The effects of increasing cognitive task complexity along [+/- planning Time] and [+/ – few Elements] on L2 oral production

MASTER THESIS

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ABSTRACT

The study examines the impact of manipulating task complexity simultaneously along +/- planning time and +/- few elements on L2 production. Firstly, the concept of task complexity is presented, followed by a brief description of the Cognition Hypothesis and the Triadic Componential Framework. Finally, the specific literature related to planning time and the number of elements is reviewed. The first hypothesis states that reducing cognitive complexity along pre-task planning time will increase learners' fluency and lexical complexity, whereas performing without time for planning will have negative effects on all dimensions of production. The second hypothesis predicts that increased number of elements will increase lexical complexity, structural complexity and accuracy, but it will cause disfluency. The combined effects of manipulating simultaneously two variables of task complexity as well as the role of different L1 backgrounds will be also analyzed. Using a repeated measures design, 14 upper-intermediate English level Spanish and Russian students were asked to perform four decision-making tasks manipulated along +/- planning time and +/- elements combinations. Measures included Unpruned Speech Rate A and Pruned Speech Rate B for fluency; Guiraud's Index of Lexical Richness and the percentage of lexical words for lexical complexity; the number of clauses per AS-units for structural complexity; and the percentage of error-free AS-units and the percentage of error-free clauses for accuracy. The results of Friedman and Wilcoxon signed-rank tests showed that planning time positively affects lexical and structural complexity, but it does not display fluency or accuracy significantly. Increasing task complexity along the number of elements generates negative effects for fluency and structural complexity, a positive impact on lexical complexity and no significant effect on accuracy. The results, discussed in the light of Cognition Hypothesis and L2 production research, only partially confirm previous theories and findings (Skehan & Foster, 1997; Robinson, 2001, 2003, 2005; Gilabert, 2006; Michel, Kuiken & Vedder, 2007).

RESUM

Aquest treball investiga l'impacte de la manipulació simultània del temps de planificació i del número d'elements d'una tasca sobre la producció oral en l'L2. En primer lloc, en el treball es defineix el concepte de la complexitat de les tasques, i, després, es descriu la Hipòtesi Cognitiva i el *Triadic Componential Framework*. Finalment, es presenten els estudis específics relacionats amb el temps de planificació i el nombre d'elements. La primera hipotesi afirma que la reducció del temps de planificació augmentarà la fluïdesa i la complexitat lèxica dels parlants, tot i que l'absència del temps de planificació afectarà negativament totes les dimensions de la producció oral. La segona hipòtesi planteja que augmentar el nombre d'elements millorarà la complexitat lèxica i esturcutral i la correctivitat, encara que tindrà un impacte negatiu sobre la fluïdesa. D'altra banda, es planteja analitzar l'efecte combinat de la manipulació simltània dels dos variables de la complexitat de les tasques i el paper de les diferents L1s. S'utilitza el disseny de mesures repetides per a l'obtenció dels suggeriments orals de 14 subjectes espanyols i russos d'un nivell intermig/alt de les tasques manipulades simultàniament respecte al temps de planificació i el nombre d'elements. Les mesures inclouen: per a la fluïdesa, el nombre de síl·labes per minut de la transcripció exacta i el nombre de síl·labes per minut de la transcripció depurada; per a la complexitat lèxica, l'índex de Guiraud de riquesa lèxica i el percentatge dels mots lèxics; per a la complexitat estructural, el nombre de nodes verbals per cada unitat estructural; i per a la correcció, el percentatge d'unitats estructurals sense errors i el percentatge de nodes sense errors. Els resultats dels tests Friedman i Wilcoxon demostren que proporcionar temps de planificació té un impacte positiu sobre la complexitat lèxica i estructural, però no té cap efecte significatiu sobre la fluïdesa i la correcció. L'augment de la complexitat cognitiva de tasca respecte al nombre d'elements produeix efectes negatius sobre la fluïdesa i la complexitat estructural, un impacte positiu sobre la complexitat lèxica i no afecta de forma significativa la correcció. Els resultats són interpretats segons la Hipotesi Cognitiva i estudis de la producció de l'L2; la confirmació dels quals és només parcial (Skehan & Foster, 1997; Robinson, 2001, 2003, 2005; Gilabert, 2006; Michel, Kuiken & Vedder, 2007).

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CHAPTER I

BACKGROUND OF THE STUDY

1.1 Introduction

Nowadays people all over the world use and learn foreign languages for different reasons, to achieve different goals and under different conditions. Their communicative experience is also different depending on the discrete tasks they fulfil, while travelling (e.g. booking a hotel, renting a car), applying for a job or negotiating with international partners. Both intrinsic (e.g. a relative difficulty of the task to deal with) and extrinsic (e.g. the pressure of time, tenuous relationship with a interlocutor) factors of the communicative task at hand may influence the speed, the length, the structure and the lexical richness of our speech in the L2 (as it is also the case with the L1). These conditions of performance affect our speech in such a way that they can increase or decrease some of its discrete elements (speed, grammar, vocabulary) and they may be controlled to some extent and manipulated through task design.

Over the past decade, researchers have aimed at investigating the processes underlying the L2 written and oral performance of communicative tasks and the effects of their design on linguistic performance and development. Two different but complementary perspectives have arisen which are interested in task design: an interactionist one (Mackey & Gass, 2007; Long, 2000) and an information-processing one (Robinson, 2005, 2007; Skehan & Foster, 2001). On the other hand, the Interaction Hypothesis suggests that interaction has a beneficial effect on L2 oral production. Through negotiating meaning, learners rearrange, reformulate their ideas and their language to be more precise and therefore understood. They are led to give a more accurate output and this, in turn, may generate opportunities for language learning. Another aspect of the Interaction Hypothesis is the “noticing” theory (Schmidt, 2001), which claims that when learners try to explain their ideas and intentions, they notice the gaps in their L2 knowledge which do not allow them to be completely clear and precise. Noticing can be internal (when learners detect their lacks themselves) or external (when more competent interlocutors or teachers detect and report back their errors). On the other hand, information-processing models investigate how different cognitive task factors influence the performance of L2 learners. Studies that draw on information-

processing theories take as a starting point the fact that human beings have a limited processing capacity and, thus, they are not able to attend simultaneously to all aspects of task performance (Alderson, 1995). In the field of SLA it has been claimed that second language learners usually do not succeed at attending to meaning and form at the same time when performing a task. In this way, they tend to prioritize meaning and they need to decide which dimensions (e.g. vocabulary, syntactic structure, fluency, accuracy) of their performance they are to pay more attention to (Alderson, 1995; Skehan, 1996).

From an information-processing perspective, the objective of this research project is to analyze the effects of manipulating the cognitive complexity of tasks on L2 monologic oral production. More specifically, the study explores how fluency, accuracy and complexity are effected during L2 task performance under four conditions of cognitive complexity which are achieved by manipulating two variables: +/- planning time (i.e. the amount of time learners are given before performing a task) and +/- few elements (i.e. the number of elements or items learners have to deal with during task performance).

1.2 Task Complexity

As more and more language learning programmes use tasks as their basic units of organization (e.g. task-based language teaching, project work, content and language integrated learning); many researchers have focused on the analysis of task design and the effect of task complexity manipulation on L2 oral production. Research in the last two decades has shown that learners' performance on a task may be affected by its design (e.g. the number of elements involved in the task), the modes under which it is executed (e.g. monologic or dialogic tasks), as well as by a number of learner factors (e.g. motivation, aptitude). Since it is difficult to control learner factors before a language program starts, task design is relatively more predictable and therefore can be controlled and manipulated in terms of its complexity. It is in this context that the concept of task complexity was born within SLA, that is, as a means to understand cognitive processes of L2 learners and sequencing tasks in a reasoned way.

A first distinction that needs to be drawn is between task difficulty and task complexity. In Skehan and Foster's view (2001:196) "task difficulty has to do with the amount of attention the task demands from the participants. Difficult tasks require more attention than easy tasks". Moreover, Skehan (1996) suggests a three-way distinction of

difficulty: code complexity, cognitive complexity and communicative stress to which he also adds learner factors. He distinguishes three aspects of language performance: fluency, "concerns the learner's capacity to produce language in real time without undue pausing or hesitation" (Skehan, 1996:22); complexity "concerns the elaboration or ambition of the language that is produced" (Skehan, 1996:27); accuracy shows the correct use of linguistic features of a target language and points out that they must be considered separately because they are differently affected by learners' processing forms, as learners' priorities about attentional resources can vary under different conditions. He advocates that the information obtained from the analysis of task difficulty manipulation can be used in pedagogic practice to establish instructional sequences to improve L2 performance and promote interlanguage development.

For Robinson (2001:28) "task complexity is the result of the attentional, memory, reasoning, and other information processing demands imposed by the structure of the task on the language learner. These differences in information processing demands, resulting from design characteristics, are relatively fixed and invariant". Robinson (2001, 2003a, 2003b, 2005) has elaborated a model of cognitive Task Complexity of the task which makes specific predictions about how manipulating task design may affect performance and development of adult L2 learners.

1.3 The Cognition Hypothesis and its associated Triadic Componential Framework

Assuming that some factors of task demands direct learners' attention to language, Robinson (2005) advanced The Cognition Hypothesis which claims that increasing task cognitive complexity has the potential to generate linguistic complexity along certain dimensions of production. The Triadic Componential Framework represents an instrumental part of the Cognition Hypothesis, which includes cognitive (e.g. +/- pre-task planning time; +/- prior knowledge), interactive (e.g. familiar/unfamiliar participants; same/different gender of participants) and learner factors (e.g. anxiety, confidence) as three components of task complexity that can be studied separately, but may also be combined in order to examine synergistic effects among them.

As suggested by Robinson (2003b), adults retain a scale of conceptual complexity acquired in childhood. When using an L2, learners tend to employ the

simplest forms available in their repertoire and only move to more elaborate forms under communicative pressure. Robinson suggests that in order to push the use of more complex forms of the target language, the cognitive demands of tasks may be increased by raising memory and attentional demands during L2 performance (Robinson & Gilabert, 2007).

However, the cognitive complexity of tasks may be manipulated in various ways so as to achieve differential effects. One of the important theoretical issues of the Triadic Componential framework, which is associated with the Cognition Hypothesis, is the distinction between resource-directing and resource-dispersing dimensions of complexity (Robinson, 2003a). Robinson argues that when tasks are made more cognitively demanding along resource-directing factors, such increased demands address or "direct" our attentional and memory resources to the way certain concepts are expressed (i.e. the complexity and the accuracy of the linguistic code). As a consequence, L2 oral production becomes heightened, since learners may produce more complex structures and richer vocabulary. Resource-directing factors include: +/-here-and-now, where the task requires a reference to events that are visually present and happening now or to events that occurred in the past and are no longer visually present; +/-few elements, or reference to few or to many similar elements; +/- spatial reasoning, or reference to a special location easily identifiable with many known landmarks or without such support; +/-casual reasoning, simple information transmission or reasoning about causal events and connections between them; +/- intentional reasoning, simple information transmission or reasoning about other people intentions ; +/-perspective taking, whether a speaker has to take into account one or many perspectives about an event or another person. The Cognition Hypothesis, then, predicts that increases in task complexity along resource-directing dimensions lead to both more accurate and more complex L2 performance. For instance, a task with greater number of elements should push the learners to use more varied vocabulary and to construct structurally more complex sentences in order to be able to take into account all the elements they must deal with during performance (Robinson, 2001). Resource-directing variables help, therefore, to speed up grammaticalization and syntactization of L2 speech.

In contrast to resource-directing variables, complexifying tasks along resource-dispersing factors attentional and memory resources become "dispersed" or "depleted" in a way that they do not direct learners to any specific aspect of the L2. Resource-

dispersing variables include manipulating task complexity along pre-task planning time (+/- planning time); tasks with background knowledge (+/-prior knowledge); +/-single task; +/- task structure; +/- few steps and independency of steps. According to the Cognition Hypothesis, increases in task complexity along resource-dispersing dimensions will negatively affect all dimensions of L2 production. Within a pedagogical framework, for example, the manipulation of resource-dispersing variables may be used to promote automatic access to already established language system, rather than to analysing L2 forms acquisition by making tasks more complex along resource-dispersing variables to approach real-life conditions of performance.

1.4 Cognitive Complexity and the three dimensions of L2 Production

We have already established two types of factors within the cognitive complexity of tasks: resource-directing and resource-dispersing ones. By manipulating variables along these two dimensions, the three dimensions of linguistic performance distinguished by Skehan (1996) (i.e. fluency, complexity and accuracy) may be altered. The conditions under which tasks are performed will lead learners to shift their attention from one dimension to another.

As far as the influence of the two types of cognitive factors on the three dimensions of L2 production is concerned, studies have triggered a variety of results which are more or less stable depending on the dimension. Providing pre-task planning time as one of the examples of resource-dispersing variables has a positive impact on language production, especially for fluency and complexity (Ortega, 1999; Foster & Skehan, 1996). Most studies report positive results for lexical complexity under pre-task planning time conditions (Ortega, 1999, Gilabert, 2007). On the contrary, mixed results have been obtained for accuracy. Foster and Skehan (1997) have found that planning time leads to increased accuracy in case of a personal and a narrative task, but not in a decision-making task. Ortega (1999) in her study of Spanish learners reported positive effects on accuracy for noun modifiers, but not for articles.

Regarding resource-directing variables, findings are neither unanimous as for the effects of their manipulation on the three dimensions of L2 production. There is general agreement that increased task complexity along resource-directing factors will cause disfluency (Robinson, 1995; Gilabert, 2007; Michel, Kuiken & Vedder, 2007). However, mixed results have been achieved as far as lexical complexity, structural

complexity and accuracy are concerned. With respect to complexity some researchers report a trend for higher lexical variety (Kuiken, Mos & Vedder, 2005; Kuikken & Vedder, 2007). As for accuracy, Kuiken, Mos and Vedder (2005) and Kuiken and Vedder (2007) report a significant effect on accuracy and lexical complexity along more complex task, whereas Robinson (2001) by manipulating the factor +/- few elements did not obtain any significant effects for accuracy.

Another important issue is related to the trade-off effects among the different dimensions of production. Due to the limited processing capacity learners need to prioritize what to attend to. Skehan and Foster (1997) propose a trade-off effect between complexity and accuracy. In their study, Skehan and Foster (1997) show that task type (a narrative task; a decision-making task) is crucial in gearing the effects of planning toward accuracy or complexity. Conversely, Wendel (1997) suggests that the trade-off effects involve accuracy and fluency. Based on the post-task comments of his participants he concluded that planning in advance predisposes learners to organize the ideas and to build the content which results in greater accuracy at the expense of fluency.

To sum up, the evidence of the influence of task design and task complexity manipulation has drawn researchers' attention on the central concept of task complexity with the Cognition Hypothesis as its theoretical framework. This includes three factors influencing L2 production and L2 development: cognitive, interactive and learners' factors. One set of factors which may be controlled and predicted by syllabus designers and teachers during task design is the cognitive one. Complexity may be of two dimensions (resource-directing and resource dispersing ones) which affect in a different way the different areas of L2 production (e.i. fluency, complexity and accuracy). As for this research project, it deals with the combination of two dimensions of the cognitive complexity of tasks (+/- planning time and +/- few elements). Prior to analyzing the synergic effects of the simultaneous manipulation of the two variables, a brief overview of previous studies in relation to planning time and the number of elements is provided in the following section.

1.5 Previous studies on task complexity

This section reviews studies on the effects of varying the amount of pre-task planning time and the number of elements which are relevant to the present research. In

this review, I am especially interested in oral task performance and the findings concerning the effects it produces on L2 oral production. For a more detailed overview of planning time studies see Ellis (2005). As we will see, few studies have been carried out on the analysis of the effects of manipulating tasks along +/- few elements on L2 oral production.

1.5.1 Planning time studies

Research into the effects of +/- planning time on production have shown that providing students with pre-task planning time seems to benefit their fluency and complexity, while for accuracy there is no unanimous agreement.

Ellis (1987) analyzed how different levels of planned discourse affect learners' written and oral production. He organized an experiment around three different degrees of planned discourse predicting that access to no automatised forms such as regular past "-ed" would benefit from planning time. Ellis reported that learners mostly used correct past forms of irregular verbs at different levels of planning. He concluded that increased planning time leads to higher accuracy of rule-based features, whereas unplanned speech is more lexical in nature.

Foster and Skehan (1996, 1997) investigated the effects of varying the amount of planning time on three different task types: a personal information gap task, a narrative task, and a decision-making task. A two-by-two research design was used with two and resource-dispersing variables (+/- prior knowledge and +/- planning time). Their statistical analysis showed that planning time results in higher fluency in terms of number of the pauses and total silence. The effects of planning on complexity, measured by sentence nodes per C-unit, and accuracy, calculated by error-free units, however, were not so clear and not as consistent as for fluency. They also suggested that trade-off effects may exist between the variables used in the study, when fluency, complexity and accuracy compete for attention with one another.

The study conducted by Ortega (1999) explored the effects on pre-task planning time on focus on form at the level of strategic attention to form during planning time, as well as at the level of production during L2 task performance. Using an oral narrative task under 10-minute planning condition and a no-planning condition with learners of Spanish, Ortega's results demonstrated that pre-task planning produced significantly

more fluent and complex speech (measured by pruned speech rate, type-token ratio and words per utterance, respectively), while mixed results were observed for accuracy (calculated by noun-modifier TLU and Article TLU). Furthermore, she decided to use retrospective analysis to determine the effectiveness of pre-task planning as perceived by her participants. She distinguished the advantages of planning time on L2 oral performance: a cognitively complex task would benefit more from planning time than a simple one; planning time may increase learners' readiness to perform and also promote task essentialness. Finally, learners' orientation towards form or meaning and also learners' proficiency also play an important role and, therefore, need to be taken into consideration.

To shed light on the performance results while manipulating +/- planning time in L2 oral production, Yuan and Ellis (2003) used the concept of "online" planning, which they distinguish from pre-task planning. A single-factor design between 42 undergraduate students was used with three levels of planning conditions (no planning, pre-task planning, and on-line planning). The results showed that pre-task planning enhanced fluency, which was measured by means of pruned and unpruned speech rates; grammatical complexity, calculated by the ratio of clauses to T-units and the total number of different grammatical verb forms used in the task and lexical richness, measured by mean-segmental type-token ratio; while on-line planning positively influenced accuracy (error-free clauses and correct verb forms measurements) and grammatical complexity. They also proposed the existence of trade-off effects between fluency and accuracy, with both pre-task planning and on-line planning, promoting higher accuracy. Finally, Yuan and Ellis concluded with the fact that pre-task planning increased lexical complexity, whereas on-line planning increased accuracy at the expense of varied vocabulary.

Gilabert (2007) analyzed the effects of manipulating the cognitive complexity of tasks on L2 narrative oral production. Four picture stories (wordless comic strips) were narrated by 48 second-year university students under four conditions. He found that increasing complexity along the [+/- here-and-now] variable makes learners reduce their fluency of speech, but they gear their attention toward lexical complexity and accuracy, while the here-and-now dimension only slightly improves fluency. As far as [+/-planning time] is concerned, increasing task complexity by reducing planning time does not seem to direct learners' attention to any grammatical features of the language.

However, with pre-task planning time given to the learners they displayed improvements in lexical variety as well as in fluency.

1.5.2 +/- Few elements studies

A small number of studies has been carried out which investigate the +/- few elements factor. As we pointed out in a previous section, the Cognition Hypothesis predicts that an increased number of elements results in more complex and more accurate speech, but it causes disfluency. The experiments dealt with this factor have mainly agreed as for the fluency dimension. However, they obtained different results for complexity and accuracy.

Robinson (2001) manipulated the +/- few elements variable in an oral interactive task. 44 Japanese university undergraduates participated in the study. They were randomly assigned for the role of speaker (information-giver) or hearer (information-receiver) on two map tasks (one map was one of a small area, whereas another was a map of a larger authentic Tokyo area). The speaker was asked to give directions from A to B using a map. To measure fluency the number of words per C-unit was used. Syntactic complexity was assessed by a measure of subordination, clauses per C-unit. Accuracy was assessed using a general measurement, error-free C-unit. Results of the study of the relationship between task complexity, difficulty, and production showed that increasing the cognitive complexity of the task affects speaker-information-giver production and hearer-information-receiver interaction. The more cognitively complex task promoted significantly richer speech, while neither structural complexity nor accuracy showed any significant effects. Cognition complexity also significantly affects learner perceptions of difficulty, rated on a 9-point Likert scale. Task role assigned to learners significantly affects perception of difficulty, while sequencing affects the accuracy and fluency dimensions of L2 oral production.

Kuiken and Vedder (2007) aimed at investigating the effects of increasing the demands of tasks on syntaxic complexity, lexical variation and accuracy in L2 written production, as well as the interaction of task complexity with proficiency level. 91 students of Italian and 76 students of French involved in the experiment were asked to write a letter to a friend in a task which was manipulated along the number of elements. Linguistic performance in French was operationalised as accuracy (total number of errors per T-unit), syntactic complexity (the number of clauses per T-unit) and lexical

variation (type-token ratio). They found partial evidence in support of Robinson's Cognition Hypothesis, as the performance of the complex task contained fewer errors than those based on the less complex task. It also seemed to be lexically more varied. However, they suggested that further investigation is needed to confirm such a statement. In contrast with earlier studies they did not detect that the effect of task complexity on accuracy was stronger for high-proficiency learners.

Michel, Kuiken and Vedder (2007) partially questioned the Cognition Hypothesis with respect to its predictions of the effects of task complexity (+/- few elements) and task condition (+/- monologic) on L2 production. 44 learners of Dutch performed both a simple and a complex task in either a monologic or a dialogic condition. The L2 performance was analyzed in terms of fluency, assessed by pruned and unpruned speech rate; lexical complexity, measured by Guiraud's Index of Lexical Complexity and the percentage of lexical words in relation to the total number of words; structural complexity, measured by means of the total number of clauses per AS unit and by a subordination index; and accuracy calculated by the total number of errors per AS unit, the number of lexical errors as well as the total number of AS units. As predicted by the Cognition Hypothesis, increased cognitive complexity promoted more accurate, but less fluent speech. On the other hand, linguistic complexity was not significantly affected. The dialogic condition generated more accurate and fluent L2 production. However, learners produced less structurally complex speech. The interaction of task complexity and task condition was only statistically significant for accuracy: in the monologic condition task complexity prompted more accurate performance.

Gilabert (2007) analysed the effects of manipulating the cognitive complexity (+/- few elements, +/- here-and-now and +/- reasoning demands) of L2 oral tasks on L2 production. He was particularly interested in using self-repairs as an accuracy measure, since they not only indicate attention to form but also learners' attempts at being accurate. 42 learners of English were asked to perform three different task types: a narrative task manipulated along +/- Here-and-Now; an instruction-giving task manipulated along +/- few elements; and a decision-making task manipulated along +/- reasoning demands. Repeated-measures design was used for the comparison of stories and conditions, whereas one-way ANOVA was chosen to detect potential differences between low-intermediate and high-intermediate students. Results confirmed the

prediction of the Cognition Hypothesis which states that the task performed under complex conditions would trigger less errors and therefore significantly higher levels of accuracy (rate and proportion of repairs). No differences were found in terms of self-repairs between low and high proficiency students. In relation to the trade-off effects between fluency and accuracy or complexity and accuracy in the L2 oral production, the results show that attention can be devoted to "form" while communicating meaning.

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The focus of the present study is to analyze the effects on L2 performance of manipulating two factors: a resource-directing one (the number of elements) and a resource-dispersing variable (pre-task planning time). Additionally, it is also my interest to analyze the L2 oral production of learners coming from two different L1 backgrounds (Romaine and Slavic languages).

As far as I know, only a few studies (Robinson, 2005; Michel, Kuiken & Vedder 2007; Gilabert, 2007) have combined simultaneously two cognitive variables and no studies have specifically looked at the effects of manipulating the number of elements and the amount of planning time. The study is therefore an attempt at analyzing unexplored dimensions within the field of task complexity studies.

1.6 Questions and hypotheses

1.6.1 Research questions

Following the Cognition Hypothesis (Robinson, 2005) and the results of previous studies, I've drawn on the following research questions:

1. How does the number of elements included in a task affect the fluency, complexity and accuracy of L2 learners?
2. How does the amount of time allotted to planning performance affect fluency, complexity and accuracy of L2 learners' speech?
3. Are there any combined effects of simultaneously manipulating the number of elements and the amount of pre-task planning time?
4. Does task complexity match learners' perception of task complexity?

5. Are there any differences in the performance of participants with two different L1 backgrounds?

1.6.2 Hypotheses

This study is motivated by the fact that there is no research evidence regarding the synergistic effects of combining pre-task planning time and the number of elements of a task. On the other hand, this study is an attempt to shed more light on attention to form and predictions regarding the trade-off effects among fluency, complexity and accuracy of increased task complexity on L2 production.

In order to provide an answer to the research questions above, the following hypotheses are advanced:

1. Reducing task cognitive complexity along pre-task planning time will increase learners' fluency and lexical complexity, but the structural complexity and accuracy dimensions will not be affected significantly. On the contrary, increasing cognitive complexity along planning time will have negative effects on all dimensions of production.
2. Increasing cognitive complexity along the number of elements will increase lexical complexity, structural complexity and accuracy, but it will cause disfluency.

No hypotheses are advanced with regard to research questions 3 and 4 since there is little research evidence to support any directional hypotheses. In addition, possible differences between L2 `production of two groups of participants (Russian and Spanish) will be analyzed due to the fact that eight participants out of fourteen were Russian and other six were Spanish. Again, no hypotheses will be put forward in this context, since there is also a gap in the studies focusing on participants of different L1 backgrounds.

CHAPTER II

THE EXPERIMENT

2.1 Experimental design

A repeated-measures design was used in which the within-learner factor was Task Complexity. Due to the small number of participants (14) a non-parametric statistical analysis was carried out to measure the effects of Task Complexity and the differences among task conditions. The participants were asked to perform four different tasks (see Table 1).

Table 1 *Four conditions of task manipulation*

		Resource-dispersing variable	
		Planned time	*Unplanned time*
Resource-directing variable	*Few elements*	**Condition 1** Few elements Planned time	**Condition 2** Few elements Unplanned time
	Many Elements	**Condition 3** Many elements Planned time	**Condition 4** Many elements Unplanned time

In order to avoid carryover effects from one task performance to another, students were randomly assigned to four different sequences in a Latin Square design (see Table 2). Affective perception was tested by means of an affective variable questionnaire[1] in which learners rated task difficulty, stress, confidence, interest and motivation on a 9-point Likert scale (used by Robinson, 2001; Gilabert, 2007).

2.2 Participants

Two groups of Russian (8 participants) and Romance-language speakers (5 Catalan and 1 French) learning English participated in the experiment on a volunteer basis. All the participants had an intermediate level of

[1] The use of Affective Questionnaire is particularly important since, to this date, we do not have validated scales of task complexity making sure that the operationalisation of task complexity matches perception is therefore of utmost importance.

Table 2 *Latin Square Design*

	Condition	**Condition**	**Condition**	**Condition**
Group 1	I	II	III	IV
Group 2	IV	I	II	III
Group 3	III	IV	I	II
Group 4 (…)	II	III	IV	I

English. Proficiency was controlled for by means of the X-Lex (Meara & Milton, 2005) and Y-Lex tests (Meara & Miralpeix, 2006). Results displayed a normal curve and no outliers were found. Participants received instruction in English with an average of 7 years and in different institutions (Colleges, Universities, and Official Schools of Languages in Spain, Language Centres and Private Classes). Learners' age ranged between 22 and 60. Ten participants had also learnt French, two out of fourteen Spanish, and two others – German (see Appendix A).

2.3 Design

A repeated-measured design was used with four levels of Task complexity as the independent variable:

Condition 1: Planned few elements

Condition 2: Unplanned few elements

Condition 3: Planned more elements

Condition 4: Unplanned more elements

A non-parametric statistical analysis of the dependent variables was applied. The variables included: unpruned speech rate (Rate A) and pruned speech rate for fluency (Rate B); Guiraud's Index of lexical richness and Ratio of lexical to function words for lexical complexity; the S-Nodes per AS-units for structural complexity, the total number of errors per AS unit and, the total number of errors per clause. Measures are described in Section 2.5.

2.4 Tasks and Procedures

The experiment consisted of two parts. Firstly, the participants were given a questionnaire which was administered in order to retrieve personal information, such as their English learning background and their knowledge of other languages (see Appendix A).

In a task design with +/- few elements and +/- planning time as a within-subject factor each of the 14 participants performed 4 tasks. Following the task design elaborated by Michel, Kuiken and Vedder (2007), participants received a full-colour leaflet with two holiday destinations or two flat descriptions in their L1 (Catalan or Russian, respectively) in the simple task (few elements) and with six holiday destinations or flat descriptions in the complex task (many elements). All the descriptions have the same type of elements and very similar features (e.g. price, duration, square meters) in order to counterbalance the different versions of two simple and two complex tasks. Subjects were instructed to leave a message on the answering machine of a friend's cell phone who had asked them for advice about the destination they should choose for their holidays or the flat they should rent in Paris. As for the +/- planning time variable, participants were given five minutes for planned narratives and one minute for unplanned ones. Task design was previously tested during a pilot study (Levkina, 2007).

In order to counterbalance carryover effects subjects were given only two tasks in each session. It was thought that this way the effects of fatigue would be avoided. As mentioned before, the participants performed the four tasks in a different order, with the use of a Latin square design, to counterbalance the effects of sequence of their performance. While performing, the participants were allowed to use the sheets with the characteristics of the holiday destinations and flat descriptions written in their native language (Catalan or Russian), since the goal was for participants to have no linguistic support in English. The participants were not limited as far as the duration of their task performance was concerned.

2.5 Production measures

The output was coded for oral production in terms of fluency, lexical complexity, structural complexity and accuracy.

With respect to fluency, two measures were chosen following Yuan and Ellis (2003): Rate A, as the number of syllables within each narrative, divided by the total number of seconds used to complete the task and multiplied by 60; Rate B, the same calculation as for Rate B, but repetitions, reformulations, false starts, and comments in the L1 were excluded from the calculation. The advantage of both measures is that they take into account the amount of speech (the number of syllables) and the length of pauses (the total number of seconds), Rate B being more precise since it excludes elements such as repetitions or reformulations and through which learners sometimes try to gain time. These two measures have been extensively used in the literature (Mehnert, 1998; Ortega, 1999; Gilabert, 2007; Michel, Kuiken & Vedder, 2007).

Lexical complexity was measured by Guiraud's Index of Lexical Complexity (Guiraud, 1954) and the percentage of lexical words in relation to the number of function words (Robinson, 2001; Gilabert, 2005; Michel et al., 2007). Guiraud's index was calculated by dividing the number of types by the square root of the number of tokens. This measure compensates for text length since it includes the square root of the tokens, which makes it more appropriate than a simple type-token ratio (Malvern & Richards, 1997). Structural complexity was measured by means of the total number of clauses per AS unit as a general measurement.

Regarding accuracy, it was calculated by means of the total number of errors per AS-Units (Michel, Kuiken & Vedder 2007), as well as the total number of errors per clause. The decision to use the second measurement was guided by the fact that the task elaborated for this experiment pushed the participants to use multiple-clause sentences that needed to be taken into account and calculated in terms of a more precise measure. Errors units included syntactic, morphological and lexical choice errors.

2.6 Statistical instruments

A Microsoft Excel spread sheet was used to introduce data for further statistical analysis and Microsoft word was used for Figures and Graphics. All statistical analyses were carried out with SPSS 15 for Windows.

Three different kinds of statistical tests were used for data analyses: Friedman test, which provides information about means and standard deviations; the Wilcoxon signed-rank test for a pair-wise comparison among the four Conditions; and Spearman

correlations were used to see any correlations between production measures and affective variables.

2.7 Transcription and Coding

Speech samples were transcribed using CLAN (MacWhinney, 2000). The transcription of the narratives was carried out by the researcher and the interrater which was given a sample of 10 % of randomly selected data. Interrater reliability was calculated by means of percentage agreement. The percentages of interrater reliability reached for the coding of task performance are the following:

Fluency:	Rate A = 95%
	Rate B = 97%
Lexical Complexity:	Guiraud's Index = 88%
	% of lexical words = 88%
Structural Complexity:	S-nodes per AS-units = 90 %
Accuracy:	Error-free AS-units = 87%
	Error-free clauses = 86%

Table 3 *Descriptive statistics for affective variables by task: difficulty, stress, confidence, interest, and motivation*

Dependent Variable	***Condition 1***				***Condition 2***				***Condition 3***				***Condition 4***			
	Few elements Planned				***Few elements Unplanned***				***Many elements Planned***				***Many elements Unplanned***			
	M	***SD***	***Sk***	***K***	***M***	***SD***	***Sk***	***K***	***M***	***SD***	***Sk***	***K***	***M***	***SD***	***Sk***	***K***
Difficulty (n=14)	4,50	1,65	,477	-,151	4,36	1,78	,321	-,257	5,50	1,56	-,857	1,138	5,64	1,78	-,607	-,132
Stress (n=14)	5,50	1,95	0,036	-,432	5,43	2,06	-,004	-,872	5,29	1,82	-,316	-1,961	5,64	1,86	-,303	-,028
Confidence (n=14)	4,50	1,40	,294	,226	4,57	1,55	,991	,390	4,29	1,27	,698	-,150	4,21	1,48	-,762	,393
Interest (n=14)	6,36	2,21	1,18	1,20	5,79	2,03	-1,30	1,42	6,57	2,03	-1,64	3,63	6,50	1,91	-1,85	5,09
Motivation (n=14)	5,86	2,63	-,829	-,184	5,14	2,71	-,553	-1,162	5,79	2,39	-1,083	,726	6,00	2,57	-,918	,259

M = mean; SD – standard deviation; Sk – skewness; K – kurtosis.

CHAPTER III

RESULTS

3.1 Introduction

This section reports the results obtained from the statistical analysis of the data. They are presented according to the research questions and the hypotheses presented in Section 1.6. Due to the fact that a small sample was used (n=14), all the participants, including the statistically detected outliers, were counted in the statistical analysis of the data. Affective perception variables are presented first, which are followed by the results related to the effects of task manipulation on the three dimensions of oral production.

3.2 Affective perception results

As seen from the Table 3 and Table 4, a non-parametric analysis for the five affective variables[2] showed a significant main effect for the perception of difficulty, whereas no significant main effects were found for stress, confidence, interest or motivation. The learners graded Condition 1 (+ planning time / + few elements[3]) and Condition 2 (- planning time / + few elements) as simpler, in comparison with Condition 3 (+planning time / - few elements) and Condition 4 (- planning time / - few elements).

Table 4 *Friedman test for affective variables by task: difficulty, stress, confidence, interest, and motivation*

Dependent variables	N	X^2	Df	p
Difficulty	14	10,132	3	0,017*
Stress	14	0,371	3	0.946
Confidence	14	1,029	3	0,794
Interest	14	3,494	3	0,322
Motivation	14	6,038	3	0,110

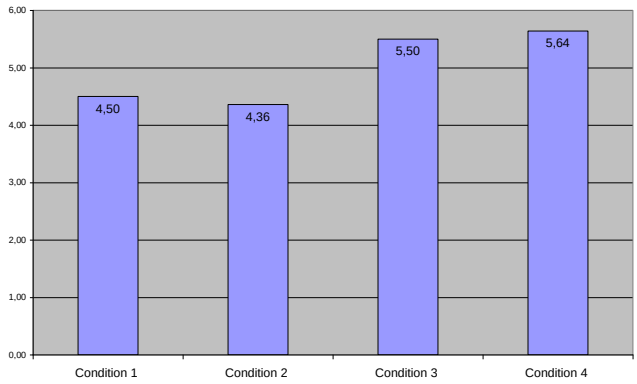
X^2 - chi-square; df – degree of freedom; $p < 0,05$

[2] The affective perception questionnaire was used to check whether the operationalization of Task Complexity was matched by the learners' perception

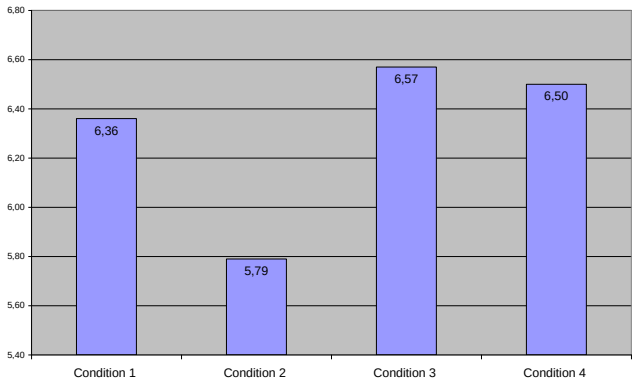
[3] + planning time = with pre-task planning time
- planning time = without pre-task planning time
+ few elements = few elements
- few elements = many elements
These labels will be used alternatively in the report of results

Pairwise comparisons carried out by using Wilcoxon signed-rank tests (see Table 5) showed that participants perceived the complex task along +/- few elements as more difficult than the complex task along +/- planning time. Pairwise comparisons for interest showed a strong trend between Condition 2 (- planning time / + few elements) and Condition 3 (+ planning time / – few elements), with Condition 3 being perceived as more interesting.

Figures 1 & 2 *Results of the affective variable questionnaire*



Difficulty



Interest

Finally, for motivation's pairwise comparisons a main effect was found between Condition 2 (- planning time / + few elements) and Condition 4 (- planning time / - few elements), as the learners felt more motivated while performing with increased number of elements and without pre-task planning time.

Figure 3 *Results of the affective variable questionnaire: motivation*

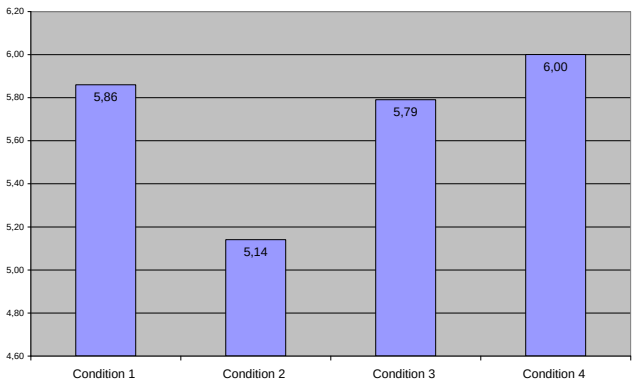


Table 5 *Wilcoxon signed-rank test of pairwise comparisons for affective variables by task: difficulty, stress, confidence, interest, and motivation*

Dependent Variable	**Condition 1** ***Few elements Planned*** ***vs*** **Condition 2** ***Few Elements Unplanned***		**Condition 1** ***Few elements Planned*** ***vs*** **Condition 3** ***Many Elements Planned***		**Condition 1** ***Few elements Planned*** ***vs*** **Condition 4** ***Many Elements Unplanned***		**Condition 2** ***Few elements Unplanned*** ***vs*** **Condition 3** ***Many Elements Planned***		**Condition 2** ***Few elements Unplanned*** ***vs*** **Condition 4** ***Many Elements Unplanned***		**Condition 3** ***Many Elements Planned*** ***vs*** **Condition 4** ***Many Elements Unplanned***	
	Z	***p***	***Z***	***p***	***Z***	***P***	***Z***	***p***	***Z***	***p***	***Z***	***p***
Difficulty (n=14)	-,316	0,752	-2,401	0,016*	-2,156	0,031*	-2,169	0,030*	-1,876	0,061	-,503	0,615
Stress (n=14)	-,259	0,796	-,206	0,837	-,275	0,784	-,361	0,718	-,463	0,643	-,884	0,377
Confidence (n=14)	-,306	0,760	-,884	0,377	-,534	0,593	-,517	0,605	-,618	0,537	-,250	0,803
Interest (n=14)	-1,273	0,203	-,425	0,671	-,514	0,607	-1,913	0,056	-1,642	0,101	-,264	0,792
Motivation (n=14)	-1,310	0,190	-,378	0,705	-1,379	0,168	-1,219	0,223	-2,430	0,015*	-,264	0,792

* $p < 0,05$

The findings about learners' difficulty perception of the task manipulated along +/- few elements is in the line with previous studies (Robinson, 2001; Gilabert, 2005; Gilabert, 2007), since the results of X-Lex and Y-Lex tests of proficiency for normality of the participants showed no significant difference, that means that the level of proficiency does not significantly affect the results of difficulty perception as in Gilabert (2007). Two conclusions can be drawn based on the affective variable questionnaire: the overall operationalization of the task from simple to complex versions was confirmed by the perception of participants; however, this perception was caused by the increase of task complexity along +/- few elements, but not along +/- planning time[4].

Results show that although more complex tasks are perceived as more difficult (according to the operationalisation) they are not perceived as less interesting or motivating but quite on the contrary. This may suggest that, for pedagogical reasons, learners may perceive complex tasks as more challenging.

3.3 Effects of increasing task complexity along planning time on L2 oral production

I hypothesized that providing pre-task planning time would increase learners' fluency and lexical complexity, but structural complexity and accuracy would not be significantly affected, whereas an unplanned time condition would affect negatively all dimensions of oral production.

Table 6 *Friedman test for three dimensions: fluency, lexical and structural complexity, and accuracy*

Dependent variables	***N***	X^2	***df***	***p***
Unpruned speech rate	14	2,143	3	,543
Pruned speech rate	14	1,543	3	,672
Guiraud's Index	14	10,029	3	,018*
% lexical words	14	4,714	3	,194
Structural Complexity	14	4,065	3	,255
% error-free ASU	14	4,338	3	,227
% error-free clauses	14	2,482	3	,479

X^2 - chi-square; df – degree of freedom; $p < 0,05$

[4] Stress and confidence are not reported by means of graphs for the sake of space.

Table 7 *Descriptive statistics for the three dimensions: fluency, lexical and structural complexity, and accuracy*

Dependent Variable	**Condition 1**				**Condition 2**				**Condition 3**				**Condition 4**			
	+ Few elements + Planning time				***+ Few elements – Planning time***				***- Few elements + Planning time***				***- Few elements – Planning time***			
	M	***SD***	***Sk***	***K***	***M***	***SD***	***Sk***	***K***	***M***	***SD***	***Sk***	***K***	***M***	***SD***	***Sk***	***K***
Unpruned speech rate (n=14)	126,26	28,00	0,27	-,998	118,10	30,64	,94	1,13	114,65	24,87	,252	,060	116,38	30,50	,978	1,473
Pruned speech rate (n=14)	112,38	31,41	0,15	-,886	101,18	27,76	1,49	3,76	104,44	28,17	,275	,195	105,90	31,39	1,1015	, 521
Guiraud's Index (n=14)	6,26	,83	-,55	-,339	5,73	,67	-,97	2,76	6,14	,52	,206	,860	6,26	,65	-,064	-1,460
% lexical words (n=14)	60,66	14,68	-,76	1,99	53,22	14,12	-1,08	1,10	63,49	9,83	,963	1,940	67,51	12,64	,232	-1,027
Structural Complexity (n=14)	1,52	,27	-,26	-,433	1,51	,28	1,31	2,03	1,46	,25	,643	,114	1,37	,21	-,304	-,471
% error-free ASU (n=14)	58,64	13,01	-,30	-,760	50,81	13,12	,084	-,86	51,84	19,22	,238	,021	53,17	14,93	-,982	1,652
% error-free clauses (n=14)	51,52	13,13	-,37	-,682	59,98	16,73	-,10	-1,23	53,34	14,49	-,941	,479	54,74	17,89	-1,383	2,953

M = mean; SD – standard deviation; Sk – skewness; K – kurtosis.

The results showed that when learners are given time for preparing, they produce more lexically and structurally complex speech, while there is not a significant impact on fluency and accuracy. Conversely, performing without pre-task planning time negatively affects lexical and structural complexity, whereas fluency and accuracy are not significantly transformed (see Table 6, Table 7 and Table 8).

The hypothesis was partially confirmed for lexical complexity and structural complexity, which were negatively affected when performing without pre-task planning time; as for accuracy, it was not significantly transformed when providing time for planning (see Table A).

Table A *Results for four conditions of three dimensions: fluency, lexical complexity, structural complexity, and accuracy*

Dependent Variable	**Condition 1** ***+ Few elements*** ***+ Planning time***	**Condition 2** ***+ Few elements*** ***- Planning time***	**Condition 3** ***- Few elements*** ***+ Planning time***	**Condition 4** ***- Few elements*** ***- Planning time***
Unpruned speech rate	↓	=	↑	=
Pruned speech rate	=	=	=	=
Guiraud's Index	↑	↓	↑	↑
% lexical words	=	↓	↑	↑
Structural Complexity	↑	=	=	↓
% error-free ASU	=	=	=	=
% error-free clauses	=	=	=	=

3.3.1 Planning time under + few elements condition

As seen from Figure 4 and Figure 5, having planning time before task performance along few elements made learners more fluent, but not significantly (see Table 8; [p=0,272] for unpruned speech rate and [p=0,470] for pruned speech rate). Lexical complexity also seems to improve with pre-task planning time (see Figure 6) and Wilcoxon signed-rank text showed a significant difference (p=0,041) between Condition 1 (+ few elements / + planning time) and Condition 2 (+ few elements / - planning time). The percentage of lexical words (see Figure 7) shows a strong trend between Conditions 1 and 2, whereas Structural Complexity (see Figure 8) is not affected by planning time (p = 0,826). As for accuracy, the two measures (the percentage of error-free AS-units and the percentage of error-free clauses have the opposite results for planning time dimensions along few elements (see Figure 9 and Figure 10). Learners are more accurate with pre-task planning time according to the results of the percentage of error-free AS-unit

measurement. However, in the case of the percentage of error-free clauses reported accuracy increased when performing without planning time under few elements condition. Pairwise comparison did not reveal any significant difference for accuracy measures.

3.3.2 Planning time under - few elements condition

Regarding fluency, there was a slight increase in fluency where reducing planning time condition for both unpruned speech rate and pruned speech rate measures (see Figure 4; Figure 5), but Wilcoxon signed-rank test did not reveal a significant effect between Condition 3 (- few elements / + planning time) and Condition 4 (- few elements / - planning time). Similarly, increased cognitive complexity along +/- planning time causes the lexical complexity dimension to rise, as measured both by the Guiraud's index of lexical richness and the percentage of lexical words (see Figure 6 and Figure 7), but a pairwise comparison of the conditions did not attest a significant difference. between them (see Table 8). Structural complexity, measured by S-nodes per AS-units, was negatively affected by increased task complexity along +/- planning time with many elements condition (see Figure 8). Meanwhile, there was no significant difference for structural complexity between Condition 3 and 4 (see Table 8). Finally, accuracy slightly increased, although not significantly, while performing under Condition 4 (- few elements – planning time -- see Figure 9, Figure 10), measured by the percentage of error-free AS-units and the percentage of error-free clauses (see Table 8).

3.4 Effects of increasing task complexity along the number of elements on L2 oral production

With Hypothesis 2 we set to investigate the impact of increasing complexity along +/- few elements variable under both planned and unplanned conditions. It was predicted that increasing cognitive complexity of the task along the amount of elements would affect fluency negatively, but cognitively complex tasks along +/- few elements would increase learner's lexical complexity, structural complexity and accuracy. Results provide evidence that increasing the number of elements in the task affects fluency and structural complexity negatively, whereas lexical complexity significantly increases. Accuracy is not significantly affected by changes of the number of elements in the task (see Table 6; Table 7 and Table 8). Therefore, my hypothesis is partially confirmed for fluency, and for lexical complexity, but not for structural complexity, nor for accuracy.

Results corresponding to Hypothesis 1

Figure 4. *Fluency measure: unpruned speech rate*

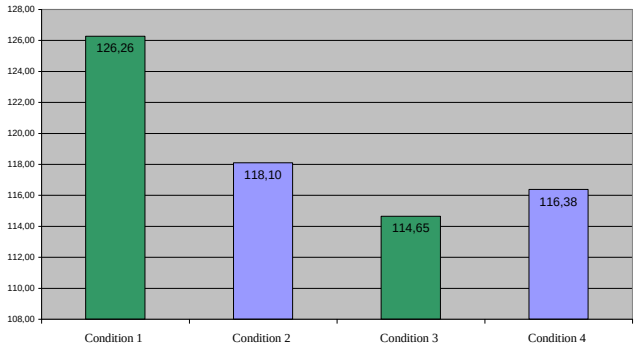


Figure 5. *Fluency measure: pruned speech rate*

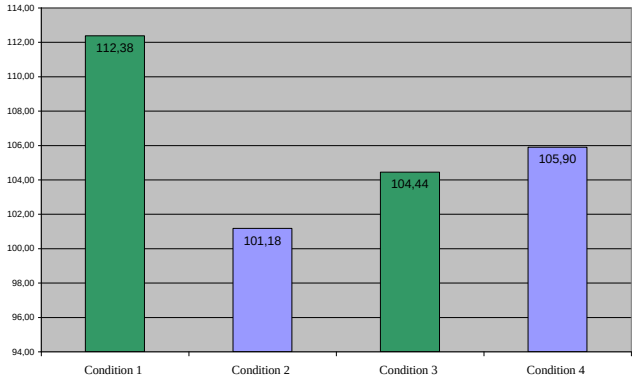


Figure 6. *Lexical complexity: Guiraud's index of lexical richness*

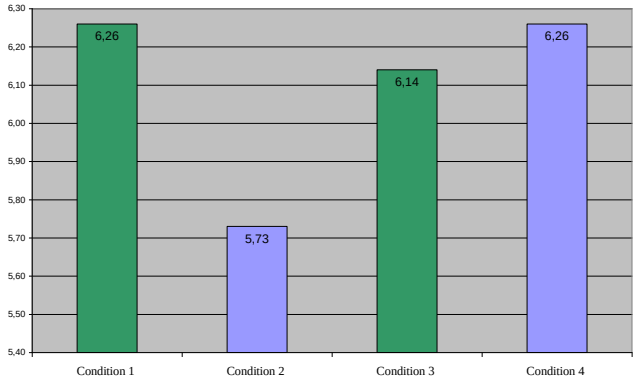


Figure 7. *Lexical complexity: percentage of lexical words*

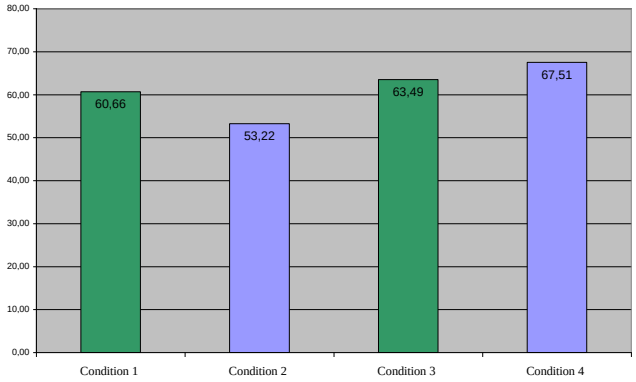


Figure 8. *Structural Complexity measure: clauses per AS-units*

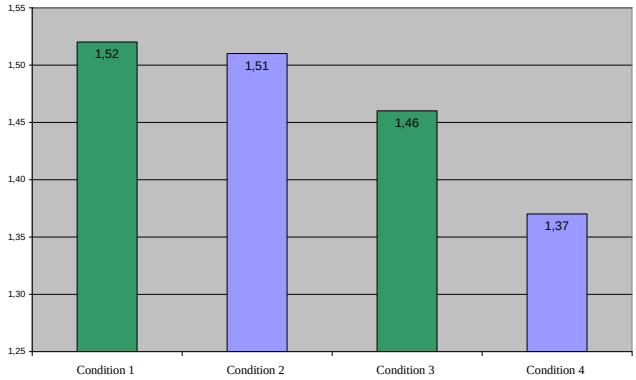


Figure 9. *Accuracy measure: percentage of error-free AS-units*

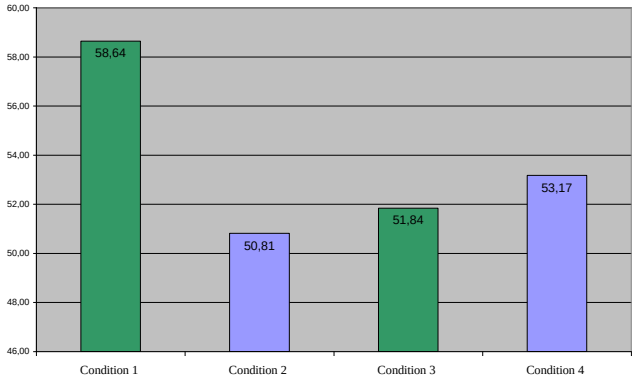
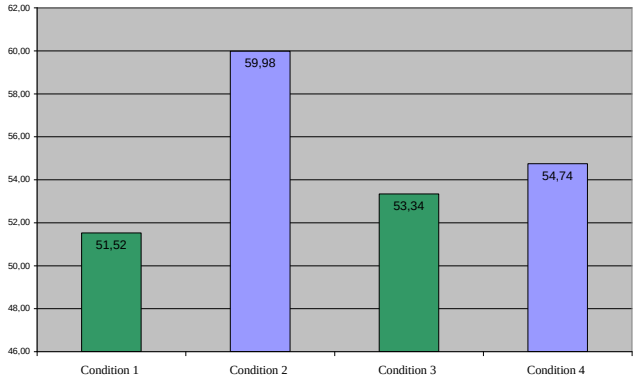


Figure 10. *Accuracy measure: percentage of error-free clauses*



Condition 1: Planned few elements

Condition 2: Unplanned few elements

Condition 3: Planned more elements

Condition 4: Unplanned more elements

Table 8. *Wilcoxon signed-rank test of pairwise comparisons for three dimensions: fluency, lexical and structural complexity, and accuracy*.

Dependent Variable	**Condition 1** ***Few elements Planned*** ***vs*** **Condition 2** ***Few Elements Unplanned***		**Condition 1** ***Few elements Planned*** ***vs*** **Condition 3** ***Many Elements Planned***		**Condition 1** ***Few elements Planned*** ***vs*** **Condition 4** ***Many Elements Unplanned***		**Condition 2** ***Few elements Unplanned*** ***vs*** **Condition 3** ***Many Elements Planned***		**Condition 2** ***Few elements Unplanned*** ***vs*** **Condition 4** ***Many Elements Unplanned***		**Condition 3** ***Many Elements Planned*** ***vs*** **Condition 4** ***Many Elements Unplanned***	
	Z	***p***	***Z***	***p***	***Z***	***P***	***Z***	***p***	***Z***	***p***	***Z***	***p***
Unpruned speech rate (n=14)	-1,099	,272	-2,229	,026*	-1,789	,074	-,973	,331	-,157	,875	-,094	,925
Pruned speech rate (n=14)	-,722	,470	-1,601	,109	-1,161	,245	-,031	,975	-,220	,826	-,031	,975
Guiraud's Index (n=14)	-2,040	,041*	-,722	,470	-,785	,433	-2,291	,022*	-2,542	,011*	-,847	,397
% lexical words (n=14)	-1,789	,074	-,596	,551	-,785	,433	-2,229	,026*	-2,291	,022*	-,847	,397
Structural Complexity (n=14)	-,220	,826	-,847	,397	-2,062	,039*	-,596	,551	-1,789	,074	3,296	,133
% of error-free ASU (n=14)	-1,664	,096	-1,161	,245	-3,296	,245	-,031	,975	-,534	,594	-384	,701
% of error-free clauses (n=14)	-,384	,701	-,345	,730	-,847	,397	-,546	,551	-1,412	,158	-,596	,551

* p < 0,05

3.4.1 +/- Few elements under + planning time condition

A non-parametric statistical analysis showed a significant difference for fluency in unprunned speech (p = 0,026) between Condition 1 (+ planning time / + few elements) and Condition 3 (+ planning time / - few elements), which increases with a reduced number of elements (see Table 8; Figure 4). However, pruned speech rate did not display a significant difference between them (see Table 8; Figure 5). Regarding lexical and structural complexity, there was no significant difference between the two Conditions, calculated by means of Guiraud' index of lexical richness, and the percentage of lexical words (see Table 8; Figure 6; Figure 7). Increasing the number of elements learners need to deal with during task performance along planning time conditions caused less structurally complex speech among the learners (see Figure 8), whereas a pairwise comparison test did not report a significant difference between the two Conditions. The graphs show a difference between Condition 1 (+ few elements / +planning time) and Condition 3 (- few elements / - planning time) for accuracy, measured by the percentage of error-free AS-units (see Figure 9), and almost no difference when calculated by means of the percentage of error-free clauses (see Figure 10). However, pairwise comparisons tests did not display a significant difference for neither measure (see Table 8).

3.4.2 +/- few *elements under - planning time condition*

There was no significant difference between Condition 2 and Condition 4 for fluency, measured by unpruned speech rate (see Figure 4); as for pruned speech rate for fluency there was a trend between the two Conditions (see Figure 5). However, a pairwise comparison test did not show significant differences for fluency between the Conditions (see Table 8). Condition 2 affected negatively lexical complexity, with the results form the Guiraud's index being stronger (see Figure 6). A pairwise comparison test confirmed a significant difference for both the Guiraud's index and the percentage of lexical words measurements (see Table 6). Increasing the number of elements when no planning time was provided seemed to have an impact on structural complexity of oral production (see Figure 8). As far as accuracy is concerned, the opposite results for Condition 2 and Condition 4 were obtained between the percentage of the error-free AS-units (see Figure 9) and the percentage of error-free clauses (see Figure 10). The difference was not significant in terms of the results of a pairwise comparison test (see Table 8).

Results corresponding to Hypothesis 2

Figure 4. *Fluency measure: unpruned speech rate*

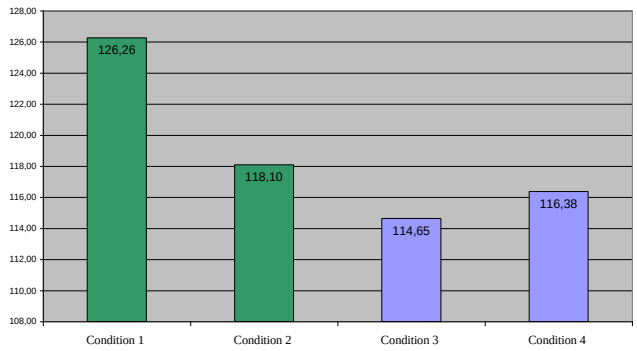


Figure 5. *Fluency measure: pruned speech rate*

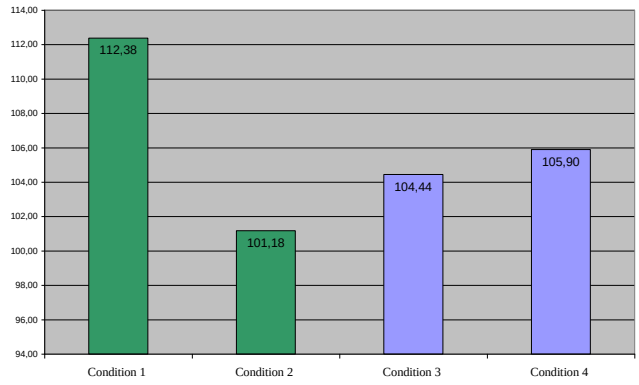


Figure 6. *Lexical complexity: Guiraud's index of lexical richness*

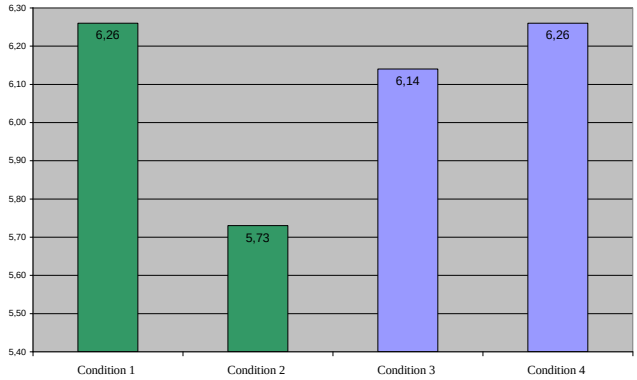


Figure 7. *Lexical complexity: percentage of lexical words*

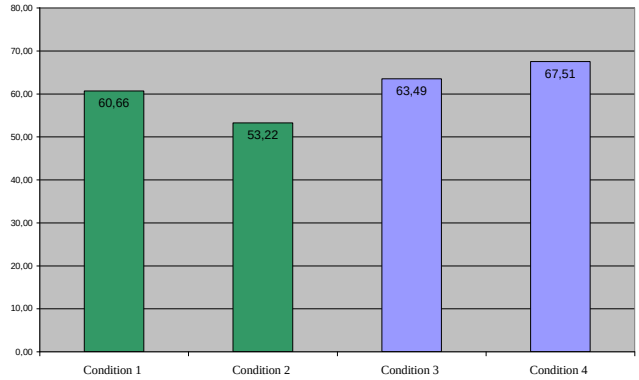


Figure 8. *Structural Complexity measure: AS-units per S-nodes*

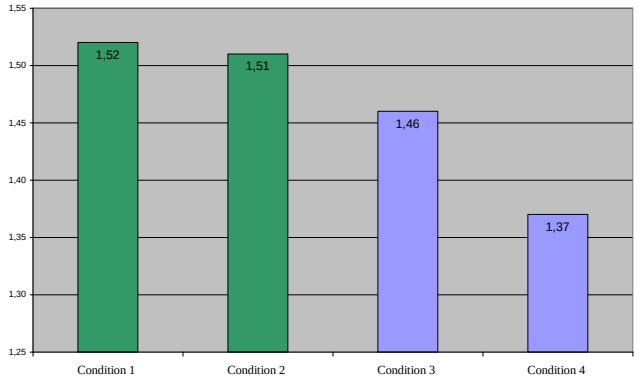


Figure 9. *Accuracy measure: percentage of error-free AS-units*

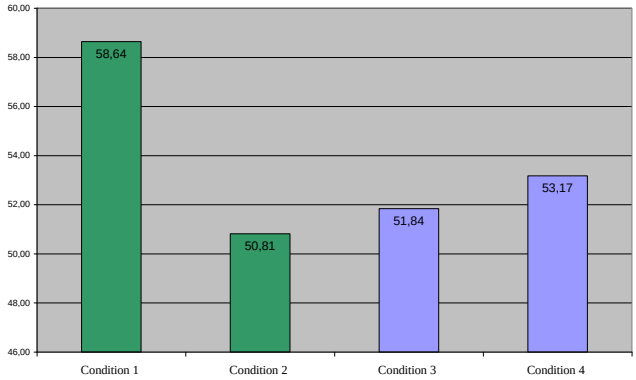
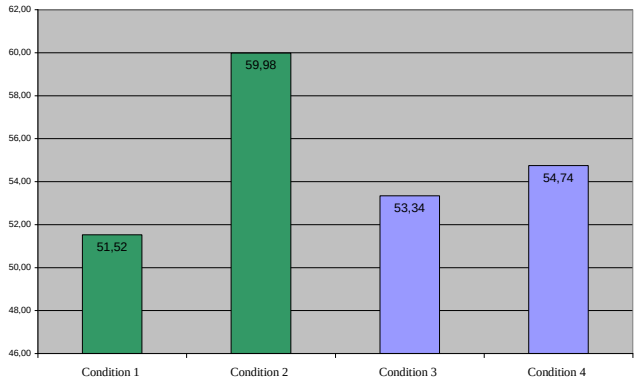


Figure 10. *Accuracy measure: percentage of error-free clauses*



Condition 1: Planned few elements

Condition 2: Unplanned few elements

Condition 3: Planned more elements

Condition 4: Unplanned more elements

3.5 Combined effects of simultaneously manipulating the number of elements and the amount of pre-task planning time

Table B. *Combined results for three dimensions: fluency, lexical complexity, structural complexity, and accuracy*

Dependent Variable	**Condition 1 *vs* Condition 2**	**Condition 1 *vs* Condition 3**	**Condition 1 *vs* Condition 4**	**Condition 2 *vs* Condition 3**	**Condition 2 *vs* Condition 4**	**Condition 3 *vs* Condition 4**
Unpruned speech rate	=	↑↓	=	=	=	=
Pruned speech rate	=	=	=	=	=	=
Guiraud's Index	↑↓	=	=	↓↑	↓↑	=
% lexical words	=	=	=	↑↓	↑↓	=
Structural Complexity	=	=	↑↓	=	=	=
% of error-free ASU	=	=	=	=	=	=
% of error-free clauses	=	=	=	=	=	=

We had no hypothesis regarding the effects of simultaneously manipulating the number of elements and +/- planning time on L2 oral production, since there is no sufficient research evidence in this area. Wilcoxon signed-rank test ratings for unpruned speech showed a positive effect on oral fluency along reduced number of elements: Condition 1 (+ few elements + planned time) versus Condition 3 (- few elements / + planned time) (see Table 8). However, there was no significant difference among these conditions for pruned speech rate. With regard to lexical complexity the results assessed a significant difference both along +/-planning time and +/- few elements manipulation. A pairwise comparison for Guiraud's index for lexical richness detected a significantly positive effect of manipulating cognitive complexity along +/- few elements: Condition 2 (+ few elements / - planning time) versus Condition 3 (- few elements / + planning time) (see Table 8) and Condition 2 (+ few elements / - planning time) versus Condition 4 (- few elements / – planning time) (see Table 8); as well as with the manipulation along +/- planning time: Condition 1 (- few elements / + planning time) versus Condition 2 (few elements / - planning time) (see Table 8) and Condition 2 (+ few elements / - planning time) versus Condition 3 (- few elements / + planning time) (see Table 8). The percentage of lexical words reported a significant difference along

manipulating +/-few elements for Condition 2 (+ few elements / - planning time) versus Condition 3 (- few elements / + planning time) (see Table 8) and for Condition 2 (+few elements / - planning time) versus Condition 4 (- few elements / - planning time) (see Table 8). However, as far as manipulation of cognitive complexity along +/- planning time is concerned, it only reported significant ratings for Condition 2 (+ few elements / - planning time) versus Condition 3 (- few elements / + planning time) (see Table 8), whereas it detected a trend of significance for Condition 1 (+ few elements / - planning time) versus Condition 2 (+few elements / - planning time) comparisons (Table 8). Results for structural complexity showed a significant difference of manipulating along +/- planning time and +/- few elements for Condition 1 (+ few elements / + planning time) versus Condition 2 (- few elements / - planning time) (see Table 8) and a trend of significance while manipulating along +/- few elements: Condition 2 (+ few elements / - planning time) versus Condition 4 (- few elements / - planning time) (see Table 8). There are no significant results for accuracy when manipulating along +/- planning time, nor +/- few elements (see Table 8).

3.6 Results of the performance for the participants with two different L1 backgrounds

There were no major differences between the two groups with different L1s. The overall results of dependent variables showed a strong trend for unpruned speech rate (p=0,098) and for the percentage of error-free clauses (p=0,056) of the Russian sample (see Table 9; Table 10).

Wilcoxon signed-rank test of four conditions for the L1 Russian speakers reported a significant difference along +/- few elements for unpruned speech rate: Condition 1 (+ few elements / + planning time) versus Condition 4 (- few elements / - planning time) (see Table 11) and for the percentage of error-free clauses: Condition 2 (+ few elements - planning time) versus Condition 4 (- few elements / - planning time) (see Table 11). As for manipulating cognitive complexity along +/- planning time there is a significant difference for Condition 1 (+ few elements / + planning time) versus Condition 2 (+few elements / -planning time) in Lexical functional Ratio (see Table 11) and the percentage of error-free clauses (see Table 11) and for Condition 1 (+few elements / +planning time) versus Condition 4 (- few elements / - planning time) measured by unpruned speech rate (see Table 11). As far as the Spanish sample is

concerned there is a significant difference detected for structural complexity manipulating along +/- few elements: Condition 1 (+ few elements / + planning time) versus Condition 4 (- few elements / - planning time) (see Table 11); and for Lexical Complexity measured by Guiraud's Index of lexical richness: Condition 2 (+ few elements / - planning time) versus Condition 4 (- few elements / – planning time) (see Table 11). A significantly positive effect of planning time was assessed for structural complexity: Condition 2 (+ few elements / -planning time) versus Condition 4 (- few elements / - planning time (see Table 11).

Table 9 *Friedman test for three dimensions between Russian and Spanish samples: fluency, lexical and structural complexity, and accuracy*

Dependent variables	***Russian sample***				***Spanish sample***			
	N	***X2***	***df***	***p***	***N***	***X2***	***df***	***p***
Unpruned speech rate	8	6,300	3	0,098	6	3,000	3	,392
Pruned speech rate	8	4,650	3	,199	6	,600	3	,896
Guiraud's Index	8	4,950	3	,175	6	6,200	3	,102
% lexical words	8	2,700	3	,440	6	2,200	3	,532
Structural Complexity (n=8/6)	8	1,253	3	,740	6	4,627	3	,201
% of error-free ASU (n=8/6)	8	2,924	3	,403	6	2,000	3	,572
% of error-free ASU (n=8/6)	8	7,557	3	,056	6	,600	3	,896

X^2 - chi-square; df – degree of freedom; $p < 0,05$

Table 10 *Descriptive statistics for three dimensions between Russian and Spanish samples: fluency, lexical and structural complexity, and accuracy*

Dependent Variable (n=Russian/Spanish)	***Condition 1 Few elements Planned***				***Condition 2 Few elements Unplanned***				***Condition 3 Many elements Planned***				***Condition 4 Many elements Unplanned***			
	Russian		***Spanish***		***Russian***		***Spanish***		***Russian***		***Spanish***		***Russian***		***Spanish***	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Unpruned speech rate (n=8/6)	120,96	31,52	133,33	23,30	108,99	35,49	130,24	19,16	109,84	29,95	121,07	16,31	104,51	18,58	132,21	37,55
Pruned speech rate (n=8/6)	105,87	35,25	121,05	25,84	100,40	36,69	102,22	22,48	100,01	34,45	110,36	18,11	94,52	20,36	121,08	38,69
Guiraud's Index (n=8/6)	6,42	,85	6,05	,84	5,83	,47	5,60	,90	6,21	,58	6,05	,46	6,29	,82	6,23	,41
Lexical Funtional Ratio (n=8/6)	65,07	10,48	34,79	18,29	55,39	13,22	50,32	15,99	65,15	13,69	61,28	3,94	70,11	13,79	64,05	11,14
Structural Complexity (n=8/6)	1,42	,31	1,64	,16	1,39	,16	1,68	,32	1,44	,33	1,48	,09	1,33	,25	1,42	,14
% of error-free ASU (n=8/6)	56,73	12,79	61,18	14,05	50,05	14,69	51,84	11,97	49,86	22,77	54,47	14,84	50,34	16,55	56,54	12,89
% of error-free ASU (n=8/6)	53,40	10,82	49,01	16,46	63,01	14,21	55,94	20,28	52,44	14,08	54,53	16,29	53,71	23,71	56,13	8,90

M = mean; SD – standard deviation; Sk – skewness; K – kurtosis.

Table 11 *Wilcoxon signed-rank test for three dimensions between Russian and Spanish samples: fluency, lexical and structural complexity, and accuracy*

Dependent Variable	***Few elements Planned Few Elements Unplanned***		***Few elements Planned Many Elements Planned***		***Few elements Planned Many Elements Unplanned***		***Few elements Unplanned Many Elements Planned***		***Few elements Unplanned Many Elements Unplanned***		***Many Elements Planned Many Elements Unplanned***	
(n=Russian/Spanish)	***Russian p***	***Spanish p***	***Russian p***	***Spanish p***	***Russian p***	***Spanish p***	***Russian p***	***Spanish p***	***Russian p***	***Spanish p***	***Russian p***	***Spanish p***
Unpruned speech rate (n=8/6)	,327	,753	,123	,116	,017*	,917	,779	,075	,889	,600	,401	,463
Pruned speech rate (n=8/6)	,889	,917	,263	,249	,093	,753	,889	,753	,889	,600	,401	,600
Guiraud's Index (n=8/6)	,069	,249	,401	,917	,484	,917	,093*	,116	,161	,028*	,345	,575
% lexical words (n=8/6)	,050*	,463	,779	,463	,484	,753	,093*	,116	,093	,173	,327	,917
Structural Complexity (n=8/6)	,779	,753	,889	,116	,401	,043*	,889	,249	,327	,116	,176	,463
% error-free ASU (n=8/6)	,208	,249	,575	,345	,327	,600	1,00	,753	,889	,463	,735	,753
% error-free clauses (n=8/6)	,036*	,917	,779	,917	,889	,345	,017*	,463	,043*	,753	,779	,600

* p <0,05

CHAPTER IV

DISCUSSION AND CONCLUSIONS

4.1 Introduction

The objective of the present study was to explore the effects of manipulating task complexity along +/- few elements and +/- planning time. In addition, I was interested in looking at the combined effects that the two variables of task complexity could yield when manipulated simultaneously. Finally, a third aim was to find out whether different L1 backgrounds had any effects on L2 oral production.

4.2. Hypothesis 1: Effects of increasing task complexity along planning time

Unlike previous studies (Foster and Skehan, 1997; Ortega 1999; Gilabert, 2007), results did not reveal any significant effects of manipulating planning time on fluency. Two explanations may be provided regarding these results. Firstly, Yuan and Ellis (2003) did not find any significant differences for fluency in a cognitively complex task along +/- planning time. However, both the pre-task planning and no-planning conditions required the learners of their study to perform under time pressure, which might have produced an equalizing effect on fluency, whereas in the present study there was no time restriction during task performance. Secondly, the participants' level of proficiency was relatively high, which may be the reason why the lack of pre-task planning time did not affect significantly the fluency of their speech. Higher proficiency learners may not need planning time to activate the concepts, words, and structures before task performance in the same way as lower proficiency learners do. More automatic access to forms may have not affected their fluency significantly. It should be noted, however, that in Conditions 1 and 2 with reduced number of elements participants of the present study obtained higher results for the fluency measures while performing with pre-task planning time (126,26 vs 118,10 in Rate A; and 112,38 vs 101,18 in Rate B).

As expected, increased task complexity by reducing planning time resulted in less lexically rich speech, which is in line with the results of Ortega (1999), Yuan and Ellis (2003) and Gilabert (2007), who found strong effects of increased task complexity on lexical richness. The retrospective analyses from the Ortega's study (1999) showed

that the pre-task planners first conceptualized and then formulated their ideas which then were retrieved again during performance. As for structural complexity, based on previous studies (Foster and Skehan (1997); Gilabert (2007), I hypothesized that pre-task planning time would not have a significant impact on structural complexity. However, providing + planning time had a strong effect on syntactic complexity. The same results for structural complexity, when the participants were given time for planning, were obtained by Foster and Skehan (1996), Wendel (1997) and Yuan and Ellis (2003). A possible interpretation is that planning time provides learners with the possibility of elaborating ideas and verbalizing them into structurally complex sentences. Decision-making tasks used in the experiment may also push them to the use of complex syntactical structures in order to come up with the ideas they have in mind. With regard to structural complexity while performing without pre-task planning time, it was negatively affected, which confirms my initial predictions. Similar findings were obtained by Foster and Skehan (1996) and Ortega (1999). As explained by Foster and Skehan (1997), a wide range in use of structural variety may depend on the nature of a task. In a decision-making task, which was employed in the present study, the participants used a more structurally complex sentences, whereas in a narrative task the planners were more accurate in Foster and Skehan's (1997) research. According to Wendel (1997), enhanced cognitive complexity triggers linguistic complexity with the need of coordinating and subordinating ideas. However, learners cannot build up complex sentences without time provided for it which is necessary to think the structures over. On the other hand, only one general measurement was used to calculate structural complexity which must be completed by other ones in the further investigation to achieve a wider picture of the structural complexity dimension. It is an ongoing debate that more precise measures for structural complexity are needed.

Finally, the accuracy dimension was not significantly affected by increased cognitive complexity along planning time, which partially contradicts my hypothesis, as it was said that increased cognitive complexity would negatively affect learners' performance. In previous studies (Skehan & Foster, 1997; Ortega, 1999) it also was difficult to see any consistent results. The measures of accuracy (% of error-free AS-units and % of error-free clauses), sometimes are not sufficiently sensible to reflect a significant difference between planned versus unplanned performance. The present results showed a non-significant difference between two conditions: planned versus

unplanned. Once again, it could be connected with the relatively high level of English, which allowed the participants to control their speech for accuracy. The measures for accuracy (% of error-free AS-units and % of error-free clauses), though being general and standard in the literature, may not have been sufficient to capture any significant differences. Measures to be considered for further research should include a more exact count of errors and other forms of attention to form (like self-repairs as in Gilabert, 2007).

4.3 Hypothesis 2: Effects of task complexity along +/- few elements

Hypothesis 2 stated that tasks performed under complex conditions would trigger less errors and a significantly higher level of lexical and structural complexity; however, it would cause disfluency. As seen in the results sections the predictions were only partially confirmed.

In line with previous studies (Robisnon, 2001; Michel, Kuiken & Vedder, 2007; Kuiken & Vedder, 2007), increased number of elements in the task negatively affected fluency, whereas operating with few elements in the task learners' speech became faster. As in Michel et al. (2007) study, the effect was significantly reflected only by Unpruned Speech Rate A. However, Pruned Speech Rate B, which does not count pauses, hesitations and word repetitions, was not significantly affected. Michel et al. (2007) also used the number of filled pauses, but they found no significant impact on fluency. A reduced number of elements may be manageable for learners to deal with without slowing down significantly, whereas increased number of elements does not allow being fluent when working on task.

Regarding lexical complexity, the results confirmed the Cognition Hypothesis as they showed an effect of task complexity concerning lexical variation. Both Guiraud's Index for lexical richness and the percentage of lexical words measurements demonstrated a significant difference between + few elements and – few elements conditions. These findings confirmed Robinson's (2001) and Kuiken & Vedder (2007) results. However, they do not replicate Michel et al.'s (2007) results which did not reveal any significant difference of task complexity by increasing the number of elements. Dealing with more elements may force learners to consider a variety of appropriate words, and therefore stretch their vocabulary repertoire. Unlike previous

studies (Robinson, 2001; Kuiken &Vedder, 2007), increased cognitive complexity along +/- few elements triggered less structurally complex speech. This may be explained by the fact that the result was obtained in a comparison of Condition 1 (+few elements / + planning time) with Condition 4 (- few elements / – planning time), where the lack of pre-task planning time in Condition 4 may have influence the present results.

With regard to accuracy, no significant difference was found with the general measures (% of error-free AS-units and % of error-free AS-clauses) used in order to calculate it, which does not confirm my hypothesis. Unlike Robinson's (2001), Kuiken & Vedder (2007) and Michel et al. (2007) findings, there was no trend in the direction of the Cognition Hypothesis which claims that increasing cognitive complexity along +/- few elements generates more accurate speech. Again the measures were not sensitive enough to capture any changes in accuracy from simple to complex versions. Further research is needed to investigate this pattern of oral production under +/- few elements variable manipulation.

4.4. Combined effects of +/-planning time and +/- few elements

Combined effects of two variables of task complexity will be discussed in terms of three dimensions of oral production: fluency, lexical complexity, structural complexity and accuracy. There was a significant overall effect of manipulating task complexity for lexical complexity, measured by Guiraud's index of lexical richness (see Table 8). However, no significant general results for other dimensions were found.

By means of Wilcoxon signed-rank test analysis a pairwise comparison of the four conditions of task performance was carried out. There was a significant difference for fluency, measured by unpruned speech rate A, when manipulating task complexity along +/- number of elements. The participants were more fluent when performing a task with + few elements: Condition 1 (+ few elements / +planning time) versus Condition 3 (- few elements / +planning time). At higher levels of L2 proficiency, it is the number of elements that may affect learners' performance, and not the lack of planning time. This finding corresponds to the predictions of the Cognition Hypothesis, as increasing number of elements in a task negatively affects fluency in oral production. Similarly, results of pruned speech rate B for fluency had a trend of a positive effect when reducing task difficulty along +/- few elements.

As for lexical complexity, increasing the number of elements as well as providing with + planning time had a positive impact on L2 oral production. When learners had pre-task planning time (Condition 1 [+few elements +planning time] versus Condition 2 [+ few elements / – planning time]), they were lexically richer than when dealing with a task without time for preparing. Since learners had time to elaborate their explanation of a task they could have put together words and expressions they needed. As a result, both measures of lexical complexity (Guiraud's Index of lexical richness and % of lexical words) showed a significantly increased lexical complexity manipulated along the number of elements, as seen between Conditions 2 versus 3 and Conditions 2 versus 4. Regarding structural complexity, reduced number of elements had a positive effect on structural complexity, even if no pre-task planning time is provided: Condition 1 (+ few elements + planning time) vs Condition 4 (- few elements / – planning time); Condition 2 (+ few elements / – planning time) vs Condition 4 (- few elements / – planning time). In this case, the number of elements played an essential role in task performance. Apparently, learners' structural complexity increases with reduced the number of elements, rather than with provided pre-task planning time. However, the findings may be different when analysing students with lower levels of proficiency, where +/-planning time must not be underestimated. Accuracy was not significantly affected either by +/- few elements or by +/- planning time. As suggested above, future research should consider more precise and sensitive measures.

To conclude, as far as the combined effects between two variables (+/- few elements / +/- planning time) of task complexity are concerned, it is observed that participants' oral production in the present study was mostly affected by +/- few elements; in particular, fluency, lexical and structural complexity dimensions; whereas accuracy did not show a significant difference. This may occur because in advanced levels of proficiency, learners' speech may not be significantly transformed by the lack of pre-task planning time. However, manipulating task complexity along +/- few elements caused disfluency, though lexically rich and structurally complex speech, and it did not affect accuracy. Further studies should be conducted to shed more light on the combined effects of two variables: +/- few elements and +/- planning time.

4.5 Task complexity and task difficulty

Differences in task complexity were reflected in participants' perceptions of task difficulty (see Figure 1 and Table 3). It should be noted that learners perceived as more difficult the tasks manipulated along +/- few elements (Condition 1 vs Condition 3; Condition 1 vs Condition 4; Condition 2 vs Condition 3). No significant difference was found for stress or confidence (see Table 3) along increased cognitive complexity, unlike previous studies (Robinson, 2001; Gilabert, 2007). The possible explanation is that the participants of the present study did not have teacher (researcher) pressure on them, as the experiment took place outside an instructional context and there was also a certain degree of familiarity with the researcher of the present study. Additionally, differences in task complexity are related to motivation (see Table 3) between Condition 2 (+ few elements / - planning time) vs Condition 4 (- few elements / – planning time). Learners were significantly more motivated when performing with increased number of elements, which is encouraging for further investigation in pedagogical contexts.

4.6 Effects of task complexity on learners with two different L1 backgrounds

As the participants of the present study had two different L1 (Russian and Catalan/Spanish) backgrounds, I decided to examine whether manipulating task complexity affected similarly oral production with different L1.

Regarding +/- planning time condition, Russian participants were more fluent and lexically complex, when we were given a pre-task planning time, which is in line with previous studies (Ortega, 1999; Yuan and Ellis, 2003; Gilabert, 2007). Surprisingly, they were more fluent while performing without any time for preparing (Condition 2: + few elements / – planning time). Dealing with a small number of elements they were likely to reach a more accurate speech. No pre-task planning time affected negatively Spanish learners' structural complexity (Condition 4: - few elements –planning time), which is also confirmed some previous studies (Skehan & Foster, 1996; Ortega, 1999).

As far as +/- few elements is concerned, increased number of elements caused disfluency among the Russian sample and promoted lexical complexity of the Spanish

sample. These findings do not contradict the initial hypothesis and confirm the results obtained by Robinson (2001), Kuiken and Vedder (2007) for fluency and lexical complexity; and the results of Michel et al. (2007) for fluency. Spanish learners were significantly less structurally complex while performing a task with increased number of elements. Additionally, Russian participants were significantly less accurate when they were provided a task with many elements to deal with. In this case a small number of elements (Condition 2: + few elements / – planning time) affected negatively the accuracy dimension.

4.7 Limitations of the study

The present study has a number of limitations which should be acknowledged. Firstly, the research focused on two cognitive variables without taking into account other variables, such as individual ones, which also may play a significant role in task performance. On the other hand, a Latin square design was used to minimize the effects of task sequencing on production. L2 proficiency was also controlled for by means of X-Lex and Y-Lex tests. It is difficult to predict individual variability (aptitude, intelligence) during syllabus design before the course started, so much more investigation is required to shed light on this area. Secondly, as far as task design is concerned, the present study is based on a decision-making task. Previous studies (Gilabert, 2007; Michel et al., 2007) found differences in performance depending on the task type. Therefore, future research should aim at exploring the effects of manipulating two analyzed here variables with different task types. Thirdly, due to the time constraints of the present study, only a small number of participants (n=14) could be involved in the research project, which may affect the results. In further research the sample could be extended up to 50 people. Fourthly, it would be appropriate to use more special measurements, as in case of structural complexity and accuracy in order to obtain more precise results. In the fifth place, my results may only apply to adult language learners. Age-specific tasks should be used with different age groups. Finally, measuring L1 performance would be advisible in order to explore more deeply to which extent L1 affects L2 production or not.

4.8 Implications, conclusions and further research

The present study has been an attempt at analyzing the effects of manipulating the amount of pre-task planning time and the number of elements on L2 oral production. The results of the present study, as previous ones, provide evidence that task complexity is a robust basis for syllabus design. Task complexity manipulation has some predictable effects on performance that may be controlled and therefore improved, since predictions about learners' performance may eventually help us to make decisions regarding which task should be used first and which ones should follow it. Further investigation is needed to explore individual effects (working memory, aptitude, intelligence) on L2 production. It is also important to compare results of the effects of different type tasks (a narrative task; an instruction-giving task) manipulated along two variables of task complexity on L2 oral production. The operationalization and manipulation of task complexity can be transferred to pedagogic practice in order to control and, possibly, enhance different dimensions of L2 oral production, as teachers will receive information about how learners are going to behave when facing tasks that have been designed beforehand. Finally, the results are also applicable to language testing, since they may help to adjust expectations from a test to test design.

In further research extended number of participants (up to 50) will be used. Native English speakers will be tested in order to find out the effects of increased task complexity on L1 production. Moreover, the participants will be asked to perform not only in L2 (English), but also in their L1 to examine whether L1 background plays a role in L2 production. Finally, combined effects of the factors analysed in the present research will be explored in more detail.

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