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**Research Paper**

**The Effects of Pre-Task Conditions on EFL Learners' Cognitive Processes and Writing Performance**

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**Abstract**

EFL writing proficiency is not merely about stringing together grammatically correct sentences; it reflects learners' ability to convey thoughts effectively and creatively. Thus, exploring the cognitive mechanisms becomes imperative for educators to enhance students' writing skills. In this convergent mixed methods study, the researchers investigated the impact of three pre-task conditions (brainstorming, FonF, and metacognitive strategy instruction) on the cognitive process (planning, translating, revising) and the Complexity, Accuracy, and Fluency of the learners' writings production. The participants chosen through convenience sampling included 150 tertiary learners in three intact classes majoring in the English Language at *IAU, Islamshahr Branch*. The study lasted four months (16 90-minute sessions), held once a week. Each group experienced a specific type of pre-task:

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brainstorming, metacognitive strategy instruction, or FonF activities. The researchers used writing pretest and posttest, think-aloud protocol, and semi-structured interviews to collect the data. They also employed Multivariate Analysis of Variance (MANOVA) and thematic analysis to analyze the data. The results demonstrated that the pre-task conditions, though not equally, have statistically significant impacts on the participants' writing performance and cognitive processes. Implications of the study are also discussed.

**Keywords:** Cognitive Processes, Brainstorming, Metacognitive Strategy, Fluency, Complexity, Accuracy

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## 1. Introduction

As writing is one of the challenging skills for learning and teaching (Ishikawa, 2018), proposing a specific method to teach it constructively seems necessary (Abdel Latif, 2019). Writing appears to be challenging when assessing language skills, requiring more quality instructions and interventions (Etemadi & Abbasian, 2023). Among the various approaches (e.g., product-based, process-based, genre-based) and teaching methodologies (Content-based, Cooperative Learning, Communicative Language Teaching), it seems that Task-based Language Teaching (TBLT) can be an appropriate and relevant method since it not only encourages instructors to create, manipulate, and supply a diversity of tasks but also provides learners with the opportunity to experience and inspect the target language (Barrot & Gabinete, 2021; Hayes, 2012). Saeedi (2023) asserts that task is a central and effective tool in TBLT, which can generate meaningful interaction necessary for EFL learners' interlanguage development. Task-oriented practices lead to better performance of EFL learners than conventional approaches to teaching writing due to the involvement nature of task-based practices. Despite conventional classes with no interaction between students and teachers, in

task-based classes, students experience real-life situations when putting their thoughts on paper (Derakhshan, 2018). Therefore, the researchers assumed that a task-based approach could help teachers in improving the writing abilities of L2 learners.

While various designs have been suggested for task-based lessons (Chenoweth & Hayes, 2001; Hayes & Berninger, 2014; Housen & Kuiken, 2009; Ishikawa, 2018; Jagaiah et al., 2020; Johnson, 2017), all suggest three principal phases- pre-task, during the task, and post-task--which echo the timeline of a task-based lesson. Although the 'during task' phase is the only obligatory phase, and the 'pre-task' or 'post-task' phases are not, the latter phases can guarantee the maximum efficiency of the task performance (Ellis et al., 2019). Therefore, researchers can obtain different results by manipulating the pre- and post-task phases. Thus, the current study researchers selected the pre-task phase to manipulate and kept the 'during the task' phase unchanged to examine whether it could improve learners' writing abilities.

Another crucial issue in research on writing is the measurement of task-based writing. In the past, researchers used to view writing as a product and focus on its mechanical aspects without considering the processes involved (Johnson, 2017). After the paradigm shift in teaching methods in language contexts and the innovation of think-aloud protocols, researchers paid more attention to the cognitive processes and mental resources involved in creating written texts (Housen et al., 2012; Mellati & Khademi, 2018). Therefore, process-oriented approaches emerged, focusing on the writer and the cognitive processes, replacing the focus on the form (Albus et al., 2021; Chen, 2015; Lamb et al., 2019; Sam et al., 2021).

Through observations of students' writing, cognitive processes theory has focused on the foundations and specific details of thinking processes in

writing skills. The framework includes the cognitive processes writers generally use when creating written texts, the mental resources they can draw on, and the task environment in which these cognitive processes operate (Hayes & Berninger, 2014).

Regarding the role of pre-task conditions in writing, various studies (Hayes, 2012; Kuiken & Vedder, 2017; Polio & Shea, 2014) have found evidence that shows different degrees of intervention during pre-task can bring about changes in writing presentations, while some other experiments (e.g., Kane, 2013) did not find such a change in participants' writings. Despite the discrepancies, Kim (2013) also holds that including the Focus on Form technique (FonF) in the pre-task stage can increase EFL students' awareness of the language forms during planning time and task presentation.

Brainstorming in a non-threatening atmosphere can also assist learners in using their background knowledge (Kaushik, 2023) and is a valuable strategy for expanding learners' thoughts and ideas before starting the writing task (Kim et al., 2023). Thus, as Tomazin et al. (2023) assumed, it seems beneficial to create situations where students can have the chance to think about the topic before actually starting the composition.

Based on a growing body of research, writing scholars argue that fostering a metacognitive awareness of the writing process is integral to developing strong writers through improving motivation and self-regulation in writing (Lamb et al., 2019). Thus, teaching metacognitive strategies and awareness can help learners take control of their cognitive processes. Li and Zhang (2023) highlighted metacognition's implication in L2 writing and emphasized the need to provide explicit information about the role of metacognition in L2 writing. Although numerous studies have focused on measuring CAF and metacognitive strategies, the findings are controversial and necessitate further studies to confirm the results.

In the current study, the researchers selected pre-task conditions (brainstorming, FonF, and metacognitive strategy instruction), the cognitive process components (planning, translating, and revising), and writing performance (CAF) for inspection. They followed a convergent mixed methods design in which quantitative and qualitative data are gathered, analyzed, and compared simultaneously to examine whether the data collected in the two modes confirmed or disconfirmed each other (Riazi & Candlin, 2014). Thus, the following research questions addressed the issue:

### **1.2 Research questions**

1. Do pre-task conditions (brainstorming, FonF, and metacognitive strategy instruction) have any differential impacts on the CAF of Iranian EFL learners' written production?
2. Do pre-task conditions (brainstorming, FonF, and metacognitive strategy instruction) change Iranian EFL learners' cognitive processes (planning, translating, and revising)?
3. How do Iranian EFL learners perceive the use of brainstorming activities, metacognitive strategies, and FonF activities (assets and drawbacks) regarding their writing abilities and cognitive processes (planning, translating, revising)?

### **2. Literature Review**

In general, a key feature of research on the cognitive theories of language writing is the use of think-aloud protocols to inspect the thinking behind the text via characterizing various types of fundamental processes, such as planning, translating, and reviewing, which repeatedly occur through writing (Benson & DeKeyser, 2019; Mellati & Khademi, 2019). Some of the most notable cognitive models include Hayes and Berninger (2014), Bereiter and Scardamalia (2013), and Hayes (1996a; 2012). Despite the differences, almost all of them elaborate on the writers' cognitive processes, including 'planner,' 'translator,' and 'evaluator' components. During the past two decades, two notable models of cognitive processes and complexity arose to help scrutinize the connection between task characteristics and learners'

performance: Skehan and Foster's Limited Attentional Capacity Model (LAC), which views working memory as a limited system (Skehan, 2014) and Robinson' (2011) Cognition Hypothesis (CH) that considers attentional capacity as comprising multiple resources.

To employ these models, teachers usually use pre-task activities to simplify the main task and stimulate learners' schematic knowledge to carry out the task in a more limited time. Such activities might consist of instructions or even some exercises for learners (Meesong & Jaroongkhongdach, 2016).

Based on a growing body of research, scholars argue that developing a metacognitive awareness in the writing process is essential to the growth of robust writers. Kuiken and Vedder (2017) examined the function of metacognitive information in language writing by associating cognitive models of first and second language writers and their writing performance. They suggested that the primary goal of L2 writing teachers should be to expand the metacognitive knowledge of their students through instruction.

Sabet et al. (2018) studied the effectiveness of writing strategy instruction for secondary students of French in England. He employed various writing strategies, including preparing, monitoring, and evaluating. The findings indicated that metacognitive strategy instruction could significantly improve the accuracy of students' writing assignments. Furthermore, the questionnaire administered before and after the intervention and think-aloud interviews showed a change in the experimental groups' thinking about language writing. They depended less on the language teachers, used the dictionary more selectively, and created their texts more carefully. Previous studies (Kim, 2013; Robinson, 2011; Yan et al., 2021) have revealed that task conditions (planning time, pre-task conditions, and topic familiarity) can lead to variations in task performance. Notable cognitive models of language

writing (Hayes, 1996b; Hayes & Flower, 1980) also view the properties of writing tasks as linked with the writing process and performance.

As writing performance is a multi-componential construct, many researchers recommended evaluating CAF and metacognitive strategies for measuring the quality of language products. For instance, Mohseni et al. (2020) compared the effects of metacognitive strategy training and critical thinking awareness-raising on EFL learners' reading comprehension of argumentative texts. They found that both types of activities significantly improved reading comprehension ability. In another study, Sabet et al. (2018) studied the impact of two brainstorming strategy instructions on the performance of Iranian intermediate L2 writers. They found that brainstorming could improve EFL learners writing skills and make them responsible for their better learning (Alavi et al., 2022).

Ellis et al. (2019) argue that the pre-task phase prepares learners for the main task in ways that can help acquisition. Similarly, Skehan (2014) offers two broad options teachers can utilize during the pre-task phase: Emphasizing the general cognitive demands and the linguistic factors. He asserts that due to the limits of attentional capacity, it is challenging for learners to respond to linguistic and cognitive demands. Activities that decrease cognitive load will set attentional capacity free to focus on linguistic factors. In another study, Baaijen and Galbraith (2018) examined the role of different planning conditions in writing and found relations between writing processes and outcome variables.

FonF, a fundamental construct in TBLT, is an approach that draws learners' attention to linguistic forms as they involve accomplishing tasks (Kim et al., 2023). It involves traditional language teaching based on teaching and practicing language features drawn from the structural syllabus. Woymo et al. (2024) studied the impact of form-focused communicative grammar

instruction on speaking performance and found it effective in advancing participants' performance. However, the study by Mehdiabadi and Arabmofrad (2015) showed no significant effects of form-focused instruction on EFL learners' writing performance.

Rashtchi and Porkar (2020) reported that brainstorming techniques significantly improved EFL learners' argumentative essays. The study also proposed that brainstorming, as a cognitive task, stimulated learners' working memory and thus could improve their writing performance.

However, empirical studies on pre-task conditions' role in EFL learners' writing performance have yielded controversial outcomes. Various studies (Khezrlou, 2021; Kim et al., 2023; Lasauskaite et al., 2023; Payant et al., 2019; Shi et al., 2020; Yoon & Abdi Tabari, 2023) have found pieces of evidence that display fluctuating degrees of pre-task conditions influence on writing performance. Nonetheless, in contrast to those studies that discovered a correlation between writing performance and pre-task conditions, some others (Lee, 2023; Phan, 2010; Pyykkonen, 2021; Rajangam & Annamalai, 2019) found no straightforward connection.

Reviewing the literature revealed no consensus among ELT researchers regarding the efficacy of pre-task conditions; therefore, the current study investigated the effects of pre-task conditions on the cognitive processes and writing CAF of Iranian EFL learners. Robinson and Gilabert (2007) focus on the function of metacognition in language writing and argue that language writing is a highly multifaceted task requiring knowledge and regulation of many cognitive activities. Skehan (2014) distinguishes between cognition and metacognition and holds that cognitive skills are compulsory to complete an assignment. According to Yan et al. (2021), cognitive processes are usually involuntary and necessary to operate or alter tasks. In contrast, metacognitive skills need conscious processing and are used to provide

decision-making control over the implementation of an assignment. As Johnson (2017) puts forth, metacognitive instruction can improve the quality of language learners' writing ability. Reviewing the literature reveals that although numerous studies have focused on measuring CAF and metacognitive strategies, the findings are controversial and necessitate further studies to confirm the results.

### **3. Method**

#### **3.1 Participants**

The participants were 150 BA university students majoring in English language translation in three intact classes at *Islamic Azad University, Islamshahr Branch*. First, the researchers explained the purpose of the study to the participants, ensured the confidentiality of their identities, and informed them that they were free to leave the study at any stage. The participants, selected via convenience sampling, were male and female learners aged 18 to 28 who had already passed two 2-credit grammar and 2-credit writing courses; thus, they were familiar with the preliminaries of writing and had some knowledge of grammar before taking part in the study. Without excluding any participant, the three intact classes were randomly assigned to Experimental Group 1 (n=50; 50 % male; 50% female) as the Brainstorming Group, Experimental Group 2 (n=50; 60 % male; 40 % female) as the Metacognitive Group, and Experimental Group 3 (n=50; 54% male; 46% female) as FonF Group. Participants of each group experienced a particular pre-task activity (brainstorming, FonF, or metacognitive strategy instruction) before the main writing task. The primary focus of the study was not on gender-related factors, and the researcher chose to focus on other variables that were more relevant to the study objectives.

## **3.2 Instruments**

### **3.2.1 Proficiency Test**

To assess the participants' overall English proficiency, the researchers administered the grammar and vocabulary sections of the online version of the Oxford Placement Test (OPT). The grammar section has two subcategories: 10 multiple-choice and 15 cloze test items. The vocabulary section has 25 multiple-choice and 10 cloze test items.

### **3.2.2. Writing Tests**

At the outset of the study, the researchers administered a writing pretest to investigate the writing proficiency of participants. The researchers asked all participants to write a 250 to 300-word essay in 45 minutes about '*Should school children be given homework (opinion)?*' as a pretest. Following the intervention, the participants were allocated another 45 minutes to write an essay about '*processed foods and ready-made meals*' as a posttest. The essays had to be written in five paragraphs following the general format accepted for argumentative essays. The Pearson product-moment correlation coefficient was used to estimate the inter-rater reliability between the two raters, who were IELTS examiners who used the IELTS rubrics to score the tests. The results showed a strong agreement between the raters ( $r = .82$ ).

### **3.2.3 Think-Aloud Protocol**

The think-aloud method, which required the participants to verbalize their thoughts, was utilized to capture their cognitive processes as they composed argumentative essays, providing valuable insights into their task performance and mental processes. The data obtained from the think-aloud protocols was then analyzed to investigate cognitive processes and evaluate the participants' writing fluency. Two of the researchers conducted the analysis of think-aloud data collaboratively. Inter-rater reliability was calculated using the Pearson

product-moment correlation coefficient, demonstrating a high level of agreement between the raters ( $r = 0.9$ ).

#### 3.2.4. Semi-Structured Interview

The researchers used semi-structured interviews to gather genuine data about individuals' skills, opinions, beliefs, awareness, feelings, and demographic data. In this study, the researchers conducted 30-minute semi-structured interviews with volunteers from each experimental group.

After the treatment, semi-structured interviews were used to monitor and explore the participants' ideas about the pre-task conditions and what they gained. They also gave extra explanations regarding the effects of interventions on their writing abilities in general and their cognitive processes in particular.

The interview questions were 14 open-ended questions based on a predetermined interview schedule to elicit an in-depth understanding of the participants' thoughts while performing the tasks. The questions were based on a model of reflective practice and learner-centered assessment in the context of ESL or EFL writing use. They aimed to elicit students' perceptions of the effectiveness and impact of various instructional activities and strategies on their writing development. They also prompted students to reflect on their own learning process, self-assess their writing skills, and consider how different instructional approaches have influenced their writing outcomes. The questions covered a range of topics related to writing instruction, including the impact of specific activities such as brainstorming, focus on form (FonF), and metacognitive strategies on writing quality, coherence, cohesion, sentence structure, accuracy, fluency, and overall writing proficiency.

Additionally, they explored students' perceptions of the relevance and utility of these activities in different stages of the writing process and their

potential transferability to other language skills or contexts. The researchers examined the validity of the interview questions by referring to experts' opinions. Three experts in the field verified that interview questions were directly aligned with competencies, enhancing the interviews' overall construct and content validity. To estimate the reliability of the questions, the researchers used Cohen's Kappa coefficient. The results indicated that the number of agreements per total number of coding decisions was .89, which indicates an excellent agreement. Data analysis was performed using MAXQDA software, version 12Pro, a comprehensive content analysis software utilized by researchers to analyze qualitative data. With MAXQDA, the researchers conducted thematic analysis, explored their coded material, and systematically analyzed their data.

### **3.3 Measurement Scales**

To assess accuracy, the researchers utilized the Weighted Clause Ratio (WCR), an index introduced by Foster and Wigglesworth (2016). WCR was calculated by defining if a clause is entirely accurate (1.0 points), includes minor errors not negotiating meaning (0.8 points), errors affecting the meaning (0.5 points), or is not comprehensible (0.1 points). The WCR was calculated by dividing the sum of obtained points by the total number of clauses.

For fluency assessment, many previous studies used various measures of language writing fluency, including length of the sentence parts, text size, holistic scoring of the text, and the number of t-units. However, since writing is the most cognitive language skill (Abdel Latif, 2018), product-based measures would not be valid indicators of writing fluency since they do not illuminate the underlying production process of writing. Therefore, some process-based measures were introduced to reflect the cognitive aspects of written fluency (Chenoweth & Hayes, 2001). In this study, the think-aloud

protocol was employed to assess the fluency of written products. Think-aloud, initially used by Newell and Simon (1972) in problem-solving, involves verbalizing thinking during writing and problem-solving. Students speak aloud any words coming to their minds while completing the task. Literature review shows that the mean length of bursts (segments before at least two seconds pause) is currently the most valid indicator of fluency. Therefore, the same measure was used in this study.

Syntactic complexity was one of the constructs used to measure the success of interventions and was measured according to the mean T-unit length of the writing products; that is, more syntactically complex sentences would favor longer T-units.

The researchers transcribed and coded the data gained from think-aloud recordings: All pauses, revisions, P-bursts (segments terminated by a pause), and R-bursts (segments terminated by revision) were specified. To assess the participants' cognitive processes, the researchers employed Hayes' (2012) model and asked the participants to think aloud while composing essays. They were required to videotape and audiotape their writing by adjusting their mobile phone to a place where they could film their hands writing on paper. The data comprised the texts produced by the writers, their videos, and the transcriptions of their think-aloud protocols. Next, the comments that had not directly led to production were bracketed. These comments included questions about the task, planning statements, and peripheral comments. Then, the protocol was timed, the pauses of two or more seconds were specified (via underlining), and the length of P-bursts was identified. After that, the protocol was segmented when the writer reviewed the formerly produced language (via italicizing), and the length of R-bursts (segments terminated by revision) was determined. After examining the cognitive processes (planning, translating, and revising), the frequency and length of

the three processes were compared to determine the proportion of time allocated to each process. Using the think-aloud protocol, the researchers could scrutinize the potential changes in students' cognitive processes after the three pre-task conditions.

### **3.4 Procedure**

The study lasted four months, one session per week, which was sixteen 90-minute sessions. Before the treatment, the researchers clarified the research purpose and procedure to the three classes. At the outset of the study, the researcher administered the OPT to evaluate the proficiency levels of the participants. Then, to examine the EFL learners' writing abilities, the participants wrote a 45-minute argumentative essay on '*Should school children be given homework (opinion)?*' as a pretest. They were required to videotape their writing processes, with a camera fixed on their hands, to record their hand-writing processes and their voices while speaking aloud whatever came to their minds (think-aloud). Then, the complexity and accuracy of the writings were analyzed. The think-aloud data were also explored to assess the fluency of the texts the participants produced and their cognitive processes while accomplishing the pretest. During sessions two and three, the teacher, one of the researchers, taught the three classes the preliminaries of essay writing and the different parts of an essay (introduction paragraph, three body paragraphs, and conclusion paragraphs), focusing on the introduction paragraph.

In the fourth session, the teacher worked on the structure of body paragraphs and the different types of concluding paragraphs in all three classes. From the fifth session, each group experienced two types of activities for ten weeks: shared activities relating to the writing course syllabus and pre-task activities specifically planned for each experimental group

(brainstorming, metacognitive strategy instruction, or FonF activities). After the pre-task phase, all groups wrote a text as the main-task activity.

In the fifth session, the teacher worked on organizing an agree/disagree essay in all classes. However, in the Brainstorming class, the teacher explained the rules of brainstorming and practiced the strategy. In the FonF class, the teacher discussed the students' grammatical problems and noticed that they lacked the knowledge of phrases and clauses and could not correctly punctuate the sentences; thus, the future activities of the FonF group focused on these subjects. In the Metacognitive strategy class, the teacher explained the concept of metacognitive strategy use: planning, monitoring, and reviewing.

In session six, working on agree/disagree essays was continued in all classes. The Brainstorming Group experienced group brainstorming, the FonF class worked on the general punctuation rules, and the Metacognitive Group practiced clustering as a prewriting strategy for idea generation. To summarize the procedure, all activities carried out in each experimental class during the study are shown in Table 1.

In the fifteenth session, after the treatment, the participants wrote another 45-minute argumentative essay as a posttest, which enabled the researcher to check potential changes in their writing abilities. As with the pretest, the participants videotaped their writing processes and verbally reported their thoughts, and the researchers analyzed the writings' CAF and the cognitive processes of the writers while accomplishing the posttest.

In the 16<sup>th</sup> session, the researchers interviewed the students for their reflections regarding the pre-task conditions and the experiences they gained during the course. Content analysis was utilized to scrutinize the gathered data, aiming to delve deeper into the intricacies of the subject matter. The findings obtained from the qualitative analysis were then amalgamated with

the quantitative data, enriching the understanding of the research questions by providing a comprehensive perspective. This integration facilitated a more robust interpretation of the collected data, leading to a more nuanced comprehension of the study's outcomes. The data was collected, analyzed, and incorporated with the results of the quantitative phase. The researcher interviewed 32 volunteer participants from the three classes (eight participants from experimental group 1, 11 from group 2, and 13 from group 3) to explain their reports and experiences with the think-aloud process. Analyzing the EFL learners' reports and interviews aided the researcher in explaining the quantitative results qualitatively. This final analysis could help the researcher clarify if and how different pre-task conditions would have resulted in better writing qualities and modified cognitive processes. Analyzing the learners' reports and interviews aided the researchers in explaining the quantitative results qualitatively.

Table 1

*The Procedure of the Study*

Session	Shared Activities			
	Shared Activities	Specific Activities		
		Brainstorming	FonF	Metacognitive
1	Administering WM span test and OPT; explaining the research procedure			
2	Administering the writing pretest (TA); explaining essay writing preliminaries			
3	Practicing the preliminaries of essay writing; teaching different parts of an essay; prewriting options; introduction paragraph of an essay			
4	Body paragraphs, concluding paragraph			
5	Agree-disagree essay (organization, useful words/phrases)	Rules of brainstorming group/individual	Diagnosing learners' problems with grammar: punctuation, phrases, clauses	Concept of metacognition, introducing metacognitive strategies (planning, monitoring, revising)
6	Agree-disagree	Whole class	Punctuation rules,	Planning strategies

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	essay (reviewing and rehearsing the introduction par.)	brainstorming	fragment/run-on sentences	(clustering, considering the audience, grabbing their attention)
<b>7</b>	Agree-disagree essay (working on sample essays)	Whole class brainstorming	Types of sentences (simple, compound, complex, compound- complex)	Planning strategies (group discussion on how to plan for an essay, time management)
<b>8</b>	Cause-effect essay (cause- effect patterns & organization, useful words/phrases)	Individual brainstorming (free writing)	Coordinating conjunctions, conjunctive adverbs	Planning strategies (planning content, details of essays, practice planning strategies)
<b>9</b>	Cause-effect essay (working on sample essays, useful words/ phrases)	Individual brainstorming (free writing)	Correlative conjunctions	Monitoring strategies (asking learners to keep thinking while writing)
<b>10</b>	Cause-effect essay (more sample essays)	Brainstorming in groups (adding to the ideas of others)	Subordinating conjunctions and adverb clauses	Monitoring strategies (reviewing the questions Ls should ask themselves)
<b>11</b>	Compare- contrast essay (patterns & organization, useful words/phrases)	Brainstorming in groups	Adverb clauses (more examples)	Monitoring strategies (group discussion on monitoring strategies)
<b>12</b>	Compare- contrast essay (sample essays)	Individual brainstorming (clustering)	Adjective clauses (examples)	Monitoring strategies (Learners modeled monitoring strategies)
<b>13</b>	Compare- contrast essay (sample essays)	Individual BS (clustering)	Adjective clauses (examples)	Revising strategies
<b>14</b>	Problem- Solution essay (patterns &	Whole class brainstorming (free writing)	Noun clauses (examples)	Revising strategies (reviewing the revising strategies,

organization, useful words/phrases)	commenting on some writings)
<b>15</b> Administering writing posttest	
<b>16</b> Conducting semi-structured interviews (32 volunteers from three intact classes)	

### 3.5 Data Analysis

Three groups of students provided the researchers with the required data. The numerical data were analyzed using SPSS, a widely used software for quantitative data analysis. To compare the possible impact of pre-task conditions on writing presentation and CAF of the three experimental groups, the researchers ran a Multivariate Analysis of Variance (MANOVA) as a statistical measurement. For the qualitative phase, qualitative data were collected and compared with results obtained from writing pretest and posttest and analyzing cognitive processes. Analyzed through MAXQDA, qualitative data were integrated into the quantitative data for a more reliable understanding of the questions. The researchers employed content analysis to analyze the qualitative data.

## 4. Results

The researchers conducted statistical analyses to answer the first and second research questions presented in the following tables.

### 4.1 Quantitative Data Analysis

A MANOVA was used to compare the groups' fluency, complexity, and accuracy in the writing pretest. However, first, the researchers had to ensure that the data confirmed the assumptions of the analysis. To test for multivariate normality as one of the main assumptions of MANOVA, the researchers calculated the Mahalanobis distances. Based on the results, two cases were removed.

Another MANOVA was performed to explore the differences in the fluency, complexity, and accuracy of participants' written production after

the treatment. The assumptions of MANOVA (Normality, linearity, outliers, homogeneity of variance-covariance matrices, and multicollinearity) were conducted, with no violations distinguished. There was a statistically significant difference among the fluency, complexity, or accuracy of the three groups' written productions,  $F(6, 286)=7.067$ ,  $p<.001$ ; Wilks' Lambda=.758; partial eta squared=.129. Therefore, the researchers concluded that pre-task conditions have statistically significant effects on the participants' writing CAF.

**Table 2***MANOVA for Effects of Pre-task Conditions on Groups' Writing CAF*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Group	Pillai's Trace	.246	6.737	6.000	288.000	.000	.123
	Wilks' Lambda	.758	7.067	6.000	286.000	.000	.129
	Hotelling's Trace	.312	7.394	6.000	284.000	.000	.135
	Roy's	.292	13.996	3.000	144.000	.000	.226
	Largest Root						

Table 3 shows that the differences to reach a statistical significance, using Bonferroni adjusted alpha level of .017, were complexity,  $F(2,145)=13.866$ ,  $p<.001$ , partial eta squared=.161 and accuracy,  $F(2, 145) = 11.482$ ,  $p<.001$ , partial eta squared=.137.

**Table 3***Between-subjects Tests for Effects of Pre-task Conditions on Groups' Writing CAF*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	Complexity	155.452	2	77.726	13.8	.000	.161
	Accuracy	.235	2	.118	11.482	.000	.137
	Fluency	2.740	2	1.370	.831	.438	.011
Error	Complexity	812.803	145	5.606			
	Accuracy	1.486	145	.010			
	Fluency	239.057	145	1.649			
Total	Complexity	31904.55	148				

Accuracy	92.201	148
Fluency	4486.170	148

An inspection of the mean scores in Table 4 indicated that the metacognitive strategy group had a higher mean than the brainstorming and FonF groups.

**Table 4**

*Estimated Marginal Means for Effects of Pre-task Conditions on Groups' Writing CAF*

Dependent Variable	Group		Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
Complexity	dimension1	Brain	13.069	.342	12.394	13.7
		FOF	14.694	.335	14.032	15.3
		Meta	15.554	.335	14.893	16.2
Accuracy	dimension1	Brain	.739	.015	.710	.76
		FOF	.770	.014	.742	.79
		Meta	.835	.014	.807	.86
Fluency	dimension1	Brain	5.384	.185	5.017	5.75
		FOF	5.505	.182	5.147	5.86
		Meta	5.178	.182	4.819	5.5

To answer the second research question, the researchers conducted another MANOVA after checking the assumptions of the analysis. To test the normality as one of the main assumptions of MANOVA, the researchers calculated Mahalanobis distances, resulting in the removal of one case for the rest of the analyses.

As Table 5 shows, there was a statistically significant difference between the planning, translating, and revising of the three groups,  $F(6, 288) = 13.3$ ,  $p < .001$ ; Wilks' Lambda = .611; partial eta squared = .218, indicating that pre-task conditions (brainstorming, FonF, and metacognitive strategy instruction) statistically affect Iranian EFL learners' planning, translation, and revising while writing.

**Table 5**

*MANOVA for the Effect of Pre-task Conditions on Cognitive Processes*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.962	1229.08	3	144	.000	.9
	Wilks'	.038	1229.08	3	144	.000	.9
	Lambda						
	Hotelling's Trace	25.60	1229.08	3	144	.000	.9
Group	Roy's Largest Root	25.60	1229.08	3	144	.000	.9
	Pillai's Trace	.400	12.08	6	290	.000	.2
	Wilks'	.611	13.38	6	288	.000	.2
	Lambda						
	Hotelling's Trace	.616	14.68	6	286	.000	.2
	Roy's Largest Root	.584	28.21	3	145	.000	.3

Table 6 shows that the only difference to reach a statistical significance, using Bonferroni adjusted alpha level of .01, was revising,  $F(2, 146) = 40.3, p < .001$ , partial eta squared = .3.

**Table 6**

*Between-Subjects Effects of Pre-task Conditions on Cognitive Processes*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	Planning	413.8	2	206.9	2.02	.13	.02
	Translating	795.6	2	397.8	2.63	.07	.03
	Revising	4231.431	2	2115.7	40.3	.000	.36
Error	Planning	14926.925	146	102.239			
	Translating	22067.562	146	151.148			
	Revising	7664.421	146	52.496			
Total	Planning	332652.000	149				
	Translating	376703.000	149				
	Revising	58318.000	149				

An inspection of the mean scores in Table 7 indicated that the metacognitive strategy group had a higher mean than the Brainstorming and FonF groups.

**Table 7***Estimated Marginal Means for Pre-task Conditions on Cognitive Processes*

Dependent Variable	Group		Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
Planning	dimension1	Brain	44.49	1.444	41.6	47.34
		FOF	45.5	1.430	42.6	48.32
		Meta	48.42	1.430	45.5	51.24
Translating	dimension1	Brain	45.44	1.756	41.9	48.92
		FOF	50.64	1.739	47.2	54.07
		Meta	50.04	1.739	46.6	53.47
Revising	dimension1	Brain	15.75	1.035	13.7	17.8
		FOF	24.88	1.025	22.8	26.9
		Meta	12.28	1.025	10.2	14.3

**4.2 Qualitative data analysis**

Content analysis and MAXQDA were employed to analyze the qualitative results of the think-aloud protocol and semi-structured interviews. The researchers used MAXQDA to conduct thematic analysis, explore their coded material, and systematically analyze their data. While the name “MAXCODA” does not directly appear in the search results, MAXQDA is a prominent tool for content analysis tasks.

The participants’ perceptions of using brainstorming activities (assets and drawbacks) on the development of their writing processes and qualities are as follows:

***Creativity***

New ideas came to my mind. When you need to be creative, your brain can be your worst enemy because you may encounter a vague idea or different thoughts that will be confusing, and you will not be able to think about them clearly. One of the benefits of brainstorming is that it can become an opportunity to get the jumbled ideas out of your head. (Student#3. Other students stated a similar idea but in different words)

Brainstorming requires an individual or team to think creatively and develop solutions that lead to better ideas and suggestions. When a group of people comes together to discuss a topic or problem, creativity increases, each idea helps shape another idea, and people come up with new solutions from each other's ideas.

### ***Generating ideas in a short period***

Brainstorming requires an individual or team to think creatively and come up with solutions that lead to better ideas and suggestions. When a group of people comes together to discuss a topic or problem, creativity increases, each idea helps shape another idea, and people come up with new solutions from each other's ideas. Brainstorming caused many questions in my mind. This strategy gave the right to choose between ideas.

A participant mentioned in the interview:

This strategy accelerates the process of writing. Before using this strategy, it took me about an hour to think about different aspects of one subject. Learning this strategy helps me to shape my mind in a short period with the help of my classmates.

Another participant stated in the interview:

By using this strategy, I can generate many new ideas that were impossible to create alone. This strategy encourages me to relax and be enthusiastic about the process.

### ***Enhancing teamwork and cooperation***

When you brainstorm as a group, one person does not feel like they are carrying the entire task workload or developing a sense of ownership over the team. On the other hand, everyone in the brainstorming session learns how to work together.

A participant stated in the interview:

In the classrooms, my major problem was cooperating with my classmates. It was difficult to work cooperatively on a project. However, the brainstorming

strategy helped me to obviate this problem. Now, I can cooperate with my peers cooperatively.

Another participant stated in the interview:

Brainstorming encourages me to collaborate with my classmates. Collaboration is all about realizing my potential, bringing my ideas, and my passion for my project. In other words, adequate collaboration can take my learning process to the next level.

### ***Encouraging critical thinking***

Critical thinking means taking a particular issue or situation and thinking about it logically, free from personal biases. Brainstorming allows team members to think critically to solve a specific problem or develop a creative idea. The more students use this technique, the better they will be at facing a problem and thinking critically about it.

Some of the other stated expressions of the participants are as follows:

Brainstorming helped us not to get away from the topic and to focus on the topic. The importance of the subjects was better defined. It helped textual coherence. I knew the starting and ending point of my writing. It increased the writing speed. We had more time to edit. We used to avoid irrelevant sentences. It did not affect the grammar.

Language learners usually think about adequate grammar structure when they write a paragraph; therefore, they revise their writing assignments and modify their grammatical errors after preparing the first draft.

Some of the other stated expressions of the participants are as follows:

Although metacognitive strategies slow the writing speed, they greatly help to write correctly. In the revise strategy, I could see my mistakes and fix them. I used to use it before, but now I use it more, and I use it according to the principles. The accuracy of the text has increased. It has a positive effect on both the coherence and cohesion of the text. My understanding of different parts of an article has increased, and I start writing more carefully.

While some learners held neutral or negative opinions toward explicit grammar instruction, they still articulated a satisfactory opinion about FonF activities, especially writing feedback. The results also highlighted that the learners preferred direct correction. In addition, many expressed strong requests for self-correction and interactive activities in the revision process.

Some of the other stated expressions of the participants are as follows:

I realized that I was using many grammars incorrectly. It had a great impact on my writing accuracy. The number of my compound and complex sentences increased drastically. I got acquainted with my grammar problems. I write longer texts. All my focus was on grammar. I was trying to focus on grammar mistakes and fix them. Grammar knowledge is more important than having ideas. Because when you have an idea and do not have the necessary knowledge of grammar, you cannot implement the idea.

## **5. Discussion**

The current study focused on pre-task conditions (brainstorming, FonF, and metacognitive strategy instruction) to examine their role in English language writing and how they improved CAF from a cognitive perspective. The results demonstrated the decisive role of the pre-task conditions on the CAF of Iranian EFL learners' written production. However, the metacognitive strategy group outperformed the other two groups in enhancing the complexity of the learners' performances, indicating a positive answer to the first research question regarding the differential impacts of pretask conditions on EFL learners' writing performances. The study also demonstrated that planning, translating, and revising are affected by the pre-task conditions, showing the outperformance of the Metacognitive Group.

Within Robinson's (2005) cognition hypothesis and his triple hybrid framework, the researchers of the present study postulate that pre-task conditions affect the quality of the written product and the frequency of the text complexity process. Thus, fulfilling the conditions before the task of

cognitive complexity will have a higher quality than grammatical accuracy. In other words, manipulating pre-task conditions affected the grammatical accuracy and complexity of the participants' writings.

The findings mark a point of agreement with the results of Abdel Latif (2019), Barrot and Gabinete (2021), Hayes and Berninger (2014), and Jagaiah et al. (2020) studies whose findings confirmed Robinson's (2005) hypothesis attributed to the influencing and intervening role of the exchange effect. Robinson asserts that due to limitations in cognitive capacity, a prioritization process occurs in which one aspect of CAF suffers deficits at the expense of other aspects. Hence, the present researchers assume that the trade-off effect hypothesized by Robinson's model is responsible for the complexity and higher grammatical accuracy of participants' performance in the Metacognitive Group.

However, the results of cognitive process analyses should be interpreted from two perspectives. First, the statistical analysis of the written productions showed that the Metacognitive Group performed more efficiently in the revising process in terms of the cognitive process in pre-task conditions. Thus, Robinson's (2005) hypothesis seems to have an acceptable presentation to explain the obtained results from the analysis of the cognitive process of the writings of EFL learners, and the current study is consistent with Robinson's (2005) prediction that using pre-assignment conditions to some extent improves the overall quality of writing. In other words, the quality of all three aspects (of CAF) increased to some extent. Second, the findings are consistent with Skehan and Foster's (2001) limited attention capacity model. That is to say, by using pre-task conditions and increasing cognitive processes, learners' performance in terms of the components of planning will also improve.

This study ties well with previous studies wherein Kim (2013), Payant et al. (2019), and Yoon and Abdi Tabari (2023) revealed that task conditions (e.g., planning time, pre-task conditions, topic familiarity, etc.) could lead to improvement in task performance. Notable cognitive models of writing also view the properties of writing tasks as linked with the writing process and textual features of the writing.

Findings are also consistent with the study of Kuiken and Vedder (2017), which showed the effects of brainstorming strategy instruction on the performance of intermediate L2 writers. However, this study contrasts with Zare et al.'s (2021) suggestion that brainstorming techniques and explicit strategy use might adversely affect writing performance.

Similar to the current study, Zabihi's (2018) meta-analysis on teaching writing to adolescents suggested that providing explicit guidance on planning, revising, and editing text, along with meaningful practice sessions, boosts adolescents' understanding and self-regulation and improves the quality of their writing. However, it remains uncertain whether and in what ways such metacognitive use can improve the academic writing performance of second language (L2) learners.

As the present study clarified, the primary use of pre-task activities in teaching writing cannot be taken for granted since writing is a complex and multidimensional skill influenced by multiple factors, which necessitates continuing this line of research. This study also emphasized the status and efficiency of task-based writing instruction for Iranian EFL teachers since TBLT provides insights into the corroboration of applicable and modern instructional practices.

## **6. Conclusion**

The research explored written products and the cognitive processes of language writers. An investigation of cognitive processes followed by

retrospective interviews and an investigation of CAF would be an example of the triangulation of data, which can yield reliable results. Considering the role of different pre-task conditions, an appropriate option for such an examination can be to delve into the interaction among such results and the effects of different pre-task conditions.

Previous studies have done much valuable work in the language writing field and its underlying cognitive processes. Many writing models have been introduced, and various task conditions have been examined to enhance the writing quality of language learners. The present study, drawing on the previous research, expects to significantly contribute to the field of language writing in different ways. The study can potentially supply constructive intuitions on how writing abilities can affect the outcome of pre-task conditions. It can also provide information on how changes in pre-task conditions can lead to any improvement in the CAF dimensions of the written products.

Therefore, the study can help teachers and materials developers design more practical writing tasks, enhance the teaching and learning process quality, and attain enhanced mastery of learning among EFL learners. The study intended to discover instructions for further research, syllabus design, and curriculum development in the writing process. The research aimed to play a part in alleviating the challenges of L2 language learning in general and L2 writing development in particular. The study argued that due to the globalization notion, ingoing and taking part in realities, particularly participation in academic societies, necessitates proficiency in both spoken and written literacy. As the written products need to exhibit high CAF indices to be accepted by the international globe, the educational system, including the authorities, materials developers, and practitioners, must provide opportunities for learners to enhance their writing performance using the

most effective cognitive processes. Though the present research does not claim to find the most reliable solutions to all questions and problems, it hopes to ignite investigation into the role of various helpful pre-task conditions in enhancing Iranian EFL learners' writing abilities. As the English language is primarily taught in conventional classes in Iranian schools and universities, the acquaintance of teachers with task-based methods of teaching, especially manipulation of the pre-task phase, can update the teaching environments and offer innovative teaching techniques. As many previous studies had been conducted in other countries, the current research hoped to urge other researchers to investigate the impact of various writing pre-tasks on the language performance of EFL learners in the Iranian context in the future. The present study focused on argumentative essays; thus, future studies can explore the effects of other types of tasks on expository, narrative, and descriptive writing styles.

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