The Impacts Of Manipulating Task Complexity On EFL Learners' Performance

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Abstract

The purpose of this study is to investigate the impact of manipulating the cognitive complexity of tasks on EFL learners' narrative task performance in terms of complexity, accuracy, and fluency of their production. To this aim, by drawing upon Robinson's (2007) Triadic Componential Framework (TCF), four levels of task complexity were operationalized. Sixty- five Iranian students studying English as a foreign language at the intermediate level participated in this research. The obtained results revealed that manipulating different dimensions of task complexity exerts differential effects on complexity, accuracy, and fluency of learners' narrative task performance. Additionally, it was shown that keeping tasks simple along the resource-dispersing dimension, while making them more demanding along the resource-directing dimension results in a simultaneous increase in complexity and accuracy, a finding which conforms to predictions based on Robinson's Cognition Hypothesis. These findings suggest that task complexity can be used as a robust basis for making grading and sequencing decisions in task-based syllabi.

Keywords: task complexity; structural complexity; lexical complexity; accuracy; fluency

Introduction

Defining and determining task complexity (TC) is of central importance in task-based language teaching because with such knowledge educators can have a better understanding of task performance, design, and development. TC can also inform grading and sequencing decisions in a language teaching syllabus (Ellis, 2003; Skehan, 1998; Robinson, 2001). The centrality of TC has inspired a growing number of studies investigating a set of task characteristics, task types, and performance conditions which are assumed to affect the difficulty of tasks well as learner performance. When describing tasks, previous research mainly used variables from a cognitive, information-processing perspective to operationalize difficulty of tasks. Overall, previous findings have confirmed that manipulating the psycholinguistic dimensions of TC has consistent effects on features of L2 oral output, such as accuracy, fluency, and complexity. For instance, tasks that use unfamiliar information, involve numerous steps for completion, and provide no planning time are considered more difficult to perform than simpler, familiar tasks that involve only a few operations and provide plenty of planning time. The study reported in this article examined the synergistic effects of manipulating cognitive complexity of narrative tasks along different dimensions on complexity, accuracy, and fluency of Iranian EFL learners' oral production. To this aim, by manipulating cognitive demands of narrative tasks along planning time, single task demand, and the degree of displaced, past time reference, four levels of TC were operationally defined.

To date, a number of studies have researched into the effects of these task factors in isolation (see Robinson, 2011 for an updated and informative review). However, the simultaneous effects of these three variables on quality of production have not been investigated so far. This study was aimed at covering this lacuna.

Theoretical Background

Within the cognitive information-processing perspective to task-based research, a considerable bulk of research has been motivated by different yet complementary models for conceptualizing TC. These frameworks are sketched below. It is essential to mention that there are other valuable emerging approaches (e.g., Van den Branden, 2006; Eckerth, 2008) which for reasons of space will not be discussed here.

Skehan's Cognitive Approach

Drawing on Candlin's (1987) framework for *task difficulty* (a term which in Skehan's framework is interchangeable with *task complexity*), and inspired by a cognitive information-processing perspective to language learning, Skehan (1996, 1998) proposed a three-way distinction for the analysis of task difficulty to which learner factors can also be added: code complexity (vocabulary load and variety; linguistic complexity and variety); cognitive complexity (familiarity of topic, discourse or task; amount of computation and organization, and sufficiency of information); communicative stress (time pressure; scale; number of participants; length of text; modality; stakes; opportunity for control); and learner factors (intelligence; breadth of imagination; personal experience).Skehan took linguistic complexity to be a "surrogate" of learners' willingness to stretch their inter-language by experimenting with more difficult forms and by trying out more elaborate language. He further argued that task difficulty is the amount of attention the task demands from the participants. His predictions are premised on a *limited-capacity* conception of attention which suggests that when task demands are high, attention can only be allocated to certain aspects of performance to the detriment of others. This tension is portrayed in his Tarde-off Hypothesis which predicts that there is a tension between form (complexity and accuracy), on the one hand, and fluency, on the other.

Robinson's Cognition Hypothesis

Robinson (2001, p.28) claimed that, "task complexity is the result of the attentional, memory, reasoning, and other information-processing demands imposed by the structure of the task on the language learner. These differences in information-processing demands, resulting from design characteristics, are relatively fixed and invariant." Regarding attentional resources, Robinson has proposed that the human brain has a multiple-resource attentional system, i.e., depletion of attention in one pool has no effect on the amount remaining in another. In this view, attention, as suggested by models such as Wickens' (1992), can draw on multiple resources. To guide research into these claims, and also pedagogy, Robinson (2007) proposed an operational taxonomy of task characteristics. This taxonomic, Triadic Componential Framework (TCF) distinguishes three categories of task. Task *condition* refers to interactive demands of tasks, including participation variables (e.g., open vs. closed tasks) and participant variables (e.g., same vs. different gender). A second category of task *difficulty* has to do with individual differences in learner factors, such as working memory capacity, which can impact the extent to which learners perceive task demands to be difficult to meet. These factors, Robinson argued, explain why two learners may find the same task to be more or less difficult than each other. The last component, task *complexity,* refers to the cognitive demands of tasks, such as their reasoning demands (Robinson, 2011).

The TCF divides task features affecting the cognitive complexity of tasks along two dimensions. Resource-*directing* dimensions of complexity affect allocation of cognitive resources to specific aspects of L2 code. As stated by Robinson (2011, p.15), "By increasing complexity along these dimensions, initially *implicit* knowledge of the L1 concept-structuring function of language becomes gradually *explicit* and available for change during L2 production." In contrast, resource-*dispersing* dimensions do not do this: Increasing complexity along these dimensions reduces attentional and memory resources with negative consequences for production, a position which is in agreement with Skehan's (1998). According to Robinson (2011), despite such negative consequences, progressively increasing complexity along resource-dispersing variables is also important in order to approximate the complexity conditions under which real-world tasks are performed. Increasing task demands along these dimensions gradually removes processing support for access to current inter-language; consequently, practice along them requires faster and more automatic L2 access and use. One of the main claims of Robinson's Cognitive Hypothesis is that increasing task complexity along resource-directing dimensions will be associated with *simultaneous* increases in complexity *and* accuracy, a claim which contrasts with Skehan's Trade-off Hypothesis prediction.

The Present Study

As was mentioned above, Robinson (2007) assumes that increasing task complexity along resource-directing dimensions of cognitive complexity (e.g., +/- Here-and-Now) will be associated with *simultaneous* increases in complexity *and* accuracy, a position which contrasts with Skehan's (1998). On the other hand, Robinson argues, increasing complexity along resource-dispersing dimensions (e.g., +/- planning time, +/- single task) reduces attentional and memory resources with negative consequences for production, a position which is in agreement with Skehan's. According to Robinson, overall, the predictions regarding the effects of task complexity on task performance have received some support from previous studies mentioned above. However, as asserted by Robinson (2001), "Synergetic effects of these resource-directing and resource-dispersing dimensions can be expected and research is needed to investigate these" (p. 35). Few studies (e.g., Gilabert, 2007), however, have simultaneously manipulated these task complexity dimensions to look into potential synergetic effects they exert on task performance. In point of fact, there seems to be a gap in the existing literature regarding studies exploring the potential synergetic effects of simultaneously manipulating task complexity along different dimensions with the aim of investigating its effect(s) on EFL learners' task performance. In response to the need for further research investigating task complexity, the current research study was developed.

Drawing on Robinson's (2007) TCF, the researchers intend to explore whether and how manipulating task complexity along resource-directing and resource-dispersing dimensions of task complexity synergistically impacts learners' task performance. They are specifically interested in investigating three variables which previous research have suggested may affect narrative task performance: planning time, single task, and Here/Now variables. In doing so, the researchers manipulated the complexity of narrative tasks along two resource-dispersing variables of planning and single task together with the resource-directing variable of Here/Now. Accordingly, the present study aims at investigating the following research questions:

1) How does increasing the cognitive complexity of tasks simultaneously along planning time, single task, and the Here/Now variables affect the complexity, accuracy, and fluency of learners' production?
2) Does making tasks more cognitively demanding along the resource-directing dimension while keeping them simple along the resource-dispersing dimension bring about a *simultaneous* increase in complexity *and* accuracy?

Methodology

Participants

Sixty-five Iranian L2 learners of English at a language institute in Isfahan, Iran participated in this study on a volunteer basis. Participants were adult male Persian speakers aged between 14 and 38 and attended the classes twice a week during a three-month term. They were assigned to intermediate-level classes based on a placement test and a short oral interview. Saeedi et al., (2010), investigated the criterion-related validity of this placement test. They reported significant correlations among participants' scores on the placement test and the criteria.

Design

This study was a between-groups design. As such, each participant performed only one of the four tasks of different degrees of cognitive demand operationalized below.

Participants were randomly assigned to tasks. In order to investigate the statistical significance of mean differences, a one-way MANOVA was carried out. In the analysis process, an independent variable (i.e., task complexity) with four levels and four related dependent variables were analyzed. These included: fluency, lexical complexity, structural complexity, and accuracy of learners' production.

Instruments

In order to have conformity with previous research in this area and, consequently, enhance the comparability of results, narrative tasks were employed in this study. Narrative tasks- retelling of stories based on sequenced sets of picture prompts or videos- have been widely used in task-based research for a variety of objectives. Because such tasks are non-interactive and fairly open to control, they have been popular among researchers (Skehan & Foster, 1999). Four video episodes were chosen as ideal narrative tasks because the episodes were (a) not too long; (b) easy to follow, without any cultural bias; and (c) absorbing and engaging, so that telling the story would be something the participants would be likely to enjoy. Following Skehan and Foster (1999), the data collection design assumed that stories were similar to one another and that what made a difference in performance was the condition under which each story was performed. Building on Robinson's (2007) TCF, four levels of task complexity were operationalized (see Table 1). It was hypothesized that the first and the fourth task conditions would be the least and the most cognitively demanding ones, respectively. The tasks were then pre-piloted and piloted with Iranian EFL learners.

Table 1: Task complexity across dimensions

Complexity dimensions	**Tasks**			
	Simple		**Complex**	
	A	B	C	D
Planning	+	-	+	-
Single task	+	-	+	-
Here/Now	+	+	-	-

Procedure

Data were collected over a period of some weeks. Under the first condition, following Ellis (2009), participants were given 10 minutes as planning time before performing Task A (see Appendix A). During this time participants were asked to do some activities (+planning). The purpose of these activities was to highlight the relevant lexical items and also familiarize participants with the topic. As for the operationalization of Here-and-Now/There-and-Then distinction, after watching the video, each participant was asked to perform the task of narrating the story in the present (see Robinson, 1995; Rahimpour, 1997; Gilabert, 2007).

Concerning Task B, participants who took this task were not given any planning time (-planning). Furthermore, they were asked to do the secondary task of answering some questions pertaining to the story content as they were watching the video (see Appendix

B). Following watching the episode, they were also asked to do the main task of narrating the story in the present (-single task; +Here/Now). As for the third task, each participant who took Task C was given a ten-minute planning time to do a couple of activities (see Appendix C). Having watched the video, each participant was asked to perform the single task of retelling the story in the past tense (+ planning, +single task; -Here/Now). Regarding the fourth task, participants were not given any planning time (-planning) before retelling Task D. In addition, they were required to answer some comprehension questions pertaining to the content of the episode while they were watching it (see Appendix D). Following watching the video, they were also asked to carry out the main task of narrating what they saw in the past (-single task; -Here/Now). Following procedures developed in Foster and Skehan (1996), the audio-taped data were transcribed and coded to measure participants' performance in terms of structural complexity, accuracy, fluency, and lexical complexity. These aspects of task performance were operationalized as follows:

Structural Complexity

This aspect of performance was measured by counting the number of clauses and dividing it by the total number of T-units. A T-unit is a main clause together with any other clause(s) dependent on it. It should be noted that the T-unit was preferred to C-unit, because this research dealt with one-way, monologic narratives which were expected to trigger no elliptical answers (see Gilabert, 2007).

Accuracy

Accuracy of performance was measured by calculating the number of error-free clauses as a percentage of the total number of clauses. This operationalization of accuracy was motivated by findings of previous research indicating the sensitivity of such a global measure of accuracy to detecting differences between experimental conditions (Skehan & Foster, 1999). The criteria for defining error-free clauses were lack of errors with regard to syntax, morphology, native-like lexical choice or word order. In general, the native-like use of the language, in terms of grammar and lexis, was used as a criterion in determining error-free clauses (see Tavakoli, 2009)

Fluency

Among the wide variety of approaches to measuring fluency, in this study, the rate of pruned speech was chosen to code and measure each narrative because it includes both the amount of speech and the length of pauses (Gilabert, 2007). Contrary to un-pruned speech rate, in pruned speech rate, repetitions, reformulations, false starts, and asides in the L1 are not considered in the calculation (Lennon, 1991). Pruned speech rate was calculated by dividing the number of syllables by the total number of seconds and multiplied by 60.

Lexical complexity

Recent research has shown that complexity, accuracy, and fluency need to be supplemented by measures of lexical use (Skehan, 2009).This area, however, has been strikingly absent in task research. This, according to Skehan (2009, p. 514) is a "serious omission". In this study, the Guiraud's index of lexical richness, a variation of type/token ratio (TTR) was used to analyze lexical use. The advantage of this measure is that by including the square root of the tokens it compensates for differences in text length. The Guiraud's Index of lexical richness was calculated by dividing the number of types by the square root of the number of tokens.

Results

The results of participants' task performance are displayed in Table 2. The table shows the descriptive statistics for all measures. In order to investigate the statistical significance of mean differences a multivariate analysis of variance (MANOVA) was also run. Where significance was reached, a *Post hoc* Scheffe test was also carried out to explore where the significant differences were located.

Table 2: Descriptive statistics for task performance: means and standard deviations

Tasks	**Lexical complexity**		**Structural complexity**		**Accuracy**		**Fluency**		**N**
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Task A	5.57	.50	1.58	.13	40%	7%	113.75	18.77	16
Task B	5.10	.42	1.46	.19	32%	10%	94.31	19.92	16
Task C	5.45	.33	1.78	.12	56%	8%	108.62	14.92	16
Task D	4.92	.41	1.62	.16	45%	6%	90.94	15.86	17

The impact of manipulating task complexity along the resource-dispersing dimension: Planning and single task variables

As shown in Table 3, there was a significant main effect for lexical complexity, $F (61, 3) = 8.235$, $p < .01$, suggesting that lexical complexity was affected by the different degrees of complexity. The results of *Post hoc* Scheffe test reported in Table 4 revealed that the planned, +Here/Now, +single task triggered significantly more fluent speech ($p < .05$) than the unplanned, +Here/Now, -single task one. Similarly, the +single task, -Here/Now task performed under planned condition generated significantly more fluent speech ($p < .05$) than the -single task, -Here/Now task performed under unplanned condition (see Figure1).

Regarding structural complexity, there was a significant main effect, $F (61, 3) =11.432$, $p < .01$. Results of *Post hoc* Scheffe test showed that structural complexity mean difference between the planned, ,+single task, +Here/Now and the unplanned, -single task, +Here/Now tasks did not reach statistical significance ($p > .05$). However, there was a statistically significant mean difference between the planned, +single task , -Here/Now and the unplanned, -single task, -Here/Now tasks ($p < .05$). Therefore, though Task A (i.e., +Here/Now, +single task) generated a slightly higher level of structural complexity than Task B (i.e., +Here/Now, -single task), the mean difference was not statistically significant. The mean difference of structural complexity between performance on Task C and Task D, on the contrary, was statistically significant (see Table 4).

Table 3: One-way MANOVA by condition: main effects obtained for all measures across different task complexity conditions

Source	Dependent variable	Df	Mean square	F-value	P-value
Task complexity	Lexical complexity	61,3	1.478	8.235	.000**
	Structural complexity	61,3	.290	11.432	.000**
	Accuracy	61,3	.154	22.019	.000**
	Fluency	61,3	1977.142	6.482	.001**

** $p < .01$

With regard to the measure of accuracy, there was a statistically significant main effect, F (61, 3) = 22.019, $p < .01$. More specifically, as shown in Table 4, the simple task performed under the planned, +Here/Now, +single task condition generated a slightly higher percentage of error-free clauses than the one performed under the more complex unplanned, +Here/Now, -single task condition. The mean difference, however, failed to reach a statistically significant level ($p > .05$). On the other hand, Task C performed under planned, -Here/Now, +single task condition elicited a significantly more accurate performance than Task D performed under unplanned, -Here/Now, and -single task condition ($p < .05$).

As for the fluency measure, there was a significant main effect, F (61, 3) = 6.482, $p < .01$, which suggests that fluency was affected by the different degrees of complexity. The results of *Post hoc* Scheffe test showed that both simple, + single task, + Here/Now and more complex, +single task and -Here/Now conditions elicited a significantly higher speech rate when performed under planned condition. More specifically, the planned, +Here/Now, and +single task triggered significantly more fluent speech ($p < .05$) than the unplanned, +Here/Now, -single task. Similarly, the -Here/Now and +single task performed under planned condition generated a significantly more fluent performance ($p < .05$) than the -Here/Now and -single task performed under unplanned condition (see Table 4 and Figure 2).

In sum, on the basis of the obtained results, it can be deduced that manipulating task complexity along the "resource-dispersing" dimension of tasks (i.e., planning time and single-task) had a significant effect on fluency and lexical complexity of narrative task performance but not on structural complexity or accuracy.

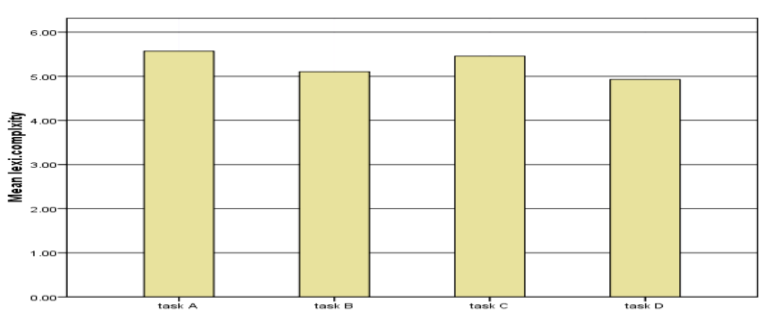

Figure1: Lexical complexity measures under different task complexity conditions

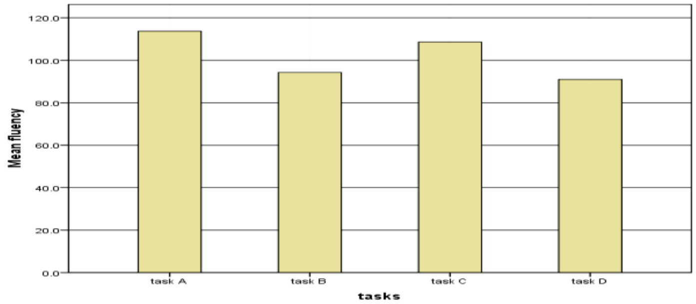

Figure 2: Fluency measures under different task complexity conditions

Table 4: Mean differences between participants' performance on simple and complex tasks: the effects of planning and single-task variables

Comparison	Lexical complexity	Structural complexity	Accuracy	Fluency
+Planning, +single task,+ Here/Now (Task A) vs. -planning, - single task , + Here/Now (Task B)	.46*	.12	.08	19.43*
+Planning, +single task, -Here/ Now (Task C) vs. -planning, - single task, - Here/Now (Task D)	.53*	.16*	.23*	17.68*

*p < .05

Impact of manipulating task complexity along the resource-directing dimension: The Here/Now variable

As displayed in Table 5, the lexical complexity of participants' performance on the simple planned, +Here/Now task (Task A) was a bit higher than that of their counterparts who took the more cognitively demanding planned, -Here/Now task (Task C). The means difference, however, was not statistically significant (p > .05). Similarly, though taking the simple unplanned, +Here/Now task (Task B) caused learners to have a more lexically complex task performance than those who took the more complex unplanned, -Here/Now task (Task D), the mean difference between their lexical complexity measure failed to reach statistical significance (p > .05). As for structural complexity, participants who took the more complex -Here/ Now under both planned and unplanned conditions had a more structurally complex performance than those who took the simpler +Here/Now condition (see Figure 3). The result of *Post hoc* Scheffe test showed these differences to be statistically significant (p < .05).

The reported results pertaining to the accuracy measure displayed that increasing complexity along the +/- Here/Now variable positively affected learners' accuracy of performance. The percentage of error-free clauses showed more attention paid to accuracy of speech when tasks were performed in the complex -Here/Now than when produced under the simpler +Here/Now condition. In other words, complex planned tasks under the -Here/Now condition triggered a significantly (*p*<.05) higher proportion of error-free clauses than the simpler planned, +Here/Now tasks. This was also shown to be the case when tasks were performed under the unplanned condition (see Figure 4).

Finally, regarding fluency of speech, though learners' performance under the simple + Here/Now condition was more fluent than that of their counterparts who took the complex -Here/Now condition, the *Post hoc* Sheffe test, however, did not confirm the statistical significance of the mean difference (*p* >.05). This was the same between simple and complex tasks when performed under both planned and unplanned conditions.

To summarize, the results of data analyses reported in this section revealed, manipulating task complexity along the "resource-directing" dimension of tasks (i.e., the Here/Now variable) had a significant effect on structural complexity and accuracy, but not lexical complexity or fluency of learners' production.

Table 5: Mean differences between participants' performance on simple and complex tasks: the effect of Here/Now variable

Comparison	**Lexical complexity**	**Structural complexity**	**Accuracy**	**Fluency**
+Planning, +single task,+ Here/Now (Task A) vs. +Planning, +single task, -Here/ Now (Task C)	.11	-.20*	-.15*	5.12
-Planning, - single task ,+ Here-Now (Task B) vs. -planning, - single task, - Here/Now (Task D)	.17	-.16*	-.12*	3.37

**p < .05*

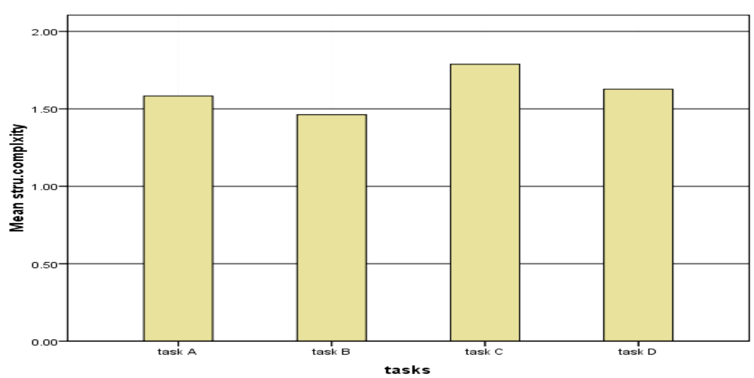

Figure 3: Structural complexity measures under different task complexity conditions

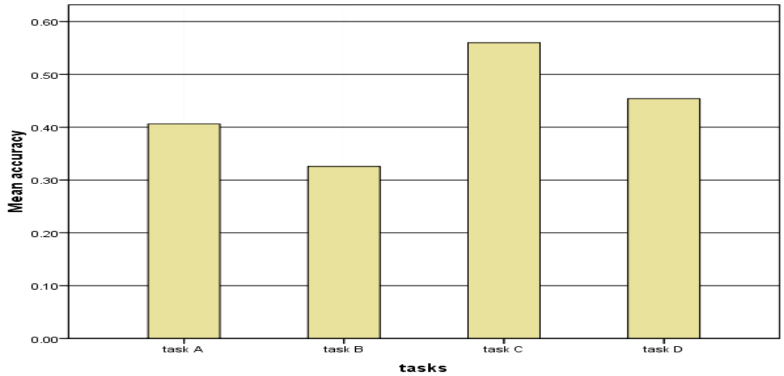

Figure 4: Accuracy measures under different task complexity conditions

Effects of simultaneous manipulation of task complexity along resource-dispersing and resource-directing dimensions: +/-planning time, +/- single task, and +/- Here/Now

A comparison between task performances under different conditions revealed that reducing task complexity along resource-dispersing dimensions (i.e., +/-planning and +/- single task) and increasing it along the resource-directing one (i.e., +/- Here/Now) has *simultaneously* raised structural complexity and accuracy of production. This significant finding seems to bear out Robinson's (2007) claims regarding the synergistic effects of manipulating task complexity along resource-dispersing and resource-directing dimensions. The results of *Post hoc* Scheffe test comparing performance on Task C to performances on the three other conditions are reported in Table 6 below. As reported in the table, participants who took Task C had the optimum performance in terms of accuracy and fluency of their production.

Table 6: Mean differences: Task C compared to other tasks

Comparison	**Lexical complexity**	**Structural complexity**	**Accuracy**	**Fluency**
Task C vs. Task A	-.11	.20*	.15*	-5.12
Task C vs. Task B	.35	.32*	.23*	14.31
Task C vs. Task D	.53*	.16*	.10*	17.68*

**P < .05*

Discussion

This study was primarily aimed at examining the effects of simultaneously manipulating the resource-dispersing and resource-directing dimension of task complexity on learners' accuracy, complexity, and fluency narrative task performance. At this section, the findings of the study will be summarized and discussed in turn.

Regarding the first research question, it was shown that manipulating pre-task planning time had a significant effect on fluency and lexical complexity of oral task performance but not on structural complexity or accuracy. It was also found out that manipulating cognitive complexity of tasks along "single-task" dimension had a significant effect on

ISSN: 1675-8021

fluency and lexical complexity but not on structural complexity or accuracy of participants' oral task performance. Additionally, it was shown that increasing the cognitive complexity of tasks along the degree of displaced, past time reference (i.e., -Here/Now) enhances structural complexity and accuracy. Manipulating this variable, however, did not affect fluency and lexical complexity of participants' oral task performance.

The effect of simplifying Task A along both resource-directing and resource-dispersing dimensions was a fluent as well as lexically complex production. However, this condition did not channel learners' attention to the way the conveyed their message. This shows that fluency is enhanced when processing demands are low. If processing load is reduced, by the effect of providing pre-task planning time, fluency increases. This further revealed that fluency is clearly sensitive to processing. Drawing on the Levelt (1989) model of speaking, it can be argued that pre-task planning does not significantly assist the formulation stage of production. Rather, it focuses attention on conceptualizing the message which results in increased fluency and complexity rather than accuracy of production. In addition, higher fluency is not the consequence of attention allocation, as complexity and accuracy would be, but the consequence of more efficient message planning and faster lexical access and selection.

The second condition was made complex along resource-dispersing dimension by not allotting any pre-task planning time and adding a secondary task. It was also kept simple along resource-directing dimension by present time reference. This resulted in disfluency. Moreover, it negatively affected lexical and structural complexity as well as accuracy of participants' performance on Task B. With regard to the negative effect of adding a secondary task to the primary task on fluency, Wickens (1989, p.73) has suggested that when a secondary task is added to a primary task, confusion between the tasks may lead to poor performance. This strategy will extract a toll on resources. These findings also bear out Robinson's (2001, 2007) speculations as to the effects of increasing cognitive demands of tasks by manipulating resource-dispersing variables. He claims that increasing complexity along resource-dispersing dimensions (e.g., +/- planning time, +/- single task) reduces attentional and memory resources with negative consequences for production, a position which is in agreement with Skehan's (1998).

Task C was was made cognitively demanding along resource-directing dimension through displaced, past time reference, but kept simple along resource-dispersing dimension by providing pre-task planning time. *Post hoc* means comparisons showed that participants who performed Task C outperformed others in terms of accuracy and structural complexity of their performance. This finding addresses the second research question posed pertaining to the synergistic effect of increasing task complexity along the resource-directing dimension and reducing it along the resource-dispersing dimension. The results suggest that completing the task under this condition can make for a *simultaneous* increase in accuracy and complexity, which provides further evidence in support of Robinson's predictions. He maintains that if tasks are kept simple along resource-dispersing dimensions (e.g., +/- planning time, +/- single task), but are made more cognitively demanding along resource-directing variables (e.g., +/- Here/Now), attention may be *simultaneously* channeled toward accuracy and complexity, a positions which contrasts with Skehan's. Drawing upon Levelt's model (1989) of speech production, Robinson has tried to provide a psycholinguistic rationale for the way task demands affect speech production. He argued that increasing the conceptual demands of tasks results in greater effort at conceptualization and "macroplanning" at the message preparation stage, thus "creating the conditions for development and re-mapping of conceptual and linguistic categories" (Robinson, Cadierno, & Shirai, 2009, p. 537, as cited in Robinson, 2011), during subsequent "microplanning" and the lexicogrammatical encoding stage into which macroplanning feeds. According to Robinson (2011, p. 16), in Levelt's model, the conceptualization stage generates a "preverbal message": "the message should contain the features that are necessary and sufficient for the next stage of processing- specially for grammatical encoding" (Levelt, 1989, p. 70). Therefore, greater effort at conceptualization during message preparation, caused by conceptually demanding tasks, should lead to "paring down" of conceptual information into a "linguistically relevant representation" for subsequent encoding, at the microplanning stage, with positive consequences for accurate and complex performance (Dipper, Black, & Bryan, 2005, p. 422, as cited in Robinson, 2011).The fact that increasing task complexity along the resource-directing dimension resulted in simultaneous increase in accuracy and complexity also cannot be explained within the limited-capacity view, according to which there are not enough attentional resources to focus on complexity and accuracy simultaneously. As was mentioned above, drawing on the limited-capacity view of attention, Foster and Skehan (1996), Skehan and Foster (1997), and also Mehnert (1998) have hypothesized that trade-off effects exist between accuracy and complexity. They have hypothesized that any gains in complexity are achieved at the expense of accuracy and vice versa.

Finally, Task D was made complex at both resource-directing and resource-dispersing levels through displaced, past time reference and not providing pre-task planning. A comparison between performance on Task C and Task D shows that the latter elicited a significantly poorer performance in all dimensions of production. On the contrary, compared with Task A and Task B, performance on this task was better in terms of accuracy and structural complexity but not fluency and lexical complexity.

Conclusion

This research added to the existing literature by simultaneously manipulating cognitive demands of narrative tasks along planning time, single task demand, and degree of displaced, past time reference since these variables have often been researched in isolation. The major contribution that this study makes is the discovery that simultaneously manipulating task demands along the above-mentioned variables can differentially affect complexity, accuracy, and fluency of EFL learners' oral production. Thus, the experimental operationalization and manipulation of different aspects of task design can be transferred to pedagogic contexts in order to attain specific effects on production and, possibly, learning. On the basis of the outcomes, it might be argued that L2 task designers need to observe the cognitive demands of a task as a key consideration in their choice, design, and sequencing of L2 teaching tasks. In this respect, Samuda

(2001) maintains that defining task complexity is essential to a rigorous evaluation of task design required for both classroom practices and teacher development programs. Additionally, the findings reported here have significant implications for language testing. To be able to design assessment which is fair, valid, and reliable, it is crucial for language testing to use tasks of appropriate level of cognitive demands.

Many other studies can be carried out in this area of research to enhance confidence in making pedagogic decisions regarding the implications of task complexity for grading and sequencing decisions and its impact on task performance. Future research can bring into the picture the impact of other difficulty factors on task-based performance not considered in this study, such as aptitude, intelligence, motivation, and proficiency level (see Chalak & Kassaian, 2010). To alleviate the shortcomings of this research, future studies may also adopt different measures and methodologies. Additionally, as this study mainly focused on cognitive complexity of tasks, the possible effects of some other potentially important variables within the variables manipulated (e.g. different types, sources, and foci of planning) as well as the tasks used were not examined. Further research is needed to probe into the potential effects of such variables on learners' task performance.

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ISSN: 1675-8021

APPENDIX A

Pre-task Planning Activities for Task A

a) What things can you use to cook chicken? Put the words in the chart. Can you add four more words?

bread crumbs	butter	flour	oil
a frying pan	a stove	salt	a knife
an oven	a refrigerator	a saucepan	

Kitchen appliances	Cooking utensils	Cooking ingredients
------------------------------	--------------------------------	----------------------------
-------------------------------	--------------------------------	----------------------------
-------------------------------	--------------------------------	----------------------------
-------------------------------	---------------------------------	----------------------------
-------------------------------	---------------------------------	----------------------------
-------------------------------	---------------------------------	-----------------------------

b) What's your favorite...?

main dish	------------------------------------	dessert	-----------------------------------
Vegetable	------------------------------------	snack	-----------------------------------

c) What food do you like to cook?

APPENDIX B

Secondary Task for Task B

Who said the following sentences? Check the correct answers as you watch the video.

	Martha	*Bob*	*David*	*Greg*
1) Will you see if he can come in…tomorrow morning…oh, around 10:15?-----------------------------------	☐	☐	☐	☐
2) I'd really like to have someone by Saturday.---------------	☐	☐	☐	☐
3) I think I'm good with people.---------------------------------	☐	☐	☐	☐
4) I'm very patient--	☐	☐	☐	☐
5) I worked on weekends while I was in school.--------------	☐	☐	☐	☐
6) we need someone who is good with money.---------------	☐	☐	☐	☐
7) We're really looking for someone who can make people laugh.	☐	☐	☐	☐
8) How did you know I could use these? ----------------------	☐	☐	☐	☐

ISSN: 1675-8021

APPENDIX C

Pre-task Planning Activities for Task C

a) What do you think are the most important factors in renting an apartment? Number the items below from 1 (most important) to 8 (least important).

appliances	◯	location	◯	noise	◯
rent	◯	security	◯	size	◯
view	◯	other------------	◯		

b) In what neighborhood do you live? What's it like?

----

c) Do you live in a house or an apartment? Which one do you prefer? Why?

APPENDIX D

Secondary Task for Task D

Who said the sentences bellow? Check the correct answers as you watch the video.

	Julia	Barbara	Laurie
1) I wonder if people are upset.-------------------------------------	☐	☐	☐
2) It probably means they're worried that things might change.	☐	☐	☐
3) Can you have lunch with me today? ----------------------------	☐	☐	☐
4) Maybe we can meet later this afternoon.-----------------------	☐	☐	☐
5) Could you come into my office please? ------------------------	☐	☐	☐
6) I think she went to see the dentist.-------------------------------	☐	☐	☐
7) That's strange.---	☐	☐	☐
8) The office staff isn't allowed to hold birthday parties.--------	☐	☐	☐
10) You weren't supposed to come in yet.------------------------	☐	☐	☐

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