The effects of +/- reasoning demands on L2 oral production during a decision-making task

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Abstract

The current study analyses data collected during a decision-making task in order to determine how task complexity, manipulated along the resource directing variable of +/- reasoning demands, affects dimensions of fluency, accuracy and linguistic complexity while the resource dispersing variable of less planning time remained constant. In addition to general measures, three developmentally based, task specific measures derived from results of studies of conjoined clauses and elaborated noun phrases, have been employed in order to determine specific effects of increased task complexity on structural complexity. Overall results indicate that as cognitive complexity increased, structural complexity was positively affected as the intended message was conceptualized in such a way as to effectively meet the demands of the increased reasoning demands. Lexical complexity, accuracy, and fluency were not affected although greater demands along the resource dispersing variable of less planning time may have minimized effects of increased reasoning demands along these dimensions. Task specific measures were successful in identifying instances of structural complexity where general measures were not able to do so.

1. Background

1.1 Introduction

Tasks, as an alternative unit to linguistic aspects in learning syllabuses, provide learners with controlled situations where communication of meaning is central in solving problems reflecting real world demands (Robinson, 2005). According to the information-processing approach to task-based learning fomented by Skehan (1996, 1998; Skehan & Foster, 2001), by manipulating the internal aspects of tasks, they can be used to push a balanced development of fluency, complexity, and accuracy of a learner's interlanguage. Sequencing tasks in increasingly more complex designs guides the learner through progress in the interlanguage, but there is a need for establishing criteria for determining appropriate parameters to do so, founded on results obtained by empirical study rather than by simple intuition. This need has fomented an interest in investigation in the area of second language acquisition research to construct a solid, supportive foundation on which to build a governing philosophy toward these ends. Some research has taken the shape of studies into how characteristics of tasks influence linguistic production, based on concepts of current models of cognitive speech processing and attentional resource allocation.

This paper will review points covered in previously published literature relevant to research into how the manipulation of task characteristics influences speech production and language acquisition which has grown out of the need for development of criteria for regulating task sequencing in a task-based curriculum. Firstly, there will be a brief discussion of prominent models of speech production. Current understandings of the workings of memory and attention as related to language processing will be touched upon leading to a discussion of two prominent theories about how attentional resources are allocated during language production. Research into how these theories are tested and the observed trade-off effects between manipulated task characteristics and aspects of language will be briefly reviewed centering on previous research into effects of +/- reasoning demands on oral production, the topic of concern of the current study. Hypotheses will be proposed followed by a description of the experiment, corresponding results, discussion of the outcomes, and conclusions.

1.2 Models of speech production

Among psycholinguistic models of speech production, Levelt's (1989, 1999) model of L1 speech production is prominent. Levelt's model has served as a basis for the development of other models that have been created as well to illustrate the speech production process as pertains to speakers of more than one language including those by De Bot (1992) and Kormos (2006). Levelt's model recreates the processes of speech production through the workings of a series of autonomous components that make up the system including the conceptualizer, the formulator, and the articulator. In his most recent version, Levelt (1999) fits these modules into two principal components, the first of which is referred to as the rhetorical/semantic/syntactic system and the second as the phonological/phonetic system. The first phase involves conceptual preparation in which the speaker generates a message through processes of macro- and micro-planning to make a preverbal plan which is then grammatically encoded to create a surface structure form of the message. The surface structure is processed for morpho-phonological encoding in the second component of the model where the message is then provided with a phonological and finally articulatory score which converts the message into overt speech. Throughout the production process, monitoring allows the speaker to control self-generated speech either before or after utterance through monitor loops that revert back to the conceptualization stage to ensure that the message being produced matches the intended idea. Working memory is vital to the entire process as it is what manages all the information that can be processed (Levelt, 1989).

1.3 Memory and attention

Working or short-term memory contains all the information that can be processed by the different message-generating procedures in Levelt's model and is vital to speech production. Attention is the mechanism of short-term memory which directs input from its detection by sensory receptors, to its rehearsal within the phonological loop, and to subsequent retention (or not) in long term memory (Robinson, 2005). The amount of information that attentional resources can handle is limited so attention focuses more on some sources of input than others and is allocated more toward some cognitive processes than others in accordance to what

needs must be met to complete a given task. Some debate has opened in SLA research as to how attentional resources, which play an important role in the processing of L2, are allocated under specific conditions leading to two principle theories of how task conditions may affect the language output of learners as they are complexified along specific conditions: the Limited Attention Approach and the Cognition Hypothesis.

1.4 The Limited Attention Approach

Presented in Skehan (1998) and Skehan & Foster (2001), the Limited Attention Approach (Skehan, 2007), is based on the precept that people have a limited amount of attentional capacity, a concept borrowed from the view in psychology that limited capacity is a primary characteristic of attention (Broadbent, 1958; Kahneman, 1973, as cited in Schmidt, 2001). This view stipulates that attention is located in a single store within working memory and its limited resources are allocated toward competing task demands. The degree of difficulty that a task entails is determined by its capacity consumption. From a language processing perspective, limited attentional capacity leads to competition for attentional resources between content and form under conditions where an increase in the cognitive complexity within a given task depletes any surplus of those resources. Lacking sufficient attentional resources to attend to both form and meaning, the latter tends to be prioritized to ensure that the intended message is properly conveyed. More cognitively complex tasks requiring resources to focus on message content will therefore draw attention away from language form, resulting in a decrease in performance in some areas while complexity and accuracy compete during language production when these are still in need of controlled processing as will be found during the acquisition of an L2.

1.5 The Cognition Hypothesis

Robinson's extension of Skehan's concept in his complementary although somewhat contrasting Multiple Attentional Resources Model, also referred to as the Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2007), contends that form and content do not always need to be in competition for attentional resources as learners can access multiple

attentional pools at a given time. Accordingly, and in contrast to Skehan's model, increasing task complexity may actually lead to better performance by either directing attentional resources toward features of linguistic code or dividing them, allocating resources according to priority depending on the kinds of cognitive demands imposed by particular aspects of the task at hand.

Robinson borrows from studies in psychology in referring to concepts proposed in Wickens' (1989) model of the structure of attentional resources to explain the effects of cognitive factors on speech production. As per Wickens' (1989) model of dual task performance, attentional resources flow out of multiple resource pools. The attentional demands of tasks and their relative difficulty will be increased when tasks, done simultaneously, draw on the same pool of attentional resources, in which case, due to effects of interference, it becomes impossible to carry out the tasks forcing a person to handle each task in succession. As an example, taking part in two conversations at once requires a degree of attention that an ordinary person would find it extremely difficult to manage (Robinson 1995: 290). On the other hand, when two activities are less similar in nature there is less resource competition, as in the case of a person driving a car while talking. More than one attentional pool allows for both activities to occur simultaneously, although the dispersion of attention as allotted to both activities may result in poor performance, determined in part to short-term memory capacity of the individual (Robinson, 1995:320). Thirdly, when concurrent tasks draw on completely different pools of resources, or when one of the tasks is automatized requiring little or no attentional resources, then both may be performed simultaneously without interference between them.

Practical application of the Cognition Hypothesis to language learning tasks can be studied with a framework designed by Robinson and described in the following section.

1.6 The triadic componential framework

Robinson (2001a; 2001b, 2003) proposes a triadic framework for examining the implications of the Cognition Hypothesis toward L2 classroom learning and for syllabus design. In this framework he distinguishes between task complexity, task difficulty and task conditions, three groups of factors which interact among themselves to influence task

performance and learning. *Task difficulty* entails learner factors such as aptitude toward handling the task at hand, confidence, and motivation among other factors dependent on individual characteristics of each learner all which may add to that learner's perception of the difficulty of a particular task. *Task conditions* are described as interactive factors or how information flows between participants during a task. Conditions may be concerned with whether a task is monologic or dialogic, how participants are grouped during a task, or the personal relationship between participants. *Task complexity* is the cognitive factors of a task which can be manipulated to increase the cognitive demands that a task makes on learners during performance. According to Robinson (2003) the latter factor, task complexity, is the one which is most appropriate for task sequencing considerations in syllabus design. Variables of task difficulty, dependent on individual factors of each participant, are difficult to control and may be affected by varying task conditions. Task conditions, although controllable, may best be determined by the needs of each particular situation, and held constant while cognitive complexity is increased along variables of task complexity.

In the triadic componential framework, Robinson also distinguishes between attentional resource dispersing and attentional resource directing dimensions of complexity (Robinson, 2003). Resource dispersing dimensions of complexity differentiate between task characteristics which create performative or procedural demands such as allowing or not for planning time or requiring more or fewer steps to complete the task. Although these factors place demands on attentional and memory resources, they do not direct these resources to any particular area of the language production system. Manipulation of these variables disperses resources, simulating real-world situations where a speaker must perform under circumstances such as handling new or unexpected matters that would have to be reacted to spontaneously, promoting access to and control of already established interlanguage knowledge within an existing L2 knowledge base. The resource directing dimension of complexity differentiates between task characteristics in terms of conceptual or linguistic demands. Such demands may be met through specific aspects of the linguistic system such as through subordination to justify actions or support reasons when task demands are increased along dimensions of reasoning. Manipulating resource directing dimensions of cognitive complexity within a task directs learners' attentional and memory resources toward the aspects of the language production system. Development is promoted by extending the L2 repertoire, forcing greater

syntacticization and grammaticization as learners are pushed to complete the task while attending to the means required to do so. (Klein & Perdue, 1992).

Investigation into the interaction between task characteristics and aspects of language, and an understanding of the effects of one on the other have yet to provide researchers with a definitive model to base task sequencing on, but continued studies into trade-offs between these aspects and how manipulation of task characteristics promote their occurrence may lead toward more effective language learning approaches.

1.7 Studies investigating trade-off effects and task characteristics

The goal of developing feasible sequencing criteria for classroom tasks has stimulated an area of study intent on identifying how individual task characteristics or combinations of them can be manipulated to obtain predictable results in language output. Investigations have contemplated models of the cognitive processes involved with speech production, the interaction between aspects of fluency, accuracy and complexity in language, the manipulation of variables that determine task complexity, task conditions and task difficulty, and the resulting effects on dimensions of linguistic aspects. However, at present, a clear consensus favoring either the Cognition Hypothesis or the Limited Attention Approach has not been reached as results of investigation have varied. Some prominent studies which have worked along these lines are listed in table 1.7.1 according to the cognitive dimensions which were investigated.

Table 1.7.1 – Prominent studies dealing with observed trade-off effects due to manipulation of dimensions of cognitive complexity within language production tasks

+/-Planning time	+/- Here and Now	+/- Few Elements	+/- Previous Knowledge	+/- Task Structure	+/- Reasoning Demands
▪ Gilabert (2005; 2006)	▪ Gilabert (2007)	▪ Kuiken, F. & Vedder, I. (2008)	▪ Robinson (2001)	▪ Tavakoli & Foster (2008)	▪ Révész (Forthcoming)
▪ Yuan & Ellis (2003)	▪ Ishikawa (2007)	▪ Gilabert (2007)	▪ Bygate, *et al*. (2001)		▪ Gilabert (2007)
▪ Foster & Skehan (1996;1999)	▪ Gilabert (2006)	▪ Michel, M.C., Kuiken, F. & Vedder, I. (2007)	▪ Tavakoli & Foster (2008)		▪ Robinson (2007)
▪ Menhert (1998)	▪ Gilabert (2005)	▪ Kuiken, F. & Vedder, I. (2007)			▪ Nuevo (2006)
▪ Ortega (1999)	▪ Iwashita (2001)	▪ Kuiken, F., Mos & Vedder (2005)			▪ Niwa (2000)
▪ Skehan & Foster (1997)	▪ Rahimpour (1997)	▪ Révész (Forthcoming)			▪ Robinson (2000)
▪ Wigglesworth (1997)	▪ Robinson (2001)				
▪ Ting (1996)	▪ Robinson (1995b.)				
▪ Crookes (1989)					
▪ Ellis, (1987)					

1.8 Studies focusing on +/- reasoning demands

As the current study contends with data collected from a task in which the characteristic of +/- reasoning demands was manipulated, previous studies which worked in this area will be briefly reviewed. Robinson (2000, as cited in Robinson 2005) manipulated complexity along aspects of +/- reasoning demands in a one-way, closed dyadic task. Information in the form of written prompts made available to the speaker provided input which the speaker could use to complete the task. Usage of this information was measured in order to determine to which degree a learner may attend to and incorporate available input to fill gaps in their interlanguage while completing the task. Results showed greater attention to input as task complexity increased. Niwa (2000, as cited in Robinson, 2005; Gilabert, 2007; Révész, forthcoming) investigated effects of task complexity along +/- reasoning demands on language production in a monologic narrative task. Results indicated that as task complexity increased, structural complexity also increased. Niwa observed as well, that fluency was differentiated, to a large degree, by individual differences. Higher working memory capacity and aptitude were associated with less fluency, as those learners with higher abilities allocated resources toward greater accuracy and syntactical complexity. Robinson (2007), as well, used a narrative task with participants who were asked to place pictures in order as such as by which the speaker would relate a story. Likewise, he observed greater structural complexity with the increased reasoning demands while reporting increased accuracy as well. However, Nuevo (2006, as cited in Révész, forthcoming), in investigating learning opportunities and development of the L2 under varying conditions of task complexity along +/- reasoning demands on narrative tasks, did not report significant effects of task complexity on accuracy. Révész (forthcoming) used an argumentative group discussion task manipulated in complexity along +/- reasoning demands and +/- few elements. Results confirmed that as task complexity increased, participants' language increased in lexical complexity and accuracy but with syntactically less complex language. Finally, Gilabert (2007) focused on the use of self-repairs in L2 speech as a measure of accuracy as complexity was manipulated along dimensions of +/- here-and-now , +/- few elements, and +/- reasoning demands in three different tasks respectively: narrative, map task, and decision-making task. Results indicated an effect of increased task complexity on accuracy although differently for the varying task types.

The current study has been conducted as an extension of and draws upon the collected data

of Gilabert's (2007) study with a focus on the decision-making task, also referred to as the Fire chief task. This task consisted of participants being presented with a diagram depicting a situation where some people were trapped inside a burning building (see Appendix). Participants had to describe how they would go about saving the people and justify their decisions. Details of how the task was complexified over reasoning demands will be discussed further on.

The current study is most concerned with discussion toward Gilabert's first hypothesis which predicted that all task types performed under complex conditions would cause fewer errors and a significantly higher rate and proportion of self repairs. The hypothesis was confirmed for the instruction-giving task and partially for the narrative task but not for the decision-making task. A similar amount of errors and repairs were produced during the simple and complex versions of the task with two measures pointing in the direction of the hypothesis, while, contrarily, one measure pointed in the opposite direction indicating more repairs done in the simple version than in the complex. Gilabert notes that in addition to limited planning time, complex cause-effect relationships that made learners consider the mental states of the characters in the complex version of the task, increased complexity along the resource dispersing variable of number of steps. This may have affected the macro and micro-planning processes and the final speech production by dispersing attentional resources rather than directing them toward other aspects of the production process. That less attention was focused on monitoring, and therefore, on form, is evidenced by the smaller effect that increased task complexity had on self-repairs when compared with results of the other two tasks.

1.9 Questions and hypothesis

Results of the Fire chief task in Gilabert's (2007) study indicate that manipulation of variables affecting task complexity did not notably affect accuracy, as predicted. Resource-dispersing factors of limited planning time and the increase in number of steps in the complex version of the task may have had a hand in the outcome. As per Robinson's Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2007) manipulation of factors along resource-dispersing variables, while not directing attention toward language specific aspects of production, can be expected to disperse attentional resources in detriment to learners' output. Complementary to the measures of accuracy employed by Gilabert, task-specific measures of linguistic

complexity may help in determining if attention was allocated in this direction as increased reasoning demands may be expected to promote syntactically complex constructions for justifying decisions made during the task. In this study, conjoined clauses and elaborated noun phrases are expected to be affected by increases in the reasoning demands imposed by task design on learners' processing. The following questions will be addressed:

- Where were attentional resources allocated during the completion of the decision-making task while cognitive complexity was manipulated along dimensions of +/- reasoning demands?
- Will task-specific, developmentally based measures identify aspects of the language in the data which may otherwise remain invisible through more general measures?

The same oral data from Gilabert's (2007) study will be analyzed through a variety of quantitative measures, both general and specific, to investigate dimensions of fluency, accuracy, and linguistic complexity of the participants' speech. Results will be used to address the following hypotheses:

- *Hypothesis 1*: Increasing task complexity will have a positive impact on either accuracy or complexity but not both simultaneously, with detrimental effects for fluency.
- *Hypothesis 2*: Task specific measures will capture the impact of task complexity on learners' performance, and they will do so more clearly than general measures.

Hypothesis 1 is based on the prediction by the Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2007), which states that in a monologic task, as the cognitive demands on an L2 speaker increase, attentional resources will be directed toward both complexity and accuracy, but resulting in less fluency. This is true as long as tasks remain simple along resource-dispersing variables. Complexity added along resource-dispersing variables should reduce fluency, accuracy and complexity. The tasks used in this study are complex along the resource-dispersing variables of planning time and, in the complex version, more steps. It may be predicted that either accuracy or complexity will be attended to but not necessarily both at the same time according to previous planning time studies which showed tendency toward either greater complexity or greater

accuracy but not simultaneously (Gilabert, 2005, 2006; Crookes, 1989; Ting, 1996; Skehan and Foster, 1997; Wigglesworth, 1997; Mehnert, 1998; Ortega, 1999).

Hypothesis 2 finds its motivation in claims (Révész, forthcoming; Robinson, 2007) suggesting that task-specific measures will be more sensitive to the impact of task complexity on learners' performance. In this study, measures of conjoined clauses and elaborated noun phrases are expected to be affected by increases in the reasoning demands imposed by task design on learners' processing. It is therefore predicted that both measures will show a significant difference between simple and complex performance.

2. Methodology

2.1 Experimental design

Repeated measures analyses of variance (ANOVA) of seventeen dependent variables were calculated to measure the effects of task complexity among the different task conditions and potential effects of proficiency level and task sequencing. During the original study conducted by Gilabert (2007) it was predicted that carryover effects might vary the results so the sequence in which the tasks were performed was altered to counter this possibility. Students were randomly assigned to perform either the complex or the simple task first. An affective variables questionnaire was completed by participants in order to rate difficulty, stress, confidence, interest, and motivation on a 9-point Likert scale as inspired by Robinson (2001b as cited in Gilabert, 2007).

2.2 Participants

Participants in the study included 41 volunteers from two different universities in Barcelona. Although students from both institutions had received instruction in English for approximately the same amount of time, students from one group were determined to be of a statistically significant higher level of proficiency by means of X-lex and Y-lex placement tests used to measure vocabulary size (Meara and Milton, 2003 as cited in Gilabert, 2007). Learners' ages ranged between 18 and 40.

2.3 Materials

The original study conducted by Gilabert (2007) used three different tasks; a narrative, an instruction-giving task and a decision-making task. The current study has concerned itself with data drawn from the decision-making task. The decision-making task consisted of a 'Fire chief' task of use in cognitive psychology. Learners are presented with a picture depicting a burning building in which a number of people are trapped and must be rescued. As per Evans and Marciniak (1987, as cited in Gilabert 2007) complexity is related to the intricacy of systems, so the complexity of a system becomes a function of the number of factors and the amount of interactivity among the elements within the system. Gilabert followed Quesada, Kintsch and Gómez-Millán (2005, as cited in Gilabert 2007) by increasing complexity in the task in such a way that most of the variables were not directly related to one another so in order for learners to solve the problem in the complex version of the task, they were required to make a series of decisions, the outcome of each affecting decisions which would have to be made later on during the process. In the simple version of the task, the affected people were similar in type without distinguishing roles and were positioned under similar, low level degrees of danger. Participants were provided with sufficient means with which to solve the problem (number of fire trucks, helicopter, etc.). In the complex version of the task, the affected people were characterized by specific roles (i.e. pregnant woman, old man, etc.) and factors affecting the level of danger suffered by the people were intricately related and dynamic (i.e. various fires moving toward the victims, smoke entering into the building). Learners were also provided with fewer resources with which to solve the problem, intending to promote prioritization and justification of decisions made toward actions taken. In both tasks, learners were asked to explain which steps they would take to rescue the people in the building, determine the sequence of those steps and to justify the reasoning behind their plan.

2.4 Procedures

Data was collected for the original study by Gilabert in a single one-hour session upon a short introduction to the study and the collection of personal data from the participants. A one-

minute planning time period was allowed only for the participants to become familiar with the task, as the objective of the study was to measure task complexity independent from other variables such as extensive planning time. Some vocabulary was provided which had proved necessary through a previously carried out pilot study and tasks were done followed by completion of an affective variables questionnaire. Details of the experimental design of the original study may be found in Gilabert (2007).

2.5 Measures

The current study intends to determine how accuracy interacts with dimensions of fluency, and lexical and structural complexity as task demands are increased along the resource-directing variable of +/- reasoning demands while the resource dispersing variable of +/- planning time remains constant at no planning time. Seventeen different measures were calculated in total. For measures of fluency, Rate B was calculated by measuring the rate of syllables in pruned speech per minute. A second measure of fluency was calculated by means of a ratio of filled pauses per tokens in each transcription. Accuracy was measured by means of ratios of number of errors per analysis of speech units (AS-units). AS-units were defined following the guidelines set by Foster, Tonkyn and Wigglesworth (2000). In addition to the number of total errors per AS-unit, errors were broken down into three distinct categories: lexical, morphosyntactic, and ‘other’, for remaining errors, and ratios per AS-units were calculated for each. A ratio of the number of errors falling into each of these categories per total number of errors was calculated as well. This was done in an attempt to determine how accuracy may have been affected through lexical choice and in the grammaticalization of the conveyed message. Error-free AS-units per total AS-units were also calculated as an index of accuracy. Lexical complexity was determined through a D-value. This value was calculated using the software program D-Tools developed by Meara and Miralpeix (2007). Finally, structural complexity was determined by six measures in all. Three general measures included sentence nodes (S-nodes) per AS-units where an S-node is equivalent to a clause (Gilabert 2005), use of subordination per AS-unit and mean length of utterance (MLU). The three task specific measures included a measure of elaborated noun phrases and two measures of conjoined clauses described in continuation.

2.6 Task specific measures of structural complexity

According to Robinson (2007), using specific, developmentally-motivated measures is necessary while studying outcomes which may be predicted by the Cognition Hypothesis for dimensions of resource-directing aspects of language as these are associated with particular conceptual/linguistic domains. Three such measures used in this study are intended to offer insight into dimensions of structural complexity as it is in this particular area that it is expected, according to predictions based on the Cognition Hypothesis, to observe effects of task complexity manipulated along aspects of +/- reasoning demands. The first, inspired in work done by Eisenberg *et al*. (2008) in their study of L1 development of school age children uses noun phrase elaboration as a developmental measure. The other measure being used currently in a study of L2 development carried out by Révész (forthcoming) is based on the usage of conjoined clauses and their corresponding conjunctions as identified during the investigation of the acquisition of complex sentences by Diessel (2004) who measured the salience of this linguistic feature during the development of the L1 in children.

That adults retain a scale of conceptual complexity acquired in childhood (Slobin, 1985) would prompt an adult L2 learner to use simpler structures during performance of a simple task. When task complexity increases, the learner should be pushed beyond simple structures to use more complex structures in order to communicate better according to findings by Perdue (1993). Therefore, the use of measures based on developmental sequences derived from the study of L1 acquisition in children are expected to reflect changes in the cognitive demands of the task through the level of structural complexity of the language produced during task performance.

2.6.1 Noun Phrase Elaboration

Eisenberg *et al*. (2008) carried out a cross-sectional study in which they used noun phrase elaboration to identify a developmental pattern in the L1 speech among children 5, 8, and 11 years of age while performing oral narratives. As sensitive indicators of language development, measures of elaborated noun phrases (ENP's) can differentiate language ability groups (Greenhalgh & Strong, 2001; Loban 1976, as cited in Eisenberg *et al*., 2008).

Eisenberg *et al*. based their definition of ENP's on Greenhalgh and Strong (2001, as cited

in Eisenberg *et al*., 2008). They analyzed their data by measuring salience of four types of ENP's designated PRE1 for simple designating noun phrases comprising one noun element in addition to the head noun (i.e. *the car*); PRE2 for simple descriptive noun phrases comprising one descriptive element before the noun as well as the determiner (i.e. *a little boy*); PRE3 which comprised two or more descriptive elements before the noun such as adjectives, modifiers and adverbs (i.e. *the funny little boy*); and finally, POST which consisted of noun phrases with post-modification as in the case of prepositional phrases or clauses (i.e. *the boy named Joshua; a girl who was reading*). Noun phrase types were then measured as a function of age, syntactic position, and as a function of the kind of narrative context.

Results of the Eisenberg *et al*. study showed a clear developmental pattern in the use ENP's as children grow in their L1. It was demonstrated that PRE1 type of noun phrase can be expected to be used first as these were produced by even among the youngest children in the study, followed by PRE2 which became salient in the speech produced by children having reached 8 years of age. Next to appear is POST type of noun phrases or complex post-modification, which preceded complex pre-modification, identified as PRE3, being produced least and latest of all types investigated in the study.

Based on this data, elaborated noun phrases as a developmental measure shall be used in analyzing the structural complexity of the data available for the present study. The classification of ENP types used in Eisenberg *et al*. (2008) will be adopted as follows:

- PRE1: simple designating, pre-modifying noun phrases consisting of a determiner or other non descriptive element such as demonstratives, possessive pronouns, and quantifiers, and a head noun (i.e. *the fire; some people*)
- PRE2: simple descriptive pre-modifying noun phrases consisting of an adjective or noun modifier in addition to the determiner and head noun (i.e. *the elder man; all the people*)
- PRE3: complex pre-modification consisting of two or more modifiers in addition to the determiner (i.e. *the big red trucks*)
- POST: complex post-modification including qualifying elements after the head noun (i.e. *the man trapped in the elevator; the injured man on the roof*)

Given the results of the Eisenberg *et al*. study, the current study will qualify the ENP types

in the order of less complex to more complex as: PRE1, PRE2, POST, PRE3. The measure of analysis for the current study will be a ratio of the number of each type of ENP per total number of ENP's identified in each transcript.

2.6.2 Conjoined Clauses

Diessel's (2004) study of the development of complex sentences in early child speech focused on determining when complex sentences first emerge, how the earliest subordinate clauses may be characterized, and which developmental procedure is followed as a child grows in the L1. Due to lack of a clear cut definition distinguishing between adverbial and co-ordinate clauses, he refers to the continuum of related constructions formed by adverbial subordination and clausal co-ordination as *conjoined clauses*.

Diessel (2004) observed conjoined clauses to emerge in stages in the L1. He describes the development of early conjoined clauses distinguished by *and*, *because*, *so*, and *but* and then later conjoined clauses marked by *if*, *when*, *while*, *before*, *after*, *until* and *since*. Early conjoined conjunctions initially tend to be linked to intonationally unbound, independent utterances. As the child's language develops, these appear in larger proportions of intonationally bound clauses. Later conjoined clauses, however, tend to be integrated immediately into biclausal, intonationally bound utterances. Diessel observed that most of the children's earliest conjoined clauses in his data appeared in a final position, following a matrix clause. Initial conjoined clauses, positioned before the matrix clause, appeared later in their language development. Tables 2.6.1 and 2.6.2 provide some examples of conjoined clauses.

Table 2.6.1 - Examples of bound and unbound conjoined clauses in italics (Diessel, 2004)

Bound conjoined clause	Unbound conjoined clause
▪ I can't get them out *because my hand is too big*.	▪ Adult: That's yours? Adult: Ok. Child: *And this is mine*.

Table 2.6.2 - Examples of initial and final positioned conjoined clauses in italics (Diessel, 2004)

Initial conjoined clause	Final conjoined clause
▪ *After it dries off* ...then you can make the bottom.	▪ She broke it *when she was playing with her mother's stuff*

Measures of conjoined clauses used in my investigation have been inspired in work, as of yet unpublished, by Révész (upcoming) who investigated the effect of task complexity on the extent to which adult L2 learners focus on form-meaning connections while participating in task-based work in a classroom setting. In addition to general measures, Révész uses measures of conjoined clauses as a task-specific developmentally-motivated measure which indicated a greater use of conjunctions in conjoined clauses during performance of a task when cognitively complexity was increased along dimensions of +/- reasoning demands. According to Révész (upcoming), the measure of conjoined clauses in participant's speech is relevant to the +/- reasoning demands of a task, as tasks with greater reasoning demands will likely need coordinate conjunctions such as *but* and adverbial clauses with *because, so*, and *if*, more so than tasks that impose less reasoning demands on the speaker.

As a language specific measure of structural complexity, this study intends to observe the participants' use of conjoined clauses in their oral speech. The study will compare instances of initial versus final conjoined clauses in the two versions of the task. As per Diessel (2004), initial conjoined clauses carry a heavier processing load, needing more resources in working memory than final conjoined clauses, so these will be considered of greater structural complexity. In addition, we will compare the ratios of bound conjoined clauses to those of unbound clauses, specifically in the case of clauses beginning with *and, because, so* and *but*. All four of these conjunctions are often linked to independent utterances in early child speech (hence unbound) but are used in greater proportion to intonationally bound conjoined clauses as the children grow older. Bound conjoined clauses, therefore, will be considered of a greater level of structural complexity.

2.7 Statistical Instruments

Three kinds of statistical analyses are used in this study: descriptive statistics which provide information about means and standard deviations, and repeated measures analyses of variance (ANOVA) are used for the calculation of main effects. Paired-sample t-tests were used for comparisons between pairs of groups of data but are not reported, preferring results of the repeated measures ANOVA as they allow for including proficiency level and sequencing as

between-subject factors.

Outliers were not removed in considering them an integral part of the data. Data for a small number of participants was found to be missing for some measures in which cases the null value was substituted by an average value calculated from available data. Significance levels were set at $\alpha = .05$.

The CA mode of CHILDES (MacWhinney, 1995) was used for the calculation of items (e.g. words or tags) in the transcripts. Mean percentage rate of interrater agreement out of a randomly selected sample of 10% can be seen for each measure in table 2.7.1.

Table 2.7.1 - Interrater reliability: Mean percentage of rater agreement

	Dependent variables	N	Mean
Fluency	▪ Filled pauses per tokens	8	100.00
	▪ Pruned speech rate B	8	98.15
Accuracy	▪ Total Errors per AS-Unit	8	82.28
	▪ Lexical errors per AS-Unit	8	84.71
	▪ Morphosyntactical errors per AS-Unit	8	78.06
	▪ Other errors per AS-Unit	8	84.62
	▪ Error-free AS-Units per total AS-Units	8	81.33
	▪ Lexical errors per total errors	8	88.91
	▪ Morphosyntactical errors per Total Errors	8	80.02
	▪ Ratio other errors per total errors	8	82.95
Lexical Complexity	▪ D-Value	8	99.29
Structural Complexity	▪ S-nodes per AS-Units	8	100.00
	▪ Subordination per S-node	8	80.96
	▪ Mean length of utterance	8	100.00
	▪ Difference bound per unbound conjoined clauses per tokens	8	85.25
	▪ Ratio bound clauses in initial vs. final position	8	82.74
	▪ Ratio type ENP per total ENP	8	87.29

3. Results

3.1 Affective perception

The affective variables questionnaire distributed to participants at the time of data collection carried out by Gilabert (2007) showed that the complex version of the decision-making task was perceived as significantly more difficult than the simple version. Learners also felt significantly less confident during performance of the complex task than during the simple task. The conclusion is drawn that operationalizing complexity within the tasks was successful according to the perception of the participants. Details of the results of the affective perception questionnaire can be found in Gilabert (2007).

3.2 General measures of fluency, accuracy and complexity

Table 3.2.1 presents the means, standard deviations, and levels of kurtosis and skewness for the results obtained from the measures employed for fluency, accuracy, and lexical and structural complexity. A repeated measures analysis of variance (ANOVA) with complexity and as a within-subjects factor and proficiency level and sequencing as a between-subjects factor indicated no cases in which proficiency level resulted in a significant interaction effect for any of the measures at $p<.05$ (see table 3.2.2 below). Pruned speech rate-B showed a significant interaction effect for sequencing, however no conjectures will be made in this respect. Given that sequencing did not prove to be a determining factor toward results in the Gilabert study and as it does not appear to do so in any other instance in the current study. It is therefore assumed that any impact sequencing may have on performance is overridden by the impact of task complexity and will not be considered relevant for further discussion. In regards to dimensions of aspects of the language, one measure, error-free AS-units to total AS-units used as a dimension of accuracy, showed significant results. These results will be contemplated further on. Hypothesis 1 is therefore partially confirmed by the ratio of error-free AS-Units but not by any of the other measures.

Table 3.2.1 - Descriptive statistics for general measures: means, standard deviations, skewness, and kurtosis.

	Dependent variables	Task condition	N	Mean	Std. Deviation	Skewness	Kurtosis
Fluency	▪ Filled pauses per tokens	Simple	41	0.06	0.05	1.56	2.44
		Complex	41	0.05	0.04	1.23	1.54
	▪ Pruned speech rate B – syllables per minute	Simple	41	113.19	37.12	0.21	-0.60
		Complex	41	114.13	35.61	-0.12	-0.88
Accuracy	▪ Total errors per AS-Unit	Simple	41	1.01	0.50	0.66	0.06
		Complex	41	0.97	0.57	0.77	0.12
	▪ Lexical errors per AS-Unit	Simple	41	0.50	0.27	1.00	0.85
		Complex	41	0.48	0.29	0.42	-0.61
	▪ Morphosyntactical errors per AS-Unit	Simple	41	0.30	0.20	1.15	0.93
		Complex	41	0.25	0.14	0.55	-0.48
	▪ Other errors per AS-Unit	Simple	41	0.30	0.16	0.67	0.22
		Complex	41	0.34	0.25	1.58	2.55
	▪ Error-free AS-Units per total AS-Units	Simple	41	0.37	0.19	0.19	-0.90
		Complex	41	0.43	0.20	0.19	-0.33
	▪ Lexical errors per total errors	Simple	41	0.53	0.18	0.66	0.97
		Complex	41	0.51	0.19	0.43	0.48
	▪ Morphosyntactical per errors total errors	Simple	41	0.26	0.14	2.37	8.47
		Complex	41	0.24	0.11	1.15	2.93
	▪ Other errors per total errors	Simple	41	0.30	0.15	0.45	-0.02
		Complex	41	0.34	0.15	0.43	-0.30
Lexical Complexity	▪ D-Value	Simple	41	35.49	12.69	0.68	0.40
		Complex	41	34.28	12.13	1.01	2.44
Structural Complexity	▪ S-nodes per AS-Units	Simple	41	1.77	0.40	0.22	-0.47
		Complex	41	1.77	0.39	0.14	-1.26
	▪ Subordination per S-node	Simple	41	0.41	0.13	0.10	0.21
		Complex	41	0.40	0.13	-0.19	-0.22
	▪ Mean length of utterance	Simple	41	13.85	4.75	2.68	11.22
		Complex	41	13.38	3.31	1.44	3.41

Table 3.2.2 - Repeated measures ANOVA by level of complexity for general measures: degrees of freedom, sum of squares, F-value, and p-value, effect size and significance of interaction with level and sequencing

	Dependent variables	Type III Sum of Squares	df	Mean Square	F	Sig.	η2	Significance of interaction with proficiency level	Significance of interaction with sequencing	Significance of interactions with proficiency level and sequencing
Fluency	▪ Filled pauses per tokens	0.00	1	0.00	0.88	0.35	0.02	0.74	0.35	0.82
	▪ Pruned speech rate B – syllables per minute	48.60	1	48.60	0.25	0.62	0.01	0.64	0.04	0.27
Accuracy	▪ Total errors per AS-Unit	0.09	1	0.09	0.87	0.36	0.02	0.28	0.45	0.36
	▪ Lexial errors per AS-Unit	0.04	1	0.04	1.14	0.29	0.03	0.27	0.87	0.08
	▪ Morphosyntactical errors per AS-Unit	0.04	1	0.04	1.72	0.20	0.04	0.90	0.11	0.96
	▪ Other errors per AS-Unit	0.00	1	0.00	0.05	0.82	0.00	0.28	0.73	0.88
	▪ Error-free AS-Units per Total AS-Units	0.06	1	0.06	3.96	0.05	0.10	0.90	0.73	0.27
	▪ Lexial errors per total errors	0.03	1	0.03	1.04	0.31	0.03	0.23	0.38	0.10
	▪ Morphosyntactical errors per total errors	0.00	1	0.00	0.00	0.95	0.00	0.35	0.09	0.81
	▪ Other errors per total errors	0.03	1	0.03	2.09	0.16	0.05	0.90	0.49	0.09
Lexical complexity	▪ D-Value	56.13	1	56.13	1.59	0.22	0.04	0.29	0.60	0.24
Structural complexity	▪ S-nodes per AS-Unit	0.03	1	0.03	0.37	0.55	0.01	0.26	0.66	0.30
	▪ Subordination per S-nodes	0.00	1	0.00	0.02	0.90	0.00	0.37	0.34	0.26
	▪ MLU	20.40	1	20.40	1.83	0.18	0.05	0.06	0.31	0.09

df= Degrees of freedom; Ƞ2= partial eta squared effect size. p<0.05

3.3 Task specific measures of structural complexity

3.3.1 Conjoined conjunctions.

Ratios of usage were calculated for both bound and unbound conjoined clauses marked by *and, because, so,* and *but* by dividing frequency of saliency by number of tokens for each transcript. The differences between the ratios for bound and unbound clauses were calculated and compared between task conditions. As per the Cognition Hypothesis it would be expected to find a greater use of bound clauses in the complex version of the task indicating use of greater structural complexity under complex task conditions. Table 3.3.1 presents the means, standard deviations, and levels of kurtosis and skewness for the differences. A repeated measures analysis of variance (ANOVA) with complexity as a within-subjects factor and proficiency level and sequencing as between-subjects factors indicated no cases of statistical significance at $p<.05$ (table 3.3.2). Neither proficiency level nor sequencing showed to have any effect on the results except for the case of significance of sequencing in the case of *because* which will be disregarded for reasons discussed previously. The results indicate that attentional resources were not allocated toward structural complexity as measured by a ratio of usage of bound to unbound conjoined clauses.

Table 3.3.1 - Descriptive statistics for conjoined clauses: mean difference in ratios of usage between bound and unbound conjoined clauses, standard deviations, skewness, and kurtosis.

		N	Mean	Std. Deviation	Skewness	Kurtosis
And	Simple	41	-0.002	0.020	0.00	2.23
	Complex	41	-0.003	0.017	0.05	0.36
Because	Simple	41	0.012	0.008	0.51	-0.03
	Complex	41	0.013	0.013	1.49	2.56
So	Simple	41	0.000	0.006	0.81	4.53
	Complex	41	-0.001	0.005	-0.01	6.03
But	Simple	41	0.001	0.004	0.04	0.47
	Complex	41	0.001	0.004	3.21	15.18

Table 3.3.2 - Repeated measures ANOVA by level of complexity for difference between ratios of bound and unbound conjoined clauses: degrees of freedom, sum of squares, F-value, and p-value, effect size and significance of interaction with level and sequencing

	Type III Sum of Squares	df	Mean Square	F	Sig.	η2	Significance of interaction with proficiency level	Significance of interaction with sequencing	Significance of interaction with proficiency level and sequencing
And	0.00	1	0.00	0.25	0.62	0.01	0.85	0.45	0.41
Because	0.00	1	0.00	0.03	0.87	0.00	0.17	0.04	0.40
So	0.00	1	0.00	1.29	0.26	0.03	0.43	0.69	0.48
But	0.00	1	0.00	1.62	0.21	0.04	0.02	0.84	0.12

df= Degrees of freedom; η2= partial eta squared effect size. p<.05

The complex version of the task produced a greater amount of bound conjoined clauses appearing in an initial position than in a final position under complex conditions. Table 3.3.3 shows the means, standard deviations, and levels of kurtosis and skewness for the results obtained from the ratio of salience per tokens in each transcript. An analysis was carried out using a repeated measures ANOVA in which sequencing and proficiency level showed to have no effect on the results (table 3.3.4). A strong trend may be observed toward the use of conjoined clauses in the initial position as task complexity increases. Although this trend does not reach statistical significance at $p<.05$, the data shows a tendency which points to complex task conditions pushing learners to use more complex structures in order to properly convey meaning of the intended message and is supportive of predictions made by the Cognition Hypothesis and of both hypotheses 1 and 2 in the current study.

Table 3.3.3 - Descriptive statistics for initial and final position clauses ratio per tokens: means, standard deviations, skewness, and kurtosis.

		N	Mean	Std. Deviation	Skewness	Kurtosis
Initial position	Simple	41	0.004	0.005	1.029	0.534
	Complex	41	0.006	0.008	2.048	5.591
Final position	Simple	41	0.033	0.018	1.019	1.422
	Complex	41	0.036	0.019	0.664	1.701

Table3.3.4 - Repeated measures ANOVA by level of complexity for clauses in initial and final position: degrees of freedom, sum of squares, F-value, and p-value, effect size and significance of interaction with level and sequencing

Position	Type III Sum of Squares	df	Mean Square	F	Sig.	η2	Significance of interaction with proficiency level	Significance of interaction with sequencing	Significance of interactions with proficiency level and sequencing
Initial	0.00	1	0.00	3.80	0.06	0.09	0.13	0.54	0.70
Final	0.00	1	0.00	0.01	0.91	0.00	0.15	0.39	0.26

df= Degrees of freedom; Ƞ2= partial eta squared effect size. p<0.05

3.3.2 Elaborated noun phrases

The category of elaborated noun phrases PRE2 which marked the use of simple descriptive pre-modifying noun phrases that consist of an adjective or noun modifier in addition to the determiner and head noun showed to be significantly more common in the output elicited by the complex task. Significance was also reached in greater use of the simplest elaborated noun phrase form, PRE1, as well as the more complex form, PRE3 in the simple version of the task. Table 3.3.5 shows the means, standard deviations, and levels of kurtosis and skewness for the ratios of each type of noun phrase per total number of noun

phrases. Results of a repeated measures ANOVA are illustrated in Table 3.3.6. Proficiency level and sequencing did not show any effect on the results. These results of noun phrase elaboration partially confirm hypothesis 1 and confirm hypothesis 2.

Table 3.3.5 - Descriptive statistics for ratio ENP type per total ENP's: means, standard deviations, skewness, and kurtosis.

		N	Mean	Std. Deviation	Skewness	Kurtosis
PRE1	Complex	41	0,532	0.13	0.59	-0.14
	Simple	41	0,600	0.11	0.30	-0.60
PRE2	Complex	41	0,302	0.11	0.13	-0.35
	Simple	41	0,189	0.10	0.61	-0.38
PRE3	Complex	41	0,009	0.03	4.62	24.29
	Simple	41	0,006	0.02	2.95	7.37
POST	Complex	41	0,157	0.08	-0.02	-0.48
	Simple	41	0,206	0.09	0.11	-0.12

Table 3.3.6 - Repeated measures ANOVA by level of complexity for ratio ENP type per total ENP's: degrees of freedom, sum of squares, F-value, and p-value, effect size and significance of interaction with level and sequencing

Noun phrase type	Type III Sum of Squares	df	Mean Square	F	Sig.	η2	Significance of interaction with proficiency level	Significance of interaction with sequencing	Significance of interactions with proficiency level and sequencing
PRE1	0.05	1	0.05	4.39	0.04	0.11	0.24	0.93	0.24
PRE2	0.19	1	0.19	21.86	0.00	0.37	0.60	0.88	0.14
PRE3	0.00	1	0.00	0.50	0.49	0.01	0.83	0.47	0.85
POST	0.05	1	0.05	7.43	0.01	0.17	0.37	0.79	0.93

df= Degrees of freedom; η2= partial eta squared effect size. p<.05

4. Discussion

It is important to note that, according to the Cognition Hypothesis, as tasks are increased in complexity along resource-dispersing dimensions, such as less planning time, speech production should result in less fluency, accuracy and linguistic complexity. Where these dimensions are simplified, effects of task complexity modified along resource-directing dimensions should result in more accurate and complex but less fluent speech. Synergetic effects of simultaneous demands from both resource-directing and resource-dispersing factors may provide an explanation for why general measures, for the most part, found little effect for task complexity in the present study which was complex for planning time dimensions and, in the complex version, number of steps. This may have mitigated increases in measures of complexity and accuracy due to resource-directing demands during performance of the complex task.

Of the general measures, the one which gave significant results showed that as task complexity increased, there was a higher incidence of error-free AS-units. Since other measures in the current study and in Gilabert's (2007) show little difference in number of errors in the simple and complex tasks, it becomes evident, from fewer AS-units containing errors, that errors produced during the complex task are grouped close together. During performance of the simple task the same number of errors are produced, but spread over more AS-units. Increased task complexity provoked not more errors, rather a different kind of error in the language produced during the complex task likely resulting in this grouping. The incidence of morphosyntactical errors and lexical errors did not differ between task conditions indicating that the effect is not a result of influence on the formulation of the message. The errors which were grouped as observed are likely the result of how the message was conceptualized during performance of the complex task. Increasing reasoning demands can be expected to influence message conceptualization in order to meet task demands requiring justification of decisions made during performance. As a result learners take risks as the interlanguage is stretched to meet these demands. Skehan (1996) claims that a focus on meaning and restructuring, or conceptualization, increases the chances that new language forms be incorporated into the interlanguage promoting risk taking. These results are evidence of allocation of attentional resources toward meaning rather than to form and are, in part, supportive of the first hypothesis.

As refers to the observation of more initially bound conjoined clauses in the speech samples of the complex version of the task, positioning of information in an utterance may affect the kind of informational perspective that a speaker is interested in achieving for an intended message. Placing new or important information in a final position may be a particularly important strategy for making a justification. That significance was nearly reached in the use of bound conjoined clauses positioned initially under complex conditions, may be interpreted as attentional resources being focused on conceptualization of the message in the speakers' planning of how information is focused to attract the listener's attention, a process which takes place during the micro-planning stage of speech production (Levelt, 1989). The following example, taken from one of the transcripts performed under complex conditions, is an illustration of how one participant justifies a decision employing initial positioning of a conjoined clause:

GuAd: uh if I have the uh the two children uh with me I I don't think I could help him.

In the utterance, previously given information is reiterated in the initially positioned conjoined clause (evidenced by the definite article used in denoting the known referent). The new information, the justification, is in the matrix clause in final position where it may be better noticed by the listener. Results indicate that attentional resources were allocated to meaning through greater structural complexity, partially supportive of the first hypothesis. These results are supportive of hypothesis 2 as well. The task-specific measure of positioning of conjoined clauses indicated the use of a complex structure toward a specific end under complex conditions that was undetectable by general measures or other task-specific measures employed in this study.

The measure of elaborated noun phrases also provides insight into the effect of increased task complexity on speech production. The significantly greater use of PRE2 type of elaborated noun phrase in the complex version of the task compared with lesser usage in the simple version of the task is evidence of how attentional resources were allocated toward structural complexity as task complexity was increased. Different from the simple task which consisted of rescuing a homogeneous set of people from the burning building, the complex task included people suffering from varying degrees of personal conditions including a pregnant woman, an elderly man, and an injured man. This factor likely led participants to distinguish between the victims in the complex task by means of the PRE2 category of noun phrases which included the use of a noun modifier in addition to the determiner and the head noun of the phrase.

It was also observed that there was significantly more post-modification of nouns produced by the participants during their performance on the simple task than on the complex task. Post-modification, according to the criteria established above, is considered to suggest greater structural complexity than the category of PRE2 type pre-modification. This observation points against what is predicted by the Cognition Hypothesis which would lead us to expect more complex structures produced during the complex version of the task. As a possible explanation for this phenomenon it may be argued that where cognitive complexity was increased along reasoning demands by depicting victims whose personal conditions would be expected to force learners into complex decision-making situations as, for example, how to deal appropriately with the elderly man, the pregnant woman, and the children, all who need special care, concurrently we may be simplifying the task along the resource directing variable of few elements (Robinson & Gilabert 2007; Robinson, 2007). Fixing distinctive characteristics upon the victims tags them with pre-established identifying features. In the simple task, participants must distinguish between victims whose general condition is

homogeneous requiring more effort during the macro-planning stage of message conceptualization in making reference to the objects from available contextual information. The result is of greater use of complex post-modification in the simple task to define victims by identifying and describing their condition within the context (i.e. *the man on the roof; the man trapped in the elevator, the family on the fourth floor,* etc.) when no appropriate noun pre-modifier could be used (i.e. *the elderly man, the pregnant woman*, etc.).

In addition to greater ratio of post-modification of nouns, a significantly greater ratio of PRE1 pre-modification was observed in the simple task. The greater ratio of the simplest form of pre-modification in the simple task as operationalized in the study is predictable according to the idea that adults maintain a scale of conceptual complexity acquired in childhood (Slobin, 1985). It may be expected that this leads to their use of simple forms in L2 production under simple conditions. Where the task was complexified along number of elements, participants were pushed to use complex structures in order to communicate better as per Perdue (1993), but only in those specific instances to meet specific task demands. In the task complexified along reasoning demands, the increased cognitive complexity pushed the participants toward more complex structures as well, evidenced from greater incidence of PRE2 and lesser incidence of PRE1 type noun phrases.

Hypothesis 1 was partially confirmed according to the results of the study. As task complexity increased, measures indicated that some attentional resources were allocated to specific dimensions of structural complexity although not to all measures overwhelmingly. According to the hypothesis, if attention was allocated toward complexity, then it would be predicted that accuracy would not be affected. The one measure of accuracy which achieved significance appears to have done so as a result of how the message was conceptualized. This is interpreted as evidence of attention allocated toward conveyance of meaning rather than form. The conclusion has been reached that as task complexity increased in this study, specific aspects of structural complexity were positively affected while accuracy was not affected. Fluency, however, was not affected as predicted.

Hypothesis 2 was confirmed while task-specific measures of conjoined clauses and elaborated noun phrases offered some insight into specific dimensions of structural complexity that were not visible through more general measures.

5. Conclusion

The current study has performed a series of analyses from previously collected data from a study carried out by Gilabert (2007) with the intention of identifying effects on oral production through measures of fluency, accuracy and linguistic complexity, attributable to the increase of cognitive demands along dimensions of the resource-directing variable of +/- reasoning demands. Results are supportive of proposals set forth by the Cognition Hypothesis in that as task complexity was increased along dimensions of reasoning demands, attentional resources appear to have been allocated toward structural complexity without detriment toward accuracy or lexical complexity. Fluency was not affected, however, as would be expected from predictions of the Cognition Hypothesis.

Determining conclusions, however, cannot be made as results have not been overwhelming. As stated earlier, the effect of the resource-dispersing characteristics of limited planning time and more steps in the complex version can be expected to have dispersed resources to a degree that fewer were allocated sufficiently to create large differences in the speech production between complex and simple versions of the task resulting in a small number of statistically significant results

The three task-specific measures employing elaborated noun phrases and conjoining clauses have helped bring to light areas of structural complexity which were affected by manipulations in levels of task complexity where other measures were not able to do so. As a result, a trade-off between increased cognitive demands and complexity can be appreciated in the data.

Further inquiry into the same spoken data may reveal in just which way errors were grouped among error-free AS-units. This information would add to an increasing knowledge base of how task manipulation affects surface structure of learners' language (see Robinson, 2007 for a review). In addition, the use of task-specific measures which focus on particular changes in linguistic performance that result from increasing complexity along resource-directing variables will likely grow in future research. This should be an invaluable tool for more accurately identifying effects of manipulation of task characteristics on linguistic output which will in turn prove useful knowledge to designers of task-based curricula. Further pedagogical implications of this study are those which offer complementary support to investigation whose goal it is to provide empirical evidence in support of effective guidelines for creating and sequencing tasks for successful language learning in the classroom.

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Appendix

Fire chief task (Gilabert, 2007)