



Exploring the Interplay of Planning Time, Reasoning Demands, and Language Learning Aptitude in Iranian EFL Learners' Written Production

Simin Sattarpour

University of Tabriz, Iran

Farahman Farrokhi

University of Tabriz, Iran

First, this investigation – inspired by Robinson's (2001a, 2001b, 2003, 2011) Cognition Hypothesis and Skehan's (1998, 2003) Trade-Off Hypothesis – intends to explore how second language writing can improve language learning through manipulating cognitive task complexity dimensions. Second, it attempts to examine if task complexity factors and cognitive learner-related variables have interaction effects on linguistic production. It focuses on planning time and intentional reasoning demands, language learning aptitude, and measures of lexical complexity, syntactic complexity, and accuracy. The participants were 226 intermediate Iranian EFL learners. In a between-subjects design, the participants were first assigned to three experimental groups randomly, each group receiving a task with different level of reasoning demands. Then, within each group, we did a stratified random sampling and assigned an equal number of learners with higher and lower aptitude levels to planned and unplanned groups. The results revealed that (a) planning time availability led to significantly more syntactic complexity, (b) increasing task complexity with regard to reasoning demands resulted in higher gains of lexical and syntactic complexity, whereas no significant effect was detected on accuracy, (c) a significant interaction effect between planning and reasoning demands was found only on accuracy, and (d) a three-way interaction among planning, reasoning demands, and language learning aptitude was observed on accuracy. Generally, the findings are discussed with regard to the predictions of the Cognition Hypothesis and the Trade-Off Hypothesis.

Keywords: task complexity factors, planning time, reasoning demands, language aptitude

Introduction

Task utilization has been an appealing issue in the field of second language teaching and research in the past two decades. Although the relationship between different task designs and spoken production has been extensively studied, task-based research with writing is quite emerging in the literature. According to Kuiken and Vedder (2008), "in the literature on both L1 and L2 writing, it has been suggested that some task types result in lower test scores than others, but the relationship between task type or task complexity and writing performance is by no means clear" (p. 49). The influence of task complexity on language production is a principal issue in task-based language learning and teaching. In order to manipulate task complexity, researchers have utilized various complexity features, such as pre-task planning time, reasoning demands, here-and-now variables, and removal of narrative context (e.g., Ishikawa, 2007;

Kormos, 2011; Kuiken & Vedder, 2007, 2008, 2011, 2012; Ong, 2014; Ong & Zhang, 2010, 2013).

Due to high diversity in manipulated task features, linguistic measures, and consequently inconclusive results, more similar research studies are needed to reach rigorous conclusions. Johnson (2017), who did a comprehensive meta-analysis of the task complexity research in L2 writing, contended that if we want to reach a better understanding with regard to differential systems and processes of composition and language production, we need to do more research to elaborate the link between cognitive task complexity (CTC) and L2 writing, focusing on attentional resources. Intending to contribute to the existing literature, we attempted to find out how increasing cognitive task complexity along planning time and reasoning demands can affect Iranian EFL writers' language performance in terms of lexical complexity, syntactic complexity, and accuracy. In addition to task features, learner-related variables such as self-efficacy, working memory capacity, and aptitude are also considered as an integral part of Robinson's (2001a, 2001b, 2003, 2007b, 2011) Triadic Componential Framework. These factors can influence task performance by intervening the way learners attend to different aspects of language, handle attentional limitations, and also acquire particular aspects of linguistic competence (Kormos & Trebits, 2012). Thus, in the current study, we also explored if learners with different levels of language aptitude may benefit from task manipulation in different ways.

Background to the Study

Writing and Language Development

Cumming (1990) is one of the early researchers who argued that writing can cause learners to pay more attention to the link between meaning and form, and as a result, learners can gain more control over their knowledge of language. Recently, Byrnes and Manchón (2014) also claimed that L2 writing can stimulate language learning because of its three major features. First, writing is a problem-solving task; second, more time is available for the writers in comparison to the L2 speakers while doing a task; and third, since it is a highly complicated meaning-making task, the learners have to attend more precisely to language use.

According to Kormos (2012), writers are privileged to move backward and forward recurrently, and this can result in more precision with linguistic elements and consequently with 'languaging'. Languaging has been defined by Swain (2006) as a "dynamic, never ending process" through which the learners make meaning and learn language simultaneously (p.196). Ruiz-Funes (2015) also connected these assertions to Swain's (1995, 2005) Output Hypothesis. In this hypothesis, it is claimed that language learning occurs as a result of language production, either spoken or written. Swain (2005) also proposed that when learners are pushed to convey a meaningful message more "precisely, coherently, and appropriately," they can develop their linguistic knowledge more (p. 473).

Conflicting Models of Cognitive Task Complexity (CTC)

By CTC, we mean changing some features of a task to make it more difficult to complete. More technically, task complexity refers to "attentional, memory, and other information processing demands imposed by the structure of the task on the language learner" (Robinson, 2001b, p. 29). This study is mainly inspired by two influential but conflicting models of task complexity which illustrate the effects of modifying task designs on how students use, organize, and direct their attentional resources to different linguistic elements during task performance.

In Skehan's (1996, 1998, 2001, 2003, 2009, 2014) Limited Attentional Capacity Model (or Trade-Off Hypothesis), it is predicted that doing cognitively complex tasks would lead to some competition among accuracy, fluency, and complexity. In other words, he stated that some linguistic aspects would be attended to at expense of the others due to the limited attentional resources of the mind. Cognitively

complex tasks distract learners' attention from linguistic forms since more attention will be paid to conveying the meaning of the message, and consequently, the task performers cannot allocate their attention to all aspects of language at the same time (Skehan, 2009).

Contrarily, in the Cognition Hypothesis, or the Triadic Componential Framework, Robinson (2001a, 2001b, 2003, 2005b, 2007b, 2011) takes the position that there are multiple attentional resources which are flexible and can be allocated to different aspects of language when a cognitively complex task is being performed. Robinson claimed that when a task is designed to impose more cognitive loads on the learners' attentional resources, it would not have a hindering role in producing more accurate and complex language; conversely, it would make the learners pay more attention to language input and output. He introduced resource-directing and resource-dispersing dimensions as two main task design features which can determine the cognitive complexity of the tasks. The resource-directing dimension includes sub-features such as +/- reasoning or +/- Here-and-Now, which direct learners' attention to specific linguistic aspects while doing a task. On the other hand, resource-dispersing involves factors like +/- planning time and +/- prior knowledge. These kinds of features scatter learners' attention over many non-specific aspects, which would degrade L2 performance.

Robinson (2011) claimed that by increasing the task complexity along the resource-directing dimension, "initially implicit knowledge of the L1 concept-structuring function of language becomes gradually explicit and available for change during L2 production" (p. 15). Thus, increasing task complexity along this dimension can direct learners' attention to construct concepts and functions required by the task by using specific linguistic forms, and in the end, this can lead to greater accuracy and complexity of production. Robinson argued that the main reason for this fact is that it causes noticing. Schmidt (2001) defined noticing as the conscious attention to language forms, and he defined it as a prerequisite of learning. This is why resource-dispersing, which deplete or disperse the learners' attention, would result in negative effects on language production. However, the joint effects of task complexity manipulation along both resource-dispersing and the resource-directing factors have been inadequately investigated, particularly in the domain of L2 writing. Thus, one of the objectives of this study is to engage in the debate between the Trade-Off Hypothesis and the Cognition Hypothesis through manipulating both resource-directing and resource-dispersing factors. In other words, it attempts to determine whether accuracy and complexity can be improved simultaneously through manipulating task design.

Research on Manipulating Reasoning Demands in L2 Writing

There are three kinds of reasoning introduced in Robinson's (2001a, 2001b, 2003, 2005b, 2007b, 2011) Triadic Componential Framework: spatial, causal, and intentional reasoning. As intentional reasoning is used to manipulate the task complexity in the present study, the following is a brief review of the studies utilizing the same reasoning demand type as ours. According to Robinson (2007b), intentional reasoning refers to "reasoning about other people intentions, beliefs and desires and relationships between them" (p. 18). In the Cognition Hypothesis, it is predicted that if we increase cognitive complexity of a task along intentional reasoning demands, the task performer would reveal more accuracy and complexity but not more in his language production.

Kuiken and Vedder (2007, 2008, 2011), in their successive studies with Dutch students studying Italian and French, examined the role of increased reasoning demands in two letter-writing tasks. Syntactic complexity was measured as the number of clauses per T-unit in their studies, and it was found not to be significantly affected by increasing the cognitive task complexity. In terms of lexical complexity, it should be taken into account that lexical complexity was measured in two ways. When using the classic type-token ratio, the results were positive for lexical complexity, whereas using corrected type-token ratio – which accounts for text length – led to non-significant or negative effects in more complex tasks. Moreover, unlike complexity measures, they noticed that the tasks with higher cognitive complexity led to accuracy improvement. Their findings partially supported the predictions of Robinson's Cognition Hypothesis. Using the data from former studies, Kuiken and Vedder (2012) also looked into the

intervening role of L2 proficiency in the connection between task complexity and written language production and came to the conclusion that no strong relationship exists between the effects of task complexity on written production and learners' proficiency levels.

Using the same letter-writing tasks, Frear and Bitchener (2015) partially replicated Kuiken and Vedder's studies. However, they measured only lexical and syntactic complexity, not accuracy. Also, rather than measuring the ratio of all dependent clauses to T-units, they considered each type of dependent clauses separately in measuring syntactic complexity. They found that though lexical complexity increased as a result of the increase in cognitive task complexity, this was not the case for syntactic complexity, which was measured as the ratio of dependent clauses to T-units across all dependent clauses. However, a decrease in adverbial dependent clauses was noticed in more complex tasks. Concerning lexical complexity, their results revealed positive effects similar to the predictions' of the Cognition Hypothesis.

Finally, Cho (2015) examined 110 Korean EFL learners' performance on argumentative writing essays. Unlike the predictions of the Cognition Hypothesis, it was found that the participants performing the complex task produced more fluent writing than those doing the simple task, and no significant effect was observed on accuracy or syntactic complexity of the argumentative writings. Unlike the above studies, Cho's findings are in contrast to Robinson's hypothesis. Generally, due to the scarcity of studies and also their inconsistent results, more similar studies are required to enable the researchers to draw more confident conclusions from cognitive complexity theories.

Research on Manipulating Planning in L2 Writing Domain

In Skehan's (1996, 1998, 2001, 2003, 2009, 2014) framework, it is predicted that increased CTC through resource-dispersing factors (in Robinson's terminology), such as planning time, would degrade complexity and accuracy, and do so simultaneously due to scarcity of attentional resources. In a relatively similar way, Robinson (2011) also contended that "performing increasingly complex versions of tasks on these dimensions promotes not *noticing* of language code, and interlanguage *development* of new linguistic, conceptual form-function mappings, but rather consolidation and fast real-time access to existing interlanguage resources" (p. 17). It is believed that resource-dispersing factors disperse the attention over many linguistic or even non-linguistic elements instead of directing it to linguistic code which would, as a result, promote automatization but deteriorate linguistic performance (Robinson, 2011, 2015).

In L2 writing, Ellis and Yuan (2004) conducted research with 42 Chinese EFL learners and tried to find out how three types of planning – including pre-task, on-line, and no planning – can affect the complexity, accuracy, and fluency in their language performance. They found that the writers who were provided with pre-task planning wrote more fluently and syntactically complexly, while the ones in the on-line planning condition revealed more accuracy. In addition, the writers who were not given time for planning showed less complex, less accurate, and less fluent production. Partially replicating Ellis and Yuan, Meraji (2011) found that pre-task planning time availability promoted accuracy, syntactic complexity, and fluency. Furthermore, Ojima (2006) who did a case study with three Japanese learners, observed positive effects of planning availability on fluency and complexity, but it had negative effects on accuracy.

More recently, Ong and Zhang (2010) studied the effects of planning time with 108 Chinese EFL learners. They looked at the amount of time provided for planning and the fluency and lexical complexity of participants' argumentative written production. They also manipulated the availability of prior knowledge at three levels and also a revising factor at two levels. They measured fluency in two ways: Fluency I was measured by counting only the writing time; fluency II was calculated by considering the whole time spent on task completion. Based on the results of their study, more complex tasks with less planning time led to significantly higher fluency II and lexical complexity. Later, Ong and Zhang (2013) utilized the same data and analyzed the effects of the same variables on writing quality, finding that the general quality of the learners' texts was elevated only in the free-writing group in which the writers were

required to write for 30 minutes without any planning. The justification provided by the researchers regarding these contrary results was that due to the different nature of the written production, the participants may have continued to plan the ideas and organization of their writing even during the task execution, thus extended planning hindered them from writing more fluently, which consequently contributed to improved lexical complexity.

The impact of planning time provision before writing was also investigated by Rahimpour and Safari (2011) measuring complexity, accuracy, and fluency (CAF) measures in 37 EFL learners' written descriptive texts. The participants in one group were supplied with 10 minutes to plan before writing, while no time was given to the other group for planning. The results of their study showed an increase in fluency as a result of the planning time provision, whereas the complexity and accuracy of the texts did not significantly differ between the groups. In addition, Mohammadzadeh Mohammadabadi, Dabaghi, and Tavakoli (2013) also conducted a study manipulating task complexity through the planning time and the +/-Here-and-Now dimensions during picture sequence narration tasks. They found a positive effect of planning time on accuracy, but not on fluency and complexity.

What can be inferred from the above findings is that there is a high variation and also a lack of consistency in the results, so it is challenging to make robust claims in this area. Therefore, in order to contribute more to the literature, we attempt to find out the differential effects of manipulating both planning time and reasoning demand on linguistic elements of written productions and also examine if learners' learner-related variables, in terms of language aptitude, mediate the effects of task features.

Learner-related Variables and Written Task Production

Robinson (2001a, 2001b, 2005b, 2007b, 2011), in his task classification model, suggested two ability requirements determining task difficulty: 1) cognitive variables such as field independence, working memory, and aptitude; and 2) affective variables like anxiety, motivation, and self-efficacy. He has clearly contended that "progress along the route from novice to expert that *instructional sequences* of tasks enable is a result of the *interaction* between the demands that tasks place on learners, and the strengths and weaknesses in abilities that they bring to them" (Robinson, 2015, p. 2). Although the contribution of learner-related variables in developing language competence has been sufficiently investigated in other language skills (e.g., speaking and reading), and even in L1 writing (Dörnyei & Kormos, 2000; Kormos & Trebits, 2012), the link between L2 writing and learner factors is still unexplored. It is expected by Kormos (2012) that individual writers with varying cognitive abilities will show different efficiency levels in managing the complex cognitive and linguistic processes of writing, and in utilizing the beneficial function of writing for L2 development.

Despite the emphasis which has been put on investigating the interaction effects of external factors such as task features and learner variables (see Robinson, 2015), there is only a small number of studies in which learner factors have been taken into account to see if they can make a change in the way task manipulations affect language production. To our knowledge, the interaction effects of learner-related variables and task features in L2 spoken task complexity research have been explored in only three studies (Kormos & Trebit, 2011; Niwa, 2000; Robinson, 2007a). In addition, this scarcity of research can be vividly seen regarding L2 written task complexity, where only two studies utilized a learner-related factor as an independent variable (Kormos & Trebit, 2012; Rahimpour & Nariman-Jahan, 2010).

Concerning affective learner variables, besides giving three written tasks (narrative, personal, and decision-making tasks) which differed in terms of complexity levels, Rahimpour and Nariman-Jahan (2010) measured the EFL writers' self-efficacy to find out whether writers with different levels of self-efficacy would show different performance on various task types in terms of the concept load, fluency, complexity, and accuracy. Self-efficacy was found not to significantly make a difference in the way the writers used task manipulation features, and the only significant difference, noted in narrative and personal tasks, was in terms of concept load. Moreover, language learning aptitude, a cognitive learner variable, was studied in Kormos and Trebit's (2012) work. In their study, two task types (cartoon

description and picture narration) with differing complexity were used in both oral and written language modes. They also examined the correlation between aptitude components and linguistic elements across both tasks. The aptitude components of deductive ability and grammatical sensitivity were found to significantly correlate with accuracy and complexity especially in less complex tasks. They also found that the variation in the relationship between aptitude components and linguistic measures was found more in oral performance than written production. In line with this finding, Robinson (2002) maintained that:

Some learners may have more clearly differentiated abilities than others - and it is particularly important to match these learners to instructional conditions which favor their strengths in aptitude complexes, in contrast to other learners who may have less differentiated abilities, and equivalent strengths, and aptitudes for learning under a variety of conditions of exposure. (p. 4)

Language Aptitude Construct and Measurement

As defined by Wen, Biedron, and Skehan (2017), “foreign language aptitude generally refers to the specific talent for learning a foreign or second language (L2)” (p. 1), and because of that, Dörnyei (2005) has referred to the research on language aptitude as a ‘success story’ due to its undeniable role in second language learning. Despite the fact that language learning aptitude cannot determine whether or not an individual can learn a foreign language, it is claimed that future success in learning a new language can be predicted by measuring language aptitude (Carroll, 1993). Robinson (2002) also confirmed the determining role of aptitude in language acquisition, but under the condition that learners are provided with sufficient instruction. Pedagogically, in order to help learners benefit more from different instructional situations and different task designs, we need to discover how language aptitude affects language performance. Thus, because of the importance of this learner factor, we selected language learning aptitude as one of the variables in our study, exploring its combined effects with cognitive task complexity factors (planning time and reasoning demands) on written production.

Carroll (1981) determined four factors that underlie foreign language aptitude: (a) phonetic coding ability, that is, the “ability to identify distinct sounds, to form associations between those sounds and symbols representing them”; (b) grammatical sensitivity, that is, the ability “to recognize the grammatical functions of words”; (c) rote learning ability, defined as “the ability to learn associations between sounds and meanings rapidly and efficiently”; and (d) deductive learning ability, which is “the ability to infer or induce the rules governing a set of language materials, given sample language materials” (p. 105). To date, different tools for measuring language aptitude have been developed, but the Modern Language Aptitude Test (MLAT) developed by Carroll and Sapon (1959) is a highly validated test. This test “is usually considered the best verbal aptitude test in terms of its predictive validity for L2 learning” (DeKeyser, 2000, p. 509), and it is very prevalent among SLA researchers. Therefore, we also utilized MLAT as a measurement tool in the current study. Although some researchers consider the MLAT as an old and outdated test, the advantage of the other measuring tools over MLAT has not been admitted, even by the developers themselves (see Dörnyei, 2005).

The Present Study

Besides the mentioned scarcity of task-based research in the domain of writing, there are insufficient studies examining the possible mediating role of learner-related variables in performing tasks manipulated through complexity features. The present study intends to examine 1) the main effects and the interaction effects of task complexity factors (intentional reasoning demands and planning time), and 2) the interaction effects of the above-mentioned factors with language learning aptitude on the written task performance of the Iranian EFL learners. The following have been chosen as the research questions of this

study:

RQ1. What are the effects of increased cognitive task complexity in terms of intentional reasoning demands on the lexical complexity, syntactic complexity, and accuracy of EFL writers' task performance?

RQ2. What are the effects of increased cognitive task complexity in terms of planning time on the lexical complexity, syntactic complexity, and accuracy of EFL writers' task performance?

RQ3. How do intentional reasoning demands and planning time jointly affect the lexical complexity, syntactic complexity, and accuracy of EFL writers' task performance?

RQ4. How does language learning aptitude interact with the cognitive task complexity features to affect the lexical complexity, syntactic complexity, and accuracy of EFL writers' task performance?

Method

Participants and the Context of the Study

The population from which the sample was obtained consisted of 257 Iranian undergraduate students who majored in English language teaching and English literature and volunteered to participate in our study. The data was collected from three state universities in Iran during normal class sessions. In order to assess the language proficiency of the participants and check their homogeneity, the Oxford Quick Placement Test (OQPT) was given to them before starting to collect the data. Twenty-eight participants identified as either highly advanced or beginner were excluded from the study. Additionally, three participants did not agree to continue with us halfway. Thus, the final sample of our study included 226 students including 128 females and 98 males. The reason for excluding low-proficiency participants was that a threshold beyond a beginner level is required to write a letter of about 200-250 words; on the other hand, highly advanced participants were also excluded because examining the language measures (CAF) is more meaningful when there are still some gaps in the interlanguage.

Dependent and Independent Variables

In the present study, the cognitive complexity of the tasks was increased through manipulating both resource-directing and resource-dispersing factors based on Robinson's (2001a, 2001b, 2005b, 2007b, 2011) task complexity model. Regarding the former factor, we increased the intentional reasoning demands of the tasks at three levels: low, medium, and high complex conditions, and concerning the latter, the amount of planning time allocated before composition was changed. Before starting to write, the group in the unplanned condition was required to write without planning, while the other group was given a 10-minute planning time. Finally, the third independent variable of the study was the learners' language learning aptitude measured by MLAT. The participants were assigned to two levels, that is, higher or lower aptitude.

In regard to dependent variables, we measured written linguistic performance in terms of lexical complexity, syntactic complexity, and accuracy. Skehan (1996, 1998, 2009) referred to these separate linguistic elements as the major second language learning objectives. He also emphasized that lexical complexity is one of the critical dimensions of language performance which must be taken into account along with the traditional CAF measures. Thus, we measured both lexical and syntactical variations in the writings of the participants, since complexity can be indicated in different ways in learner language. To measure lexical complexity, we used a mean segmental type-token ratio, which was also suggested by Wolfe-Quintero, Inagaki, and Kim (1998), and has been recently used by the researchers to compensate for the negative impact of different text lengths. In this measure, each text was divided into forty-word segments, and then the type-token ratio was measured for each segment. Then, the mean value of these

ratios was computed for each text. Concerning syntactic complexity, a subordination measure was utilized by calculating the proportion of subordinate clauses to all T-units. Accuracy was measured by calculating the ratio of grammatically accurate T-units to all T-units. Punctuation and capitalization errors were not taken into account. We used the T-unit as the measuring unit in this study since it is believed that T-units have the potential to signal development in writing (Hunt, 1965). Additionally, the T-unit is the most widely used measurement unit in the existing written task complexity research pool as reported in Johnson's (2017) meta-analysis.

Finally, 30 letters written by the participants were randomly selected and given to an English teacher and researcher to be coded and analyzed. She was provided with the necessary instructions on coding the data in a 30-minute training session. For lexical complexity, syntactic complexity, and accuracy, inter-rater reliability coefficients of .84, .88, and .91 were obtained respectively, which indicate the preciseness of the data analysis.

Procedure

As mentioned above, we did the first stage of data collection by administering the OQPT to choose learners with intermediate proficiency. This choice lessens the mediating effect of proficiency as a probable confounding variable. Then, the participants took the MLAT, which lasted about 30 minutes. Participants who got the score above the median (median=48) were determined as the higher-aptitude learners, while those gaining a score below the median were selected as the lower-aptitude ones.

The MLAT, an aptitude test developed by Carroll and Sapon (1959), consists of five parts based on four underlying dimensions of language aptitude: a) Number Learning, b) Phonetic Script, c) Spelling Cues, d) Words in Sentences, and e) Paired Associates. Due to a lack of time in an ordinary session of each class, a shortened 90-item version of the test was given to the participants. In the first section of the test, they were required to listen and learn the names of some numbers in a new language and then write down the numbers which were randomly read to them. In the second part, the test takers listened to a list of some phonemes of a non-language, and then were asked to match the appropriate phonetic script with one of the four choices given to them, but this time just one phoneme was read to them. The third section was related to presenting some misspelled and disguised English words which were supposed to be noticed and matched with their accurate meanings. In the fourth part, measuring grammatical sensitivity, the participants read a key sentence including one underlined word and chose a word with the same grammatical function in the following sentence. Finally, in section five, the participants were given a list of Kurdish-English vocabulary to memorize in a minute and then to choose the English meanings of the words in a multiple choice test without taking a look at the first list.

Afterward, we randomly formed three experimental groups to give a letter writing task with unequal cognitive reasoning demands (low, medium, and highly complex). After that, we did a random stratification of the participants in terms of their aptitude levels into planned and unplanned conditions in each reason-demand group. In other words, each experimental group consisted of two planning groups within it, and the number of the participants from each aptitude level was almost the same in each planning group. In fact, due to the between-subject design of the study, 12 separate groups were formed. Figure 1 illustrates the experimental design of the study more vividly.

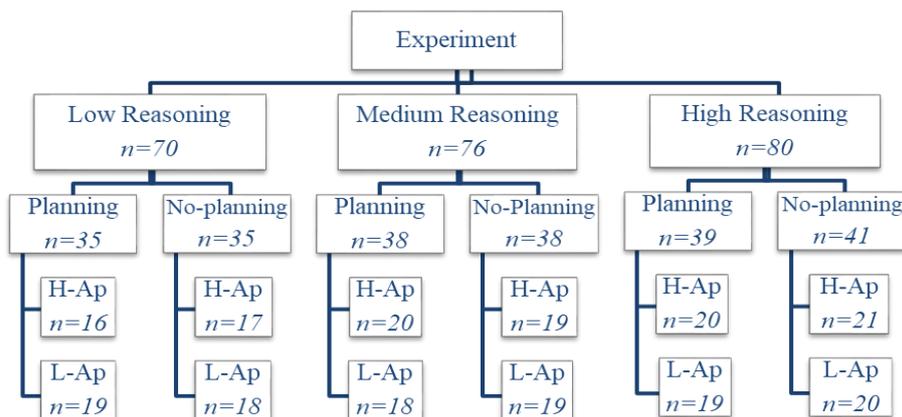


Figure 1. Experimental design of the study

We used three letter-writing tasks which differed in the level of cognitive complexity with respect to intentional reasoning demands. These tasks were almost the same as those in Frear and Bitchener’s (2015) study, and were utilized after obtaining the necessary permissions from the authors via E-mail correspondence. However, some slight modifications were done to make them suitable for our culture. Each task provided the writers with some instructions and conditions to consider before writing. In the lowest complex task in terms of reasoning demands (Task 1), the participants were asked to write to an English-speaking friend traveling to their country. The participants were required to use their resources and to write to this friend and tell him about Iran. Through manipulating the reasoning demands in the task instructions, Task 2 was made more complex, asking the participants to write to a friend coming to Iran and to inform him which of the two restaurants they would visit upon his arrival and why. In order to complete the task, the participants were expected to take into account the information about two restaurants and also the preferences of the visiting friend provided in the instructions. The most complex task (Task 3) was similar to Task 2, but this time, the participants were supposed to choose one restaurant out of three restaurants not two, and they were also expected to consider the preferences of two more friends who would be visiting the restaurant as well as the foreign visitor.

In the last data collection session, the essential instructions were given to the participants in English and also in Persian, and then 2 minutes were allocated to them in order to ask their questions in case of having any uncertainties about task completion. Afterward, the ones who were assigned to the planned condition were provided with 10 extra minutes prior to writing; on the other hand, those in unplanned condition were asked to write without any delay. The composition time allocated to all groups for writing an almost 200-word letter was 30 minutes. The participants in all groups were asked to write letters with about 200-250 words, and no dictionaries or smartphones were allowed during task performance since lexical complexity was one of the target measures of this study.

Results

The primary objective of this study was to investigate the main and interaction effects of planning time, intentional-reasoning demand, and language aptitude on the lexical complexity, syntactic complexity, and accuracy of written letters. To have a general picture of the participants’ performance, the means and standard deviations of all target linguistic elements across all the experimental groups are separately illustrated in Tables 1 through 3.

TABLE 1
Means and Standard Deviations of Lexical Complexity across All Experimental Groups

	Low Reasoning				Medium Reasoning				High Reasoning			
	No-planning n=35		Planning n= 35		No-planning n=38		Planning n=38		No-planning n=41		Planning n=39	
	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap
N	18	17	19	16	19	19	18	20	20	21	19	20
Mean	.78	.79	.79	.82	.79	.79	.77	.80	.79	.81	.80	.82
SD	.02	.03	.03	.02	.03	.03	.04	.02	.04	.03	.02	.02

Note. L-Ap= lower-aptitude, H-Ap= higher-aptitude, SD= Std. Deviation, N= number

TABLE 2
Means and Standard Deviations of Syntactic Complexity across All Experimental Groups

	Low Reasoning				Medium Reasoning				High Reasoning			
	No-planning n=35		Planning n= 35		No-planning n=38		Planning n=38		No-planning n=41		Planning n=39	
	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap
N	18	17	19	16	19	19	18	20	20	21	19	20
Mean	.36	.33	.41	.50	.34	.50	.49	.47	.32	.38	.42	.51
SD	.18	.08	.16	.11	.11	.15	.17	.16	.11	.16	.16	.20

Note. L-Ap= lower-aptitude, H-Ap= higher-aptitude, SD= Std. Deviation, N= number

TABLE 3
Means and Standard Deviations of Accuracy across All Experimental Groups

	Low Reasoning				Medium Reasoning				High Reasoning			
	No-planning n=35		Planning n= 35		No-planning n=38		Planning n=38		No-planning n=41		Planning n=39	
	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap	L-Ap	H-Ap
N	18	17	19	16	19	19	18	20	20	21	19	20
Mean	.57	.67	.47	.69	.47	.65	.65	.73	.49	.72	.57	.66
SD	.14	.12	.13	.12	.11	.19	.22	.12	.16	.12	.11	.14

Note. L-Ap= lower-aptitude, H-Ap= higher-aptitude, SD= Std. Deviation, N= number

In order to statistically answer the research questions, a 3×2×2 between-subject MANOVA was done on all target linguistic measures of 226 EFL learners' written productions. Firstly, the general report of the main and interaction effects is shown in Table 4. As illustrated below, manipulating tasks in terms of reasoning demands and planning time had significant effects on written performance. With regard to the interaction effects, the combined effect of reasoning demands and planning time was also significant, though not very strong ($\eta^2 = .043$). Interestingly, no significant two-way interaction effect was found between language aptitude and two task features separately; whereas, the three-way interplay among them was detected to be statistically meaningful [Wilks's Lambda=.88, F (8, 422) =3.22, p=.001, $\eta_p^2=.058$].

TABLE 4
Summary of Factorial Analysis Results

Factors	F	df	p	η^2
Reasoning	4.47	8	.000	.078
Planning	16.83	4	.000	.242
Reasoning × Planning	2.34	8	.018	.043
Reasoning × Aptitude	.698	8	.694	.013
Planning × Aptitude	1.90	4	.111	.035
Reasoning × Planning × Aptitude	3.22	8	.001	.058

Regarding the first research question, which explored the main effects of task complexity manipulation in terms of reasoning demands on target linguistic measures, we observed that increasing the reasoning demands of the tasks had positive effects on both syntactic complexity [F(2, 223)=4.57, $p = .011$, $\eta_p^2=.051$] and lexical complexity [F(2, 223)=3.99, $p = .020$, $\eta_p^2=.046$]. However, accuracy [F (2, 223) =.383, $p = .682$, $\eta_p^2=.004$] did not change significantly across reasoning groups. Post-hoc pair-wise comparisons using a Bonferroni test were also done, indicating that the mean score of syntactic complexity in the medium reasoning group (M=.47, SD=.15) was significantly higher than that of the low reasoning group (M=.40, SD=.15), $p=.040$, while the other groups didn't reveal any significant differences in mean scores. Post-hoc comparisons also disclosed a significantly higher lexical complexity mean score (M = .81, SD = .05) in the most complex task performance in comparison to the task with medium reasoning complexity (M = .77, SD = .03), $p = .028$, but no other significant differences were observed.

Concerning the second research question, which dealt with the effects of planning time, the statistical results proved that increased task complexity through removing planning time had negative effects only on syntactic complexity [F (1, 224) = 28, $p=.000$, $\eta_p^2=.116$], while no other effects, either positive or negative, were found on other target measures. The third question of the study sought the interaction effect between reasoning demands and planning time factors. The results revealed a two-way interaction effect only on accuracy [F (2, 223) = 6.55, $p=.002$, $\eta_p^2=.058$]. To our surprise, the accuracy measure, which was not affected by any of the manipulated factors independently, underwent some variations as a result of the combined influence of those factors. As depicted in Figure 2, the writers in the planned condition performed more accurately than the ones in the unplanned condition, performing the tasks with a medium and high level of complexity in terms of reasoning demands, and this difference in performance is more notable with the medium complex task than with the high complex task.

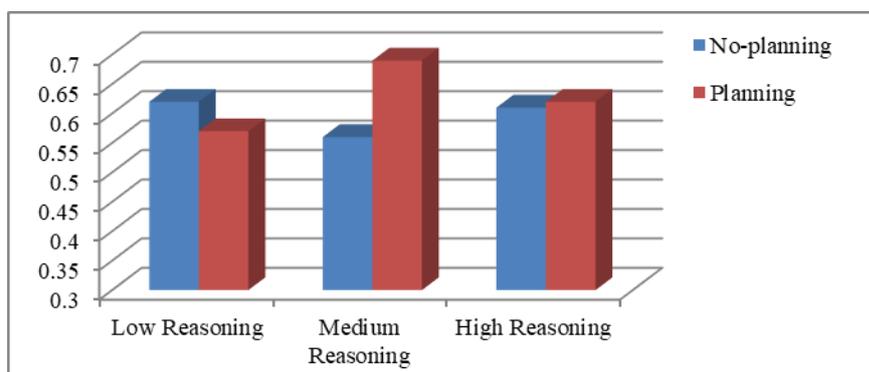


Figure 2. Joint effects of planning and reasoning demands on accuracy

Finally, concerning the fourth research question, which examined the interplay of language learning aptitude with two other manipulated factors, no two-way interaction effects between language aptitude and reasoning demands were found, nor any with planning time as a factor. Nevertheless, a significant three-way interaction effect among all three independent variables of the study was detected only on accuracy measure [F(2, 223)= 4.12, $p=.017$, $\eta_p^2=.037$] but not on other target measures. The graphical presentation of the means scores of each group can be seen in two following figures at two different aptitude levels to make the comparison easier.

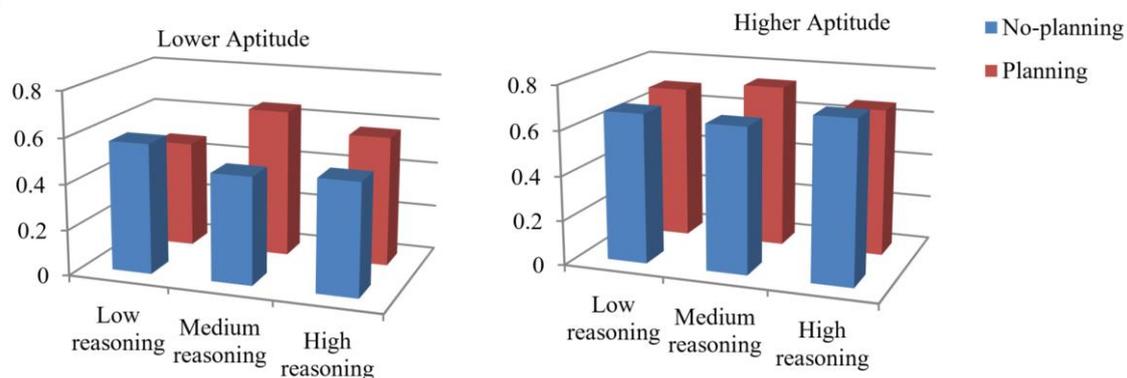


Figure 3. Comparison of accuracy means in different task complexity conditions across two aptitude levels

The general picture which can be taken from the above figures signals higher accuracy gains at the higher-aptitude level in comparison with the lower-aptitude level no matter what the reasoning group or planning condition was. In addition, it can be inferred that the joint effect of the reasoning demand and the planning time factors varied across the two aptitude levels. In the low reasoning condition, the participants at the lower-aptitude level revealed more accuracy in their performance under the unplanned condition, while those at the higher-aptitude showed less accuracy. Furthermore, in the highest complex task with respect to reasoning demands, providing the planning time helped the participants at lower-aptitude level more than those at higher level of aptitude.

Discussion and Conclusion

The Effect of Reasoning Demands

The first aim of the current study was to explore the effects of cognitive task complexity manipulation in terms of the resource-directing dimension (reasoning demands). Based on Robinson's (2001a, 2001b, 2005b, 2007b, 2011) Cognition Hypothesis, increasing task complexity would result in simultaneous increase of complexity and accuracy. Contrarily, Skehan (1998, 2001, 2003, 2009) argued that task complexity increase of this kind would lead to an improvement in accuracy *or* complexity, one at expense of the other. Taken together, the present study showed that increased task complexity along the resource-directing dimension positively affected lexical and syntactic complexity, but not accuracy.

In corroboration with Robinson's predictions, higher complexity levels (lexical and syntactic) were detected with performance on the more cognitively demanding tasks. The point that caught our attention was that the lexical and syntactic complexity did not consecutively increase from the lowest to the more complex tasks (medium and high). Lexical complexity was found to increase more between the medium and the higher complex tasks, and the syntactic complexity appeared to differ between the low and medium complexity tasks. Lastly, manipulating the reasoning demands of the tasks did not result in any difference in the accuracy of the written output, and it disconfirms Robinson in claiming that complex tasks would be done more accurately.

It would be premature to reject both of these hypotheses, or to confirm one hypothesis while rejecting the other, since our findings relatively support predictions of both the Cognition Hypothesis and the Limited Attentional Complexity Model. However, the Cognition Hypothesis is more probable to be confirmed the effect of increased reasoning demands on accuracy was not found to be negative, though non-significant, at expense of increased lexical and syntactic complexity. Comparing the results with those in the literature, a remarkable variability was noticed which might be because of different task types

or measurements used by the researchers. Thus, here, we'll specifically focus on the results of the studies manipulating the reasoning demands of the tasks as a resource-directing factor.

The results of the current study are in contrast with Kuiken and Vedder's (2007, 2008, 2011) findings with respect to accuracy and syntactic complexity. While they found positive effects of increasing task complexity on accuracy and non-significant effects on syntactic complexity, the writers in our study showed no difference in accuracy but outperformed in terms of syntactic complexity. For lexical variation, our results are in line with Kuiken and Vedder (2007, 2008, 2011, 2012), discovering that increasing task complexity boosted the lexical complexity of the learners' letter writing though with respect to classic type-token ratio; whereas Kuiken, Maria, and Vedder (2005) did not find any significant impact on lexical variation.

The findings are also in accord with those of Ruiz-Funes' (2013, 2014), who observed higher syntactic complexity at expense of accuracy and fluency by increasing written tasks' complexity in terms of reasoning demands at both intermediate and advanced proficiency levels. Nevertheless, it should be mentioned that accuracy was not negatively affected by increased task complexity in our study; we just found a non-significant effect on accuracy. Although Ruiz-Fune's findings supported Skehan's 'trade-off' hypothesis, we cannot have the same claim since the obtained mean values displayed a tendency towards higher values of accuracy on more complex tasks.

Furthermore, our results confirm Frear and Bitchener's (2015) finding with respect to enhanced lexical variation as a result of increasing the reasoning demands of letter writing tasks; however, there is a contradiction in terms of syntactic complexity. Unlike the increased syntactic complexity observed in the present study, no meaningful difference in syntactic complexity among task conditions was found in their investigation. Frear and Bitchener put forward the idea that that the higher lexical variation might be the result of the longer instructions with more varied lexical terms in more complex tasks. Yet, the evidence in our study can reject this assumption since the writers in the group with the task including the highest reasoning demands demonstrated significantly greater lexical variation in comparison to the ones in the group with the medium reasoning-demand task, even though the number of lexical items provided in task instruction was widely contrasting only between the tasks with low and high reasoning demands (Task 1 and Task 3). Thus, we believe that the role of increased conceptual demands of the tasks was more influential in increasing lexical complexity.

The enhancement of the language complexity (lexical and syntactical) due to imposing more intentional-reasoning demands on the tasks is justified by Robinson (2007b) in the way that the performers of these tasks are expected to use a variety of psychological and cognitive state terms and also their correspondingly complex grammatical structures. Moreover, higher cognitive and conceptual requirements of the tasks "prime learners – and direct their attentional and memory resources – to aspects of the L2 system required to accurately understand and convey them, thereby facilitating selective attention and noticing and so promoting interlanguage development" (Robinson & Gilabert, 2007, p. 164). As mentioned above, a trade-off between complexity and accuracy cannot be assuredly confirmed since a tendency toward an increase in accuracy was detected from low to complex tasks, although it was non-significant. The reason for not obtaining significant effects regarding accuracy can be also attributed to the nature of the instructions and requirements of the task, which might not have set up strong differences in the levels of reasoning demands, which could cause significant variations in accuracy.

The Effect of Planning Time Factor

Concerning the second research question, we noted that increasing task complexity along planning time had a negative impact on syntactic complexity. In other words, the writers who were given 10 minutes for planning prior to writing showed greater syntactic complexity in their performance while they didn't report any differences in other linguistic measures. Similarly, Robinson (2001a, 2001b, 2003, 2005b, 2007b, 2011) and Skehan (1996, 1998, 2001, 2003) also predicted that language production in terms of all linguistic measures would be degraded due to increased task complexity along resource-dispersing factors.

They believe that resource-dispersing factors “divide but do not direct attention to features of linguistic code” (Robinson, 2008, p. 8), and thus result in poor performance. Our findings revealed partial support for task complexity theories, since the negative effect of planning time removal was found only on subordination measure or syntactic complexity.

An overview of the findings in the literature pertaining to pre-task planning reveals contradictory results. Similar to our findings, Ellis and Yuan (2004) and Meraji (2011) found more complex linguistic performance with pre-task planning, but unlike our results, they also noticed higher accuracy measures as a result of a planning time provision. Moreover, Rahimpour and Safari (2011), studying the impact of pre-task planning on EFL learners’ descriptive texts, found the same results as ours with regard to accuracy; however, complexity was not significantly affected in their study. The findings of Mohammadzadeh Mohammadabadi et al. (2013) are at odds with ours since the planning time provision was found to have positive impact on accuracy but not complexity. On the other hand, in contrast to our findings – and also to the predictions of task complexity models – Ong and Zhang (2010) detected that the writers performed the tasks more fluently and lexically-complex in the unplanned condition. In addition, in Ong and Zhang’s (2013) study, only the free-writing condition enhanced the quality of the learners’ writing. These inconclusive results can be due to small number of research studies done in this field, particularly with second language writing, but also with the great variation in task types and measurements. Therefore, more studies are still needed in the scope of pre-task planning and written complexity in order to validate and consolidate the results in the literature.

The Simultaneous Effect of Resource-directing and Resource-dispersing Factors

The third objective of the study was to examine the joint effects of intentional reasoning and planning time on the linguistic elements of the written productions. The statistical results revealed an interaction effect of these two dimensions only on the accuracy of the text, not on other linguistic elements, though accuracy was not affected significantly across either reasoning groups or planning conditions groups independently. Thus, based on our results, we can assume that in order to have a balanced development in language production in terms of CAF measures, and to help the writers direct more attentional resources to more grammatically accurate ways of conveying their concepts, task complexity needs to be manipulated with respect to both resource-directing and resource-dispersing. As discussed before, the planning provision and the reasoning demand increase led to more accuracy, particularly in the tasks with medium level of complexity. This finding may be due to the fact that the difference between the amount of reasoning demands of the low and medium complexity tasks was distinguishable enough to enhance accuracy, while this difference between medium and high complexity tasks might not have been enough to cause a change.

There are only a few studies, just three, investigating the effects of task complexity manipulation along both resource-directing and resource-dispersing factors, so to verify the results more studies must be conducted in the L2 writing domain. Ong and Zhang (2010) manipulated task complexity through two resource-dispersing factors (+/- planning time and +/- writing assistance) and one resource-directing factor (+/- revising) and found no interaction effect among them on fluency and lexical complexity. The result of that study is in line with ours in terms of lexical complexity, but accuracy was not measured in their study. Similar to that study, Mohammadzadeh Mohammadabadi et al. (2013) also did not find any interaction effect between planning time and here-and-now dimensions of task complexity. Additionally, Ong and Zhang (2013) investigated the effects of the same variables on the general text quality of the learners. The only interaction effect found in their study was between planning time and revising. Generally, it should be noted that task complexity factors utilized by the researchers of the above studies are all different from ours, and the disparities between our findings and theirs can be attributed to these differences.

Interplay of Language Learning Aptitude and Task Complexity Factors

In the fourth research question, we aimed to examine if language learning aptitude intervenes in the relationship between task complexity and written performance. As Robinson (2001a, 2001b, 2007b, 2005b, 2011) has claimed, learner-related variables have the potential for helping the learners, particularly when task complexity is high. Thus, as learners differ in the degree that they can take advantage of task manipulations, there has been a continuous call in the literature for exploring interactions between learner-related variables and task manipulation factors (Robinson, 2015).

In the present study, aptitude appeared to have no two-way interaction with each of the task manipulation factors (planning time and reasoning demand). However, in analyzing the three-way interaction among these factors, we found an impact on the accuracy of the written outputs. Thus, it can be concluded that learners with varying degrees of language aptitude can display the same development in lexical and syntactic complexity of their written language through task manipulations, but this is not the case with accuracy. By comparing the mean scores in accuracy, we noticed that learners with higher language aptitudes performed more accurately in the most cognitively complex condition (highest reasoning demand, no-planning), while lower-aptitude learners in the task with high reasoning demands performed more accurately when planning time was provided as an aid.

In the existing literature, we found only two studies exploring the interaction of learner variables with written task features. Rahimpour and Nariman-Jahan (2010) selected self-efficacy as an affective learner variable and attempted to find its relationship with task performance in the tasks with different cognitive demands. Self-efficacy did not strongly affect linguistic elements of written language production. The only aspect of the production influenced by self-efficacy in narrative and personal tasks was the degree of concept load. Moreover, Kormos and Trebit (2012) explored the role of different aptitude components in written and spoken task production, finding that deductive ability and grammatical sensitivity were the only components which had positive effects on the accuracy and complexity of the productions. With regard to the increase of accuracy, their results sound similar to ours.

Limitations and Suggestions for Further Research

In summary, our findings in relation to the main effects of the resource-directing and resource-dispersing factors partially supported Robinson's Cognition Hypothesis; however, unlike the predictions of this hypothesis, accuracy was not influenced by the above factors separately. Interestingly, accuracy was noticed to significantly change as a result of interaction effects. Thus, we can roughly propose that the learners possessing higher aptitude levels would benefit more in terms of accuracy from the complex tasks that are manipulated through both resource-directing and resource-dispersing factors.

Like any other studies, our investigation also suffers from some limitations which need to be acknowledged and taken into account in future research. The first issue to be mentioned is that only one measurement formula for assessing each target linguistic measure was utilized in this study, whereas using different measurement formulas may lead to different results, as was seen in the literature. So, it is recommended to use more than one measure of CAF to raise the comparability of future studies. Secondly, Task1, holding the lowest degree of reasoning demands, can be thought to be different from the other two tasks, not only in the level of cognitive complexity, but also with regard to involving different pragmatic requirements which could have negatively affected our results. The researchers propose keeping the basic requirements of the tasks the same and to try to shift the reasoning demands by adding more elements to the tasks. The third limitation of the study refers to the way we determined the participants' aptitude levels. Language aptitude has been determined by an overall score obtained from MLAT, but different components of aptitude, as suggested by Robinson's (2005a, 2007a) Aptitude Complexes Hypothesis, are not taken into account.

Finally, because the interaction effects of task complexity features and learner-related variables have recently been suggested as a significant issue (see Robinson 2015), it is highly advised to explore the

mediating effects of other cognitive learner-related variables, such as intelligence or working memory as well as the affective learner-related variables like motivation and anxiety. From a pedagogical point of view, DeKeyser (2012) suggested that research on interaction between learner variables and task manipulation factors would result in the enhancement of the reciprocal relationship between teaching methodologies and students. Robinson (2011) also argued for scrutinizing the interconnection between the cognitive complexity task features and the learner variables to support those in lower levels who need of more time and assistance in completing complex tasks. He also asserted that the data from interaction studies can help educators to “*match* learners to sequences of simple to complex tasks along those resource-directing and dispersing dimensions they are best able to perform” (p. 8). Thus, teachers, syllabus designers, and researchers are reminded not to overlook the role of learner-related variables.

Note

1) Doing MANOVA requires meeting the assumptions of normality of distributions and of the equality of variances and covariances. Thus, Shapiro-Wilk's normality test, Leven's test, and Box's M test were all conducted to test these assumptions respectively. The results of the tests indicated p-values ($p > 0.05$) which revealed that the assumptions are met. Therefore, it can be claimed that the values produced by the MONOVA were accurate and reliable.

The Authors

Simin Sattarpour (corresponding author) is a Ph.D. candidate in TEFL at University of Tabriz, Tabriz, Iran. Her research interests include second language acquisition, task-based language teaching, vocabulary teaching and learning, and the effects of different types of oral and written corrective feedback. She has already published papers in national and international journals.

Department of English Language and Literature
Faculty of Persian Literature and Foreign Languages
29 Bahman Boulevard, Tabriz, Iran
Tel: +989143093494
E-mail: sattarpour.s@tabrizu.ac.ir; sattarpour.simin@googlemail.com

Farahman Farrokhi is a professor and presently the head of the Department of English in the University of Tabriz, Iran. He received his Ph.D. degree in English language teaching from the University of Leeds, England. He has been teaching at post graduate and graduate levels since 2000. He has published several articles in international journals. His recent research interest areas include Second Language Acquisition, Task-based language Teaching and Learning, Corrective Feedback Types, Syllabus Design, and Writing.

Department of English Language and Literature
Faculty of Persian Literature and Foreign Languages
29 Bahman Boulevard, Tabriz, Iran
Tel: +989143113978
E-mail: ffarrokhi20@yahoo.co.uk

References

- Byrnes, H., & Manchón, R. M. (Eds.). (2014). *Task-based language learning: Insights from and for L2 writing*. Philadelphia/Amsterdam: John Benjamins.
- Carroll, J. (1981). Twenty-five years of research on foreign language aptitude. In K. C. Diller (Ed.), *Individual differences and universals in language learning aptitude* (pp. 119-154). Rowley, MA: Newbury House.
- Carroll, J. (1993). *Human cognitive abilities: A survey of factor-analytic studies*. New York: Cambridge University Press.
- Carroll, J., & Sapon, S. M. (1959). *The modern language aptitude test*. San Antonio, TX: Psychological Corporation.
- Cho, H. (2015). Effects of task complexity on English argumentative writing. *English Teaching*, 70(2), 107-131.
- Cumming (1990). Metalinguistic and ideational thinking in second language composition. *Written Communication*, 7(4), 482-511.
- DeKeyser, R. M. (2000). The robustness of critical period effects in second language acquisition. *Studies in Second Language Acquisition*, 22, 499-533.
- DeKeyser, R. M. (2012). Interactions between individual differences, treatments, and structures in SLA. *Language Learning*, 62(2), 189-200.
- Dörnyei, Z. (2005). *The psychology of the language learner*. Mahwah, NJ: Lawrence Erlbaum.
- Dörnyei, Z., & Kormos, J. (2000). The role of individual and social variables in oral task performance. *Language Teaching Research*, 4, 275-300.
- Ellis, R., & Yuan, F. (2004). The effects of planning on fluency, complexity and accuracy in second language narrative writing. *Studies in Second Language Acquisition*, 26, 59-84.
- Frear, M. W., & Bitchener, J. (2015). The effects of cognitive task complexity on writing complexity. *Journal of Second Language Writing*, 30, 45-57.
- Hunt, K.W. (1965). *Grammatical structures written at three grade levels*. Urbana, IL: The National Council of Teachers of English.
- Ishikawa, T. (2006). The effect of manipulating task complexity along the (Here-and-Now) dimension on L2 written narrative discourse. In C. M. Garcí'a-Mayo (Ed.), *Investigating tasks in formal language learning* (pp. 136-156). Clevedon, UK: Multilingual Matters.
- Johnson, M. D. (2017). Cognitive task complexity and L2 written syntactic complexity, accuracy, lexical complexity, and fluency: A research synthesis and meta-analysis. *Journal of Second Language Writing*, 37, 13-38.
- Kormos, J. (2011). Task complexity and linguistic and discourse features of narrative writing performance. *Journal of Second Language Writing*, 20, 148-161.
- Kormos, J. (2012). The role of individual differences in L2 writing. *Journal of Second Language Writing*, 21, 390-403.
- Kormos, J., & Trebits, A. (2011). Working memory capacity and narrative task performance. In P. Robinson (Ed.), *Second language task complexity: Researching the cognition hypothesis of language learning and performance* (pp. 268-85). Philadelphia/Amsterdam: John Benjamins.
- Kormos, J., & Trebits, A. (2012). The role of task complexity, modality and aptitude in narrative task performance. *Language Learning*, 62(2), 439-472.
- Kuiken, F., & Vedder, I. (2007). Task complexity and measures of linguistic performance in L2 writing. *International Review of Applied Linguistics in Language Teaching*, 45, 261-284.
- Kuiken, F., & Vedder, I. (2008). Cognitive task complexity and written output in Italian and French as a foreign language. *Journal of Second Language Writing*, 17, 48-60.
- Kuiken, F., & Vedder, I. (2011). Task complexity and linguistic performance in L2 writing and speaking: The effect of mode. In P. Robinson (Ed.), *Second language task complexity: Researching the cognition hypothesis of language learning and performance* (pp. 91-104).

- Philadelphia/Amsterdam: John Benjamins.
- Kuiken, F., & Vedder, I. (2012). Syntactic complexity, lexical variation and accuracy as a function of task complexity and proficiency level in L2 writing and speaking. In A. Housen, F. Kuiken, & I. Vedder (Eds.), *Dimensions of L2 performance and proficiency: Complexity, accuracy and fluency in SLA* (pp. 143-170). Philadelphia/Amsterdam: John Benjamins.
- Kuiken, F., Maria, M., & Vedder, I. (2005). Cognitive task complexity and second language writing performance. In S. H. Foster-Cohen, M. Garcia- Mayo, & J. Cenoz (Eds.), *Eurosla yearbook*, vol. 5 (pp.195-222). Philadelphia/Amsterdam: John Benjamins.
- Mancho 'n, R. M. (2014). The internal dimension of tasks: The interaction between task factors and learner factors in bringing about learning through writing. In H. Byrnes & R. M. Mancho 'n (Eds.), *Task-based language learning: Insights from and for L2 writing* (pp. 27-52). Philadelphia/Amsterdam: John Benjamins.
- Meraji, S. R. (2011). Planning time, strategy use, and written task production in a pedagogic vs. a testing context. *Journal of Language Teaching and Research*, 2, 338-352.
- Mohammadzadeh Mohammadabadi, A. R., Dabaghi, A., & Tavakoli, M. (2013). The effects of simultaneous use of pre-planning along ±here-and-now dimension on fluency, complexity, and accuracy of Iranian EFL learners' written performance. *International Journal of Research Studies in Language Learning*, 2(3), 49-65.
- Niwa, Y. (2000). *Reasoning demands of L2 tasks and L2 narrative production: Effects of individual differences in working memory, intelligence, and aptitude* (Unpublished master's thesis). Aoyama Gakuin University, Tokyo, Japan.
- Ojima, M. (2006). Concept mapping as pre-task planning: A case study of three Japanese ESL writers. *System*, 34, 566-585.
- Ong, J. (2014). How do planning time and task conditions affect metacognitive processes of L2 writers? *Journal of Second Language Writing*, 23, 17-30.
- Ong, J., & Zhang, L. J. (2010). Effects of task complexity on the fluency and lexical complexity in EFL students' argumentative writing. *Journal of Second Language Writing*, 19, 218-233.
- Ong, J., & Zhang, L. J. (2013). Effects of the manipulation of cognitive processes on EFL writers' text quality. *TESOL Quarterly*, 47, 375-398.
- Rahimpour, M., & Nariman-Jahan, R. (2010). The influence of self-efficacy and proficiency on EFL learners' writing. *International Journal of Instructional Technology and Distance Learning*, 7 (11), 19-35.
- Rahimpour, M., & Safarie, M. (2011). The Effects of on-line and Pre-task Planning on descriptive writing of Iranian EFL learners. *International Journal of English Linguistics*, 11(2), 274-280.
- Robinson, P. (2001a). Task complexity, cognitive resources, and syllabus design: A triadic framework for investigating task influences on SLA. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 287-318). New York: Cambridge University Press.
- Robinson, P. (2001b). Task complexity, task difficulty, and task production: Exploring interactions in a componential framework. *Applied Linguistics*, 22, 27-57.
- Robinson, P. (2002). Introduction: Researching individual differences and instructed learning. In P. Robinson (Ed.), *Individual differences and instructed language learning* (pp. 1-10). Philadelphia/Amsterdam: John Benjamins.
- Robinson, P. (2003). The cognition hypothesis, task design, and adult task-based language learning. *Second Language Studies*, 21, 45-105.
- Robinson, P. (2005a). Aptitude and second language acquisition. *Annual Review of Applied Linguistics*, 25, 45-73.
- Robinson, P. (2005b). Cognitive complexity and task sequencing: Studies in a componential framework for second language task design. *International Review of Applied Linguistics*, 43, 1-32.
- Robinson, P. (2007a). Aptitudes, abilities, contexts and practice. In R. DeKeyser (Ed.), *Practice in a second language: Perspectives from cognitive psychology and applied linguistics* (pp. 256-286).

Cambridge: Cambridge University Press.

- Robinson, P. (2007b). Task complexity, theory of mind, and intentional reasoning: Effects on L2 speech production, interaction, uptake and perceptions of task difficulty. *International Review of Applied Linguistics*, 45, 237-257.
- Robinson, P. (2011). Second language task complexity, the cognition hypothesis, language learning and performance. In P. Robinson (Ed.), *Second language task complexity: Researching the cognition hypothesis of language learning and performance* (pp. 3-38). Philadelphia/Amsterdam: John Benjamins.
- Robinson, P. (2015). The Cognition hypothesis, second language task demands and the SSARC model of pedagogic task sequencing. In M. Bygate (Ed.), *Domains and directions in TBLT: Plenaries from a decade of the international conference* (pp. 87-122). Philadelphia/Amsterdam: John Benjamins.
- Robinson, P., & Gilabert, R. (2007). Task complexity, the cognition hypothesis and second language learning and performance. *International Review of Applied Linguistics*, 45(3), 161-176.
- Ruiz-Funes, M. (2013, November). The interplay between task complexity in foreign language writing at the intermediate level and measures of syntactic complexity, accuracy and fluency (CAF). Paper presented at the American Council on Teaching of Foreign Languages (ACTFL).
- Ruiz-Funes, M. (2014). Task complexity and linguistic performance in advanced college-level foreign language writing. In H. Byrnes & R. M. Mancho'n (Eds.), *Task-based language learning: Insights from and for L2 writing* (pp. 163-192). Philadelphia/Amsterdam: John Benjamins.
- Ruiz-Funes, M. (2015). Exploring the potential of second/foreign language writing for language learning: The effects of task factors and learner variables. *Journal of Second Language Writing*, 28, 1-19.
- Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language learning* (pp. 3-32). Cambridge: Cambridge University Press.
- Skehan, P. (1996). A framework for the implementation of task based instruction. *Applied Linguistics*, 17, 38-62.
- Skehan, P. (1998). *A cognitive approach to language learning*. Oxford: Oxford University Press.
- Skehan, P. (2001). Tasks and language performance assessment. In M. Bygate, P. Skehan, & M. Swain (Eds.), *Researching pedagogic tasks: Second language learning, teaching, and testing* (pp. 167-185). New York/London: Longman.
- Skehan, P. (2003). Task-based instruction. *Language Teaching*, 36, 1-14.
- Skehan, P. (2009). Modelling second language performance: Integrating complexity, accuracy, fluency, and lexis. *Applied Linguistics*, 30, 510-532.
- Skehan, P. (2014). Limited attentional capacity, second language performance, and task based pedagogy. In P. Skehan (Ed.), *Processing perspectives on task performance (task-based language teaching)* (pp. 211-260). Philadelphia/Amsterdam: John Benjamins.
- Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Seidlhofer (Eds.), *Principles and practice in applied linguistics* (pp. 125-144). Oxford: Oxford University Press.
- Swain, M. (2005). The output hypothesis: Theory and research. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 471-483). New York: Routledge.
- Swain M. (2006). Linguaging, agency and collaboration in advanced second language proficiency. In H. Byrnes (Ed.), *Advanced language learning: The contribution of Halliday and Vygotsky* (pp. 95-108). New York: Continuum.
- Wen, Z., Biedron, A., & Skehan, P. (2017). Foreign language aptitude theory: Yesterday, today and tomorrow. *Language Teaching*, 50(1), 1-31
- Wolfe-Quintero, K., Inagaki, S., & Kim, H. Y. (1998). *Second language development in writing: Measures of fluency accuracy and complexity*. Honolulu, HI: University of Hawai'i Press.