Exploring the Role of Cognitive and Procedural Task Complexity in EFL Learners' Attention to L2 System and Form-focused Self-repairs

Ahmad Reza Jafari*, Ph.D. Candidate, English Department, Islamic Azad University of Isfahan (Khorasgan), Isfahan, Iran
arjafariok@gmail.com
Akbar Afghari, Associate Professor, English Department, Islamic Azad University of Isfahan (Khorasgan), Isfahan, Iran
afghary@yahoo.com
Mansoor Koosha, Associate Professor, English Department, Islamic Azad University of Isfahan (Khorasgan), Isfahan, Iran
mansoor.koosha@yahoo.com

Abstract
In L2 development, the cognitive complexity of tasks plays a crucial role in task performance and language features produced. However, there have only been few studies addressing the impact of task complexity on EFL learners' attention to L2 system and form-focused self-repairs (FFS).This study explores the role of increasing cognitive task complexity in EFL learners' form-focused attention (FFA) to L2 system (i.e. grammar, lexis, and phonology) and FFS and the effect of increasing procedural task complexity on EFL learners' FFA to L2 system and FFS. The participants comprised one hundred EFL junior students of TEFL. The sample was chosen from the cohort of EFL students at Islamic Azad and state universities in Isfahan and Shahrekod. The participants performed under task conditions of−/+ casual reasoning and −/+ planning time. After each stage, each participant filled in a Likert-type scale to examine his/her attention to different aspects of L2 system .Finally, Wilcoxon Signed Rank Test was used to compare the learners' instances of of self-repairs at un-increased and increased task complexity occasions. Repeated-Measures ANOVA was used to examine the data. Results showed an overall effect of task complexity on EFL learners' attention to L2 system and FFA behavior across task types.

Keywords: task complexity, cognitive task complexity, procedural task complexity, form-focused attention, form-focused self-repair

Introduction

One of the research topics in TBLT is the effects of task complexity (TC) on learners' L2 performance, with TC being determined by the cognitive demands imposed by task factors on learners (Robinson, 2001a). TC can inform decisions on grading and sequencing in a language teaching syllabus (Ellis, 2003; Robinson, 2001, Skehan, 1998). Such an understanding can also inform language assessment practitioners about judicious use of tasks for assessing task performance of particular learners so that learners can demonstrate their ability and their interlanguage is assessed appropriately.

As defined in Robinson (2001a, 2001b, 2003, 2007), the Cognition Hypothesis of adult task-based language learning has advanced a series of assumptions and predictions of how increasing the cognitive complexity of language learning tasks may affect performance and potentially lead to interlanguage development. As far as performative arguments are concerned, gradually increasing the cognitive complexity of tasks along resource-directing variables has the potential to draw learners' attention to the way certain concepts are grammaticized in the L2.

The role of attention in SLA has been the subject of a significant amount of research recently. In a series of studies Shmidt (1990, 1993,1994) and Shmidt and Frota (1986) claimed that conscious attention to input is necessary for learning to take place. Robinson (1995) refined the conditions that are essential for acquisition by asserting that input will become intake if the detection of input is followed rehearsal in short-term memory. Van Patten (1990, 1994, 1996) conducted a number of experiments in which he examined how attention is divided between form and content in input processing. Schmidt (1990), for example, claims that L2 acquisition is impossible with subliminal learning, and that focal awareness on the target linguistic form (word, phrase or sentence) is necessary to acquire L2.

Skehan sees attention as a single mechanism with all cognitive demands competing for the same finite resource; while Robinson sees it as comprising multiple resources that can operate separately and/or simultaneously through a central executive (Baddeley,1986,1996)". As Robinson (2011) puts it "it is a circular argument; something is inaccurate, so we run out of attention; we run out of attention since something is inaccurate (p.47.)".

How L2 speakers manage their attentional resources influences their performance; consequently the investigation of this phenomenon is of crucial importance especially in L2 production research. Therefore, an increasing number of studies have been conducted on the allocation of attention under various constraints and conditions in L2 production.

However, there have only been few studies that have delved into the depth of the question of how the complexity of a task might influence the EFL learners' attention to L2 system and form-focused self-repairs. Self-repairs are defined to encompass all dysfluency phenomena such as reformulations/self-corrections, substitutive repetitions, replacements, and false starts because they may give us some clues about the form or meaning they notice. Therefore, an attempt was made to examine the impact of task complexity on attention to various aspects of L2 system and form-focused self-repairs in L2 oral production. Therefore, the present study addresses the following research questions:

1. To what extent does increasing CTC (Cognitive Task Complexity) result in Iranian EFL learners' differential form-focused attention to aspects of the L2 system (i.e. grammar, lexis, and phonology) and form-focused self-repairs?
2. To what extent does increasing PTC (result in EFL learners' differential form-focused attention to aspects of the L2 system (i.e. grammar, lexis, and phonology) and form-focused self-repairs?

Literature Review

As Gilabert (2007) puts it, the concept of TC springs from the need to establish criteria for sequencing tasks in a syllabus from easy/simple to difficult/complex in a reasoned way that will foster interlanguage development. Rather than looking at the linguistic features of language activities, syllabi that have used tasks as their units have focused on task design in order to find out how tasks impose cognitive demands on learners. In this way, task design has allowed researchers to speculate about the effects that increasing task difficulty or complexity may have on L2 task performance.

Talebi (2016)studied the effects of task complexity along resource –directing and resource dispersing factors . She focused on pre-task planning time and the number of elements on EFL learners' written tasks in terms of accuracy. She found that there are important differences between cognitive load of TC on EFL learners' performance as far as accuracy is concerned.Abdi Tabari (2016) tried to scrutinize the impact of pre-task planning and online planning on L2

writing production in terms of CAF and lexical variety. The findings showed that participants who conducted the task under pre-task planning condition produced more fluent texts.

According to Robinson, task complexity denotes the cognitive task features which can be manipulated so as to either increase or decrease cognitive demands placed on the learners when they are involved in the task performance. Robinson has had his own definition of task complexity: ‘‘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’’(Robinson,2001b, p. 29).

Robinson (2001b, 2005, 2007) and Gilbert (2007) identified the features of tasks which contribute to TC in his Triadic Componential Framework. His Cognition Hypothesis (CH) is based on the fusion of *information processing theories* (Schmidt, 2001) and *Interactionist explanation* of L2 task effects .In CH, Robinson provides a framework for describing task complexity by virtue of which sequencing decisions may be operationalised. The framework distinguishes three groups of factors which interact to influence task performance and learning: *cognitive* variables, *interactive* variables and *learner* variables.

Furthermore, Robinson proposes a three-dimensional model that distinguishes between three different types of factors: *cognitive complexity* factors (resource-directing ones including [+/ Here-and-Now], [+/– few elements], and [+/– no reasoning demands]; resource-dispersing ones such as [+/ planning], [+/– single task], and [+/ prior knowledge]); *interactive* factors (participation variables such as one way/two way, convergent/divergent, open/closed; participant variables such as gender, familiarity, power/solidarity); and *leaner* factors (affective variables such as motivation, anxiety, and confidence; ability variables such as aptitude, proficiency, and intelligence).

According to Robinson (2005), TC relates to the cognitive demands of tasks, of which there are two main influences: “*resource-directing* dimensions and *resource-dispersing* dimensions” (p. 4). The former relates to the content or linguistic demands that tasks place on learners which can be manipulated by changing the variables associated with it. In other words, the resource-directing dimensions make *conceptual* demands on learners. For example, tasks may involve intentional reasoning demands, that is, they require the learner to explain the actions or thoughts of other people in a story. In L2 English, this can involve the use of psychological cognitive state verbs such as *he thinks..., she believes* etc. as well as the additional L2 structures that accompany them, for example, relative clauses; *he thinks that he likes the dog which has long hair.*

The other cognitive factor of task complexity: *resource-dispersing* dimensions concerns the performance demands that tasks place on learners which can be manipulated by altering the variables associated with it such as strategic planning. For example, sequencing tasks where planning time is reduced serves to promote “greater control over, and faster access to existing interlanguage systems of knowledge” (Robinson, 2010, p.248). This process ‘pushes’ the learner to access and retrieve linguistic resources at a faster rate in order to produce L2 output without time delays. Increasing dispersing complexity therefore enhances automatisation of what learners already know and primes learners to perform tasks more fluently under the normal time pressures of everyday speech. According to Anderson’s (2000) skill theory, this process is referred to as proceduralisation in which declarative knowledge is transformed into procedural knowledge, enabling the learner to use their linguistic resources at a faster rate resulting in a more fluent performance.

Most of the studies which have been conducted in TC area to date have been concerned with the influence of increasing either cognitive or procedural task complexity on ESL/EFL

learners' oral/written performance or the putative impact of task complexity on language related episodes. There have only been few studies that have considered the question of how the complexity of a task might influence the EFL learners' attention to different aspects of L2 system and form-focused self-repairs. Therefore, an attempt has been made to examine the putative impact of task complexity on attention to various aspects of L2 system and form-focused self-repairs in L2 oral production. Moving from structures or functions to tasks as units of organization which has accompanied the evolution of task-based approaches, the data in this study can reveal part of the grey areas in the field.This study can help us see a more comprehensive picture of tasks and their design features and how task complexity affects performance in L2 settings.

Method

Participants

The participants in this study comprised 100 EFL junior students (male and female) majoring in TEFL and English Translation, with Farsi as their mother tongue. The sample was chosen from the corpus of EFL students at different branches of Islamic Azad universities as well as state universities in Isfahan and Chaharmahal va Bakhtiyari provinces. The accessible population comprising EFL students majoring in TEFL and English Translation were selected and the chosen participants demonstrated intermediate proficiency levels of English. Their years of formal EFL instruction ranged from 2 to 4 years and their ages from 18 to 22.

Instrumentation

The instruments in this study were of two types: tasks and measures. Three L2-speaking (simulated) pedagogic task structures (Ellis, 2003) were devised to operationalize different cognitive and procedural complexity levels of tasks thereby eliciting audio-recorded oral-production data. Regarding the first research question, following Robinson (2005), a −/+ causal reasoning task structure was adopted to devise the L2 speaking task and increase the 'resource-directing' cognitive dimensions of TC. Further, the −/+ planning-time task framework was chosen to operationalize the increased procedural complexity in designing oral tasks to address the second research question.

Several measures were also employed in the current study. First, a real ETS TOEFL was used to measure the potential participants' general language proficiency and choose almost homogeneous L2 learners in terms of language ability. Second, there are a number of different aspects to reliability among which internal consistency was employed for estimating the reliability of the instruments in the current study. The most frequently used statistic for measuring internal consistency, according to Pallant (2007), is Cranach's alpha coefficient. Using this statistic, therefore, the reliability of TOEFL proficiency test was estimated. The estimated reliability of the test (in this study) was $\alpha = .91$ which, according to DeVellis (2003), indicated an ideal internal consistency value.

Procedure

The ETS TOEFL instrument was administered to the potential participants in EFL academic settings in Iran, more specifically in Isfahan and Shahrekord, and those whose scores fell +/- 1 SD of the mean were regarded as intermediate in terms of their general English proficiency. Then 100 EFL students with homogeneous proficiency levels were chosen. Both measures (manipulated and manipulated task structures) were administered to the participants with a time interval to safeguard against any possible ‘carry-over’ effect.

The participants were asked to perform under two different task conditions defined in the study (i.e., −/+ Causal reasoning task and, −/+ Planning-time task. In order to tap into the "+causal- reasoning" task each participant was asked to talk about "the underlying causes of unemployment" for 3-5 minutes. Then after a remarkable interval the same participant was asked to describe his/ her feelings the night before an important exam for 3-5 minutes to address the "– causal -reasoning task.

Following several studies (Mehnert, 1998; Ortega, 1999 ;Foster &Skehan, 1996; Skehan& Foster, 1997), operationalization of planning time was 3-5 minutes for planned narratives and no time for unplanned ones. When planning time was available, subjects were encouraged to take notes on what to say and how to say it as they planned, but were told they would not be allowed to keep their notes during task performance. Therefore, to take care of "+planning time", each participant was given 3-5 minutes to plan and prepare (e.g. making notes or organizing his/her thoughts) .Then he /she was asked to talk about "the qualities of a good teacher". In the next step, the same participant was requested to speak about his/ her best trip without having any time to plan and prepare which was purported to cater to "– planning time "task condition.

After each stage each participant was asked to fill in a Likert scale which was developed to examine EFL learners' attention to different aspects of L2 system (i.e. grammar, lexis, or phonology). A form-focused scale was developed taping into L2 learners' the extent of attention paid to different aspects of the L2 system (i.e., grammatical, lexical, phonological) and frequencies were computed for their self-repairs (or monitoring) focusing on different aspects of the L2 system while speaking. Finally, Wilcoxon Signed Rank Test was used to compare the students' instances of different types of self-repairs while speaking at both un-increased and increased task complexity occasions.

The recorded speech of 100 participants was digitized with underlines for insertions and strikethroughs for deletions to keep track of the changes the participant made.The spoken data recorded were examined for instances of self-repair to investigate how often the planners chose to focus on form (FoF) or focus on meaning (FoM). Replacements and false starts were counted as FoM, and reformulations or self-corrections were seen as FoF. However, in case of a false start which contained a reformulation, the false start and the reformulation were counted separately. All the pronunciation and spelling corrections were counted as FoF. In general, instances of self-repair in the spoken data were coded according to the target of the self-repair (e.g., focus on form or meaning). Specifically, if the errors arise from a difficulty with formal linguistic aspects such as syntax, morphology, or pronunciation, the target of the self-repair is coded as Form. If learners are primarily engaged in how to express an intended meaning, the target of the self-repair is coded as meaning. Then, proportion scores are calculated for each individual for self-repair (e.g., the number of FoF self-repairs is divided by the total number of self-repairs). Inter-coder reliability was above .95 for all the counts of self-repairs in the planning data as FoF or FoM.

All statistical analyses were carried out using statistical package SPSS for Windows. Four different kinds of statistical analyses were used in this dissertation: descriptive statistics, which provide information about means, standard deviations, skewness, and kurtosis; repeated-measures analyses of variance (ANOVA) was used for the comparison of conditions; Due to the lack of a normal distribution of the data a non-parametric statistical analysis was carried out to measure the effects of TC on production.

Results

The present study explored the role of increasing cognitive task complexity in EFL learners' form-focused attention to L2 system (i.e. grammar, lexis, and phonology) and form-focused self-repairs as well as the impact of increasing procedural task complexity on EFL learners' form-focused attention to L2 system and form-focused self-repairs**.** A Repeated-Measures ANOVA was used to analyze the data.

The Effect of Increased Cognitive Task Complexity (CTC) on Learners' Attention to L2 System

Table 1. below shows the results of the impact of un-increased as opposed to increased CTC on EFL learners' attention to different aspects of L2 system (Grammar, lexis, phonology).

Table 1. *Descriptivestatistics of the Impact of CTC on EFL Learners' Attention to L2 system*

Condition	N	Min	Max	Mean	SD	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std Error	Statistic	Std Error
Attention-Grammar-Unincreased	100	1.00	4.00	2.26	.69	.169	.241	-.040	.478
Attention-Grammar-increased	100	1.00	4.00	2.82	.80	-.126	.241	-.618	.478
:tention-Lexis-unincreased	100	1.00	4.00	2.79	.72	-.132	.241	-.251	.478
:tention-Lexis-increased	100	2.00	4.00	3.06	.61	-.035	.241	-.318	.478
Attention-Phonology-Unincreased	100	1.00	4.00	1.74	.61	.483	.241	.826	.478
Attention-Phonology-increased	100	1.00	4.00	1.94	.70	.783	.241	1.321	.478

The data in the table indicate that the amount of attention to grammatical structure increases as the degree of cognitive task complexity enhances. The highest degree of increase in EFL learners' attention to L2 system was that of grammar, while the least amount of attention to L2 system belonged to the area of phonology. Regarding the differential attention EFL learners paid to lexis before and after task complexity manipulation, the table shows that as the level of cognitive complexity of a given task raises so will the amount of attention learners pay to lexical items in their speech. Furthermore, Table 2. below shows the findings of the impact of CTC on EFL learners' attention to grammatical structures. The effect size for "attention to L2 grammar" is around .3; which is considered a 'large' effect size.

Table 2. *Multivariate Tests of the Impact of CTC on EFL Learners' Attention to Grammar*

Effect	Value	*F*	Hypothesis df	Error df	*Sig*	Partial Eta Squared

Pillai's trace	.399	65.683	1.000	99.000	.000	.399
Wilks' lambda	.601	65.683	1.000	99.000	.000	.399
Hotelling's trace	.663	65.683	1.000	99.000	.000	.399
Roy's largest root	.663	65.683	1.000	99.000	.000	.399

Therefore, it can be claimed that the change made to EFL learners' attention to L2 grammatical structures after increasing CTC along resource-directing variables was noticeable and considered statistically significant. Thus, with respect to descriptive statistics in Table 1. and results of Table 2. above, it can be argued that learners paid more attention to grammatical structures following increasing CTC of speaking tasks.

Moreover, as for the impact of increased CTC on attention to lexis, the importance of the effect of the CTC on EFL learners' perceived attention to lexis was evaluated using the effect size statistics. The values in this case .2, which, according to Pallant (2007) was considered as large.

Table 3. *Multivariate Tests of the Effect of CTC on Attention to lexis*

Effect	**Value.**	***F***	**Hypothesis df**	**Error df**	***Sig***	**Partial Eta Squared**
Pillai's trace	.224	28.577	1.000	99.000	.000	.224
Wilks' lambda	.776	28.577	1.000	99.000	.000	.224
Hotelling's trace	.289	28.577	1.000	99.000	.000	.224
Roy's largest root	.289	28.577	1.000	99.000	.000	.224

Additionally, the results of the effect effect of CTC on attention rate to phonology are represented in Table 4. below:

Table 4. *Multivariate Tests of the Effect of CTC on Attention Rate to Phonology*

Effect	**Value.**	***F***	**Hypothesis df**	**Error df**	***Sig***	**Partial Eta squared**
Pillai's Trace	.051	5.351	1.000	99.000	.023	.051
Wilks' Lambda	.949	5.351	1.000	99.000	.023	.051
Hotelling's Trace	.054	5.351	1.000	99.000	.023	.051
Roy's Largest Root	.054	5.351	1.000	99.000	.023	.051

As the multivariate tests in Table 4. below show the "effect size" for phonology here is .05 which is regarded as a "small" effect size. Thus, no strong claims regarding the impact of increased CTC on phonology of L2 speech can be made and the actual effect of CTC on EFL learners' attention rate to phonology appears to be of little practical significance.

The Effect of Increased Procedural Task Complexity (PTC) on Learners' Attention to L2 System

The data in Table 5. demonstrate the effect of increased PTC on the Iranian EFL learners' degree of attention to different aspects of L2 system in performing speaking tasks. As the above table shows there seems to be differential performance by EFL learners in terms of their amount of attention to grammatical structure before and after task complexity manipulation. The learners paid, relatively, less attention to grammar when they were asked to speak under normal conditions. But when the degree of PTC increased learners tended to pay more attention to grammar than the previous stage. Regarding lexis, we can observe the same trend, i.e. learners paid more attention to lexical items under increased PTC in contrast to normal conditions. Finally, it can be seen from the above table that the attention rate to phonology is relatively higher after task complexity manipulation. Moreover, the table indicates that the largest difference between attention before and after task manipulation lies in lexis whereas the least difference belongs to the area of phonology.

Table 5. *Descriptive Statistics of the Effect of PTC on EFL Learners' Attention to Aspects of L2*

Condition	N	Min		Mean	SD	Skewness		Kurtosis	
	Statist	Statist	Statistic	Statistic	Statistic	Statistic	Std Error	Statistic	Std Error
Attention-grammar-nincreased PTC	100	1.00	4.00	1,92	.70	.107	.241	-.394	.478
Attention-grammar-increased PTC	100	1.00	4.00	2.78	.74	-.063	.241	-.413	.478
Attention-lexis-nincreased PTC	100	1.00	3.00	1.56	.57	.414	.241	-.751	.478
Attention-lexis-increased PTC	100	2.00	4.00	2.64	.67	-.426	.241	.175	.478

As Table 6. indicates ,when the degree of PTC increased learners tended to pay more attention to grammar. As it was presented in Table 6. below, the actual effect of PTC on EFL learners' attention to grammar is 0.2 that reaches statistical significance.

Table 6. *Multivariate Tests of the Effect of Increased PTC on Grammatical Structures*

Effect	Value	F	Hypothesis df	Error df	Sig	Partial Eta Squared
Pillai's Trace	.224	28.577	1.000	99.000	.000	.224
Wilks' Lambda	.776	28.577	1.000	99.000	.000	.224

Hotelling's Trace	.289	28.577	1.000	99.000	.000	.224
Roy's Largest Root	.289	28.577	1.000	99.000	.000	.224

Furthermore, Table 5. above shows the findings on the effect of increasing PTC on learners' attention to lexis. Table7. reveals that the effect size for "Lexis" is around .068; which is considered a 'moderate' effect size. Therefore, any claim about the change made to EFL learners' attention to lexis after increasing PTC along resource-dispersing variables should be made with reservations.

Table 7. *Multivariate Tests of the Effect of Increased PTC on Lexis*

Effect	**Value**	**F**	**Hypothesis df**	**Error df**	**Sig**	**Partial Eta**
Pillai's Trace	.068	7.238 (a)	1.000	99.000	.008	.068
Wilks' Lambda	.932	7.238 (a)	1.000	99.000	.008	.068
Hotelling's Trace	.073	7.238 (a)	1.000	99.000	.008	.068
Roy'Largest Root	.073	7.238 (a)	1.000	99.000	.008	.068

Table 5. above indicates that increasing PTC led to an increase in EFL learners' attention to phonology. The effect size here is .53, which is considered a 'large' effect size. This means that the difference between the amount of attention paid to phonology before and after task manipulation is quite significant.

Table 8. *Multivariate Tests of the Effect of PTC on EFL Learners' Attention to Phonology*

Effect	**Value**	**F**	**Hypothesis df**	**Error df**	**Sig**	**Partial Eta**
Pillai's Trace	.532	2.324(a)	1.000	99. 000	.000	32
Wilks' Lambda	.468	2.324(a)	1.000	99.000	.000	32
Hotelling's Trace	1.135	2.324(a)	1.000	99.000	.000	32
Roy's Largest Root	1.135	2.324(a)	1.000	99.000	.000	32

As the above table shows, when the cognitive complexity of a speaking task increases along resource-directing dimensions the instances of self-repair decreases quite remarkably. It can be seen that the mean for self-repair dropped from .90 for un-increased cognitive task complexity to .62 for increased cognitive task complexity. In regard to the putative impact of increasing procedural TC on instances of self-repair in EFL learners oral production, the above table indicates the same falling trend as that of cognitive task complexity. In other words, as the

degree of procedural task complexity rises the number of self-repairs in learners' speech goes down.

Table 9. *Multivariate Tests of the Effect of Increased CTC on Self-repair*

Effect	**Value**	***F***	**Hypothesis df**	**Error df**	***Sig***	**Partial Eta Squared**
Pillai's Trace	.091	9.930	1.000	99.000	.002	.091
Wilks' Lambda	.909	9.930	1.000	99.000	.002	.091
Hotelling's Trace	.100	9.930	1.000	99.000	.002	.091
Roy's Largest Root	.100	9.930	1.000	99.000	.002	.091

The data in Table 9 above show the impact of increasing CTC on self-repair. The 'effect size' in this table is .09 which is higher than moderate. Furthermore, as the figures in Table 12 show following increasing the PTC a remarkable decline in the number of form-focused self-repair was observed in EFL learners' speech. In other words, the mean for self-repair changed from .95 to .70. This could mean that learners produced fewer instances of form-focused self-repairs in the face of the depletion of their resources such as taking away "planning time". Besides, the data in Table 15 shows that the "effect size" for the impact of increasing PTC on form-focused repair is considered "large" which confirms the effect of respective factors

Table 10. *Multivariate Tests of the Effect of Increased PTC on Self-repair*

Effect	**Value**	***F***	**Hypothesis df**	**Error df**	***Sig***	**Partial Eta Squared**
Pillai's trace	.091	9.930(a)	1.000	99.000	.002	0.091
Wilks' lambda	.909	9.930(a)	1.000	99.000	.002	0.091
Hotelling's trace	.100	9.930(a)	1.000	99.000	.002	0.091
Roy's largest root	.100	9.930(a)	1.000	99.000	.002	0.091

This can also suggest that the possible interaction effect of CTC and PTC has resulted in less instances of self-repair among EFL learners. Also, the data in Table 10 indicate that the Wilk's Lambda index is 0.1 which is deemed quite large.

Table. 11. *Wilcoxon Sign Rank Test*

Repair-Cog-increased –	Repair-Per-increased–	Repair-CogPer-increased -

Repair-Cog-unincreased	Repair-Per-unincreased	Repair-Cog Per-unincreased
Z	- 2.864	-2.625 -3.323
Asymp. Sig. (2-tailed)	.004	.009 .001

As the figures in Table.11 indicate, for all three conditions of TC conditions the difference between instances of self-repair before and after increasing TC is statistically significant.

Discussion

Generally, as the data illustrated above, increasing CTC led to different degrees of attention rate on L2 grammar, lexis, and phonology. It was found that learners paid more attention to grammatical structures following increasing CTC of speaking tasks. Moreover, attention rate following increased CTC for lexis rose quite remarkably. However, concerning attention rate to phonology after increasing CTC, the data were indicative of a "small" effect size which means the difference between the attention rate of learners before and after task manipulation was significant but the 'effect size' was small.

The results of this study provide supports to Robinson (2003) who claims that tasks increasing in cognitive complexity require L2 learners to activate complex concepts and more detailed schemata of the communicative functions, such as the detailed description of spatial relations and event structure in a narrative, and hence drive learners to express more complex relations among the activated concepts. Attention, however, is also subject to conscious control and can be specifically allocated to different linguistic aspects of the message to be conveyed. Cognitively complex tasks might direct learners' attention to noticing the gap in their existing knowledge and might create motivation to acquire the structure that would have been needed to successfully complete the task.

Similarly, the findings of this study converge with those of Kormos (2006, 2011).Kormos, (2006) argues, in line with the Cognition Hypothesis, that tasks which are complex along resource-directing dimensions call learners' attention to the differences between the existing L1 conceptual system and L2 concepts, and drive the expansion of learners' repertoires of memorized units for expressing form-meaning relations in the L2, as well as their morphological and syntactic development.

In terms of Levelt's (1989) model of speech production, increasing the conceptual demands of tasks (naturally) leads to greater effort at conceptualization, and 'macroplanning' at the stage of message preparation. In Levelt's (1989) 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—in particular for grammatical encoding" (p. 70). Therefore greater effort at conceptualization during message preparation, induced by conceptually- demanding tasks, should lead to what Dipper, Black and Bryan (2005, p. 422) called "paring down" of conceptual information into a "linguistically relevant representation".

Moreover, the results derived from this study are in line with Gilabert, Baron, and Llanes (2009). They concluded that increasing cognitive demand along the resource-directing dimension generates more interactional moves even though there were some differences in each task type.As the results revealed following increasing PTC, the attention rate in all three dimensions of grammar (with large effect size), lexis (with moderate effect size), and phonology (large effect size) increased. The maximum increase following task manipulation belonged to attention to lexis, while the minimum was that of phonology.

Contrary to these results, according to Robinson increasing complexity along resource-dispersing dimensions (+/- planning time, +/- prior knowledge, +/- single task) reduces attentional and memory resources with negative consequences for production, a position which is in agreement with Skehan's (2003). Moreover, as Robinson (2003) found it, as speaking is an on-line activity that takes place under time-constraints, L2 speakers often need to balance fluency with the complexity and grammatical accuracy of their message. This explains why there are trade-off effects in accuracy and fluency if cognitive demands of a given task are high. As the data above indicated, by increasing CTC the instances of self-repairs in the speech of EFL learners declines quite noticeably. Meanwhile the results were indicative of the moderate to large effect size for the impact of increasing CTC on self-repair in L2 oral production. This demonstrates that increasing CTC results in a reduction of instances of self-repair which are statistically significant.

These results are not in line with findings by Rahimpour (1997), Iwashita et al. (2001), Gilabert (2005, 2007), and Ishikawa (2007) regarding accuracy in narrative performance. As for the amount of self-repair, while the percentage of self-repair did not capture any differences, significant differences were found when the ratio of repaired to unrepaired errors and its corrected version were calculated. This would suggest that increased TC may have led learners to notice more errors that needed to be repaired and repaired them.

Further, the results of this study do not back up Gilabert's (2007) findings. He analysed the effects of manipulating the cognitive complexity of L2 oral tasks on language production and focused on self-repairs. He manipulated the narrative task along +/− Here-and-Now, along with an instruction-giving task manipulated along +/− elements, and the decision-making task which was manipulated along +/− reasoning demands. He found that of task complexity had an overall effect on self-repairs behavior across task types. He found that the use of self-repair was heavily influenced by task type. Also, the findings of this study differ from Gilabert's (2007b) finding in that complex narrative tasks along the [–here and now] factor significantly promoted more self-repair.

Regarding the effect of increasing PTC on self-repair, the data indicated there was a remarkable decline in the instances of self-repair following increasing procedural task complexity (large effect size). Thus, it can be claimed that when L2 learners' resources are depleted the instances if self-repair in their speech rises. Forexample, taking away planning time would result in more instances of false starts, reformulations, hesitations, and self-repairs.Similarly, Kormos (2006) suggests that higher tasks i.e., building complex structures demands may deviates attention from monitoring. In Gilabert's (2007) view, the claim may hold true when tasks are made more demanding along resource-dispersing variable but not along resource-directing ones.

Conclusion

As Ellis (2009) argued, TBLT is of utmost importance for language learning and teaching since it operationalizes the theory of SLA, makes it more tangible, and provides more insightful perspective for learning and teaching a language. A valid and crucial criterion for designing, selecting, grading, and sequencing pedagogical tasks is in forefront of teachers' and task

designers' attention. Therefore, the findings of this study can be regarded as practical basis for above-mentioned purposes.Task complexity, both as operationalized in this study as well as in previous ones, stands out as a robust and testable construct for task and syllabus design. Findings obtained from task-based research on production lend themselves to not just task-based syllabus construction but also to other approaches such as process or content-based teaching.

Therefore, in designing and sequencing pedagogic tasks EFL teachers and task designers should take into account TC as an overriding consideration. The findings in this study may also contribute useful information to the area of task-based testing. In this sense, they can be a contribution to the need to conceptualize performance and the processing conditions which influence it (Skehan, 1998). The demands that tasks can make can lend themselves to the possibility of using tasks to manipulate learners' attention between form and meaning in a manner which can be conducive to interlangauge development. In a task-based syllabus, pedagogic tasks should be sequenced to approximate the demands of real- world target tasks, with the goal of enabling L2 users to succeed in attaining needed lifetime performance objectives.

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