

Research Article

Task Complexity, Writing Anxiety, and Flow: Associations with EFL Learners' Writing Performance

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ABSTRACT

Writing in a foreign language places considerable cognitive demands on learners as it requires them to attend to both linguistic form and psychological states. This study sought to investigate the relationships among Task Complexity (TC), two learner-related affective constructs (namely Writing Anxiety and Flow Experience), and L2 writing performance assessed in terms of complexity, accuracy, and fluency (CAF). Using Robinson's Cognition Hypothesis together with Skehan's Limited Attentional Capacity Model, the study examined how varying TC levels affect EFL learners' written output and their affective states during task performance. Thirty-one Iranian EFL students completed simple and complex forms of a writing task in a counterbalanced within-subjects design. Writing anxiety (WA) and flow were measured through validated questionnaires, while writing performance was assessed using established CAF indices. Paired-samples t-tests showed that WA was significantly higher and flow experience was significantly lower in the complex-task condition compared with the simple-task condition. Linear mixed-effects models further indicated that flow was positively associated with four measures of writing performance, particularly measures of syntactic complexity and fluency, whereas WA was associated with two measures of syntactic complexity and no significant associations with accuracy or fluency. Findings point to the complex relationships among cognitive task demands, learners' affective experiences and their writing performance. The results are examined in relation to existing theoretical frameworks and prior empirical research.

Introduction

Proficiency in a second or foreign language writing emerges from a complex interplay of learners' linguistic knowledge, cognitive processes, and affective states (Abdolrezaipoor & Ghanbari, 2025; Li et al., 2023; Li et al., 2024). Owing to the cognitive demands of writing, characteristics of instructional tasks and the way they shape learners' language production and performance have been studied by many Second Language Acquisition (SLA) researchers (Abdi Tabari & Goetze, 2024; Chen et al., 2023). In this realm, complexity has been examined from two perspectives: as a feature of learner's language production and as an attribute of the tasks they complete. The latter dimension, referred to as Task Complexity (TC), has been shown to influence a range of language skills, including listening comprehension (Joo & Lee, 2025), vocabulary selection (Zhan et al., 2021), and writing performance (Chen et al., 2023; Révész et al., 2016). Although the effects of task complexity on CAF have been widely investigated, there were divergent findings across the three CAF dimensions, particularly in writing contexts.

Two influential theoretical frameworks have informed research on TC and writing: Robinson's (1995) Cognition Hypothesis (CH) and Skehan's (1998) Limited Attentional Capacity Model (LACM). Although both models explain learners' allocation of cognitive resources during task performance, they offer distinct predictions. The Cognition Hypothesis claims that learners are able to deploy additional cognitive resources when tasks become more demanding, predicting that increased TC will enhance both accuracy and complexity. The Limited Attentional Capacity Model, on the other hand, holds that working memory is finite, meaning that tasks

with higher levels of complexity may force trade-offs among CAF dimensions. Initially formulated for oral language production (Xu & Zhang, 2023), both frameworks were later applied to written contexts (Abdi Tabari & Goetze, 2024; Frear & Bitchener, 2015; Kuiken & Vedder, 2007, 2008); nevertheless, empirical studies have reported mixed findings, leaving the impact of TC on CAF in writing unclear (Abdi Tabari & Goetze, 2024; Johnson, 2017). For example, Révész et al. (2016) reported improvements in syntactic complexity and accuracy under cognitively demanding tasks, whereas Kuiken and Vedder (2008) found gains in accuracy but little improvement in complexity. Other studies have reported minimal or inconsistent effects across CAF measures (Johnson, 2017; Abdi Tabari & Goetze, 2024). This variation in findings suggests that the influence of TC may depend on different factors including learner characteristics and task conditions.

In fact, the cognitive demands underscored by these two frameworks do not only affect learners' linguistic processing. When TC increases, learners need to devote greater attentional and cognitive resources to task completion, and this increased demand can also affect how they perceive the task. When perceived task demands exceed learners' available processing resources, they may experience heightened anxiety and reduced attentional engagement. Meanwhile, when the demands of a task are perceived as challenging but manageable based on learners' abilities, learners may experience flow, an optimal state characterized by intense concentration and intrinsic engagement. From this perspective, task complexity influences writing performance not only through its direct effects on cognitive processing but also through

influencing learners' affective experiences during task performance.

This cognitive-affective link provides a rationale for studying how writing anxiety (WA), flow, and TC relate to L2 writing performance. Negative psychological states, such as anxiety, inhibition, low self-esteem, and lack of motivation, are known to interfere with memory and attention (Arnold & Brown, 1999; Li, 2024), while positive states such as enjoyment, self-efficacy, and flow have been linked to deeper engagement and enhanced performance (Abdolrezaipoor & Ghanbari, 2022; Abdi Tabari & Goetze, 2024; Liu et al., 2022). Accordingly, affective factors should not be considered as separate from the cognitive demands imposed by writing tasks; rather, they may exert a larger impact on the way learners experience and respond to varying levels of task complexity.

Thus, in addition to cognitive factors, affective variables have received growing attention as important correlates of task performance. Writing Anxiety (WA), defined as learners' fear of writing that interferes with actual writing ability (Cheng, 2002), has been repeatedly linked to lower L2 writing performance (Cheng et al., 1999; Gibriel, 2019; Sabti et al., 2019; Tahmouresi & Papi, 2021). However, most existing studies examine WA in relation to only one CAF dimension, or none at all, and only a few studies have explored its relationship with TC (Abdi Tabari et al., 2025; Rahimi & Zhang, 2018). Of these, only Abdi Tabari and Goetze (2024) considered all three CAF dimensions simultaneously.

On the positive side, flow, described as an optimal state of full engagement in which individuals lose awareness of time and self (Csikszentmihalyi, 1990), has attracted comparatively little attention in L2 writing

research. Characterized by intrinsic motivation and heightened task involvement (Nakamura & Csikszentmihalyi, 2014), flow has been studied primarily in reading contexts (Egbert, 2003; Kirchhoff, 2013; McQuillan & Conde, 1996). Findings on its relationship with TC are contradictory: some researchers report that higher TC promotes flow (Ben Maad, 2012; Ishikawa, 2011), while others find no such effect (Cho, 2018). A survey of the available literature suggests that there is a scarcity of research regarding how flow relates to CAF performance in English as a Foreign Language (EFL) writing, or how it interacts with WA in writing task contexts.

The present study addresses these gaps by investigating the interplay among TC, WA, flow, and writing performance across all three CAF dimensions in an EFL context. Accordingly, this research focuses on: (1) whether EFL learners' WA differ across simple and complex task conditions; (2) whether EFL learners' flow differ across simple and complex task conditions; (3) whether TC affects writing performance in terms of CAF; and (4) how TC, WA, and flow jointly associate with CAF measures. Theoretically, the study advances current understanding of task-based models of L2 acquisition by focusing on both negative and positive affective variables. Pedagogically, the findings can inform teachers, curriculum designers, and test developers by showing how task complexity and learner-related affective factors affect writing performance in terms of CAF.

Literature Review

Writing proficiency in a second or foreign language can be considered as a multifaceted construct, which is affected by writers' linguistic knowledge, cognitive processing, and

affective state. Within SLA research, learner performance is typically evaluated through the CAF framework, which has become a widely accepted framework for analyzing language performance (Skehan, 1989). Linguistic complexity reflects the “size, elaborateness, richness, and diversity of the learner’s linguistic L2 system” (Housen & Kuiken, 2009, p. 464), accuracy refers to conformity to target-language norms, and fluency concerns the efficiency and speed of language production (Housen & Kuiken, 2009; Pallotti, 2009). These dimensions have been investigated in numerous studies focusing on the influences of instructional and learner-related variables in writing performance. Considering the multifaceted nature of L2 writing performance, examining the extent to which characteristics of the writing task influence learners’ performance across different aspects is a growing concern.

One factor that has attracted substantial research attention is Task Complexity (TC), defined as the cognitive demands that a task places on learners (Robinson, 2001). Drawing on cognitive information processing theories, two influential perspectives (CH and LACM) have been proposed to explain the impact of TC on second language performance. CH predicts that heightened task complexity prompts learners to focus more on linguistic form, thereby yielding more complex and accurate language outcomes. In contrast, LACM argues that learners possess finite attentional resources, resulting in trade-offs among the CAF dimensions when task demands increase. The literature provides mixed findings for these perspectives. While some studies have referred to the favorable impacts of increased TC on lexical complexity, syntactic complexity, and accuracy (Frear & Bitchener, 2015; Révész et al., 2016),

others have pointed to limited or inconsistent effects across different dimensions of writing performance (Kuiken & Vedder, 2008; Abdi Tabari et al., 2024). Therefore, the literature shows that increasing TC does not lead to comparable effects across CAF dimensions. These disagreements demand further investigation of the relationship between TC and written production.

Emerging evidence has underscored the importance of individual difference factors in learners’ responses to task demands (Abdolrezaipoor & Ghanbari, 2025). One affective factor that was found influential in learners’ responses to writing tasks is writing anxiety. Defined as the fear or apprehension associated with writing tasks (Cheng, 2004), WA has consistently been linked to lower writing performance. Previous studies have demonstrated negative relationships between anxiety and different facets of writing quality, notably complexity and fluency (Rahimi & Zhang, 2018; Güvendir & Uzun, 2023). However, most studies have examined only one dimension of the CAF framework or relied on holistic performance measures and have not examined how anxiety might influence writing performance as measured in terms of CAF. In addition, though the negative relationship between WA and L2 writing performance is confirmed in the literature, studying positive psychological states may offer a complementary perspective on learners’ performance in tasks with varying complexity levels.

However, contrary to the extensive literature on negative emotions such as WA, positive affective factors have not received due attention. One less investigated variable is the flow state, defined as a state of enhanced focus, intrinsic enjoyment, and optimal engagement during task performance (Csikszentmihalyi,

1990). It has been found to improve learning and performance by enhancing motivation and sustained attention (Abdolrezapour & Ghanbari, 2022). In SLA research, flow has been associated with learner engagement and successful task performance (Alsayed-Ahmad & Albert, 2022; Liu et al., 2022). The limited research on the relation between flow and writing performance indicates that flow may positively affect writing outcomes, yet its relationship with linguistic measures of writing outcome and other affective variables has not been sufficiently explored.

Ben Maad (2012) found that more cognitively challenging writing tasks led to greater flow as they were perceived as optimally challenging by learners. However, Cho (2018) pointed to no significant differences in perceived flow across task conditions and claimed that increasing TC alone may not be sufficient to induce flow. These contradictory findings show that the relationship between TC and flow is not linear. Increasing TC might lead to flow when learners perceive the challenge as manageable and consistent with their abilities, but greater complexity does not automatically produce optimal engagement. Thus, the effect of TC on learner's flow may depend on how they experience and perceive the demands of a particular task.

Generally, based on the literature, task complexity should not be considered solely as a cognitive manipulation affecting linguistic performance. Increasing TC can also influence learners' affective experiences, which in turn may affect the way they engage with and do the task. Studies have shown that TC influences not only linguistic outcomes but also learners' emotional experiences during writing (Abdi Tabari et al., 2024; Ghanbari & Abdolrezapour, 2021; Révész et al., 2016).

Furthermore, the literature confirms that anxiety and flow are related to cognitive engagement and performance in language learning (Abdolrezapour & Ghanbari, 2022). However, these lines of research have largely been examined separately. Research on TC has mostly dealt with linguistic outcomes, particularly CAF, whereas research on WA has generally examined its relationship with writing performance without considering differences in task conditions. Similarly, the relationship between flow and both task complexity and multiple dimensions of L2 writing performance is rarely examined. Therefore, the way TC, WA, and flow are related to one another and to learners' written performance is a gap in the literature, to the best of our knowledge. Accordingly, the current study investigates the relationships among task complexity, writing anxiety, flow experience, and L2 writing proficiency evaluated in terms of CAF.

Method

Participants

A convenience sample of 31 EFL learners participated in this study. Thirteen participants were undergraduate students enrolled in a Teaching English as a Foreign Language (TEFL) program at an Iranian university, while 18 were learners enrolled in an IELTS preparation program at a private language center. All participants had Persian as their first language. There were both male and female participants (14 males, 17 females) and their ages ranged between 18 and 26. To ensure their initial homogeneity in terms of general language proficiency, the Quick Placement Test (QPT; UCLES, 2001) was given to participants, and only those whose scores corresponded to the B2 level of the Common European Framework of Reference

(CEFR) were eligible for inclusion in the study. To ensure informed consent, ethical consent forms were received from every participant prior to initiation of data collection and they were told that their participation in the study was entirely voluntary. Although participants were studying in two different educational settings, they were regarded as a single sample because they had the same proficiency level and completed similar tasks, questionnaires, and procedures under the same study conditions.

Instruments

Quick Placement Test

To control the proficiency level of the participants, the Quick Placement Test (QPT; UCLES, 2001) was used. The test is a quick and easy-to-administer test, which is used primarily for English language placement. It assesses vocabulary, grammar, and reading skills in the form of multiple-choice questions.

Writing Tasks

Two versions of an argumentative writing task adapted from Cho (2015) were employed to manipulate task complexity. In both tasks, participants were asked to select the most suitable roommate from a set of candidates and justify their choice. The simple task required participants to evaluate four candidates based on three characteristics (hobbies, strengths, and weaknesses), whereas the complex task involved six candidates and four characteristics, with academic performance added as an additional criterion. Since the task was originally designed for Chinese participants, the Chinese names were replaced with Iranian names to ensure its suitability for the context of the current participants. Following Robinson's (2001) framework, task complexity was manipulated

through increased reasoning demands (through increasing the number of candidates) and a greater number of elements (by increasing the number of properties).

Second Language Writing Anxiety Inventory (SLWAI)

To measure the level of participants' WA, SLWAI (Cheng, 2004) was used. The instrument includes 22 items rated on a five-point Likert-type scale, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). It assesses WA under three categories of cognitive anxiety, somatic anxiety, and avoidance behavior. A representative item is "I do my best to avoid situations in which I have to write in English". Although the SLWAI was originally developed to assess writing anxiety as a relatively stable construct, in the present study participants were instructed to respond with reference to the writing task they had just completed so that the questionnaire reflected their perceived anxiety during that specific task. Cheng (2004) provided evidence for the validity of the scale in a sample of 421 EFL majors. In addition, previous research has reported high reliability for the instrument ($\alpha = .94$) and in a pilot study conducted prior to our main data collection, the instrument demonstrated satisfactory internal consistency (Cronbach's $\alpha = .81$).

Writing Flow State Scale (WFSS)

Writing Flow State Scale (WFSS) developed and validated by Liu et al. (2022) includes nine five-point Likert-type questions, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). In this study, it was used to measure whether and how strongly the participants experienced flow during the writing tasks. A representative item is "When doing this task, I was totally absorbed in what

I was doing". WFSS is an adapted version of Jackson et al.'s (2008) short version of the Flow State Scale-2 (FSS-2) which was originally developed for sports contexts. Jackson et al. (2008) reported evidence supporting the reliability and construct validity of the short form. Liu et al. (2022) have changed the wording of items in FSS-2 to align it with the writing context and labeled it as WFSS to ensure a clear distinction. Following Liu et al. (2022), the WFSS was administered immediately after task completion to assess the extent to which participants experienced flow during the writing task. In a pilot study conducted prior to the main data collection, the reliability of the questionnaire was 0.69 through Cronbach's alpha.

Procedure

The study applied a within-subjects correlational design with 31 participants. After completing the QPT, participants performed both the simple and complex writing tasks in two sessions conducted two weeks apart. To control for the order effects, task administration was counterbalanced: fifteen of the participants completed the simple task first and the complex task second, while the rest followed the counterbalanced order. Participants received identical instructions and were given the same amount of time to complete each task. Immediately after each writing task, they completed the SLWAI and WFSS questionnaires to report their levels of writing anxiety and flow experience during task performance. They were instructed to respond to both questionnaires with reference to their experience during the writing task they had just completed. The questionnaires were given to participants immediately after task completion to measure participants' task-specific perceptions.

Measures of Writing Performance

Writing performance was assessed using the CAF framework, following the measures applied by Fathi and Rahimi (2022). Complexity was measured through the ratio of clauses to T-units (C/T), the ratio of words to clauses (W/C), and the ratio of dependent clauses to clauses (DC/C). Accuracy was measured by computing the ratio of error-free t-units to the total number of t-units (EFT/T) as well as the ratio of error-free clauses to total number of clauses (EFC/C). Consistent with previous research, only lexical, morphological, and syntactic errors were considered, while other types of errors such as spelling, punctuation and capitalization errors were overlooked to avoid any unintended miscalculations originated from students' illegible handwritings (Fathi & Rahimi, 2022; Rahimi & Zhang, 2018; Wigglesworth & Storch, 2009). Fluency was measured based on the total number of words (NW), total number of T-units (NT), and T-unit length (TL). Syntactic complexity and fluency indices were calculated using Lu's (2010) L2 Syntactic Complexity Analyzer (L2SCA), whereas accuracy measures were coded manually. To ensure inter-rater reliability, 50% of the writing samples were independently scored by both researchers. Intraclass correlation coefficients exceeded .70 for all measures, which refers to acceptable inter-rater reliability.

Data Analysis

Statistical analyses were performed using SPSS software. The descriptive analysis included the calculation of means and standard deviations for writing anxiety, flow, and CAF measures under both task conditions. Paired-samples t-tests were performed to compare WA, flow, and CAF measures between the simple and complex

task conditions. In addition, Cohen's d was calculated to estimate the effect size of the paired comparisons. Subsequently, to evaluate the associations of task condition, writing anxiety, and flow experience with different CAF dimensions, linear mixed-effects models were performed. In each model, task condition was entered as a fixed categorical factor and WA and flow were the continuous covariates. In addition, participant was entered as a random effect to address the non-independence of repeated observations recorded from each participant. Prior to running the tests, the assumptions underlying paired-samples t -tests and linear mixed-effects models were assessed. The normality of the data was checked using skewness and kurtosis values. The obtained data fell within the acceptable range and no significant departures from normality were found. In addition, the normality of difference scores/residuals, homoscedasticity, and the presence of outliers were checked and all assumptions were met.

Results

This part presents the analysis of data collected from the writing samples of Iranian EFL students administered within a two-week period. As mentioned, each writing sample was collected along with two questionnaires which assessed the student's state of WA and flow. This part presents the results of statistical tests in relation to each research question.

Writing Anxiety (WA)

The first research question investigated whether simple and complex task conditions lead to significant differences in learners' WA. Descriptive statistics (Table 1) showed a noticeable higher mean score for writing anxiety in the complex task. The result of the paired-samples t -test (Table 2) indicated that there was a statistically significant difference

between participants' WA level in the simple and complex tasks, suggesting that the complex task elicited substantially greater writing anxiety. The corresponding effect size (Cohen's $d = -0.98$) was found to be high.

Table 1

Descriptive Statistics for Writing Anxiety in Simple and Complex Tasks

	Mean	N	Std. Deviation	Std. Error Mean
WA simple task	71.74	31	9.77	1.76
WA complex task	79.55	31	8.65	1.55

Table 2

Paired Samples t -test Comparing Writing Anxiety in Simple and Complex Tasks

	Mean	SD	SEM	t	df	Sig.	Cohen's d
WA simple task- WA complex task	-7.80	8.00	1.44	-5.43	30	.00*	-0.98

Note. Abbreviations: WA, writing anxiety.

* $p < .05$.

Flow Experience

The second research question examined whether flow differed significantly between the simple and complex task conditions. A paired-samples t -test was performed to examine the difference between flow in each task condition. Descriptive statistics (Table 3) suggested a greater mean score for flow in the simple task and there was a statistically significant difference between the two task conditions. The calculated effect size was 0.84, which indicated a large effect.

Table 3

Descriptive Statistics for Flow Experience in Simple and Complex Tasks

	Mean	N	Std. Deviation	Std. Error Mean
FlowSimple	3.99	31	.58	.10
FlowComplex	3.68	31	.60	.11

Table 4

Paired Samples t-test Comparing Flow Experience in Simple and Complex Tasks

	Mean	SD	SEM	t	df	Sig.	Cohen's d
Flow Simple- Flow Complex	.31	.37	.07	4.68	30	.00*	.84

* Significant at the .05 level.

Writing Performance: Syntactic Complexity

To examine whether L2 writing performance differed across task complexity conditions, we compared the three dimensions of CAF using paired-samples t-tests. The first component of the triad, complexity, was examined through Clauses per T-unit (C/T), Words per Clause (W/C), and the ratio of Dependent Clauses to Clauses (DC/C). These measures were automatically calculated using the L2 Syntactic Complexity Analyzer (L2SCA; Lu, 2010). Based on the descriptive statistics, C/T was higher in the complex-task condition ($M = 1.90$) than in the simple-task condition ($M = 1.74$), whereas W/C was higher in the simple-task condition ($M = 7.77$) than in the complex-task condition ($M = 7.45$). As for DC/C, the mean scores were similar across the two task conditions, with only a small difference between them. The results of the paired-samples t-tests presented in Table 5 indicate that none of the measures differed significantly between the simple and complex task conditions. Thus, the

change in task complexity did not lead to significant changes in the syntactic complexity of participants' written texts.

Table 5

Paired Samples t-Test Comparing Syntactic Complexity in Simple and Complex Tasks

	Mean	SD	SEM	T	Df	Sig.	Cohen's d
CTS - CTC	-0.16	0.54	0.98	-1.65	30	0.109	-0.29
WCS - WCC	0.32	1.86	.33	0.97	30	0.34	0.17
DCCS - DCCC	-0.01	0.09	0.02	-0.316	30	0.75	-0.06

Note. Abbreviations: CTC: clauses per T-units in the complex task; CTS: clauses per T-units in the simple task; DCCC: ratio of dependent clauses to clauses in the complex task; DCCS: ratio of dependent clauses to clauses in the simple task; WCC: words per clauses in the complex task; WCS: words per clauses in the simple task.

* Significant at the .05 level.

Writing Performance: Accuracy

The second component of the CAF triad, Accuracy, was assessed using the ratio of error-free t-units to the total number of t-units (EFT/T) and the ratio of error-free clauses to the total number of clauses (EFC/C). These accuracy measures were obtained through manual coding of lexical, morphological, and syntactic errors. Based on the descriptive statistics, the simple task condition ($M = 0.81$) elicited a higher proportion of error-free clauses compared with the complex task ($M = 0.71$). In contrast, T-unit accuracy was higher in the complex task ($M = 0.65$) than in the simple task ($M = 0.51$). Based on the results of paired sample t-test (Table 6), both measures differed significantly between the simple- and

complex-task conditions. The corresponding effect sizes (Cohen's $d = 0.78$ for EFC/C and $d = -0.65$ for EFT/T) indicated medium-sized effects. These results show that while clause-level accuracy seems easier to maintain in simpler tasks, learners may direct more attention to overall T-unit structure when facing more complexity. This finding points to the importance of considering the level at which accuracy is operationalized when examining the relationship between task complexity and L2 writing performance.

Table 6

Paired Samples t-Test Comparing Accuracy in Simple and Complex Task

	Mean	SD	SEM	t	Df	Sig.	Cohen's d
EFCS-EFCC	0.10	0.13	0.02	4.30	30	0.00*	0.78
EFTS-EFTC	-0.14	0.21	0.04	-3.62	30	0.00*	-0.65

Note. Abbreviations: EFCC, ratio of error-free clauses to clauses in the complex task; EFCS, ratio of error-free clauses to clauses in the simple task; EFTC, ratio of error-free T-units to T-units in the complex task; EFTS, ratio of error-free T-units to T-units in the simple task.

* Significant at the .05 level.

Writing Performance: Fluency

Fluency was calculated based on the total Number of Words (NW), Number of T-units (NT), and T-unit Length (TL), all of which were automatically calculated by the L2SCA (Lu, 2010). According to Table 7, learners' written texts had a higher mean number of words in the complex-task condition ($M = 237.65$) than in the simple-task condition ($M = 217.10$). Similarly, the mean number of T-units was slightly higher in the texts in the complex-task condition ($M = 12.32$) than in the simple-task condition ($M = 11.97$). In contrast, T-unit length was higher in the

simple-task condition ($M = 23.74$) than in the complex-task condition ($M = 20.25$). The paired-samples t-test results indicated that the difference in NT was not statistically significant, whereas both NW and TL differed significantly between the two task conditions. Thus, higher TC was correlated with a greater number of words but shorter T-units; however, the overall number of T-units remained comparatively similar across two writing conditions. These findings suggest that TC may affect different aspects of fluency differently, with learners producing more words without a corresponding increase in the number of T-units and with shorter T-units under the more complex condition.

Table 7

Paired Samples t-test Comparing Fluency in Simple and Complex Tasks

	Mean	SD	SEM	df	Sig.	Cohen's d
NTS-NTC	-0.35	4.27	0.77	30	0.65	-0.08
NWS-NWC	-20.54	50.12	9.00	30	0.03*	-.41
TLS-TLC	3.48	5.08	0.91	30	0.00*	0.69

Note. Abbreviations: NTC, number of T-units in the complex task; NTS, number of T-units in the simple task; NWC, number of words in the complex task; NWS, number of words in the simple task; TLC, T-unit length in the complex task; TLS, T-unit length in the simple task.

* Significant at the .05 level.

Associations Between Task Complexity, Writing Anxiety, Flow, and Writing Performance

To address the fourth research question, separate linear mixed-effects models were conducted to examine the joint associations of task complexity, WA, and flow with each CAF measure while considering the repeated

observations obtained from each individual participant. Table 8 summarizes the parameter estimates and significance tests for all models.

The linear mixed-effects analyses in Table 8 showed that flow was the most significant predictor of writing performance. It was found to have significant positive relationships with four of the eight CAF measures. Specifically, flow was positively associated with C/T ($\beta = .336$, $t = 4.706$, $p < .001$), W/C ($\beta = .820$, $t = 2.907$, $p = .006$), DC/C ($\beta = .038$, $t = 2.447$, $p = .020$), and TL ($\beta = 3.852$, $t = 2.722$, $p = .009$). These findings indicate that higher levels of flow were associated with higher performance on several measures of writing complexity and fluency.

However, writing anxiety showed significant relationships with two of the CAF measures. It was found to have positive relationships with C/T ($\beta = .010$, $t = 2.295$, $p =$

.028) and DC/C ($\beta = .001$, $t = 2.395$, $p = .021$). No significant associations were found between writing anxiety and other measures which included W/C, EFC/C, EFT/T, NW, NT, or TL (all $ps > .05$). A similar result was obtained for task condition in that it was found to be significantly associated with two of the eight CAF measures. It showed a positive association with EFC/C ($\beta = .089$, $t = 3.249$, $p = .002$) and a negative association with EFT/T ($\beta = -.143$, $t = -3.153$, $p = .003$). Meanwhile, it was not significantly correlated with C/T, W/C, DC/C, NW, NT, or TL (all $ps > .05$).

It is noteworthy that the effects of these predictors were not uniform across the different dimensions of CAF. In other words, task condition, writing anxiety, and flow related differently to different aspects of L2 writing performance.

Table 8.

Linear Mixed-Effects Models Examining the Associations of Task Condition, Writing Anxiety, and Flow with CAF Measures

CAF Measure	Predictor	Estimate (β)	SE	<i>Df</i>	<i>t</i>	<i>P</i>
C/T	Task Condition	-.184	.105	38.712	-1.757	.087
	Writing Anxiety	.010	.004	35.416	2.295	.028*
	Flow	.336	.071	32.653	4.706	.000*
W/C	Task Condition	-.079	.370	39.889	-.214	.832
	Writing Anxiety	-.019	.017	35.152	-1.158	.255
	Flow	.820	.282	33.109	2.907	.006*
DC/C	Task Condition	0.002	0.102	39.917	0.669	.910
	Writing Anxiety	0.001	0.001	41.053	2.395	.021*
	Flow	0.038	0.015	32.568	2.447	.020*
EFC/C	Task Condition	.089	.027	44.585	3.249	.002*
	Writing Anxiety	-.000	.001	39.274	-.494	.624
	Flow	.019	.026	37.893	.758	.453
EFT/T	Task Condition	-.143	.046	42.925	-3.153	.003*
	Writing Anxiety	.000	.003	46.002	.235	.815
	Flow	.028	.040	36.427	.701	.488
NW	Task Condition	-16.368	10.578	44.922	-1.547	.129
	Writing Anxiety	.308	.610	46.742	.506	.616
	Flow	-5.779	10.033	39.345	-.576	.568
NT	Task Condition	-0.524	0.960	47.499	-0.547	0.587
	Writing Anxiety	0.038	0.619	53.070	0.594	0.555
	Flow	1.490	1.056	45.907	1.412	0.165
TL	Task Condition	1.708	1.239	46.985	1.378	.175
	Writing Anxiety	-.076	.081	50.110	-.941	.351
	Flow	3.852	1.415	46.277	2.722	.009*

Note. Abbreviations: β , unstandardized fixed-effect estimate; SE, standard error; CTC, clauses per T-units in the complex task; CTS, clauses per T-units in the simple task; DCCC, ratio of dependent clauses to clauses in the complex task; DCCS, ratio of dependent clauses to clauses in the simple task; EFCC, ratio of error-free clauses to clauses in the complex task; EFCS, ratio of error-free clauses to clauses in the simple task; EFTC, ratio of error-free T-units to T-units in the complex task; EFTS, ratio of error-free T-units to T-units in the simple task; NTC, number of T-units in the complex task; NTS, number of T-units in the simple task; NWC, number of words in the complex task; NWS, number of words in the simple task; TLC, T-unit length in the complex task; TLS, T-unit length in the simple task; WCC, words per clauses in the complex task; WCS, words per clauses in the simple task.

* Significant at the .05 level.

Discussion

The present study examined the associations among task complexity (TC), writing anxiety (WA), flow experience, and L2 writing performance across the dimensions of CAF framework. Overall, the findings highlight the combined influence of cognitive and affective factors on learners' writing performance, although their effects vary across different dimensions of CAF.

First, writing anxiety was significantly higher in the complex-task condition. Results pointed to significantly greater writing anxiety when learners completed the complex task than the simple task. This finding supports the literature claiming that cognitively demanding writing tasks can increase learners' feelings of apprehension and cognitive burden (Güvendir & Uzun, 2023; Rahimi & Zhang, 2018).

Theoretically, the result is consistent with Skehan's LACM, which argues that increased task demands place greater pressure on learners' limited attentional capacity. As TC increases, learners may perceive a greater risk of failure, which may coincide with increased anxiety.

Second, results indicated that learners' perceived flow was significantly lower in the complex-task condition than in the simple-task condition. This finding suggests that more cognitively demanding tasks do not necessarily enhance learners' engagement or facilitate an optimal flow experience. Rather, higher cognitive demands may disrupt the balance between perceived challenges and learners' perceived skills, a condition that is considered essential for achieving a state of flow (Csikszentmihalyi, 1990). When task requirements become higher than learners' perceived capabilities, there would be a decrease in engagement rather than an increase. This interpretation is consistent with Cho's (2018) findings and highlights the importance of considering learners' abilities when designing cognitively demanding writing tasks.

The findings were mixed for the relationship between task complexity and L2 writing performance. No significant differences were found in measures of syntactic complexity, which implies that more cognitively demanding task was not associated with greater structural complexity in learners' written production. This finding is in agreement with studies pointing to the limited effects of task complexity on syntactic complexity (Abdi Tabari et al., 2024; Kuiken & Vedder, 2008). One possible explanation is that learners may have relied on familiar linguistic resources across task conditions, particularly when the increase in task demands

did not require them to significantly change their syntactic choices. The relatively homogeneous proficiency level of the participants may also have constrained the range of syntactic resources available to them, thereby reducing the likelihood of observable differences in syntactic complexity across task conditions.

In contrast to syntactic complexity, the accuracy measures revealed significant differences between the two task conditions, although the two measures showed different patterns. While one accuracy measure was higher in the complex-task condition, the other was higher in the simple-task condition. This result refers to the multidimensional nature of accuracy and supports Robinson's CH only partially. According to Robinson (2001), increasing cognitive demands of a task will direct attentions to linguistic forms, therefore contributing to a more accurate production. From this perspective, the higher T-unit-level accuracy found in the complex-task condition may be compatible with the hypothesis that higher TC can result in greater attention to form. Meanwhile, the lower clause-level accuracy found under the complex-task condition is in accordance with Skehan's LACM, which posits that higher TC may constrain the attentional resources available for linguistic processing and result in trade-offs across performance dimensions. Thus, the resulted different patterns in the two accuracy measures suggest that the relationship between TC and accuracy is not uniform and may depend on how accuracy is measured. These findings point to the importance of measuring accuracy in multiple ways, as different indices can produce contradictory results—a pattern which also exists in previous CAF research (e.g., Kuiken & Vedder, 2008).

Fluency results convey that although learners' overall productivity (word count and T-units) remained relatively stable across two task conditions, T-unit length was significantly lower in the complex-task condition. This pattern suggests that under greater challenge, learners may produce shorter units to manage the increased attentional demands of task completion. Such results mostly contribute to Skehan's LACM than Robinson's CH, indicating that giving attentional resources to one area leaves fewer resources for competing aspects. On this basis, attentional resources devoted to accuracy in our study may have reduced fluency and syntactic complexity.

The linear mixed-effects analyses further highlighted the importance of affective factors in L2 writing performance (Abdolrezaipoor & Ghanbari, 2025; Li et al., 2023; Li et al., 2024).

Flow was found as the strongest predictor of writing performance, particularly with measures of syntactic complexity and fluency. Higher levels of flow were positively associated with C/T, W/C, DC/C, and T-unit length, indicating that learners who experienced greater flow tended to produce more complex linguistic structures and longer T-units. These findings support positive psychology perspectives in SLA, which emphasize the facilitative role of engagement and enjoyment in language learning (Abdolrezaipoor & Ghanbari, 2022; Abdolrezaipoor & Ghanbari, 2025; Alsayed-Ahmad & Albert, 2022). In contrast, writing anxiety showed a more limited pattern of associations. Although anxiety was positively associated with C/T and DC/C, it was not significantly associated with the other measures of complexity, accuracy, or fluency. This suggests that positive affective experiences may have a higher causal influence on writing performance than

negative emotions in short-term task conditions.

Overall, the findings suggest that greater task complexity does not automatically result in improved L2 writing performance. Rather, based on our results, the relationship between cognitive task demands, affective states, and writing performance is complex and varies across different CAF measures. The findings also suggest that tasks should be sufficiently challenging to engage learners without imposing excessive cognitive demands that may reduce their flow experience. Therefore, designing tasks that maintain an appropriate balance between task demands and learners' abilities may provide a more supportive condition for engagement and L2 writing performance.

Conclusion

This study examined the relationships among task complexity, writing anxiety, flow experience, and L2 writing performance among Iranian EFL learners. The results demonstrated that learners experienced significantly higher writing anxiety and lower flow in the complex-task condition than in the simple-task condition. However, the relationship between task complexity and writing performance was inconsistent across the CAF dimensions. In fact, while significant differences were observed in some measures of accuracy and fluency, the measures of syntactic complexity showed negligible differences across task conditions. Overall, the findings suggest that increased task demands were accompanied by changes in learners' affective experiences, but did not result in uniform changes across different aspects of L2 writing performance.

A particularly important finding was the prominent role of flow experience. Compared

with writing anxiety, flow showed a broader pattern of significant associations with writing performance, especially with regard to syntactic complexity and fluency. This piece of evidence highlights the importance of positive affective experiences in writing tasks and suggests that learner engagement may be as important as cognitive challenge in facilitating writing production and language performance.

The study contributes to task-based language teaching research by integrating cognitive and affective perspectives into the investigation of task performance. The findings suggest that effective writing instruction should balance task demands with learners' abilities while fostering conditions that support engagement and minimize excessive anxiety. By understanding and addressing the emotional dimensions of writing, teachers and task designers can create more influential EFL educational environments that support both learners' engagement and writing performance. Such an approach may enable learners to benefit from cognitively challenging tasks without experiencing negative feelings and heightened anxiety.

The study also has some limitations. Despite the depth of findings obtained, caution should be exercised when generalizing the results due to the small sample size which was selected through convenience sampling and its focus on a single proficiency level. In addition, although the course discussed different genres, only learners' performance on the argumentative genre was considered for the analysis. To improve the precision of the results, future studies need to explore these relationships using more diverse participant sample with larger sample sizes, different task types, and longitudinal designs. Future studies may also incorporate additional measures of

writing quality and dynamic assessments of affective states to provide a more comprehensive understanding of the interplay among task complexity, emotions, and L2 writing performance.

Competing Interests

The authors declare no competing interests.

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References

- Abdi Tabari, M., & Goetze, J. (2024). Exploring the impacts of task complexity, anxiety, and self-efficacy on L2 written production: Unraveling individual differences in TBLT. *International Journal of Applied Linguistics*, 34, 1533–1555. <https://doi.org/10.1111/ijal.12582>
- Abdi Tabari, M., Farahanynia, M., & Botes, E. (2025). Examining the predictive power of L2 writing anxiety on L2 writing performance in simple and complex tasks under task-readiness conditions. *Assessing Writing*, 63, 100912.
- Abdi Tabari, M., Lu, X., & Wang, Y. (2024). Mapping the associations among task complexity, emotionality, and linguistic complexity in L2 writing. *Language Awareness*, 34(2), 345–372. <https://doi.org/10.1080/09658416.2024.2384754>
- Abdolrezaipoor, P., & Ghanbari, N. (2022). Emotional-based pedagogy and facilitating EFL learners' perceived flow in online education. *Frontiers in Psychology*, 14(13). <https://doi.org/10.3389/fpsyg.2022.960287>
- Abdolrezaipoor, P., & Ghanbari, N. (2025). The impact of an emotional literacy intervention on students' composing processes in EFL integrated writing tasks. *Language Learning Journal*, 53(3), 372–388. <https://doi.org/10.1080/09571736.2025.2473477>
- Alsayed-Ahmad, D., & Albert, Á. (2022). English Majors' Flow Experiences in L2 Writing: An Interview Study. In G. Tankó & A. M. Wind (Eds.), *DEAL 2022: Challenges and Opportunities in Contemporary English Applied Linguistics* (pp. 227–258). Eötvös University Press. <https://doi.org/10.21862/elte.deal.2022.9.227>
- Arnold, J., & Brown, H. D. (1999). A map of the terrain. In J. Arnold (Ed.), *Affect in language learning* (pp. 1–24). Cambridge University Press.
- Ben Maad, M. R. (2012). Towards a Discerning Image of Learners' Estimation of Task Difficulty and Motivation: Goal Orientations Highlighted. *Asian EFL Journal*, 14(3), 41–62.
- Chen, O., Paas, F., & Sweller, J. (2023). A Cognitive Load Theory approach to defining and measuring task complexity through element interactivity. *Educational Psychology Review*, 35(2). <https://doi.org/10.1007/s10648-023-09782-w>
- Cheng, Y. (2002). Factors associated with foreign language writing anxiety. *Foreign Language Annals*, 35(6), 647–656. <https://doi.org/10.1111/j.1944-9720.2002.tb01903.x>
- Cheng, Y. (2004). A measure of second language writing anxiety: Scale development and preliminary validation. *Journal of Second Language Writing*, 13(4), 313–335. <https://doi.org/10.1016/j.jslw.2004.07.001>
- Cheng, Y., Horwitz, E. K., & Schallert, D. L. (1999). Language anxiety: Differentiating writing and speaking components. *Language Learning*, 49(3), 417–446. <https://doi.org/10.1111/0023-8333.00095>
- Cho, M. (2018). Task complexity and modality: Exploring learners' experience from the perspective of flow. *The Modern Language Journal*, 102(1), 162–180. <https://doi.org/10.1111/modl.12460>
- Cho, H. (2015). Effects of task complexity on English argumentative writing. *English Teaching*, 70(2), 107–131. <https://doi.org/10.15858/engtea.70.2.201506.107>
- Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience* (1st ed.). Harper and Row.
- Egbert, J. (2003). A Study of Flow Theory in the Foreign Language Classroom. *The Modern Language Journal*, 87, 499–518. <https://doi.org/10.1111/1540-4781.00204>
- Fathi, J., & Rahimi, M. (2022). Examining the impact of flipped classroom on writing complexity, accuracy, and fluency: A case of EFL students. *Computer Assisted Language Learning*, 35(7), 1668–1706.
- Frear, M. W., & Bitchener, J. (2015). The effects of cognitive task complexity on writing

- complexity. *Journal of Second Language Writing*, 30, 45–57. <https://doi.org/10.1016/j.jslw.2015.08.009>
- Ghanbari, N., & Abdolrezaipoor, P. (2021). Using emotional intelligence in an EFL integrated writing assessment. *Studies in Educational Evaluation*, 70, Article 101017 <https://doi.org/10.1016/j.stueduc.2021.101017>
- Güvendir, E., & Uzun, K. (2023). L2 writing anxiety, working memory, and task complexity in L2 written performance. *Journal of Second Language Writing*, 60, Article 101016.
- Housen, A., & Kuiken, F. (2009). Complexity, accuracy, and fluency in second language acquisition. *Applied Linguistics*, 30(4), 461–473. <https://doi.org/10.1093/applin/amp048>
- Ishikawa, T. (2011). Examining the influence of intentional reasoning demands on learner perceptions of task difficulty and L2 monologic speech. In P. Robinson (Ed.), *Second language task complexity: Researching the cognition hypothesis of language learning and performance* (pp. 307–330). John Benjamins Publishing Company.
- Jackson, S. A., Martin, A. J., & Eklund, R. C. (2008). Long and short measures of flow: The construct validity of the FSS-2, DFS-2, and new brief counterparts. *Journal of Sport and Exercise Psychology*, 30(5), 561–587. <https://doi.org/10.1123/jsep.30.5.561>
- Johnson, M. D. (2017). Cognitive task complexity and L2 written syntactic complexity, accuracy, lexical complexity, and fluency: A research synthesis and meta-analysis. *Journal of Second Language Writing*, 37, 13–38. <https://doi.org/10.1016/j.jslw.2017.06.001>
- Joo, D., & Lee, J. (2025). The effect of task complexity on young EFL learners' listening comprehension and metacognitive awareness. *International Journal of Applied Linguistics*, 33(3), 1314–1325 <https://doi.org/10.1111/ijal.12702>
- Kirchhoff, C. (2013). L2 extensive reading and flow: Clarifying the relationship. *Reading in a Foreign Language*, 25(2), 192–212.
- Kuiken, F., & Vedder, I. (2007). Cognitive task complexity and linguistic performance in French L2 writing. In M.P. García Mayo (Ed.), *Investigating tasks in formal language learning* (pp. 117–135). Multilingual Matters. <https://doi.org/10.21832/9781853599286-009>
- Kuiken, F., & Vedder, I. (2008). Cognitive task complexity and written output in Italian and French as a foreign language. *Journal of Second Language Writing*, 17(1), 48–60. <https://doi.org/10.1016/j.jslw.2007.08.003>
- Li, C. (2024). Task-specific emotions in L2 writing: A control-value theory approach from a positive psychology perspective. *Studies in Second Language Learning and Teaching*, 15(1), 73–103. <https://doi.org/10.14746/ssllt.43371>
- Li, C., Wei, L., & Lu, X. (2023). Contributions of foreign language writing emotions to writing achievement. *System*, 116. <https://doi.org/10.1016/j.system.2023.103074>
- Li, C., Wei, L., & Lu, X. (2024). Task complexity and L2 writing performance of young learners: Contributions of cognitive and affective factors. *The Modern Language Journal*, 108(3), 741–770. <https://doi.org/10.1111/modl.12954>
- Liu, P., Zhang, Y., & Liu, D. (2022). Flow experience in foreign language writing: Its effect on students' writing process and writing performance. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.952044>
- Lu, X. (2010). Automatic analysis of syntactic complexity in second language writing. *International Journal of Corpus Linguistics*, 15(4), 474–496. <https://doi.org/10.1075/ijcl.15.4.02lu>
- McQuillan, J., & Conde, G. (1996). The conditions of flow in reading: Two studies of optimal experience. *Reading Psychology*, 17(2), 109–135. <https://doi.org/10.1080/0270271960170201>
- Nakamura, J., & Csikszentmihalyi, M. (2014). The concept of flow. In *Flow and the foundations of positive psychology* (pp. 239–263). Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9088-8_16
- Pallotti, G. (2009). CAF: Defining, refining and differentiating constructs. *Applied Linguistics*, 30(4), 590–601. <https://doi.org/10.1093/applin/amp045>
- Rahimi, M., & Zhang, L. J. (2018). Writing task complexity, students' motivational beliefs, anxiety and their writing production in English as a second language. *Reading and Writing*, 32(3), 761–786. <https://doi.org/10.1007/s11145-018-9887-9>
- Révész, A., Kourтали, N.-E., & Mazgutova, D. (2016). Effects of task complexity on L2 writing behaviors and linguistic complexity. *Language Learning*, 67(1), 208–241. <https://doi.org/10.1111/lang.12205>
- Robinson, P. (1995). Task complexity and second language narrative discourse. *Language Learning*, 45(1), 99–140.

- <https://doi.org/10.1111/j.1467-1770.1995.tb00964.x>
- Robinson, P. (2001). Task complexity, task difficulty, and task production: Exploring interactions in a componential framework. *Applied Linguistics*, 22(1), 27-57. <https://doi.org/10.1093/applin/22.1.27>
- Sabti, A. A., Md Rashid, S., Nimehchisalem, V., & Darmi, R. (2019). The impact of writing anxiety, writing achievement motivation, and writing self-efficacy on writing performance: A correlational study of Iraqi tertiary EFL learners. *SAGE Open*, 9(4), 1-13. <https://doi.org/10.1177/2158244019894289>
- Skehan, P. (1998). *A cognitive approach to language learning*. Oxford University Press.
- Tahmouresi, S., & Papi, M. (2021). Future selves, enjoyment and anxiety as predictors of L2 writing achievement. *Journal of Second Language Writing*, 53, 1-14. <https://doi.org/10.1016/j.jslw.2021.100837>
- Xu, T., & Zhang, L. J. (2023). Effects of cognitive task complexity and online planning on second language learners' argumentative writing. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1121994>
- Zhan, J., Sun, Q., & Zhang, L. J. (2021). Effects of manipulating writing task complexity on learners' performance in completing vocabulary and syntactic tasks. *Language Teaching Research*, 28(3), 1011-1032. <https://doi.org/10.1177/13621688211024360>