	Coherence 1	31	2.35	.79	-.75	-.98	1	3
	Coherence 2	31	2.87	.76	-.25	-.13	1	4
	Organization 1	31	2.51	.76	1.11	-.29	2	4
	Organization 2	31	3.90	.94	.20	-1.92	3	5
	Cohesion 1	31	2.22	1.20	.51	-.82	1	5
	Cohesion 2	31	2.29	1.24	.40	-1.07	1	5
	pretest	31	7.09	2.52	.28	-1.25	4	12
	posttest	31	9.06	2.79	.23	-1.37	5	14
High Complexity	Coherence 1	32	2.25	.76	-.46	-1.09	1	3
	Coherence 2	32	3.37	.97	.26	-.81	2	5
	Organization 1	32	2.50	.67	1.02	-.05	2	4
	Organization 2	32	4.40	.49	.40	-1.96	4	5
	Cohesion 1	32	2.25	1.07	.45	-.29	1	5
	Cohesion 2	32	2.34	1.03	.35	-.13	1	5
	pretest	32	7.00	2.28	.10	-1.49	4	11
	posttest	32	10.12	2.39	.29	-1.07	7	15

***Note:** N= Number; M= Mean; SD= Standard Deviation; Min. Minimum; M= Maximum; 1= Pretest; 2= Posttest

In the low-complexity condition, the mean scores for coherence, organization, and cohesion remained relatively stable between the first and second measures, and there were slight increases in coherence (from M = 2.21 to M = 2.27) and organization (from M = 2.54 to M = 2.63). Analysis of the pretest and posttest scores revealed a small improvement (M = 7.00 to M = 7.18). In the medium-complexity condition, an increase was observed in coherence (from M = 2.35 to M = 2.87) and organization (from M = 2.51 to M = 3.90) and posttest scores (M = 9.06) were higher than the pretest scores (M = 7.09). In the high-complexity condition, coherence and organization showed the highest gains, particularly in organization (from M = 2.50 to M = 4.40), and posttest scores showed the highest increase (M = 10.12) compared to the pretest scores (M = 7.00). Skewness and kurtosis values indicated that the data distributions were normal. Based on the guidelines suggested by Tabachnick and Fidell (2013), if the skewness and kurtosis measures fall between -2 and +2, the data is considered to meet the assumption of normality. The findings indicated that increased TC was linked to greater improvements in writing performance, particularly in organization and coherence. The descriptive statistics for SE, LP, and techniques for self-regulated writing are reported in Table 2.

Table 2

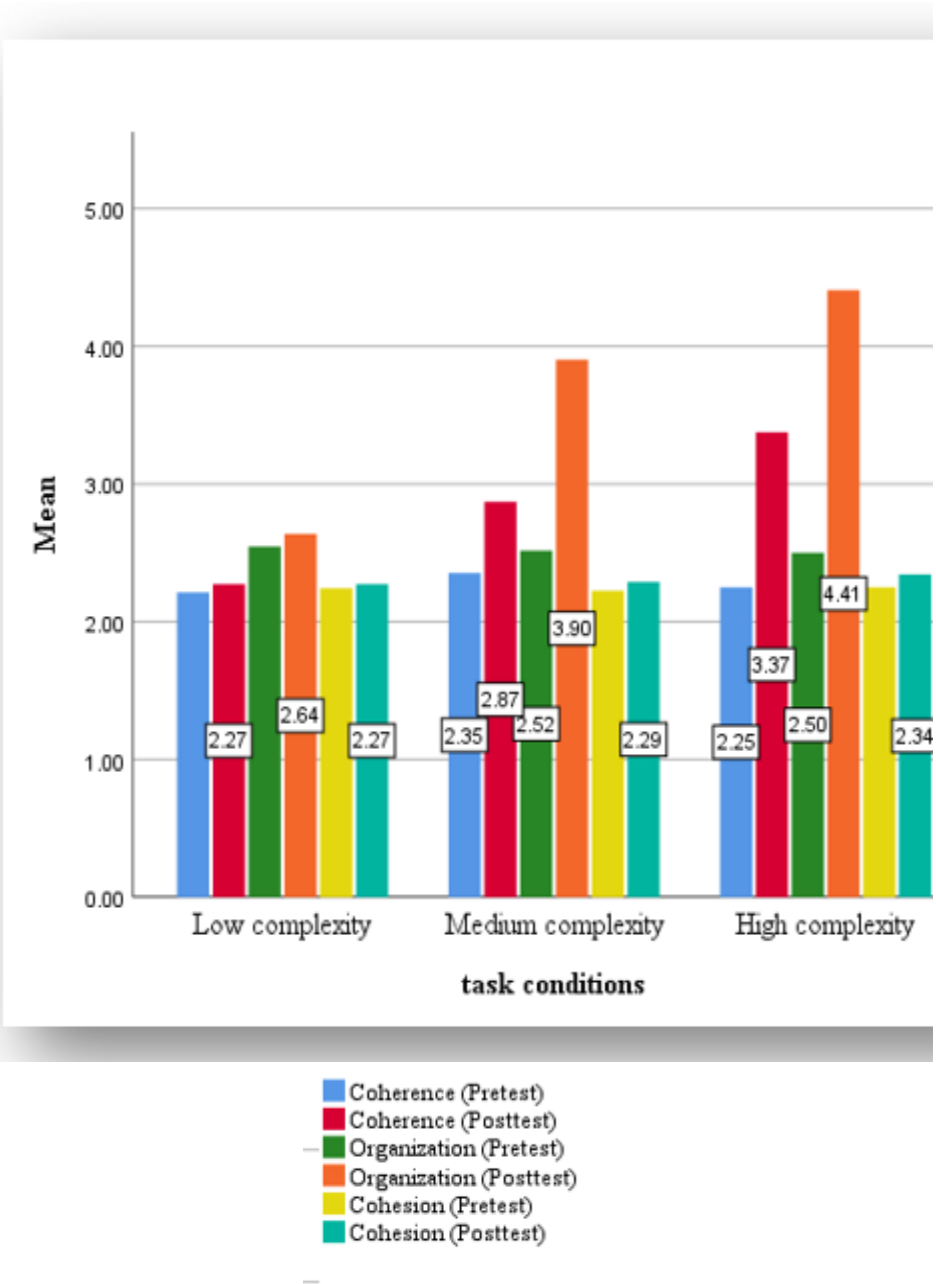
Descriptive Statistics for Self-Regulated Writing Strategies and SE

Task conditions		N	M	SD	Min.	Max.
Low Complexity	LP	33	138.90	30.34	20	149
	SRWS	33	36.63	12.90	19	60
	SE	33	36.30	12.46	18	63
Medium Complexity	LP	31	144.41	2.43	140	149
	SRWS	31	83.38	8.58	61	95
	SE	31	84.87	8.59	63	99
High Complexity	LP	32	145.34	3.20	140	149
	SRWS	32	102.90	5.13	95	110
	SE	32	123.50	5.04	110	130

In the low-complexity condition, participants showed a wide range of scores in LP (M = 138.90, SD = 30.34), SRWS (M = 36.63, SD = 12.90), and SE (M = 36.30, SD = 12.46). In the medium-complexity condition, LP (M = 144.41, SD = 2.43), SRWS (M = 83.38, SD = 8.58), and SE (M = 84.87, SD = 8.59) demonstrated higher mean values than those observed in the low-complexity condition. Participants exposed to the high-complexity task exhibited the greatest levels of LP (M = 145.34, SD = 3.20), SRWS (M = 102.90, SD = 5.13), and SE (M = 123.50, SD = 5.04), suggesting that increased TC was generally associated with improved performance across all three variables. These findings suggest that as TC increases, both SRWS and SE, along with LP, tend to improve. Figure 1 presents the mean differences in writing performance across TC conditions.

Figure 1

Bar Chart for the Coherence, Organization, and Cohesion Scores across TC Levels



The bar chart illustrated a clear upward trend in coherence, organization, and cohesion scores corresponding to higher levels of TC. The high-complexity tasks yielded the highest scores in all categories, followed by medium-complexity tasks, and low-complexity tasks showed the lowest scores. The findings imply that a higher degree of TC corresponded to more advanced levels of coherence, organization, and cohesion in learners' written outputs.

Inferential Statistics

This section presents the findings of the inferential statistical analyses, encompassing multiple regression models, carried out to answer the research questions.

TC and the AWP in Terms of Discourse Features

To investigate the first research question and evaluate the impact of TC on academic writing in terms of discourse features, a one-way ANOVA was conducted to compare coherence, organization, and cohesion scores across the three levels of TC. The assumptions of normality and homogeneity of variances were verified using skewness measures and Levene's test, respectively. Table 3 displays the ANOVA results.

Table 3

One-Way ANOVA Results for TC and Writing Performance

		Sum of Squares	df	Mean Square	F	Sig.
Coherence (Pretest)	Between Groups	.346	2	.173	.295	.745
	Within Groups	54.612	93	.587		
	Total	54.958	95			
Coherence (Posttest)	Between Groups	19.804	2	9.902	14.053	.000
	Within Groups	65.529	93	.705		
	Total	85.333	95			
Organization (Pretest)	Between Groups	.035	2	.017	.032	.968
	Within Groups	49.924	93	.537		
	Total	49.958	95			
Organization (Posttest)	Between Groups	54.175	2	27.087	41.940	.000
	Within Groups	60.065	93	.646		
	Total	114.240	95			
Cohesion (Pretest)	Between Groups	.010	2	.005	.004	.996
	Within Groups	115.480	93	1.242		
	Total	115.490	95			
Cohesion (Posttest)	Between Groups	.088	2	.044	.036	.965
	Within Groups	114.151	93	1.227		
	Total	114.240	95			
pretest	Between Groups	.197	2	.098	.018	.982
	Within Groups	504.710	93	5.427		
	Total	504.906	95			
posttest	Between Groups	144.678	2	72.339	11.475	.000
	Within Groups	586.280	93	6.304		
	Total	730.958	95			

For coherence, organization, and cohesion, no significant differences were found at the pretest stage (all *p*-values > .05), which indicated that the groups were similar before the task. However, significant differences emerged in the posttest scores for coherence and organization, in the posttest scores (*p*-values < .05). This suggested that TC significantly impacted writing performance regarding organization and coherence and higher complexity was associated with better performance. Post hoc Scheffé comparisons were conducted to determine specific group differences (As shown in Table 4).

Table 4

Scheffé Test for the Posttest Scores

Dependent Variable	Comparison	Mean Difference (I-J)	Sig.	95% Confidence Interval
Coherence (Posttest)	Low vs. Medium	-0.59824*	0.020	[-1.1205, -0.0759]
	Low vs. High	-1.10227*	0.000	[-1.6204, -0.5842]
	Medium vs. High	-0.50403	0.064	[-1.0303, 0.0222]
Organization (Posttest)	Low vs. Medium	-1.26686*	0.000	[-1.7669, -0.7668]
	Low vs. High	-1.76989*	0.000	[-2.2659, -1.2739]
	Medium vs. High	-0.50302	0.050	[-1.0069, 0.0008]
Cohesion (Posttest)	All comparisons	Not significant	p >.05	-
Overall Posttest Score	Low vs. Medium	-1.88270*	0.014	[-3.4450, -0.3204]
	Low vs. High	-2.94318*	0.000	[-4.4928, -1.3935]
	Medium vs. High	-1.06048	0.251	[-2.6346, 0.5136]

Significant differences in mean scores were observed for coherence, organization, and overall posttest performance between the low- and high-complexity groups, with the low-complexity group scoring lower than the high-complexity group ($p < .05$). Additionally, the participants assigned to the medium-complexity task outperformed those in the low-complexity group in both coherence and organization ($p < .05$). Nonetheless, the comparison between the medium- and high-complexity conditions revealed no statistically significant differences in coherence ($p = .06$) or organization ($p = .05$). Furthermore, no statistically significant differences were observed in cohesion ($p > .05$) across the groups, suggesting that TC exerted a significant influence on coherence and organization but had a relatively limited effect on cohesion. The ANOVA results for LP, SRWS, and SE are summarized in Table 5.

Table 5

ANOVA for LP, SRWS, and SE

		Sum of Squares	df	Mean Square	F	Sig.
Language Proficiency	Between Groups	787.83	2	393.91	1.22	.299
	Within Groups	29969.49	93	322.25		
	Total	30757.33	95			
Self-Regulated Writing Strategy	Between Groups	75536.28	2	37768.14	419.96	.000
	Within Groups	8363.71	93	89.93		
	Total	83899.99	95			
Self-efficacy	Between Groups	124192.28	2	62096.14	724.18	.000
	Within Groups	7974.45	93	85.74		
	Total	132166.74	95			

The analysis revealed that group differences in language proficiency were not statistically significant ($F = 1.22$, $p = .299$). In contrast, statistically significant variations emerged for SRWS ($F = 419.96$, $p < .001$) and SE ($F = 724.18$, $p < .001$), which indicated that TC influenced both SRWS and SE scores. Figure 2 provides a visualization of the mean differences.

Figure 2

Bar Chart for LP, SRWS, And SE

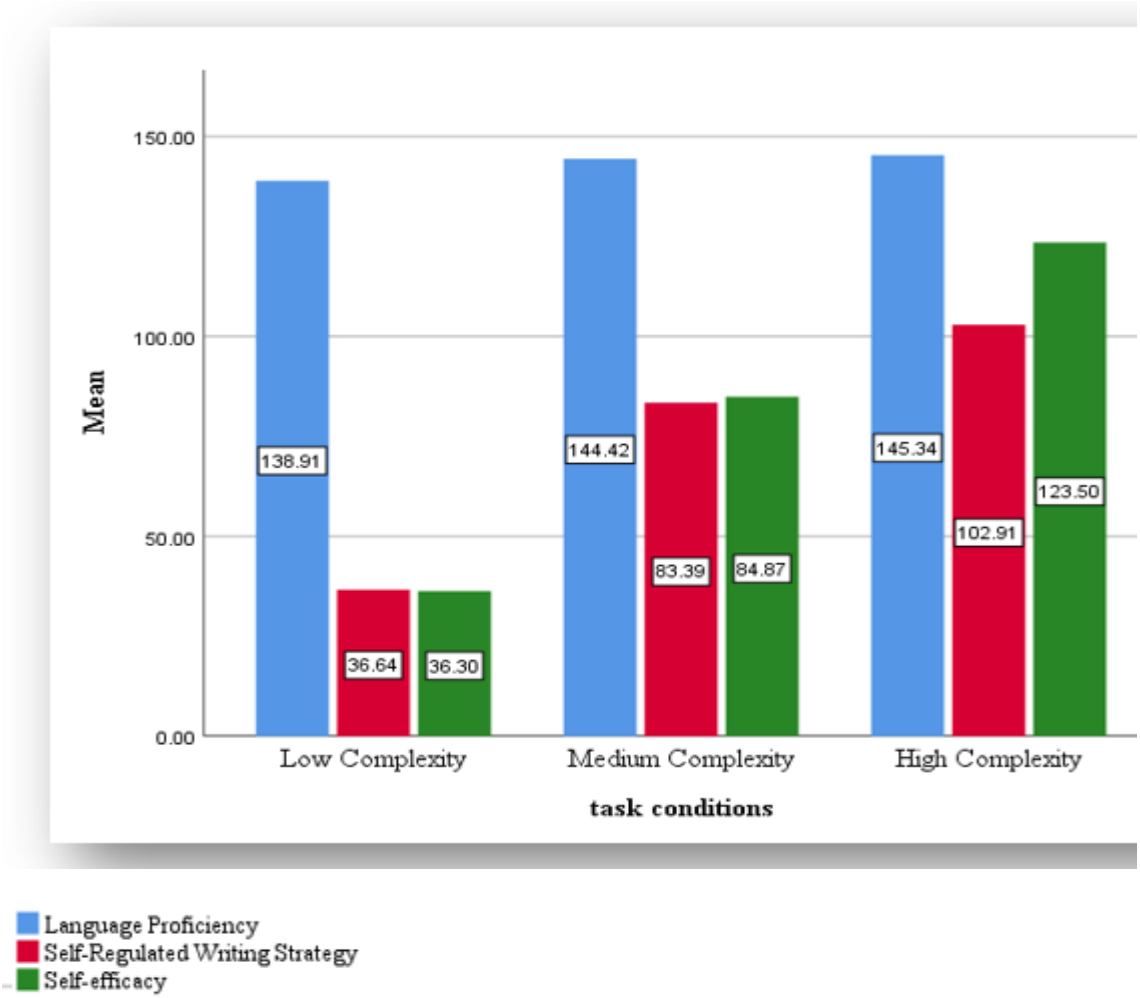


Figure 2 showed that higher self-regulated writing strategy and SE scores are associated with higher TC, while LP was relatively stable across the different conditions.

Role of LP, SRWS and SE

To investigate the second research question and examine the contribution of learner-related variables (i.e., SRWS, SE, and LP) in predicting academic writing performance across different levels of TC, a multiple regression analysis was performed. The results are presented in Table 6.

Table 6

Model Summary b

Task conditions	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Low Complexity	1	.556[a]	.309	.238	2.04
Medium Complexity	1	.763[a]	.582	.536	1.90
High Complexity	1	.803[c]	.644	.606	1.50

Note: a. Predictors: (Constant), SE, LP, and SRWS
b. Dependent Variable: academic writing
c. Predictors: (Constant), SE, SRWS, LP

The R-squared (R^2) values reflected the proportion of variance in academic writing performance explained by the predictor variables. In the low-complexity condition, the model explained 30.9% of the variance ($R^2 = .309$), while the adjusted R^2 (.238) indicated a moderate decrease after accounting for model complexity. In the medium-complexity task, the explained variance increased to 58.2% ($R^2 = .582$), with an adjusted R^2 of .536, which indicated a stronger predictive relationship. The highest explanatory power was observed in the high-complexity task, where the model accounted for 64.4% of the variance ($R^2 = .644$, adjusted $R^2 = .606$). This suggested that as TC increased, the predictors became more effective in explaining AWP. The standard error of the estimate (SEE) decreased from 2.04150 in the low-complexity condition to 1.50176 in the high-complexity condition, which further supported the model's improved fit with increasing task difficulty. The findings suggested that LP, SRWS, and SE play a progressively stronger role in predicting AWP as TC increases.

Table 7

ANOVA for the Regression Model

Task conditions	Model		Sum of Squares	df	Mean Square	F	Sig.
Low Complexity	1	Regression	54.046	3	18.015	4.323	.012[b]
		Residual	120.864	29	4.168		
		Total	174.909	32			
Medium Complexity	1	Regression	136.187	3	45.396	12.547	.000[b]
		Residual	97.684	27	3.618		
		Total	233.871	30			
High Complexity	1	Regression	114.352	3	38.117	16.901	.000[c]
		Residual	63.148	28	2.255		
		Total	177.500	31			

Note: a. Dependent Variable: academic writing
b. Predictors: (Constant), SE, LP, SRWS
c. Predictors: (Constant), SE, SRWS, LP

The ANOVA results assess the overall significance of the regression models predicting AWP across three TC levels. In the low-complexity condition, the regression model reached statistical significance, $F(3, 29) = 4.323$, $p = .012$, indicating that SE, LP, and SRWS jointly accounted for a meaningful share of the

variance in AWP. However, the proportion of variance that was explained was moderate. In the medium-complexity task, the model showed a stronger fit, F (3, 27) = 12.547, $p < .001$, which suggested a more substantial predictive effect of the independent variables on academic writing. The strongest model fit was observed in the high-complexity task, F (3, 28) = 16.901, $p < .001$, with the lowest residual variance, which indicated that the predictors became increasingly effective as TC increased.

Table 8

Coefficients

Task conditions	Model	β	t	Sig.	Correlations			Collinearity Statistics	
					Zero-order	Partial	Part	Tolerance	VIF
Low	Constant		.851	.402					
	LP	.216	1.28	.211	.387	.231	.198	.836	1.19
	SRWS	.319	1.79	.084	.475	.315	.276	.750	1.33
	SE	.180	1.00	.325	.408	.183	.154	.733	1.36
Medium	Constant		-3.60	.001					
	LP	.400	3.07	.005	.560	.509	.382	.912	1.09
	SRWS	.295	2.11	.044	.547	.376	.262	.789	1.26
	SE	.345	2.46	.020	.571	.429	.307	.793	1.26
High	Constant		-5.45	.000					
	LP	.402	2.98	.006	.679	.492	.337	.704	1.42
	SRWS	.267	2.11	.043	.554	.372	.239	.801	1.24
	SE	.351	2.68	.012	.636	.453	.303	.744	1.34

Note: a. Dependent Variable: academic writing; LP= Language Proficiency; SRWS= Self-Regulated Writing Strategies; SE= self-Efficacy; β =Standardized Coefficients Beta

The regression coefficients indicated the relative contributions of LP, SRWS, and SE to AWP across different TC levels. In the low-complexity condition, none of the predictors reached statistical significance ($p > .05$), which suggested weaker associations between these variables and academic writing. However, SRWS (β = .319, $p = .084$) demonstrated a marginal effect, which indicated a potential influence on writing performance. In the medium-complexity condition, LP (β = .400, $p = .005$), SE (β = .345, $p = .020$), and SRWS (β = .295, $p = .044$) all significantly contributed to academic writing. These findings imply that with increasing TC, individual learner differences exert a stronger influence on predicting writing performance.

In the high-complexity condition, all predictors including LP (β = .402, $p = .006$), SE (β = .351, $p = .012$), and SRWS (β = .267, $p = .043$) remained significant. The growing influence of these variables across varying complexity levels suggests that greater task demands amplify the contribution of cognitive and self-regulatory mechanisms to writing performance. It is worth mentioning that the Collinearity diagnostics revealed Variance Inflation Factors (VIF) below 1.5 for all predictors, which indicated no multicollinearity concerns. Table 9 presents the residual statistics employed to assess the assumptions of normality and equal variance in the regression analysis.

Table 9

Residuals Statistics a

Task conditions		Minimum	Maximum	Mean	Std. Deviation	N
Low Complexity	Predicted Value	3.56	9.60	7.18	1.299	33
	Residual	-4.48	3.92	.000	1.943	33
	Std. Predicted Value	-2.78	1.86	.000	1.000	33
	Std. Residual	-2.19	1.92	.000	.952	33
Medium	Predicted Value	4.32	12.71	9.06	2.130	31
Complexity	Residual	-3.21	3.57	.000	1.804	31
	Std. Predicted Value	-2.22	1.71	.000	1.000	31
	Std. Residual	-1.68	1.88	.000	.949	31
High	Predicted Value	5.29	12.56	10.12	1.920	32
Complexity	Residual	-2.93	3.34	.000	1.427	32
	Std. Predicted Value	-2.51	1.26	.000	1.000	32
	Std. Residual	-1.95	2.23	.000	.950	32

*Note: a. Dependent Variable: academic writing

Before conducting the repeated measures ANOVA, the assumptions of normality and homoscedasticity of residuals were examined across the three TC conditions. The statistics indicated that the mean residuals across all TC conditions was approximately zero, and the standardized residuals remained within an acceptable range (approximately ±2), suggesting that the assumptions were reasonably met.

Discussion

The results, corroborating with Kormos (2011) on discourse characteristics of performance, indicated no substantial alterations in the use of cohesion relative to TC. Consistent with these findings, Yildiz and Yeşilyurt (2021) observed that although learners' essays in the complex task demonstrated a wider use of causal and intentional cohesive markers and included additional linkers to highlight relationships among ideas and information, the degree of cohesion remained statistically similar across task types. Golparvar and Rashidi's (2021) findings revealed that while the frequency of additive, logical, temporal, and intentional cohesive devices remained relatively stable, the use of causal connectives showed a significant improvement. Golparvar and Rashidi (2021), together with Kormos (2011), maintained that cohesion indices were unaffected by task manipulation. The marked improvement in causal connective usage and text cohesion within the synthesis writing task might be attributed to how information was organized across segments of the more demanding task. The results can be elucidated by referencing Kellogg et al.'s (2013) assertion that various aspects of writing may engage distinct elements of working memory in accordance with task demands, owing to the relatively unhurried nature of writing. According to Ong and Zhang (2010), modifying task conditions influences the way learners distribute their attentional and working memory resources while composing texts. According to Revesz et al. (2017), the primary cause of the formulation operation's heavy attentional resource load is that it leaves insufficient attentional capability for the monitoring stage, which includes drafting and revising. Thus, TC modification is supported by a trade-off hypothesis proposed by Skehan (2014, 2016) by diverting L2 writers' focus from other coherent cues. The

findings imply that TC may influence the employment of cohesive devices by L2 writers by drawing their focus to higher-order aspects of L2 written production. Nonetheless, the outcomes showing minimal variation in cohesion appear to differ from earlier investigations on expository and argumentative writing (Connor, 1984; Leki et al., 2008; Tapper, 2005), which consistently reported a more frequent use of coordinating conjunctions by learners.

The outcomes of the present investigation indicated that higher TC significantly influenced the coherence of learners' written products, in line with the results by Abdi Tabari et al. (2023). Similarly, earlier research has shown that TC can affect the overall quality of written performance (Kormos, 2011; Revez et al., 2017). To clarify, the researchers observed that during more demanding tasks, writers must rely more heavily on their L2 lexical resources to maintain semantic connectivity among ideas, consequently generating a higher proportion of content words and reducing the recurrence of nouns across clauses. Rahimi (2018) asserted that the complexity of tasks may have compelled students to formulate more intricate concepts and enhance their structure, hence enhancing the quality of content, organization, and overall text scores.

The findings, along with Rahimi (2018) and Rahimi and Zhang (2018), revealed an enhancement in students' text organization. From a cognitive standpoint, one possible account for the enhanced organization is that raising task demands—through the inclusion of additional elements and reasoning processes—placed heavier cognitive and functional loads on L2 writers' attentional capacity. The planning, translation, and monitoring mechanisms consequently drew on more attentional resources to cope with the heightened cognitive load (Kellogg, 1996). To generate more structured preverbal messages, the planning processor was likely prompted to engage in deeper semantic encoding, generate a greater range of ideas, and focus more extensively on higher-level planning (Rahimi, 2018; Rahimi & Zhang, 2018). Regarding learner variables, the findings corroborate with Teng and Zhan's conclusion that the influence of task complexity on writing was mediated by EFL students' SE beliefs and self-regulation. One plausible account for this phenomenon is that learners who were aware of SRWS experienced reduced cognitive overload (i.e., the limited capacity of working memory to hold information at a given time), according to Zabihi (2018). A lower working memory capacity may result in a greater cognitive burden and heightened learning-related challenges for students who infrequently employ self-regulatory writing techniques (Zabihi, 2018). SRWS may also assist students in managing the difficulties of academic writing and reducing their cognitive load.

Conclusion and Implications

The analysis demonstrated that TC played a decisive role in shaping Iranian EFL learners' AWP, especially concerning coherence, organization, and cohesion. However, no statistically significant variation in cohesion was observed across different levels of TC. The present findings underscore the growing influence of individual learner variables, namely, language competency, SE, and SRWS —on AWP as TC increases. While these predictors showed limited impact in low-complexity conditions, their significance became evident under medium and high-complexity tasks, highlighting the importance of cognitive and self-regulatory factors in more demanding writing contexts. These results suggest that as learners engage with more complex tasks, their internal resources and strategies exert greater influence on their writing performance. Therefore, pedagogical approaches that foster self-regulated learning and build learners' confidence and language competence may be particularly beneficial in helping students navigate cognitively demanding writing tasks.

The current findings underscore several pedagogical and assessment-related implications. From a pedagogical standpoint, the results highlight the need for targeted instructional support in handling complex writing tasks. According to CH (Robinson, 2007), more demanding tasks increase cognitive load, prompting learners to employ their linguistic, metacognitive, and affective resources. Therefore, rather than

adopting a uniform approach across tasks, instructors should implement different teaching strategies-offering more scaffolded and reflective support as TC rises. It is also recommended that explicit instruction in SRWS be systematically integrated into academic writing curricula, particularly when learners engage in cognitively demanding writing tasks (Teng & Zhang, 2016). From an assessment perspective, the interplay of TC and learner variables underscores the need for designing writing assessments that go beyond static, one-size-fits-all formats. Assessments should consider the varying cognitive demands of tasks and the ways in which individual learner traits affect performance (Skehan, 2009; Kuiken & Vedder, 2011). Incorporating a range of task types in writing evaluation can lead to more valid inferences about learners' actual writing abilities and allow for fair judgments.

Evidently, the study suffers from limitations. The study investigated the impact of TC on L2 writing performance through controlled adjustments in element quantity and reasoning requirements. Future inquiries could explore the potential impact of additional components within the Triadic Componential Framework on foreign language writing performance. Moreover, the findings were based on quantitative data. By incorporating qualitative analysis, the study could examine the features of self-efficacy and strategies for self-regulated writing.

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