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WORKING MEMORY CAPACITY AND THE ACQUISITION OF A SYNTACTIC STRUCTURE IN L2 SPEECH

Por

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ABSTRACT

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2009

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This study investigated whether working memory capacity is related to the acquisition (measured in two phases, one of retention and another one of acquisition proper) of a syntactic structure as it emerges in L2 speech. Departing from Information Processing Theory (for example McLaughlin & Heredia, 1996) L2 speaking is conceptualized as a complex skill requiring both automatic and controlled processes working in tandem for its execution (Fortkamp, 2000; Shiffrin & Schneider, 1977). The study departs from the general hypothesis that working memory capacity assessed in terms of a speaking span test used in two versions, one in L1 and another one in L2, will correlate with the retention and acquisition of a syntactic structure in L2 speech. Ninety-seven adult learners of English as a foreign language participated in this study, 50 control and 47 experimental. The method used was quasi-experimental and mainly quantitative and correlational. Following suggestions of a pilot study (Finardi, 2007), the target language structure investigated was agreeing with *So+aux+I* and *Neither+aux+I* in short responses in L2 speech. Retention of a syntactic structure was operationalized as correct use of the target language structure in a focused, immediate test. Acquisition of a syntactic structure was operationalized as accurate use of the target language structure in an unfocused, delayed test. Overall results show that working memory capacity

(assessed in terms of a speaking span test in both L1 and L2) is related to the acquisition of a complex syntactic structure in L2 speech. Results suggest that the acquisition of a syntactic rule in L2 speech is mediated by working memory capacity operating on controlled processes in the rule-based system. Notwithstanding the relationship between working memory capacity and the acquisition of a syntactic structure in L2 speech, linguistic accounts of L2 processing are used to complement and explain the acquisition of a complex syntactic structure in L2 speech. Results are discussed in terms of the linguistic and psycholinguistic complexity of the syntactic structure investigated in relation to working memory capacity, processing of form versus processing of meaning, the acquisition of a rule by the rule-based system, L1 and L2 linguistic variations (based on UG theories) and constraints in L2 speech production, presenting both quantitative and qualitative data to foreground the discussion.

Keywords: acquisition of a syntactic structure in L2 speech, working memory capacity, controlled processes in the rule-based system

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RESUMO

CAPACIDADE DE MEMÓRIA DE TRABALHO E A AQUISIÇÃO DE UMA ESTRUTURA SINTÁTICA NA FALA EM L2

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2009

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Este estudo investiga se há relação entre a capacidade de memória de trabalho e a aquisição (analisada em duas fases, um da retenção da regra e outro da aquisição em si) de uma estrutura sintática na fala em L2. Partindo da teoria do processamento da informação (por exemplo, McLaughlin & Heredia, 1996) a fala em L2 é conceitualizada como uma habilidade complexa que requer o funcionamento de processos automáticos e controlados para sua execução (Fortkamp, 2000; Shiffrin & Schneider, 1977). A hipótese geral que norteia o trabalho é de que a capacidade de memória de trabalho, medida por um teste de amplitude da fala em L1 e em L2, correlacionará com a retenção e aquisição de uma estrutura sintática na fala em L2. Noventa e sete estudantes adultos de inglês como idioma estrangeiro participaram no estudo, 50 no grupo de controle e 47 no experimental. O método usado foi quase-experimental e predominantemente quantitativo e correlacional. Seguindo sugestões de um estudo piloto (Finardi, 2007), a estrutura alvo investigada foi concordar usando as fórmulas *So+aux+I* e *Neither+aux+I* nas respostas curtas da fala em L2. A retenção de uma estrutura sintática na fala em L2 foi operacionalizada como o uso correto dessa estrutura numa tarefa focada e imediata. A aquisição, por sua vez, foi operacionalizada como o uso correto dessa estrutura em uma tarefa não focada e não imediata. Em geral os resultados mostram que a capacidade

de memória de trabalho (medida através de testes de amplitude de fala em L1 e em L2) está relacionada com a aquisição dessa estrutura sintática na fala em L2. Os resultados do estudo sugerem que a aquisição dessa regra sintática é mediada pela capacidade de memória de trabalho que opera com processos controlados no sistema baseado na produção de regras. Não obstante a relação entre a capacidade de memória de trabalho e a aquisição de uma estrutura sintática na fala em L2, o estudo complementa a explicação da aquisição dessa estrutura feita pela psicologia cognitiva com estudos de processamento sintático em L2 partindo de um arcabouço linguístico. Os resultados do estudo são discutidos em termos da complexidade linguística e psicolinguística da estrutura sintática investigada em relação à capacidade de memória de trabalho, ao processamento da forma e do significado, a aquisição de uma regra pelo sistema baseado na produção de regras, a variações linguísticas entre L1 e L2 e a limitações na fala em L2, apresentando dados quantitativos e qualitativos para embasar a discussão.

Palavras-chave: aquisição de uma estrutura sintática na fala em L2, capacidade de memória de trabalho, processos controlados e sistema baseado na produção de regra.

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CHAPTER 1

INTRODUCTION

1.1 Preliminaries

As a life-long language learner and an English teacher for over 16 years, I have always wondered how people come to master a second language[1] (L2). Among the many abilities that learners must develop in the course of L2 acquisition, speaking is the one which always represented the biggest challenge for me to learn as an adult learner, and to teach as a foreign language instructor. Due to the difficulty associated with learning to speak a second language fluently on one hand, and its importance on the other, this research endeavor represents an attempt to better understand L2 learning in general, and the processes involved in L2 speech acquisition in particular.

Information processing theory has been used as a framework to study both L2 acquisition and speaking in a systematic way for over a decade now (Fortkamp, 2008). A basic tenet of this approach is that human beings process information under the constraints of a limited capacity cognitive system – working memory - which functions as a computational arena, fueled by limited cognitive resources (attention) that support both the execution of various symbolic computations and the maintenance of intermediate products generated by these computations (Just & Carpenter, 1992;

1The terms second, third and foreign language are used interchangeably in this dissertation, unless otherwise stated.

Miyake & Friedman, 1998). In this framework, working memory is treated as the theoretical construct that refers to the system or mechanism underlying the maintenance of task-relevant information during the performance of a cognitive task (Shah & Miyake, 1999, p.1). Others (for example Jarrold & Towse, 2006) have defined working memory as the ability to hold information in mind in the face of potentially interfering distraction in order to guide behavior. Researchers investigating working memory claim that its capacity is limited.

The earliest reference to limitations in this system was associated with short-term memory and became known as the *Magical Number Seven* introduced by Miller (1956) who noticed that the memory span of young adults was around seven elements or chunks. More recently, Cowan (2001) proposed that working memory capacity is about four chunks in young adults and fewer in children and old adults. Working memory capacity is usually assessed in terms of complex span tests which are dual-tasks comprising a memory span measure and a concurrent processing task. Measures of working-memory capacity are strongly related to performance in other complex cognitive tasks such as reading comprehension, problem solving, and with measures of intelligence quotient (Miyake & Shah, 1999).

Within information processing theory, the construct of working memory has been used to explain human processing and there is evidence that working memory capacity constrains a number of cognitive processes, among which are L1 and L2 speaking (Bergsleithner, 2007; Daneman & Green, 1986; Daneman, 1991; Finardi, 2007; Finardi & Prebianca, 2006; Finardi & Weissheimer, in press; Fontanini, Weissheimer, Bergsleithner, Perucci & D'Ely, 2005; Fortkamp, 1998; 2000; Guara-Tavares, 2008; Mizera, 2006; Weissheimer, 2007; Xhafaj, 2006). Overall these studies show that individuals with larger working memory capacity tend to outperform those

with smaller working memory capacity in different aspects of speech production such as fluency, accuracy, complexity and weighed lexical density.

According to the aforementioned studies, working memory capacity plays an important role in the processes involved in L2 speech production and development. Based on this evidence, this study goes a step further to suggest that working memory capacity may also play a role in the processes involved in L2 speech acquisition. More specifically, this study investigates whether working memory capacity is involved in the acquisition of a syntactic structure as it emerges in L2 speech. In order to do so, it seeks to understand the role of working memory capacity in two moments of the acquisitional process which include the retention of a syntactic rule in L2 speech and the acquisition proper of this rule in L2 speech. For the sake of this study, retention is assumed to reflect the use of the form of the syntactic structure investigated whereas acquisition is assumed to reflect the use of the form and meaning together, in a communicative context. Retention is operationalized as the production of the syntactic rule in L2 speech in a focused (Ellis, 2003) and immediate test in which the target language structure cannot be circumvented whereas acquisition is operationalized as the production of the syntactic structure in a communicative test where other structures are possible. Thus, this study investigates whether working memory capacity is related to the retention of the syntactic form of the target language structure and to the acquisition of the syntactic structure which is assumed to require the processing of both the form and meaning of the syntactic structure investigated.

Most accounts of L2 acquisition (for a comprehensive review see Ellis, 1994) do not emphasize the role of L2 speech production as a potential variable to trigger acquisition. Among the rare accounts of L2 acquisition that include speaking (for example, Bialystok, 1982; 1991), Skehan's (1998) account of L2 learning was selected

for this study because of the importance of (speech) production for acquisition in his view of L2 learning. According to Skehan (1998), L2 learners are driven by a focus on meaning. Drawing on Swain (1985), Skehan claims that production (for him, through tasks) is necessary to force the learner to focus on form, syntacticalizing language. Skehan's view of L2 learning is rooted in dual-process theories of mind which conceptualize our cognitive system as being subdivided into two systems: a memory-based system responsible for synthesis and a rule-based system responsible for analysis (Skehan, 1998). In the case of language use and acquisition, according to Skehan, the memory-based system is responsible for synthesizing language, producing, for example, formulaic language, and the rule-based system is responsible for syntacticalizing language, computing, for instance, grammar rules. For Skehan, production is the means through which learners engage in cycles of analysis and synthesis of language[2], thus adding items to and transferring from the memory-based and the rule-based system. The rule-based system (which is the focus of this study) is responsible for computations and requires attention, which is assumed to be limited in working memory.

As previously mentioned in this section, the relationship between working memory capacity and L2 speech production seems to have been clearly established by a number of studies (Bergsleithner, 2007; Finardi, 2007; Finardi & Prebianca, 2006; Finardi & Weissheimer, in press; Fontanini et al., 2005; Guara-Tavares, 2008; Weissheimer, 2007; Xhafaj, 2006) inspired in Fortkamp (2000). Nevertheless, the relationship between working memory capacity and L2 speech development, to the best of my knowledge, is still in its infancy, with only a few studies contributing insights. Variations in working memory capacity in the course of L2 acquisition due to an increased automatization of the procedures necessary to speak

[2] These terms will be fully explained in the review of literature in chapter 2.

represent an interesting research question (Berquist, 1998; Fortkamp, 2000; Harrington, 1992; Harrington & Sawyer, 1992; Miyake & Friedman, 1998; Weissheimer, 2007) which was investigated, with different scopes and to a certain extent, by a number of studies (Bergsleithner, 2007; Finardi, 2007; Finardi & Weissheimer, in press; Weissheimer, 2007). Notwithstanding these attempts, research focusing on the role of working memory capacity in L2 acquisition is still scarce, though the field is starting to acknowledge that a better understanding of the relationship between working memory capacity and L2 performance and acquisition might shed light on a wide range of individual differences in the level of L2 proficiency attained by adult L2 learners (Finardi & Weissheimer, in press; Miyake & Friedman, 1998, pp. 339 -340). Despite these attempts to better understand the relationship between working memory capacity and L2 speech development (Bergsleithner, 2007; Finardi, 2007; Finardi & Weissheimer, in press; Weissheimer, 2007), except for Finardi (2007), to the best of my knowledge, no studies have investigated the relationship between working memory capacity and the acquisition of a syntactic structure in L2 speech.

So as to fill in this gap in the literature, the present doctoral dissertation draws on existing research on working memory capacity and L2 speech production to advance the proposal that working memory capacity may also be involved in the retention and acquisition of a syntactic structure in L2 speech. In order to do that, the retention and acquisition of a syntactic structure will be viewed in this study as the production of a syntactic rule by the rule-based system (Skehan, 1998) which operates by means of controlled processes in working memory.

Because cognitive theories (such as information processing theory or the psycholinguistic accounts of language acquisition brought to bear in this study) alone cannot fully explain L2 acquisition, this study also reviews linguistic accounts of L2

processing which see linguistic knowledge as being unique and separate from other knowledge systems and L2 acquisition as being different from other kinds of learning and guided by mechanisms that are specifically linguistic in nature (Ellis, 1994, p.348).

Notwithstanding the psycholinguistic assumption that at least some aspects of an L2 can be learned in adults like other skills (McLaughlin, 1987), this study acknowledges the fact that cognitive theories are but one way of explaining L2 learning and so psycholinguistic accounts of L2 acquisition are complemented by linguistic accounts of L2 processing. Thus, this study departs from the psycholinguistic assumption that cognitive variables (such as working memory capacity) play an important role in the retention and acquisition of a syntactic structure in L2 speech, but also acknowledges the possibility that linguistic variables such as the linguistic complexity of the structure being learned and parameter resetting[3] in the L2 (White, 1983) may also affect the acquisition of a syntactic structure in L2 speech.

Because this study deals with the acquisition of a syntactic structure that may be affected by L1 parameters (White, 1991) the overall tone and departure point of this study is cognitive theory, more specifically, information processing theory, but a review of linguistic accounts of L2 processing will also be included so as to offer a more comprehensive picture of variables involved in the retention and acquisition of a syntactic structure in L2 speech.

1.2 Statement of the Purpose

The main aim of this study is to investigate the extent to which working memory capacity is related to the retention and acquisition of a syntactic structure in L2

[3] According to White (1983) learners at the initial stages of L2 acquisition are likely to show the effect of the L1 parameter in their L2 processing.

speech. In this study working memory is understood to comprise the system responsible for storing and processing information online during the performance of complex cognitive tasks (Shah & Miyake, 1999). Limitations in this system are assumed to reflect the efficiency with which individuals can perform the task-specific ability of orally producing sentences (Daneman, 1991; Daneman & Carpenter, 1980; Fortkamp, 2000). Working memory capacity was assessed by means of the speaking span test based on Daneman (1991) and adapted to L1 (Prebianca & Mota, 2008) and L2 (Weissheimer, 2006).

The English (L2) target language structure investigated was agreeing with sentences using the formula (*So+aux+I* and *Neither+aux+I*). This structure is assumed to be a complex linguistic structure because it requires verb movement for processing and parameter resetting (i.e., changing the parameter used in L1) in L2 for acquisition (White, 1991). The retention of this syntactic structure is instantiated in this study as the production of the target language structure (*So+aux+I* and *Neither+aux+I*) in an immediate, focused test (Ellis, 2003) which requires the use of this specific linguistic structure in obligatory contexts, whereas acquisition is instantiated as the production of the target language structure in an unfocused, delayed test in which other linguistic structures are possible. The production of this grammar rule in L2 speech production is assumed to happen in the rule-based system (Skehan, 1998) which, in turn, is assumed to operate on controlled processes. The controlled processes needed to produce this rule are assumed to required attention which, in turn, is assumed to be limited in working memory.

Ninety-six adult learners of English as a foreign language (EFL) comprise the pool of participants in this study, divided into a control (N=50) and an experimental group (N=46). Participants' first language (L1), Brazilian Portuguese

differs from English (L2) in the use of the syntactic structure investigated. Whereas in Portuguese agreement is usually achieved by repeating the main verb in a sentence as in

A- Eu falo espanhol.

B – Eu tambem falo.

in English the speaker has to undergo different syntactic computation to produce the target language structure so as to agree with a sentence, using an auxiliary verb which agrees with the main verb heard in the prompt as in:

A – I speak Spanish.

B- So do I.

In Portuguese agreement follows the canonical order of subject and verb whereas in English this form is used in the prompt but not in the target language structure used to agree. Moreover, in English there is an encapsulation of the idea expressed in the prompt in the particles *So* and *Neither,* which are placed at the front of the phrase. This agreement structure in English also requires the substitution of the main verb and verb inversion whereas in Portuguese none of this is necessary. The grammar structure used to agree in English will be more fully explained in Chapter 2 in the section that reviews linguistic accounts of L2 processing.

The study is mainly quantitative since statistical procedures are used to answer the six hypotheses raised and only one research question is answered with a qualitative analysis. The general research question of whether there is a relationship between working memory capacity and the retention and acquisition of a syntactic structure in L2 speech was answered mainly with Pearson correlations and supported by qualitative analyses of the interviews with participants, which were used to triangulate the data.

1.3 Significance of the study

The present study contributes to existing research on individual differences in working memory capacity and L2 speech production and acquisition in four main ways. First it provides insights that may disambiguate mixed results found in studies that sought to tap into the relationship between working memory capacity and accuracy of L2 speech (for example: Finardi & Prebianca, 2006; Finardi, in press; Fontanini et al, 2005; Weissheimer, 2007). These studies used global measures of accuracy which proved to be problematic in the study of L2 speech development[4]. So as to overcome limitations found in global measures of accuracy, the present study used a focused task eliciting the target language structure as opposed to counting the total number of errors made. The adoption of this measure proved to be more appropriate to study L2 acquisition (Finardi, 2007) since it allows the researcher to see what the participant knows instead of looking at what learners do not know as is the case with global measures.

Second, the present study contributes to both the literature on working memory and L2 speech production and acquisition by providing evidence that working memory capacity is related to the retention and acquisition of a syntactic structure in L2 speech. Finding evidence for the relationship between working memory capacity and the acquisition of a syntactic structure in L2 speech is perhaps the first and necessary

4 Studies using global measures of accuracy did not find correlations with working memory capacity. The issue of why focused tests which require the production of particular linguistic features in obligatory contexts (Ellis, 2003) may be better suited for studying L2 development will be dealt with in chapter 2.

step to justify further studies on the relationship between working memory capacity and L2 acquisition in general since the acquisition of a syntactic structure in L2 speech is but one aspect involved in L2 acquisition in general.

Third, it raises and discusses the important question of whether L1 and L2 working memory capacity scores are related suggesting that the L2 speaking span test may confound working memory capacity and L2 proficiency level. Finally, it addresses the acquisition of a syntactic structure from both an information processing and a linguistic perspective, bridging and bringing insights from both fields to the discussion of what is involved in the retention and acquisition of a syntactic structure in L2 speech.

1.4 Organization of the dissertation

This dissertation is organized in six chapters. Chapter 1 presented the statement of the purpose and significance of the study. Chapter 2 reviews the literature on L2 acquisition (Skehan, 1998) and working memory capacity (for example Fortkamp, 2000) from an information processing perspective and then reviews linguistic accounts of language processing so as to offer a different perspective on the acquisition of syntactic structures in L2 (Flynn, 1989; White, 1991). Chapter 3 presents the research questions and hypotheses investigated in the present study. It also presents the method used to investigate the question of whether working memory capacity is related to the retention and acquisition of a syntactic structure in L2 speech and the statistical procedures used to analyze and triangulate the data with the qualitative analysis. The results are presented in Chapter 4, discussed in Chapter 5 and summarized in Chapter 6.

Chapter 6 also presents a conclusion to the study with some pedagogical implications and the limitations of the study with suggestions for further research.

CHAPTER 2

REVIEW OF LITERATURE

This chapter reviews the literature from which this study departed to answer the general research question of whether working memory capacity is related to the acquisition (seen in two moments, one of retention of the form and another one of acquisition per se) of a syntactic structure in L2 speech. More specifically, the purpose of this chapter is to review the literature on L2 acquisition and working memory capacity from a psycholinguistic perspective which tends to view the acquisition of L2 in adults as being similar to the acquisition of other complex cognitive skills (for example, Skehan, 1998). Because cognitive theories alone cannot fully explain L2 acquisition, this chapter also reviews linguistic accounts of L2 acquisition (for example, White, 1991). Cognitive theories of L2 acquisition contrast with linguistic accounts of L2 acquisition which see linguistic knowledge as being unique and separate from other knowledge systems and L2 acquisition as being different from other kinds of learning and guided by mechanisms that are specifically linguistic in nature (Ellis, 1994, p.348).

Notwithstanding the psycholinguistic assumption that at least some aspects of an L2 can be learned in adults like other skills (McLaughlin, 1987), I agree with McLaughlin (p.150) and Ellis (1994, p. 462) that psycholinguistic theories cannot fully account for L2 learning since learning an L2 involves the acquisition of a complex

cognitive skill, but also the acquisition of a complex *linguistic* skill (my emphasis). According to McLaughlin (1987, p. 150) cognitive theories are but one way of explaining L2 learning and in order to have a more complete and powerful explanation of L2 learning, cognitive theories must be complemented by linguistic theories. Ellis (1994, p. 462), in line with McLaughlin, claims that any explanation of L2 acquisition must consider what learners are trying to learn, in our case, a second/foreign language.

The two perspectives (cognitive and linguistic) are not mutually exclusive and a comprehensive account of L2 acquisition incorporates elements of both (Ellis, 1994, p. 462). Though I believe that cognitive variables (such as working memory capacity) play an important role in the acquisition of a syntactic structure in L2 speech, I also acknowledge the possibility that perhaps not all aspects of language are learned in a similar fashion and that the acquisition of a syntactic structure in L2 may also be affected by linguistic variables such as the linguistic complexity of the structure being learned and parameter resetting[5] in the L2 (White, 1983). Based on the aforementioned need to complement cognitive theories with linguistic accounts of L2 processing, and also based on the fact that this study deals with the acquisition of a complex syntactic structure that requires verb movement for processing and parameter resetting (i.e., changing the parameter used in L1) in L2 for acquisition (White, 1991), the overall tone and departure point of this study is cognitive theory, more specifically, information processing theory, but a review of linguistic accounts of L2 processing will also be included so as to offer a more comprehensive picture of variables involved in the processing and acquisition of a syntactic structure in L2 speech.

The chapter is divided in two main sections, one dedicated for accounts of L2 acquisition based on cognitive theories and another for accounts of L2 processing

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1 As mentioned in chapter 1, according to White (1983) learners at the initial stages of L2 acquisition are likely to show the effect of the L1 parameter in their L2 processing.

and acquisition based on linguistic theories. Section 2.1 outlines principles of information processing and dual process theories reviewing Skehan's (1998) account of L2 acquisition based on dual-process theories of mind. Section 2.2 is dedicated to a powerful and pervasive construct in cognitive psychology – working memory – which has been used to explain a plethora of phenomena related to human behavior. Section 2.3 reviews the construct of working memory and working memory capacity departing from information processing and dual process perspectives and section 2.4 reviews studies on the role of working memory capacity in L2 speech production, development and acquisition. The second part of this chapter aims at complementing the psycholinguistic account of L2 acquisition with a brief review of linguistic accounts of syntactic processing in section 2.5, so as to offer a yardstick against which the acquisition of a specific syntactic structure in L2 can be compared.

2.1 Psycholinguistic Accounts of L2 Acquisition

At the outset, this section offers an overview of information processing theory which inspired different approaches to the systematic study of second language acquisition (SLA), such as the Output Hypothesis (Swain, 1985, 1995), Skehan's (1998) psycholinguistic account of L2 learning based on dual-process theories of mind, and studies that seek to understand the role of working memory capacity in L2 speech production and acquisition (e.g.: Bergsleithner, 2007; Finardi & Prebianca, 2006; Finardi, 2007; Finardi, in press; Finardi & Weissheimer, in press; Fortkamp, 2000; Guara-Tavares, 2008; Mota, 1998; Weissheimer, 2007; Xhafaj, 2006). Although another model of syntactic processing is offered in this section, the overall theory informing this study is information processing theory, thus its overview in this section.

Information processing theory is based on the assumption that people are autonomous and active information processors (Ashcraft, 1994) with a cognitive system that comprises a limited capacity working memory system responsible for online processing and temporary maintenance of information during the performance of complex tasks (Baddeley, 1990; 1999; Carpenter & Just, 1989; Daneman & Carpenter, 1980; Fortkamp, 2000, Just & Carpenter, 1992; Shah & Miyake, 1999; among many others). In this theory, complex behavior comprises the interplay of automatic and controlled processes that can be isolated and studied independently (for example McLauhglin & Heredia, 1996; Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977). These processes take time and so predictions based on reaction time can be used in this framework (Ashcraft, 1994; DeKeyser, 2007; McLaughlin, 1987; McLaughlin & Heredia, 1996; Schmidt, 1992).

As suggested by McLaughlin and Heredia (1996), because of the limited nature of working memory, people have to practice procedures to make them automatic, thus freeing up attentional resources to be allocated in the execution of other tasks. When one component of a task becomes automatized, attention can be devoted to other components of the task and it is in this sense that cognitive accounts of skill building view complex abilities as those which require the interplay of automatic and controlled processes for their execution and mastery (Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977).

Automatic processes are fast, efficient, unavailable to introspection, hard to alter, effortless, not limited by working memory capacity, not under voluntary control and run in parallel whereas controlled processes are slow, serial, flexible, inefficient, effortful, limited by working memory capacity, under the subject's control and are at least partly accessible to introspection (McLaughlin & Heredia, 1996; Ashcraft, 1994;

Schmidt, 1992). Controlled processes are used to maintain goals in working memory and to apply general procedures to new situations which happen in novel and inconsistent processing tasks (Schmidt, 1992).

For information processing theory, learning involves the transfer of information to long-term memory (McLaughlin, 1987). This transfer is regulated by controlled processes which, in turn, use up attention and take time. Complex tasks are characterized by a hierarchical structure, that is, tasks are composed of subtasks that can become automatized through practice, thus freeing up controlled processes to be allocated to other components of the task or to the execution of other tasks (McLaughlin, 1987; DeKeyser, 2007). Practice is paramount in this view of learning for it is the means through which a skill is built and information is stored in long-term memory (Ashcraft, 1994; DeKeyser, 2007; McLaughlin & Heredia, 1996).

In this view, and for this study specifically, learning a syntactic structure is understood to comprise two phases. In a first moment, of controlled practice and production, the form (in this case, the rule) of the syntactic structure is retained in long-term memory. In a second moment, of freer practice and production, the form of the syntactic structure is accessed and used in a communicative task in which meaning must be processed with the form of the syntactic structure. In this study the first moment is termed retention and the second moment, acquisition, since it is only in the second moment that the syntactic structure is believed to have been fully acquired.

In cognitive accounts of skill acquisition (for example, DeKeyser, 2007, p. 7), people are believed to start learning with the presentation of information in an explicit form (declarative knowledge). For the sake of this study, this declarative knowledge involves the rule to use the syntactic structure (*So+aux+I* and *Neither+aux+I).* This information is then incorporated (proceduralized) into behavioral

routines through practice. Once established, procedural knowledge can become automatized. As it is, learning starts with controlled processes that are used to transform declarative knowledge into procedural knowledge which can be automatized through practice, thus freeing up cognitive resources to be allocated to other aspects of learning or performance.

Though this view of learning can account for how most skills are learned, it falls short in explaining language acquisition and merits criticism. Wong Fillmore (1976, cited in McLaughlin & Heredia, 1996) cites evidence that children are capable of producing sophisticated language which was memorized as chunks, rather than analyzed. These unanalyzed packed chunks are then unpacked gradually and used as the basis for more productive speech later on when learners' speech is simpler and shorter as rules are analyzed and consolidated. If language development goes from a process of packing and unpacking (or synthesis and analysis) of language, as the evidence brought by Wong Fillmore suggests, then L1 acquisition cannot be explained as the accumulation of linguistic items which become automatized through practice.

In the case of L2 learning, Lightbown (1990) also pointed out that the equation "practice makes perfect" cannot fully account for L2 acquisition. Evidence for that claim can be found in the fact that L2 learners seem to go through a period of restructuring (McLaughlin, 1987; 1990) in which performance is worse before it improves again when new forms are taught. If L2 learning is understood as the automatization of procedures through practice, L2 items would be added to the interlanguage system (Selinker, 1972) in a cumulative way and performance would mimic a linear, ascending and progressive line. That is not the case. The phenomenon of restructuring is usually associated with a U-shaped curve which seems to be a better depiction of L2 development than the ascending line (McLaughlin, 1990). The reason

for this terminology (U-shaped) is that behavior is optimal in initial phases of learning when items are simply added to the system in a cumulative way but becomes worse in subsequent stages of learning when items learned are incorporated to the system forcing it to be restructured to accommodate them (McLaughlin, 1987; 1990). Once the restructuring phase is over, performance improves again, mirroring a U-shaped line, thus its name. There are many phenomena in the L2 literature suggesting that performance declines as more complex internal representations replace simpler ones, increasing again after the system has been restructured to accommodate these new and more complex items (McLaughlin, 1990).

In line with other researchers who acknowledge the limitations of cognitive theories to explain L2 development (for example, McLaughlin, 1987; VanPatten, 1996; DeKeyser, 2007), Muranoi (2007, p.65) suggests that skill building theories are limited when the skill at hand is L2 learning since some linguistic rules may not be acquired following the transition path from declarative to procedural knowledge mentioned previously (DeKeyser, 2007). He also reminds us that the possible positive effects of practice on the acquisition of some grammatical forms depend on the linguistic features of those particular forms (Muranoi, 2007, p.65; DeKeyser, 1998).

Though practice cannot fully account for L2 learning, it plays an important role in the view of acquisition adopted in this study and it will be linked to the concept of production and used to explain at least part of the acquisition of a syntactic structure in L2 speech. Production, in turn, can be linked to one of the three stages (output) in the information processing system and second language acquisition: input, central processing and output (Skehan, 1998, p.43). In simple terms and relating these stages to language processing, input can be understood as all the stimuli in the environment and, I would also argue, in the individual's long-term memory above a

certain threshold of activation (Anderson, 1995). Central processing is the process through which input is processed, producing intake which is a subset of filtered input that is made available for further processing (VanPatten, 1996, p.10) and output is the spoken or written result of this processing, that is, production.

According to both VanPatten (1990, 1996) and Skehan (1996, 1998), input is what feeds processing and in the case of L2 learners it is processed for meaning before it can be processed for form. Moreover, for learners to process form that is non-meaningful they must be able to process informational content at no or little cost to attentional resources, since these are limited in our cognitive system, more specifically, in working memory (VanPatten, 1996, p.16; Skehan, 1998, p.45). It follows from this that comprehension-based approaches such as Krashen and Terrell's (1983) Natural Approach are unable to direct learners' attention to form since these approaches are dominated by the need to extract meaning. Krashen (1985), in his Input Hypothesis, claimed that comprehensible input was the necessary and sufficient condition to drive second language acquisition.

However, after reviewing evidence from the Canadian Immersion program in which learners were taught according to this rationale and had problems going beyond a certain level of proficiency, Swain (1985, 1995) suggested that comprehensible input was not enough and comprehensible output was also necessary to drive language development beyond a certain level of proficiency. Swain (1985, 1995) proposed her Output Hypothesis postulating that comprehensible input was not enough to account for second language acquisition because the processes involved in language comprehension were different from those involved in language production.

In language production, learners may be required to process language in ways that may not be necessary for comprehension. During language comprehension,

grammatical decoding may be bypassed and learners may circumvent syntactic analysis, relying more on contextual cues to decode messages (Skehan, 1998). The same cannot be said for production that requires grammatical encoding (Izumi, 2003, p.183; Skehan, 1998). The level of analysis required during comprehension (semantic) is different from the one required during production (syntactic) (Izumi, 2003; Skehan, 1998; Swain, 1985) and depending on the level of analysis undergone by the learner, language development may or may not develop beyond a certain proficiency level (Swain, 1985, 1995). Indeed, as Gass (1997, cited in Izumi, 2003, p.172) reminds us, one important factor to determine whether input converts into intake is the level of analysis undergone by the learner. She claims that the analysis at the level of meaning (which is achieved during comprehension) is not as useful for intake as the analysis made at the level of syntax which is achieved during production.

Swain (1995) specifically claims four functions for output that are key for SLA, namely 1) the fluency function (the opportunity to practice in meaningful contexts); 2) the Hypothesis-testing function (through which learners receive feedback); 3) the metalinguistic function (enabling learners to control and internalize linguistic knowledge through the reflection on their own output) and; 4) the noticing or consciousness-raising function (through which learners may notice the gaps in their interlanguage (IL) system, thus, cueing themselves to attend to input in future encounters).

Skehan (1998, pp. 16-19), drawing on and extending Swain's Output Hypothesis, suggests that output plays seven roles in SLA: 1) it generates better input through feedback that learners elicit; 2) it forces syntactic processing; 3) it allows Hypothesis testing; 4) it helps in the automatization of L2 knowledge; 5) it provides learners with opportunities to practice discourse skills; 6) it helps learners develop a

personal voice by forcing them to move the conversation towards topics that are interesting to them; and 7) it provides auto-input.

Ellis (2003, p.111), reviewing Skehan (1998) pointed out that function 7 plays an important role in SLA by making learners aware of what they do not know yet. The other roles (mentioned in the previous paragraph) outlined by Skehan suggest that production can contribute more directly to SLA by helping in the automatization process since output enables learners to practice what they already know. Finally, another function of output which is essential for SLA development (according to both Skehan and Ellis) is function 2 for it forces learners to engage in syntactic processing in a way that comprehension does not. As will become evident in Skehan's (1998) account of L2 learning reviewed in the ensuing sections, production plays a key role in SLA.

So as to address the criticism that information processing theories received when trying to explain L2 learning as the simple accumulation of linguistic items that become automatized through practice, Skehan (1998) resorted to dual-process theories of mind which propose the existence of a dual-code system to explain learning, including of an L2 (p.4). Skehan reviews evidence that in L1 learning children go from a process of lexicalization to syntacticalization of language before re-lexicalizing language again. According to him, this process of lexicalization and syntacticalization of language will not happen in L2 unless contrived by production, which forces the L2 learner to analyze language at a syntactic level.

Skehan (1998, p.14) claims that during language comprehension syntactic analysis can be circumvented since learners can be helped by contextual cues to comprehend messages whereas this is not possible during language production. Thus, so as to force the L2 learner to process language at a syntactic level, moving from lexicalization to syntacticalization and vice-versa, production is needed (p. 90).

Moreover, in line with VanPatten (1996), Skehan (1998, p.50) claims that in L2 processing meaning has priority over form with the consequence that a focus on form will only happen when there are enough attentional resources (in working memory) to process it.

Skehan (1998, p.91) claims that L2 learning happens when items from the rule-based system (the system responsible for analyzing language) are transferred to the memory-based system (the system responsible for synthesizing language), and vice-versa. This movement is what enables the L2 learner to have linguistic items available in the two modes, thus being able to use the two systems depending on processing conditions and goals. When people are speaking and the main goal is fluency, L2 learners will draw more on the memory-based system whose products are faster than the products of the rule-based system because this system does not require excessive internal computation. The advantage of using items from this system is that information in the memory-based system is readily available (from memory) and requires little (or no) attention (from working memory). On the other hand, when the aim is to produce complex or accurate language, learners will draw more on the rule-based system which uses controlled processes (and attention) for its execution (Skehan, 1998, pp. 88-92).

According to Skehan (1998) second language acquisition is different from first language acquisition in that in L2, learners have schematic knowledge (factual, socio-cultural background and discoursal procedural) but limited systemic knowledge (syntactic, semantic, morphological), thus, relying more on certain strategies (semantic and contextual cues) than others (syntactic) to overcome linguistic limitations during comprehension. In Skehan's view then, production is essential to force the learner to process linguistic data at a syntactic level, forcing the learner to move from one system (memory-based) to the other (rule-based) and vice-versa. Language

acquisition would proceed from language production, that is, production would serve as a way for material stored in the memory-based system to move to the rule-based system and vice-versa, enabling the analysis (syntacticalization) and synthesis (lexicalization) of language. Both analysis (of memorized chunks of language) and synthesis (of language produced originally by rules) are necessary for language development to occur: the former to allow generativity and the latter to enable fluency (p.92).

Skehan (1998, p.88) claims that the rule-based system is flexible, creative, generative and economically organized, prioritizing analyzability, but these advantages are paid for by a heavy processing burden during ongoing language use since rules need complex processes of construction and require more attention during both comprehension and production, depleting cognitive resources. The memory-based system, on the other hand, is less parsimonious, more rigid and faster for it does not require excessive internal computation and analyzability (p.89).

Skehan (1998, p. 90) proposed this view of L2 learning based on evidence from L1 development which shows that language acquisition goes through three main stages. During the first stage children learn language in a lexicalized way. In a second stage, enabled by a language acquisition device (LAD), children go through a process of syntacticization of their lexicalized repertoire. Finally, during the third stage of L1 acquisition, children go through a process of relexicalization of language, thus making the language analyzed and learned as a rule, available again as a memory instance, thus, avoiding excessive computation to use it in natural communication in future opportunities. In that way, children will fill in both systems with repertoire and will use each one in the future, depending on processing conditions.

For Skehan (1998), in order to learn an L2 it is necessary to contrive the movement through the three stages of lexicalization, syntacticalization and

relexicalization of language, engaging learners in cycles of analysis (to include items in the rule-based system) and synthesis (to include items in the memory-based system), so that language can be lexicalized, syntacticalized and relexicalized through production, thus becoming available as a rule and as a memory instance for the user, mirroring L1 development.

Skehan's (1998) proposal of L2 learning has the advantage of explaining how this dual system is used and acquired and is summarized (p.86) with the following principles governing L2 acquisition and use:

- our cognitive system (working memory) does not have enough resources to process in an exhaustive manner all the second language input received (Van Patten, 1996; Doughty, 1991, cited in Skehan, 1998)
- meaning has priority in L2 communication, with the result that a focus on form has to be manipulated in some way (Van Patten, 1990; 1996; Van Patten & Cadierno, 1993);
- people represent and learn languages in the form of rules or exemplars (Schmidt, 1994; Skehan, 1992);
- learners benefit from some degree of awareness or attention (Schmidt, 1994);
- during natural communication, people produce lexicalized language from the memory-based system unless beneficial processing conditions prevail enabling the construction of analyzed language from the rule-based system (Crookes, 1989; Ellis, 1987; Foster & Skehan, 1996; Skehan, 1992).

Based on what was exposed in this section, it is possible to summarize Skehan's view of L2 acquisition as stemming from the transfer of items from the memory-based system to the rule-based system, and vice-versa, through production,

forcing the limited-capacity-system learner to engage in cycles of analyses and synthesis of language, thus going through the processes of lexicalization, syntacticization and relexicalizeation of language, and operating in these two modes (rule-based or memory-based), depending on processing conditions.

Because Skehan's (1998) account of L2 learning connects these two systems via production, it was selected to explain L2 learning in this study. More specifically, Skehan's, account of L2 learning was selected for this study because of the importance placed on production for acquisition in his model. As will be seen in the review of working memory capacity, there is evidence that working memory capacity constrains the processes involved in L2 speech production (for example, Fortkamp, 2000). If working memory capacity constrains L2 speech production (Fortkamp, 2000) and production is necessary for acquisition (Skehan, 1998), then it might be reasonable to suspect that working memory capacity also constrains L2 speech acquisition. That is the main question motivating this study.

To the best of my knowledge, there are no models describing or explaining the acquisition of L2 speech, specifically. Because Skehan's (1998) account of L2 acquisition is rooted in dual-process theories of mind and information process theory, highlighting the importance of production for acquisition, it will be used to explain the acquisition of a syntactic rule in L2 speech in this study. It is important to stress that when acquisition is defined in broad terms, it can be equated with interlanguage development (or restructuring as previously suggested). In this study, however, acquisition will be defined in strict terms and will refer to the acquisition of a specific syntactic item or rule in L2 speech by the rule-based system. To reiterate, Skehan (1998) views language development as going from a process of lexicalization to syntacticalization and then re-lexicalization. This study, however, deals with the second

phase (in Skehan's account) of language development only, that is, with the syntacticalization of language which is assumed, in this study, to happen when learners are forced to focus on the syntactic form to produce the grammatical structure being learned. In that sense, and from now on, the term acquisition refers to the acquisition of a syntactic structure which is assumed to take place in the rule-based system.

Finardi (2007) suggested that the acquisition of the syntactic structure investigated takes place in the rule-based system (Skehan, 1998) because its production in L2 speech requires computation, which in turn is believed to be regulated by controlled processes in working memory. Skehan could probably argue that ultimate acquisition involves the transfer of items from one system to the other, however, this study is narrower in scope and is concerned with only one stage of acquisition which involves the retention and acquisition of a syntactic rule by the rule-based system, before this item is transferred (if it is) to the memory-based system. Because the rule-based system is believed to operate on controlled processes in working memory, whose capacity, in turn, is believed to be limited, the next session will review the construct of working memory and working memory capacity.

2.2 Working Memory and Working Memory Capacity

This section will review an important construct of information processing theory that affords a wealth of explanations to cognition in general and to L2 speech production and acquisition in particular – working memory. But before we actually plunge into that review, I will link this construct to the theory brought to bear in

this study. More specifically, I will link the construct of working memory to dual process theory.

A central tenet of dual-process theories which view our cognitive system as being made up of a rule-based and a memory-based system is that behavior (and learning) is the product of the interplay of automatic and controlled processing. Researchers who view working memory capacity as the ability to control attention (for example, Engle, 2002; Kane, Conway, Hambrick & Engle, 2007; Redick & Engle, 2006; Unsworth & Engle, 2008) claim that working memory capacity may mediate the interplay of controlled and automatic processes (Barret, Tugate & Engle, 2004). Working memory capacity can be understood as the ability to simultaneously maintain (information active for later recall) and process information (for example, Unsworth & Engle, 2008), or put differently, the ability to engage in controlled processing in attention-demanding situations (such as when individuals are required to hold some information in mind while concurrently processing other amounts of information), especially when faced with the need to suppress or inhibit interference (for example, Engle, Kane & Tuholski, 1999).

Barret, Tugate and Engle (2004) reviewed different implications of dual-process theories to working memory capacity. According to these authors, dual-process theories vary in the emphasis placed on the influence of automatic processing (such as in studies of persistent thought) or on cognitive control and information processing, which is the focus of this study. The aforementioned authors define automatic processes as being stimulus-driven, bottom-up, reflexive and exogenous and controlled processes as being goal directed, top-down and endogenous. According to these authors, learning and behavior can be understood as the product of the competition between controlled and automatic processes or as the interaction between endogenous and exogenous forms

of attention. Automatic processes are the default process in humans. When attention is captured by a stimulus activating a representation that is inconsistent with the goal, attention is needed to solve the conflict. In those situations, attention will be applied to maintain or enhance the activation of already activated goal-relevant representations or to suppress the activation of goal-irrelevant representations. This manipulation of representations by the control of attention is what is understood as controlled processing and the hub of this attention (working memory capacity) provides a wealth of explanations to human behavior and learning.

Barret, Tugate and Engle (2004) claim that working memory capacity is related to a host of phenomena in cognitive tasks and review available evidence for its role in the following: activation effects, resisting interference, suppression effects, the use of processing strategies, the construction of mental representations that support new learning, rule-based learning, encoding of new information, establishing coherence between various parts of a text, reading comprehension, language comprehension, listening comprehension, problem solving, reasoning, adapting strategies to changing success rates, vocabulary learning, spelling, following directions, logic learning, taking lecture notes, writing, storytelling, emotional processing and the ability to reason, solve novel problems and adapt to new situations. What these studies show is that working memory capacity constrains all the aforementioned processes. Of special interest to this study is the role of working memory capacity in rule-based learning since this study deals with the acquisition of a syntactic rule by the rule-based system.

In short, from the perspective of dual-process theories, working memory capacity may be seen as the capacity to engage in controlled processing, thereby determining our ability to control our thoughts, feelings and actions. The rule-based system is responsible for modifying knowledge representations online and as such,

working memory capacity may be related to the ability to incorporate new or inconsistent information to existing representations, moderating a myriad of phenomena (Barret, Tugate and Engle, 2004).

Barret, Tugate and Engle (2004) also suggest that with repeated use, the rule-based knowledge will eventually be applied associatively (automatically) and may be passively activated by the environment, thus requiring no effort for its execution. That is, people with more working memory capacity will eventually store more information in the associative system as rules become automatized. This transition from rule-based to the memory-based system, which is the essence of learning for dual-process theories, may be better achieved by people with more working memory capacity who will have more attention to devote to controlled processes which, in turn, will be used to guide feelings, thoughts and actions. Thus, individual differences in working memory capacity may have a lot more to say to cognition than previously assumed and when linked to dual-process theories, the construct of working memory capacity, which will be explained in what follows, gains more explanation power since it can shed light into how people differ in their ability to learn rules.

The concept of working memory gained importance in language research with the advent of information processing models of language acquisition which see L2 learning as the development of a cognitive skill which requires practice and attentional resources to develop (for example, McLaughlin & Heredia, 1996). Several definitions for working memory have been proposed in the literature, including some metaphors such as workbench of cognition (Klatzky, 1980, cited in Jarred and Towse, 2006), online window (Miyake & Friedman, 1998), mental workplace (Stoltzfus, Hasher, & Zacks, 1996), arena of computation (Baddeley & Hitch, 1974; Harrington, 1992; Just & Carpenter, 1992), and the activated part of long-term memory (Cowan, 1999). Miyake

and Shah reviewed several models of working memory (1999, p. 45) to propose a comprehensive definition of the term, considering working memory as "…those mechanisms or processes that are involved in the control, regulation, and active maintenance of task-relevant information in the service of complex cognition, including novel as well as familiar, skilled tasks." Evident in this definition of working memory is its functional nature which was adopted for this study. This functional view of working memory contrasts with Baddeley's (1981, 1990, 1992a, 1992b, 1992c, 1999; Baddeley & Hitch, 1974) structural view of working memory proposed by Baddeley and Hitch (1974), which views working memory as s system consisting of a limited capacity attentional controller (the central executive) and two slave systems – the phonological loop and the visuospatial sketchpad - responsible for storing and manipulating speech-based and visual information, respectively (Baddeley & Logie, 1999).

As pointed out by Ashcraft (1994) among others, researchers seem to accept the idea that the human cognitive system is limited in terms of the amount of information it can process and maintain simultaneously (for example, Unsworth & Engle, 2005; 2007), but disagree on whether individual differences in working memory capacity are structural (Baddeley, 1981, 1990, 1992a, 1992b, 1992c, 1999; Baddeley & Hitch, 1974), the result of processing efficiency (Berquist, 1998; Daneman & Carpenter, 1980; Harrington, 1992), affected by the availability of attentional resources (Engle, 2002; Cantor & Engle, 1993; Cowan, 1993; Unsworth & Engle, 2007) or more recently, by a combination of factors (Jarred & Towse, 2006). Research on individual differences in working memory capacity suggests that working memory depends on a combination of domain-specific representational systems and domain-general processing and control systems, and that working memory measures capture individuals' ability to combine

maintenance and processing demands in a way that limits information loss from forgetting or distraction (Jarred & Towse, 2006).

Those who interpret individual differences in working memory capacity as being structural (for example Baddeley & Logie, 1999, p. 32; Gathercole & Baddeley, 1993) see these differences as reflecting the number of items or representations that can be maintained in working memory. The problem with this view (Turner & Engle, 1986) is that measures of working memory capacity (typically assessed in terms of digit or word span) do not correlate with measures of complex tasks, perhaps, because these measures of working memory capacity are in fact, measures of short term memory or measures of one of the components of working memory (phonological loop) as acknowledged by other researchers (for example, Jarred & Towse, 2006).

In contrast, the processing efficiency view of working memory capacity interprets these limitations as reflecting the individual's efficiency in processing information (Daneman & Tardiff, 1987). The more efficient an individual is at processing information, the more capacity there will be left available to store the products of this processing or for material retrieved from long-term memory. This processing efficiency is believed to be task-specific (Daneman & Green, 1986; Daneman, 1991), that is, an individual's working memory capacity will vary depending on their efficiency to process task-specific information. Measures of working memory capacity that involve a processing efficiency component correlate with complex tasks such as L1 reading (Carpenter & Just, 1989), reasoning (Carpenter et al., 1990), L1 speech production (Daneman & Green, 1986) and different measures of L2 speech production (Bergsleithner, 2007; Finardi & Prebianca, 2006; Finardi, in press; Finardi, 2007; Fontanini et al., 2005; Fortkamp, 2000; Weissheimer, 2007; Xhafaj, 2006).

This view of working memory capacity underlies the notion of trade-off effects between the processing and storing functions of working memory capacity (Berquist, 1998), the more efficient the processing, the more capacity will be left for storing information. Seen from a different angle and mirroring the discussion of skill acquisition previously outlined in this review, these trade-off effects can be interpreted as the interplay of controlled and automatic processes. The more automatic a process is, the more capacity will be left to be used by controlled processes.

The view that working memory capacity is constrained by attentional resources, the attention-view of working memory (Engle, 2002; Conway & Engle, 1996; 2005; Cowan, 1993; Engle, Cantor, & Carullo, 1992; Engle et al., l999; Engle & Oransky, 1999; Kane & Engle, 2002; 2003) – interprets limits in working memory capacity as reflecting the amount of attentional resources available to maintain and recover information that is relevant to the task as well as to block task-irrelevant information (Kane et al., 2007). Most of the evidence supporting the attentional view of working memory capacity stems from the work of Engle and colleagues (Conway & Engle, 1996; 2005; Engle et al., 1992; Engle & Oransky, 1999; Kane & Engle, 2002; 2003; Kane et al., 2007), who have consistently shown that individual differences in working memory capacity are related to individuals' general ability to control attention. In other words, studies conducted by these researchers have shown that individuals who score higher on a working memory capacity measure (in their case, the Operation Word Span Test) are better at the task of controlling attention.

Finally, those who view working memory limitations as stemming from a combination of factors (Jarred & Towse, 2006), view working memory capacity as being more than storage capacity and processing efficiency. They claim that working memory limitations are all that plus executive processes such as controlled attention

which are necessary for the coordination and integration of the storage and processing aspects of a task. In sum, they view working memory capacity as being affected by three independent sources, namely: storage capacity, processing efficiency and executive demands involved in combining storage and processing functions.

Though the discussion of whether working memory capacity limitations are structural, due to processing efficiency, attentional resources or a combination of factors, ranges on in the literature in general and in L1 research in particular, L2 research tends to support the processing efficiency view of working memory limitations, at least in the case of adult learners (Harrington, 1992; Miyake & Friedman, 1998) who are assumed to have a biologically developed working memory capacity (Weissheimer, 2007). In adult L2 acquisition, the variation in working memory capacity cannot be explained by developmental factors and is thus accounted for by a processing efficiency view of working memory capacity which states that as L2 processes become automatic, working memory capacity can develop (Harrington, 1992).

Miyake and Friedman (1998) claim that the role of working memory capacity in the performance of linguistic tasks may be stronger in L2 than in L1 and that at least in highly skilled L2 users, L2 processing may draw from the same pool as L1 processing. Evidence (Miyake & Friedman, 1998) indicates that the correlation between L1 and L2 skills increases as the learner's proficiency level in L2 increases. This evidence suggests that the relative contribution of L2-specific and non-specific factors may change over the course of L2 development in such a way that in early stages performance in L2 is more strongly linked to the learner's L2-specific knowledge of grammar and vocabulary and as the proficiency level increases the contribution of L2-specific knowledge decreases and the relative contribution of non-L2-specific factors such as working memory increases. Miyake and Friedman (1998) also suggest that

when working memory is construed as an arena for task-relevant information, its capacity measure should take into account both the nature of the information being maintained and the nature of the operations being applied, thus supporting the processing efficiency view of working memory.

The view that working memory capacity is constrained by a number of factors (among which are the processing efficiency and attention limitations) was adopted in this study because it offers a plausible explanation for the type of processing investigated here. The processing-efficiency view of working memory capacity was adopted to explain the interplay of controlled and automatic processes, which, in turn, is related in this study to the operation of a dual-code memory system made up of a memory-based system operating with automatic processes and a rule-based system operating with controlled processes. This study deals with the acquisition of a syntactic structure by the rule-based system. This acquisition is assumed to require attention (which is limited in working memory) and to operate on controlled processes in the rule-based system. The controlled processing necessary to produce the target syntactic structure will require the individual's use of his/her attentional resources and will depend on the efficiency with which the individual can perform the processing component of the task. Thus, the amount of controlled processing available for the production of the target syntactic structure will depend on the individual's attentional resources and the efficiency with which the individual can perform the processing component, in this case, the production of oral sentences in L2.

Because this study deals with the relationship between working memory capacity and the acquisition of a syntactic structure in L2 speech, the next section will review studies that dealt with the relationship between working memory capacity and different aspects of L2 speech production, development and acquisition.

2.3 Working Memory Capacity and L2 Speech Production, Development and Acquisition

Research on the relationship between working memory capacity (assessed in terms of an L2 speaking span test) and L2 speech production (usually assessed in terms of fluency, complexity and accuracy of speech) and acquisition has amassed evidence that working memory capacity may be a good predictor of L2 speech performance and acquisition (Bergsleithner, 2007; Finardi & Prebianca, 2006; Finardi, 2007; Finardi & Weissheimer, in press; Fontanini et al., 2005; Fortkamp, 2000; Mendonça, 2003; Mota, 1995; 1998; Weissheimer, 2007; Xhafaj, 2006).

Fortkamp (2000) started a fruitful research agenda when she found that working memory capacity (WMC) was related to L2 speech production in terms of speech rate, mean length of run, accuracy and complexity in monologic tasks and it was at least linearly related to fluency, accuracy and complexity of L2 speech performance. She found a negative correlation between working memory capacity and number of errors in L2 speech production, concluding that WMC was a good predictor of learners' accuracy of L2 speech. She also claimed that the processes captured by the speaking span test (SST) and the L2 speech performance tests were those involved in the grammatical encoding (Levelt, 1989) in the formulator. According to her, L2 speech production is more complex and difficult than L1 speech production because, in the former, the processes involved in the formulation of messages are highly automatic, which is not the case in L2. She concluded that L2 speech production involves more controlled processes than in L1 and thus, uses more attentional resources (from working

memory) than the latter. The ground seemed to be fertile for more studies scrutinizing the relationship between working memory capacity and L2 speech production and acquisition and this goal was then pursed by her advisees. Their studies will be reviewed in what follows and the term working memory capacity, from now on, unless otherwise stated, refers to the central executive function of working memory capacity measured in terms of a speaking span test in L2 and the view of working memory limitations held by this group is that they are related to processing-efficiency.

Mendonça (2003) investigated the relationship between working memory capacity and the retention of L2 vocabulary (one aspect involved in L2 speech production and development) and found that individuals with a higher working memory capacity overall were better able to learn L2 vocabulary than lower spans.

Fontanini et al. (2005) investigated the relationship between working memory and L2 performance, including L2 speech performance measured in terms of fluency (speech rate) and accuracy (global measure) and found significant correlations between working memory capacity and accuracy but found no correlations between WMC and fluency.

Unlike the other studies reviewed in this section which were inspired in Fortkamp (2000), Mizera (2006) investigated whether working memory capacity assessed in terms of a speaking span test (SST), a math span test and a non-word repetition test affects L2 fluency assessed in terms of speed of delivery in a monologic narrative task, a word translation task, and an imitation grammaticality task. The expected correlations between WMC and different measures of fluency were not found and according to both Mizera (2006) and his advisor, Juffs (2006), WMC alone cannot explain the complexities involved in L2 speech production. The only significant correlations found in Mizera's study were those between the SST and fluency measured

in terms of speech rate, and those between the SST and the imitation grammaticality task which involved an accuracy component since participants had to correct the input. There were no significant correlations between the other two WMC measures and speech rate. Therefore, as regards the correlations between WMC in Mizera's study, only the SST scores correlated with fluency and accuracy, thus corroborating results of Fortkamp (2000) and her advisees (Bergsleithner, 2007; Finardi & Prebianca, 2006; Finardi, 2007; Guara-Tavares, 2008; Weissheimer, 2007; Xhafaj, 2006).

Xhafaj (2006) investigated the relationship between WMC and pauses in L2 speech production, producing evidence that higher spans were better able to sustain L2 fluency. Finardi and Prebianca (2006) investigated the relationship between WMC and L2 speech performance (assessed in terms of fluency, complexity, accuracy and weighted lexical density) in a picture description task with repetition, finding statistically significant correlations between WMC and fluency (assessed in terms of speech rate unpruned) of L2 speech in the first trial of the repetition condition.

Guara Tavares (2008) investigated the relationship between WMC, planning and L2 speech performance finding significant correlations between participants' WMC and L2 speech accuracy for the control group (no planning) and L2 fluency for the experimental group (planning). Under planning conditions, working memory capacity significantly correlated with L2 speech fluency and complexity.

Weissheimer (2006) studied the relationship between WMC and L2 speech development and Bergsleithner (2005) studied the relationship between WMC, noticing and L2 speech development. Of particular relevance to the present study because of the focus on L2 speech development are Weissheimer's (2006) and Bergsleithner's (2005) findings. Weissheimer found that working memory scores predicted the development of L2 fluency and complexity of speech, but not of accuracy.

Neither higher nor lower spans showed gains in accuracy scores in terms of number of errors in a hundred words and both spans showed, instead, a decrease in this measure. This result was not predicted and could not be explained by the task complexity differences since the two tasks used in her study were counterbalanced to prevent task effects.

Weissheimer (2006) explained her unexpected results for accuracy hypothesizing that although the accuracy measures she used (number of errors per a hundred words and percentage of error-free clauses) had consistently been shown to be efficient for measuring speech performance (Fortkamp, 2000; Foster & Skehan, 1996), maybe they were not good measures for investigating speech development. One way to overcome this, she concluded, was to use focused tasks which elicit specific forms such as, Ellis' (1987) study with the past forms when accuracy was indexed by target language use (TLU).

This finding mirrors, in a way, unexpected findings in Bergsleithner (2005) who also used a global measure of accuracy (number of errors per 100 words following Fortkamp, 2000) which proved to be inadequate to look at language development. She also suggested the use of focused tasks in future research aiming at tapping accuracy of L2 speech development. In fact, in her doctoral research (2007) she abandoned the picture description task altogether and used a focused task with a limited number of sentences (indirect questions, 12 sentences) so as to see how learners incorporated that particular structure after treatment. These two studies are relevant to the present study because of their suggestions concerning accuracy measures (such as target language use in focused tasks) which were incorporated in Finardi (2007) and the present study.

Weissheimer (2007) set out to investigate whether individuals with more or less WMC (higher and lower spans) would experience any kind of improvement on WMC scores as a function L2 speech development. Results showed that only lower span individuals improved WMC scores. She then concluded that lower spans had more room for improvement and that WMC assessed in terms of an L2 SST was a good predictor of L2 speech development.

Bergsleithner (2007) investigated the relationship among working memory capacity, noticing of L2 forms, and L2 oral production and found statistically significant correlations among working memory capacity, noticing of L2 forms, and grammatical accuracy on L2 oral performance. Individuals with more working memory capacity noticed more L2 formal aspects of the target structure and demonstrated better performance in L2 oral tasks than individuals with smaller working memory capacity.

Finardi (2007) set out to investigate the relationship between working memory capacity and the retention and acquisition of a syntactic structure (*So+aux+I* and *Neither+aux+I)* in L2 speech. She found statistically significant correlations between WMC and the retention of a syntactic structure in L2 speech and statistically significant and strong correlations between WMC and the acquisition of a syntactic structure in L2 speech. Motivated by her findings she pursued the issue further in the present research endeavor.

Finardi and Weissheimer (in press) set off to investigate whether working memory capacity would vary in the course of L2 speech development. Seventy-nine basic and intermediate level English as a foreign language students were used in their study which yielded positive and statistically significant correlations between working memory capacity scores and L2 proficiency measures. Results of their study point to the conclusion that working memory capacity (assessed in terms of an L2

SST) varies as a function of L2 speech proficiency corroborating Miyake and Friedman's (1998) suggestion that working memory's relative contribution of L2-specific and non-specific factors may change over the course of L2 acquisition in such a way that in early stages performance in L2 is more strongly linked to the learner's L2-specific knowledge of grammar and vocabulary and as the proficiency level increases the contribution of L2-specific knowledge decreases and the relative contribution of non-L2-specific factors such as working memory increases.

Guara-Tavares (2008) investigated the relationship between pre-task planning, working memory capacity, and L2 speech performance. Results of her study show that under a no-planning condition, working memory capacity significantly correlates with L2 speech accuracy (for the control group) and L2 speech fluency (for the experimental group). Under a planning condition, working memory capacity significantly correlates with L2 speech fluency and complexity.

Except for Mizera (2006), the studies reviewed in this sub-section were grouped here for a very important reason: they all used the same measure of working memory capacity, namely, the speaking span test in L2, in some cases, even the same version of the speaking span test and so results can and should be compared across studies. All in all, these studies point to the conclusion that working memory capacity, more specifically, working memory capacity in L2 (assessed in terms of an L2 speaking span test), plays a key role in the processes involved in L2 speech production, development and acquisition. What remains to be seen is whether working memory capacity in L1 (assessed in terms of an L1 SST) is also involved in L2 speech production, development and acquisition. Testing this Hypothesis is one of the aims of the present research endeavour which is mainly concerned with the relationship between

working memory capacity (be it in L1 or in L2) and the acquisition of a syntactic structure in L2 speech.

Nevertheless, as previously mentioned, because working memory capacity alone cannot account for the acquisition of a syntactic structure in L2 speech, the next section complements the psycholinguistic account of L2 acquisition with linguistic accounts of L2 processing.

2.4 Linguistic Accounts of Syntactic Processing and Acquisition

Ellis (1994, p. 408) reminds us that it is yet impossible to build a comprehensive theory of L2 acquisition which incorporates both a linguistic and a cognitive perspective. Accounts of L2 acquisition emphasize either the cognitive or the linguistic nature of the acquisition, the former looking to psychology and the latter to linguistics to explain L2 acquisition (Ellis, 1994, p. 415). Because a linguistic theory provides us with strong hypotheses about a speaker's knowledge (competence) of a language, the particular theory one adopts constrains the theory about how languages are learned. If, for example, we accept a view of language as a specialized capacity – as Noam Chomsky (1981) suggests – we would also have to assume that aspects of SLA could only be understood on their own terms, rather than through our understanding of learning in other, more generalized domains of knowledge.

Though this study assumes that language learning can be in part like other forms of learning (thus the adoption of information processing theory to explain acquisition), I also assume that some aspects of language, among which is perhaps the acquisition of the syntactic structure investigated here, may be at least in part explained

by linguistic theories, thus this detour from information processing theory to offer a brief review of linguistic accounts of syntactic processing.

The theory of Universal Grammar (UG) and the model of Government/Binding proposed by Chomsky (1981) aim at explaining people's knowledge of language (linguistic competence) and how the acquisition of this knowledge is possible based on the paradox of the poverty of the stimulus (for example White, 1991a; 1992b). This theory was selected to complement the psycholinguistic account of L2 acquisition brought to bear in this study because of its conceptual relationship with Skehan's (1998) view of L2 learning which sees L1 learning as being different from L2 learning, among other reasons, because of the possible existence of an innate system in L1, namely, the language acquisition device (LAD).

For UG theory, competence is assumed to be represented in an abstract system of principles and rules (generative grammar) that accounts for such formal properties of language as syntax, phonology, morphology, and certain aspects of semantics (White, 1991). The question that concerns us in this study is whether these principles, parameters and rules (UG) would also play a role in L2 processing and acquisition (Flynn, 1987; Gass & Schachter, 1989; Hilles, 1986; Liceras, 1985; Phinney, 1987; White, 1985a; 1985b; 1991a; 1992b)

Bley-Vroman and Chaudron (1990) cite a considerable amount of work devoted to the exploration of a parameter-setting model of language acquisition in general and second language acquisition in particular (Hilles, 1986; Liceras, 1985; White, 1985a; 1985b; 1991a; 1992b). These researchers are not alone in that (for example, Gass & Schachter, 1989; White, 1985a; 1985b; 1991a; 1992b) and also claim that a parameter-setting model provides a framework to study the influence of L1 on L2 acquisition. In a series of publications, including a book (1987a, cited in Bley-Vroman

& Chaudron, 1990, p. 246), Flynn has reported that L2 processing is affected by the learner's L1.

Evidence for the complexity of processing certain L2 syntactic structures depending on L1 parameters is also found in Gass and Schachter's (1989) book which devotes four chapters for cross-linguistic studies based on the Universal Grammar Model of acquisition proposed by Chomsky (1981). The parameterized model of acquisition proposed by Chomsky (1981) has served as the theoretical framework for a number of studies in the field of second language acquisition (SLA), of which Flynn (1987), Phinney (1987), and White (1988) are examples. One of the aims of this line of research is to examine whether the acquisition device or Universal Grammar (UG) that supposedly constrains L1 acquisition is still operating in L2. In this paradigm, both L1 and L2 learners supposedly set a number of parameters according to the options permitted by UG. It is important to highlight that the theory of UG refers to L1 acquisition and does not make explicit predictions for L2 acquisition. Nevertheless, if principles of UG characterize a language faculty that is biologically determined and that is necessary to acquire an L1, it is possible to assume that principles of UG are also at play in L2 acquisition. Finding evidence for this assumption is the main goal of research carried out in this paradigm.

Based on this assumption, Flynn (1987, 1989) suggests that L2 learners use principles of syntactic organization in L1 acquisition for the construction of the L2 grammar. Where principles involve parameters, L2 learners in early stages of acquisition recognize a match or a mismatch in the values of these parameters between the L1 and L2. When L1 and L2 values differ, L2 acquisition is disrupted as learners must assign new values to cohere with the L2 grammar. When values match, L2 is facilitated.

So as to test this hypothesis, Flynn (1989) investigated how Japanese and Spanish speakers acquire restrictive relative clauses in English. Results of her study show that there were important overall differences between the Spanish and Japanese speakers in their production of each of the relative clauses tested. Moreover, her results held even when speakers were equalized in English as a second language ability. Spanish speakers (whose L1 have the same parameters as English) were significantly more successful at imitating the sentence types tested than the Japanese speakers (whose parameters differ to English) thus confirming the first prediction that there would be facilitation in production of English embedding under an noun phrase (NP) by English as a second language (ESL) learners with a head-initial language (such as the Spanish speakers) and disruption of this production by ESL learners with a head-final language (such as the Japanese speakers). She also found that there were qualitative differences in the nature of the errors made by the two groups in terms of their patterns of acquisition of relative clauses in English and strongly indicate that adult L2 learners are not only capable of shifting L1 hypotheses with respect to a particular parametric value but are also capable of reinterpreting each of the deductive consequences associated with this parameter in terms of the relevant language-specific facts for the L2.

Bley-Vroman and Chaudron (1990) criticized Flynn's results suggesting that the L1-based differences reported by Flynn were artifacts of experimental method and inappropriate analysis, especially of the incorrect use of analysis of covariance in an attempt to correct for a mismatch between experimental groups. They also claimed that Flynn's results may be equivocal regarding the support for a particular version of a parameter setting model which could not be accounted for by her data. However, the point that interests us here is that though Flynn's results may be worthy of criticism, her insights concerning the notion of parameters in question remains interesting and her

general research question, valid. What Bley-Vroman and Chaudron (1988) have shown is that a particular version of a parameter setting model may be not supported by Flynn's data, not that her model is incorrect in principle.

In a reply to Bley-Vroman and Chaudron (1990), Flynn and Lust (1990) counter-attacked by claiming that their results were consistent with predictions made by the parameter-setting model introduced to the field of L2 acquisition by Flynn (1980, 1981, 1983, 1987) and that UG-based (more specifically, parameter-setting) studies provided ample evidence that it is possible to attain a fruitful interplay between linguistic theory and L2 acquisition studies (p. 443). Again, what is important, for the sake of this study, is the rationale motivating these studies, namely, that linguistic parameters in L1 may affect L2 processing and acquisition. So let us not lose focus with academic debates and return to the more pressing question of whether L1 can affect L2 processing and acquisition.

Regarding the availability of UG in L2 acquisition, four different views can be distinguished: 1) the complete access view, 2) the no access view, 3) the partial access view, and 4) the dual access view (Ellis, 1994, p. 453). According to the first, UG is involved in L2 acquisition (Flynn, 1986, p. 29) and L1 plays a crucial role in L2 acquisition as in cases where the L1 and L2 differ in parameter settings and learning is made more difficult or, on the contrary, in cases where the L1 and L2 parameters are similar and learning is facilitated because learners consult the structural configuration established for the L1 in the construction of the L2 grammar (Flynn, 1987, p. 30). The complete access view or Flynn's parameter-setting model (1987) assumes that adult L2 learners have access to the same language faculty as L1 learners. According to the no-access view (for example, Clahsen & Muysken, 1986; Meisel, 1991; cited in Ellis, 1994, p. 454) adult L2 acquisition is very different from L1 acquisition because whereas

L1 learners use their language faculty, adult L2 learners resort to general learning strategies. The partial-access position draws on the distinction between principles that have parameters and those that do not (Ellis, 1994, p. 454). According to this position, learners cannot acquire L2 values of parameters when these differ from the L1. Finally, the dual-access position claims that adults have continued access to UG but also make use of general problem solving strategies which compete with the language-specific system because adult learners are unable to suppress the operation of the problem-solving module. This study tends to accept the first position, that is, that adult L2 learners are affected by their L1 parameters.

Schachter (1974) showed interesting results for relative clauses and direction of branching (the position of relative clauses with respect to the noun). She reported that native adult speakers of Arabic and Persian, which share a right-branching sentence structure with English, were far more likely to produce English sentences with relative clauses than were native speakers of Japanese and Chinese, which are left-branching, even though they were comparable in overall proficiency in English. Overall studies on UG applied to L2 are concerned with the linguistic *competence* of L2 users and seem to show that depending on the parameters of L1, the acquisition of L2 structures may be more or less difficult to acquire depending on whether their parameters resemble or differ from those in L1.

Juffs (2006) replicated a study (1998) that reinforces the finding that L2 learners use L1 argument structure in parsing and comprehension but added working memory measures. Thirty Chinese-speaking, 28 Japanese-speaking, and 46 Spanish-speaking, learners of ESL took tests to measure working memory capacity, L2 proficiency and on-line processing of sentences containing structural ambiguity. A native speaker comparison group was also included. Juffs concluded that differences in

working memory capacity could not explain the large variability in online L2 processing tasks and that variability in L2 processing might be attributed primarily to L1 influence.

Overall, the studies reviewed in this section tend to accept the idea that L1 parameters can affect L2 processing. This study departed from the general assumption that working memory capacity is related to the acquisition of a syntactic structure in L2 speech but accepts the idea that L1 parameters may also affect the processing of the target language structure investigated.

So as to answer the general research question of whether working memory capacity is related to the acquisition of a syntactic structure in L2 speech, the next chapter will describe the method used in this study, along with the statistical procedures employed in the analysis.

CHAPTER 3

METHOD

This chapter describes the method used to investigate the question of whether working memory capacity is related to the retention and acquisition of a syntactic structure in L2 speech. In order to do so, the research questions and hypotheses raised in this study will be outlined, followed by a description of the participants, the instruments and procedures of data collection and analysis and the study design.

The method used in this study was quantitative, longitudinal[6], quasi-experimental[7] and correlational (Bachman, 2005; Brown, 1988; Dancey, 2004; Hatch & Lazaraton, 1991) though qualitative measures were also used in a mixed methods design[8] (Dornyei, 2007). The main aim of this research endeavor is to investigate the role of working memory capacity in the retention and acquisition of a syntactic structure, namely, agreeing with *SO+aux+I* and *NEITHER+aux+I* in short responses in L2 speech. This target language structure was selected in face of results of a pilot study which aimed at testing the acquisition of different syntactic structures in English as a foreign language. Three syntactic structures were piloted, namely: *used to*, *comparatives* and agreeing with *So+aux+I* and *Neither+aux+I*. All the structures were tested with focused tests where the target language structure could not be circumvented

[6] A longitudinal study examines the behavior of one or more subjects as that behavior develops over time (Brown, 1988).
[7] Quasi-experimental groups are similar to experimental groups but use subjects not randomly assigned since they naturally belong to one group or the other (Brown, 1988).
[8] A design that combines quantitative and qualitative methods (Dornyei, 2007).

and acquisition was operationalized as accurate use of the target language structure. Results of the pilot study showed that the syntactic structure required to agree in English was more cognitively demanding (as shown by a comparison of means of accuracy scores) than the other syntactic structures piloted. Because the aim of this study was to analyze the extent to which individual differences in working memory capacity were related to the retention and acquisition of a particular syntactic structure in L2 speech, the most cognitively demanding structure was selected for this study so as to tax working memory capacity to its limit in order for individual differences to emerge.

Following insights of the pilot study (Finardi, 2007, reviewed in section 3.9) conducted to test the instruments of this study, the target language structure selected for this study was the formula required to agree in English using *So+aux+I* and *Neither+aux+I* in short responses in L2 speech. Also following Finardi (2007), retention was operationalized in this study as accurate use of the target language structure in a focused, immediate test in which it was assumed that processing for form rather than processing for meaning would be the priority, whereas acquisition was operationalized as accurate use of the target language structure in an unfocused, delayed test in which it was assumed that processing for both meaning and form would be required.

The linguistic complexity and cognitive load imposed by the processing of the syntactic structure selected for this study will be discussed in the Discussion Chapter. To reiterate, the aim of this study was to determine whether differences in working memory capacity correlated with the retention and acquisition of a syntactic structure in short responses in L2 speech. The questions raised to investigate this issue are outlined in the next section.

3.1 Research Questions

So as to answer the general research question of whether working memory capacity was related to the retention and acquisition of a syntactic structure in L2 speech, seven research questions were pursued in this study. The first research question concerns the treatment - in this case, the instruction focused on form of the target language structure (So+aux / Neither+aux), given to the experimental group.

Research question 1 – Are the retention and acquisition of the target syntactic structure in L2 speech caused by the instruction given?

The second research question addresses the performance in the retention and acquisition tests which were designed for this study and piloted in Finardi (2007), yielding positive results in regards to the performance in these two tests. This question is based on the assumption, supported by evidence in Finardi (2007), that the performance in the acquisition test would be more taxing in terms of cognitive load than in the retention test since in the former learners would have to process meaning and form to answer the questions correctly whereas it was possible to circumvent meaning processing to answer the questions correctly in the retention test, thus, having participants focus only on form.

Research question 2 – Is the performance in the retention test more accurate than the performance in the acquisition test?

Research questions three and four represent the main drive for this research endeavor and concern the relationship between L2 working memory capacity and the retention and acquisition of a syntactic structure (So+aux / Neither +aux) in L2 speech. Based on evidence that working memory capacity, assessed in terms of an L2

speaking span test constrains L2 speech performance (Fortkamp, 2000; Finardi & Prebianca, 2006, Finardi, 2007; Xhafaj, 2006; Weissheimer, 2007), this study went a step further to suggest, as explicit in question 4, that working memory capacity might also be related to L2 speech acquisition.

Research question 3 – Is L2 working memory capacity related to participants' retention of a syntactic structure in short responses in L2 speech?

Research question 4 – Is L2 working memory capacity related to participants' acquisition of a syntactic structure in short responses in L2 speech?

Research questions five and six are secondary and exploratory in nature and concern the relationship between working memory capacity in L1 and the retention and acquisition of a syntactic structure in L2 speech and the relationship between working memory capacity measures in L1 and L2.

Research question 5 – Is there a relationship between working memory capacity, assessed in terms of an L1 speaking span test, and the retention and acquisition of a syntactic structure in L2 speech?

Research question 6 – Is working memory capacity in L1 related to working memory capacity in L2?

Finally, research question seven is of a qualitative nature and concerns the reported perceptions and strategies used by participants during the execution of the tests employed in this study.

Research question 7 – What are participants' reported perceptions on the tests used in this study in regards to the difficulty of the tests and strategies used during the execution of the tests?

3.2 Hypotheses

The seven research questions just outlined generated six hypotheses:

Hypothesis 1: Participants in the control group will neither retain nor acquire the target language structure without instruction.

Hypothesis 2: Participants' performance in the retention test will be more accurate than in the acquisition test.

Hypothesis 3: There is a positive and statistically significant correlation between L2 speaking span test scores and accuracy scores in the retention test. Higher spans are more accurate in the retention test than lower spans.

Hypothesis 4: There is a positive and statistically significant correlation between scores in the L2 speaking span test and accuracy scores in the acquisition test. Higher spans are more accurate in the acquisition test than lower spans.

Hypothesis 5: There is a positive and statistically significant correlation between scores in the L1 speaking span test scores and accuracy scores in the retention and acquisition tests. Higher spans retain and acquire more the target language structure than lower spans.

Hypothesis 6: There is a positive and statistically significant correlation between scores in the speaking span tests in L1 and L2. Those with a higher working memory capacity in L1 will be the same with higher working memory capacity in L2.

Hypothesis 7 was made in face of prior results of Finardi (2007).

Hypothesis 7: Participants will find the tests increasing in difficulty in this order: the retention test, the acquisition test, the L1 speaking span test and the L2 speaking span test.

3.3 Participants

One hundred and fifty-three students belonging to 13 different groups of the Level 2 of the Extracurricular Course of English at the Universidade Federal de Santa Catarina (UFSC) integrated the original pool of this experiment which was conducted in the second semester of 2007. The Extracurricular Course at UFSC offers foreign language classes to university students and personnel. Classes have an average of 20 students per class and one course comprises one academic semester or four months of classes. The English 2 course is the second semester out of eight, thus a basic level course with classes twice a week for 1 and a half hours each or once a week for three hours with a break in between. The book used in English 2 is Interchange 2 (Richards, 1996) and the classes cover all four skills, namely, reading, writing, listening and speaking. Students who did not take a test in the end of their extracurricular course the previous semester and wish to enroll in this course have to take a placement test in the beginning of the term to enroll in the Extracurricular Course at UFSC. The English 2 level Course was selected for this study precisely because it is in this level, specifically in unit 13 of the text book, that the target language structure is taught. Though all participants were pre-tested to participate in this study, selecting a group according to the syllabus taught would guarantee more homogeneity of participants.

After visiting all the groups and explaining the aim of the study, the researcher administered a written focused test to all the students in the eight groups selected to participate in this study so as to guarantee that none of them knew (supplied

the correct structure in the focused test) the target language structure before the experiment was conducted. After the pre-test, 96 participants signed a consent form (Appendix A) agreeing to take part in this study on a volunteer basis and were then divided into two groups according to the classes in which they were enrolled - 46 experimental (in 9 groups) and 50 control (in 4 groups). Out of the 46 experimental participants who did all the tests, only 50% (23) did the speaking span test in L1 because the researcher could not convince the others to come to another test session for the L1 speaking span test.

The total cohort consisted of 27 female and 19 male experimental participants and 33 female and 17 male control participants, ages ranging between 18 and 55 with a mean of 25,5. Participants had studied English for an average of one semester, most of them did not speak another foreign language apart from English (7 reported speaking or understanding a little Spanish) and reported that their main goal for studying English was to develop oral fluency. They all lived in the metropolitan area of Florianopolis and either studied or worked at UFSC. Their courses and professions ranged from engineering, architecture, administration, physiotherapy, accounting and others. This information was gathered in biographical interviews and the inventory with answers can be seen in Appendix B.

Participants were not paid but received a chocolate candy or eraser every time (at least four for each participant) they met with the researcher for data collection. Students in the extracurricular course do not receive course credit to participate in research, which is why the researcher gave them a candy or eraser as incentive to take part in this research endeavor. Thus, the experimental group was composed of 46 participants who did all the tests, except for the L1 speaking span test, which was conducted with a smaller sample (N = 23) of the participants.

Besides the material incentive (chocolate candy or eraser), participants in the experimental group received feedback of their language as well as some tips on how to use their memory, either in individual meetings with the researcher or by e-mail. The feedback on language consisted on correcting exercises or sentences that participants sent by email and the feedback on the memory test consisted on tips on how to use their memory. These tips were also sent by email and can be seen in Appendix C. Participants in the control group only received emails with tips on how to use their memory to study and had no individual meetings with the researcher. The instruction on the target language structure was focused on form and was the same for all the groups and consisted on teaching the grammatical rule to the group, providing ten examples. Participants in the experimental group received the instruction on the target language structure from the researcher whereas the participants in the control group received the instruction by their own teacher and after the experiment was conducted.

3.4 Instruments

Five instruments of data collection were used in this study: three to assess target language use and two to assess working memory capacity in L1 and L2. The target language tests were: one focused written test – the pre-test - and two speaking tests - one focused and one unfocused – to test target language retention and acquisition, respectively. The terms focused and unfocused tests will be explained in the ensuing sections. The target language tests were designed by the researcher and piloted (Finardi, 2007) yielding positive results about the relationship between working memory capacity and the processing that was assumed to take place in the acquisition of the target language structure. The working memory tests were based on Daneman

(1991) and both were in the speaking mode but one was in L2 and the other in L1. The L2 speaking span test was designed by Weissheimer (2006) and piloted in Finardi (2007) and the L1 speaking span test was designed by Prebianca and Fortkamp (2007).

The tests were administered in this order: 1) pre-test – focused written test 2) retention - immediate focused speaking test, 3) acquisition - delayed unfocused speaking test 4) L2 working memory capacity – L2 speaking span test and 5) L1 working memory capacity – L1 speaking span test. All tests were collected in individual sessions with participants in the experimental group and were followed by an interview. In what follows, the tests will be described in the order in which they were administered.

3.4.1 Pre-test

A focused written test was used in the pre-test to check whether participants knew the target language structure. Those participants who got at least one item correct in the written test were discarded and only those who scored zero were invited to participate in this study. The pre-test consisted of 10 sentences with which participants were instructed to agree using SO+AUX+I or NEITHER+AUX+I. The pre-test can be seen in Appendix D. The instruction can also be seen in the aforementioned appendix, they were the same for all the participants. Participants were not allowed to ask questions. If they did not know how to fill in the sentences, they returned the slip of paper to the researcher blank.

3.4.2 Retention Test

The focused speaking test aimed to target language structure retention and was administered to the experimental group immediately after instruction (focused on form: the grammar rule and ten examples) in individual sessions with the researcher. In the retention test (Appendix E) participants were instructed to agree with the sentences heard using the target language structure (So+aux+I or Neither+aux+I) they had just been taught. Following suggestions of Finardi (2007) who found interesting results regarding the lenient and strict scores of the language tests, two scores were calculated for the retention test, one strict and one lenient. The criterion to calculate the strict score was to give one point only for answers completely correct. In the lenient score one point was given for answers completely correct and half a point was given for answers which had either the auxiliary verb or the target structure (So/Neither) correct, for example, if in sentence 10 of the retention test the participant had produced (so do I) or (neither did I), half a point would be given for these answers since in the first answer the auxiliary verb is correct but the target language structure is not whereas in the second answer the opposite situation happens.

3.4.3 Acquisition Test

The acquisition test (Appendix F) was similar to the retention test in the sense that it also consisted of 10 sentences (which were similar but not the same of the retention test) but it differed from the retention test in that now participants were required to agree or disagree according to their real situations with the statements presented. The reason why the researcher wanted participants to agree or disagree with

the sentences heard was to make sure that participants were processing both form and meaning to answer the questions correctly. Recall that in the retention test participants were not required to respond with the truth, instead they were required to agree with the sentences heard (even if in real life they did not) using the target language structure to do so. Nevertheless the researcher was interested in checking whether participants had acquired the form of the target language structure and could use it in communicative tasks in which they would have to process the meaning as well, thus, demonstrating acquisition of that particular target language structure in the full sense of the word.

The acquisition test was designed after the researcher had had individual meetings with the participants in the experimental group (N = 46), collecting biographical data so as to elaborate sentences in which participants had to necessarily agree or disagree, depending on their personal circumstances. These meetings lasted about 5 minutes and were informal, in the sense that the questions asked by the researcher did not follow a pre-arranged order, resembling more a talk than an interview. Though the questions were not fixed, the researcher asked all the participants what their nationalities were, where they worked, whether they spoke another foreign language apart from English or not, how many semesters they had studied English before and where they lived. After assembling the biographical data from the interviews, the researcher knew where the participants lived, where they worked, how many languages they spoke and what nationality they were. Once this information was coded (see inventory in Appendix B), the researcher was able to design sentences with which participants had to agree or disagree, depending on their real life situations. The sentences in the acquisition test were designed in such a way that participants would have to agree with at least 5 sentences and disagree with the other 5, thus demonstrating whether participants had retained the syntactic form (the rule to use So+aux and Neither

+aux), generalizing it in a communicative test in which they would have to process both form and meaning to answer the questions correctly.

Again, following suggestions in Finardi (2007), two scores (one strict and one lenient) were calculated for the acquisition test but now the criterion was slightly different from that used in the retention test. In the strict score, similarly to the retention test, only sentences completely correct were given one point. In the lenient score half a point was given to sentences partially correct but now the criterion for partially correct was whether it agreed or disagreed when it had to and whether either the auxiliary verb or the target structure (so/neither) was correct. For example, if the answer to sentence 5 in the acquisition test (Appendix F) (I'm not Brazilian) was: (So am I), the participant would be given half a point in the lenient score because the structure was correct but he/she hadn't disagreed using the correct form (I am). Similarly, if the answer to the same question was: (Neither am I), although the sentence was grammatically correct, the participant would be given only half a point for he/she should have disagreed with this sentence.

3.4.4 Working Memory Capacity Test in L2

The working memory capacity test in L2 used in this study was the version piloted in Finardi (2007) and proposed by Weissheimer's (2006) for the L2 speaking span test (SST), which, in turn, was constructed based on Daneman's (1991) original version and Fortkamp's (1998) adapted version for L2. Fortkamp's (1998) adaptation of Daneman's (1991) speaking span test originated the other versions of the speaking span test used by the group of researchers (for example Bergsleithner, Finardi, Guara-Tavares, Prebianca, Weissheimer, and Xhafaj) who carried out studies on the

relationship between working memory capacity and different aspects of L2 speech production reviewed in chapter two.

The L2 speaking span test used in this study consisted of 60 unrelated words organized in five sets of 2, 3, 4, 5 and 6 words. The words of the test were presented individually, in the middle of a computer screen, for one second. The test requires participants to read the words that appear in the computer screen silently, trying to memorize them first. Question marks (in the same number of the words presented in the set) appear in the middle of the computer screen in the end of each set, signaling the number of sentences that participants are required to make. When all the words in the set have been presented, participants see question marks and are required to make sentences orally with the words read, in the order they appeared. Participants are instructed to make one sentence per word read, in a grammatically correct form. Instructions for this test were given in participants' L1 (Portuguese) orally by the researcher and participants underwent a practice trial before actually starting the test.

The L2 SST used in this study was proposed by Weissheimer (2006) for intermediate level groups. Since the group in this study was of a basic level, the researcher, following Finardi's (2007) suggestion, included the words of the L2 speaking span test in the memory tips sent to the participants by email so as to guarantee that all participants knew the words included in the test. The reason to do this was to guarantee that all participants were familiar with the words used in the speaking span test in L2 so as to safeguard against the possibility that the L2 SST was assessing participants' vocabulary in L2 instead of their working memory capacity in L2.

Participants were instructed (in L1 Portuguese, orally by the researcher) to read the words silently and make sentences orally when the question marks appeared and did two trials to become familiar with the test before doing the next three trials

which were recorded and transcribed for analysis. Participants' L2 speaking span was defined as the maximum number of words (out of 60) for which they could generate sentences. Similar to the language tests, two scores were calculated for this test, a strict and a lenient one, following Finardi (2007) and Weissheimer (2007). In the strict score, only sentences which were grammatically correct and used the target word in the correct order were given one point, in the lenient score half a point was also given for sentences which were partially correct (e.g.: The girl live on the farm) or when the sentence was correct but the target word was in an order other than the one presented. Sentences such as (I don't know gift) were considered correct if the target word (gift) was produced in the correct order. Regarding the form of the words presented in the test, participants were instructed to use the word as it appeared. If, for example, the word presented was GIFT, then they should not use GIFTS in the sentences. If they did, they would receive points only in the lenient score. The words included in the three trials of the speaking span test in L2 can be seen in Appendix G and the transcripts for this test can be seen in Appendix L.

3.4.5 Working Memory Capacity Test in L1

The L1 speaking span test used in this study was designed by Fortkamp and Prebianca (2007), also based on Daneman (1991). It was similar to the L2 speaking span test in every sense except that it was administered in the participants' L1 (Portuguese). The procedures for this test, including the instructions, were exactly the same as the one given for the L2 speaking span test. This test also generated two scores, a strict and a lenient one, mirroring the L2 criteria to correct the test. Forms such as *tá* instead of *está* were considered correct. One difference between the L1 and L2 SST is

that in the L1 SST the words were longer (7 letters) than most words in the L2 and in the L2 all words were nouns whereas in the L1 SST there were also adjectives. The words included in the three trials of the L1 SST can be seen in Appendix H and the transcriptions for this test can be seen in Appendix M.

3.5 Study Design

Following suggestions in Finardi (2007) and so as to address the issue of whether working memory capacity was related to the retention and acquisition of a syntactic structure in L2 speech, answering the research questions and hypotheses raised in this study, the following study design was employed:

Table 1

Study Design

	August	September	September	October	October	November
Experim. N=46	Pre-test Focused Written Test	Treatment Instruction – focused on form	Retention Focused Speaking Test and Interview	Acquisition Unfocused Speaking Test and Interview	WMC in L2 L2 Speaking Span Test and Interview	WMC in L1 L1 Speaking Span Test and Interview
Control N=50	Pre-test Focused Written Test		Post-test Focused Written Test			

3.6 Procedures

The procedures of data collection employed in this study were decided upon based on Finardi's (2007) suggestions and will be described in what follows. Before selecting the groups for this study the researcher checked in which level of the Extracurricular Course the target language structure would be taught. Once verified that the target language structure was taught in Unit 13 of Interchange II of the English 2 Level course, the researcher contacted all the teachers of the extracurricular course who were teaching English 2 to explain the aim of her research and plan collaboration with the teachers to collect data in their classes and teach the target language structure to the groups. The researcher explained that the target language structure would have to be explained by the researcher to the experimental groups so as to guarantee uniformity of instruction and asked teachers whether they would accept to have the researcher in their classes on those particular days.

The researcher then selected four groups to act as control and nine groups were selected as experimental based on the researcher's and the teachers' availability to participate in the study. The next step, after dividing the groups, was to visit each class, to explain the procedures of the research and invite students to participate in it. In the same visit, the researcher gave all students who accepted to participate in the study the pre-test, instructing them to agree with the sentences in the slip of paper using *So* or *Neither*. If they asked what those words meant the researcher said they would learn that structure the following week and that she was giving them this test to check if any of them knew the structure before starting the study. The researcher did not explain the structure but promised to do so the following week. Not all students wanted to take the pre-test and the researcher respected that and did not

insist, the pre-test took 5 minutes and those who did not want to take it went on working on another exercise given by the teacher. After students finished the pre-test the researcher collected the tests and left the room while the teacher carried on with the class normally. A total of 96 students took the pre-test.

The researcher returned only once more to the control groups to repeat the same written test they had taken as pre-test two weeks earlier since the control group did not take the speaking span tests. All the other procedures described in what follows apply to the experimental groups only. After the pre-test, in a second encounter with the whole group (that is, with the 46 participants divided in 9 experimental groups), those participants who were selected (those who scored zero in the pre-test) were invited to participate in the research. The researcher then explained to the participants invited what they would have to do to participate in the research saying that they would have to meet the researcher in individual meetings, after their class at least four more times and also said that only those who were selected and agreed to participate would have to sign the consent form (Appendix A) although she would teach the target language structure to the whole group. This procedure was repeated for the 9 experimental groups. After the researcher explained that those who agreed to participate would have to meet the researcher at least four times individually (since all of them would meet the researcher during class for the instruction of the target language form) for the test, some students were discouraged to take part in the study. The researcher then explained that she would give support for their English classes for free for those who participated in the experiment and also mentioned that only those who agreed to participate in the research would receive memory tips by email and personal feedback after all the tests.

The researcher then read the consent form, asked if participants had any questions and then collected their signatures. After collecting the signatures on the

consent form, the researcher explained the rule of the target language structure explicitly to the whole group in each of the 9 experimental groups. All groups received exactly the same instruction with the same sentences and examples. The instruction was given orally and the examples can be seen in Appendix N. After teaching the target language instruction to the whole group the researcher left the room and the teacher carried on with the class normally. The researcher then waited for the participants in a separate room where she meet each one of them individually, on the same day of the instruction, for the retention test and interview. During the interview, and before the retention test, the researcher explained that she would tell them ten sentences with which they would have to agree using the structure they had just been taught. The researcher also said she would record this test. After the test, the researcher asked participants what they thought about the test and whether they had tried to use any strategies to do the test. The answers to the interview can be seen in the results section.

During these individual meetings the researcher began the interview by asking the participants, in English, their names, ages, courses and other questions so as to make participants at ease to start the retention test and collect important information about the participants' background so as to design the unfocused test (Appendix F). This information was written in a diary as soon as each interview finished. The researcher then told them to agree with the sentences heard using *So* or *Neither* and read the 10 sentences. The researcher gave the instruction in the participants' L1 (Portuguese) and said that she could not repeat the sentences and that participants should try to start speaking as soon as they heard the sentence.

An interview in L1 was carried out with participants in the experimental groups after all the tests in this study so as to find out participants' perceptions on the tests employed in this study. In these interviews the researcher asked them what they

thought about the test they had just taken and whether they had used or tried to use any strategies to do the test. The list of strategies employed can be seen in the results section. These interviews were carried out in individual meetings and recorded in a portable tape recorder. The tests were fully transcribed immediately after each session to guarantee the greatest integrity. However, the interviews were not fully transcribed, instead they were coded according to topics and then translated to enable triangulation. The coded answers can be seen in the results section.

Two weeks after the retention test the researcher returned to each experimental group to apply the acquisition test. During those two weeks participants did not receive any other instruction from the researcher but practiced the target language structure in their classes (according to their teachers' reports) as part of the program of their courses. The procedures for the acquisition test were similar to the retention test except for the fact that it was a delayed test (administered two weeks after instruction) and now participants were required to agree or no with the sentences heard according to their real situations. In that sense, the acquisition test was a communicative test since participants would necessarily have to focus on meaning so as to respond adequately and other language structures, apart from the target language structure, were possible.

Two weeks after the researcher collected the acquisition test she met students in the experimental groups again for the memory test though the researcher was in contact with participants (and teachers) all the time by email, even when she was not collecting data. These contacts via email were important to gather information from teachers regarding their programation and to remind participants of their time and day for the memory test. The researcher sent participants and teachers one memory tip per week by email and sometimes also helped them with their English lessons via email.

The researcher also substituted two teachers on two different occasions in exchange for their help with the research though the researcher did not go through the target language structure again with these groups as the teachers had already done so in their programation.

As previously pointed out, the L2 speaking span test used in this study was originally conceived for intermediate groups. Because the groups in this study were of a basic level, so as to prevent the possibility that some students might not know all the words in this test, the researcher included all the words of the L2 speaking span test in the memory tips and exercises (Appendix C) that students received by email during the data collection phase. Nevertheless, before administering the L2 speaking span test, the researcher told participants (instructions for this test can be seen in Appendix O) that if there was a word they did not remember they could produce sentences such as: “I don´t know X” or “I don´t remember X”. A training phase (40 words) preceded the testing phase (60 words) and the actual test did not start until the participants reported feeling comfortable to perform the test. Participants were instructed to make simple sentences and to start speaking as soon as the question marks appeared on the screen.

Three participants asked to do the test again (they thought they would do better on a second attempt) and were allowed to do so although the researcher considered only the first execution. One participant started to speak before the question marks appeared despite the researcher´s insistence that he wait for the question marks to speak. He mentioned, before the test, that he expected his memory to be bad on account of his age (55) and was obviously concerned about performing well on the test. When this happened the researcher asked him again to wait for the question mark but considered his performance. The decision to apply the L1 SST was made after the researcher had already collected the other tests in this study. So as to further explore the

role of working memory capacity in the retention and acquisition of a syntactic structure in L2 speech, the researcher decided to collect the L1 speaking span test although she was aware that it would be very difficult to collect this test with all participants because it was the end of the semester and they were already tired of having to meet the researcher in individual meetings to do tests. Thus, a subset (N= 23) of the sample was submitted to the L1 speaking span test, for which the same procedures (as those of the L2 test) were followed. In what follows, a summary of the variables created by the four tests used in this study will be shown.

3.7 Summary of Variables

A summary of the variables created in this study is presented below. After the pre-test, four tests were administered to the experimental group yielding two scores each:

RS retention strict

RL retention lenient

AS acquisition strict

AL acquisition lenient

L2S L2 speaking span strict

L2L L2 speaking span lenient

L1S L1 speaking span strict

L1L L1 speaking span lenient

3.8 Data Analysis

The data in this study were submitted to different statistical procedures using the statistical program SPSS 10.0. The statistical techniques used in this study will be described in what follows.

3.8.1 Descriptive Statistics

So as to address the hypotheses raised in this study, descriptive analyses of the data were conducted so as to have a general picture of the participants' performance in the four tests used in this study. Moreover, the data were checked for normal distribution.

3.8.2 Correlations

The correlational approach has been used in studies of working memory capacity and complex cognitive performance (Daneman, 1991; Daneman & Carpenter, 1980; 1983; Daneman & Green, 1986; Turner & Engle, 1989; Miyake & Friedman, 1998; Fortkamp, 1999; 2000; Friedman & Miyake, 2004; Guara Tavaras, 2006; 2007; Finardi, 2007; Finardi & Prebianca, 2006; Xhafaj, 2006; Weissheimer, 2007; among others). This approach was also used in this study to determine the degree of association between working memory capacity scores and scores on the target language tests and also between the three raters' scores for the memory tests. Because of robust evidence in the literature for the relationship between working memory capacity and measures of

L2 speech production, the correlations were one tailed and the alpha was set at .01. Correlations were qualified as weak (> .3), moderate (≥ .3 < .7) and strong (≥.7).

3.8.3 Inter-rater reliability

A total of three raters analyzed the speaking span tests. Two independent raters (apart from the researcher) analyzed all the transcriptions of the working memory tests. One rater was a professor and a PhD in Applied Linguistics having defended her dissertation on L2 working memory capacity and L2 speech production and development. Rater 2 also had extensive knowledge of the speaking span test (SST) having elaborated the L2 SST used in this study. The other rater (rater 3) was pursuing her PhD in Applied Linguistics also studying working memory capacity and L2 speech production, and designed the L1 SST used in this study. Correlations were run among the three scores and a decision was made to accept only strong correlations (above .7), if they were weak then the data would have to be reanalyzed and the raters would have to discuss individual cases to reach agreement. The correlations among raters for the L1 SST can be seen in Appendix P and the correlations among raters for the L2 SST can be seen in Appendix Q. Only the researcher had access to the qualitative data of the memory tests, that is, the participants' reports on the tests and the strategies they had tried to use while doing the tests. An average score was also calculated among the raters but used as mere illustration in the study and can be seen in the results section. A methodological decision was made to use the scores yielded by Rater 1 (the researcher) to answer the main hypotheses raised in this study since there was good inter-rater reliability and Rater 1 was the only one involved in data collection with access to the qualitative data. The reason to use other raters was to certify that any inconsistencies in

the scores of the speaking span tests, specially for the lenient scores, were subjective, thus attempting to use the most objective criteria to analyze results of the memory tests.

3.8.4 Paired Sample *t*-tests

A series of Paired-Samples *t*-tests were run to analyze the performance between the retention and acquisition tests and also between the working memory test in L2 and L1. The alpha was set at .05 for the *t*-tests.

3.8.5 Extreme-groups design

So as to address, in a more comprehensive way, hypotheses 3, 4, 5 and 6, which stated that individuals rated as higher spans would retain and acquire more the target language structure than lower spans, an extreme-groups design was used in this study. Due to a limited sample size, a tertile split design (in which the sample is divided in three and the middle range is ignored) was used instead of a quartile split design (in which the sample is divided in four and only the extreme upper and extreme lower are used), following Weissheimer (2007) and Finardi (2007). The procedure for this division was to statistically assign participants into one of three groups: higher spans (coded as 1), intermediate spans (coded as 2) and lower spans (coded as 3). Thus, a middle score between the highest (27 strict L2, 27 lenient L2, 40 strict L1 and 43 lenient L1) and the lowest (6 strict L2, 13 lenient L2, 18 strict L1 and 26 lenient L1) scores was first calculated, then the scores were divided into three percentiles according to the middle score calculated, 33% falling in the lowest, 33% in the middle, next to the average, and 34% falling in the highest percentiles. The participants in the lowest

percentiles were categorized as lower spans (8 strict L2, 6 lenient L2, 2 strict L1 and 6 lenient L1), the participants in the middle as intermediate spans (not used in the statistical analysis) and the ones in the upper percentiles as higher spans (6 strict L2, 13 lenient L2, 4 strict L1 and 2 lenient L1). The intermediate spans were disregarded in the analysis of nominal variables.

3.8.6 Independent Sample *t*-tests

Independent samples *t*-tests were run between the nominal values assigned for working memory capacity groups (higher and lower spans) and the target language tests used in this study to verify whether higher spans in fact performed better than lower spans in the target language tests and whether that difference in performance was statistically significant.

3.9 Pilot Study

Two experiments were conducted before this study, the first aimed at testing the acquisition of different syntactic structures in L2 speech so as to select one syntactic structure for this study and the second aimed at testing the instruments and procedures for this study once the target language structure had been selected. In the first experiment three syntactic structures were tested, namely, *Used to*, *Comparatives* and Agreeing with *So+aux+I* and *Neither+aux+I*. Nine participants received instructions on the aforementioned structures and did a focused and an unfocused test. Results of a comparison of means showed that the acquisition of the latter structure was more demanding as shown by the lower means. That is, participants had a better

performance in the retention test than in the acquisition test and this was taken as evidence that the former was demanding than the latter. Since the aim of this study was to select a syntactic structure which was cognitively demanding to allow for individual differences in working memory capacity to emerge, the latter structure was selected.

So as to investigate whether working memory capacity in L2 was related to the retention and acquisition of a particular syntactic structure in L2 speech, and also to pilot the instruments used in this study, a second experiment was conducted (Finardi, 2007) at the same university between the months of March and May of 2007. The cohort used in this pilot study comprised 47 experimental and 8 control participants. Participants were also studying in the extracurricular course at UFSC at English 2 level.

Two tests were designed by the researcher for the pilot study, a focused test (in the written and speaking modes) to test target language retention and an unfocused test (also in the written and speaking modes) to test target language acquisition. The working memory test used in the pilot study was the same as the one used in this study (L2 SST) and was designed by Weissheimer (2006). The basic design used in Finardi (2007) differed from this study in that in the former there were no interviews after the tests and there were also written tests (both focused and unfocused) apart from the speaking tests and there was only one memory test (L2 SST) as opposed to this study in which two memory tests (L1 and L2 SST) were used. The design used in Finardi (2007) can be seen below:

Table 2

Design of Finardi (2007)

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6
Experimental N= 47	Pre-test Focused Written Test	Treatment Instruction focused on form	Retention Focused Written Test	Retention Focused Speaking Test	Working Memory Test - L2 SST	Acquisition Unfocused Written and Unfocused Speaking Test
Control N= 8	Pre-test Focused Written Test					Post-test Focused Written Test

The general question driving Finardi (2007) was whether working memory capacity in L2 scores would correlate with scores in the retention (focused) and acquisition (unfocused) tests (both written and speaking modes). Results of non-parametric correlations showed that working memory capacity in L2 scores were in fact related to all the retention and acquisition tests as can be seen in Table 3.

Table 3

Correlation coefficients among L2 SST and retention and acquisition tests in Finardi (2007)

	RWS	RWL	AWS	AWL	RSS	RSL	ASS	ASL
L2 SST strict	.284*	.286*	.582*	.564**	.296*	.263*	.681**	.686**
L2 SST lenient	.256*	.257*	.589**	.564**	.311*	.265*	.693**	.708**

N=47

Retention written strict – RWS, Retention written lenient – RWL, Acquisition written strict – AWS, Acquisition written lenient – AWL, Retention speaking strict – RSS, Retention speaking lenient – RSL, Acquisition speaking strict – ASS, Acquisition speaking lenient - AS

The weak correlations found between working memory capacity in L2 scores and scores in the retention tests (focused) were explained in the pilot study in terms of a methodological problem since the retention test was administered immediately after the focused written test, being probably affected by it. The researcher then opted to abandon the written tests altogether in the present study so as to guarantee the validity and reliability of the data originating in the speaking tests which represented the main focus of this study.

Finardi (2007) also explained the weak correlations found between the retention test and the L2 SST in terms of the processes involved in execution of the retention test. She suggested that during the execution of the retention test (focused), participants were processing only the form of the sentence, thus not taxing working memory capacity as much as when they had to process both meaning and form (as was the case of the acquisition test). So as to check whether this possibility was true, the researcher suggested using interviews with the participants, immediately after the tests, to check what they thought about the test they had just done and what strategies (if any) they were using while doing the tests.

Another important insight concerning the present study which was gained from Finardi (2007) was that when participants do the speaking span test they get very frustrated and stressed and it is difficult to convince them to meet the researcher again to do other tests after that. Because of this characteristic of the L2 speaking span test, a methodological decision was made in this study to leave the memory tests to the end, to guarantee the largest number of participants for the study so as to allow statistical variation. Moreover, the researcher decided to apply the L1 speaking span test only after she had guaranteed that all participants had done the other

tests which were essential for this study, that way, she could gain insights from the L1 results but did not depend on them to answer the main research question which was whether working memory capacity in L2 was related to the retention and acquisition of a syntactic structure in L2 speech.

Finardi (2007) was important for this study in yet another way. When analyzing the data originating in the L2 speaking span test the researcher realized that many students used sentences such as “I don´t know X” or “I don´t remember X”, pointing to the possibility that they did not know some of the words included in the L2 speaking span test which was designed for intermediate groups whereas the groups in Finardi were basic level groups. So as to protect the data from this possibility, the researcher made sure that all participants knew the words included in the L2 SST by including them in the memory tips and exercises sent to participants before administering the L2 SST in the present study. That way, all the tests and words included in this study were piloted before, guaranteeing more validity for their results.

Finally, Finardi (2007) suggested the inclusion of interviews after the tests so as to be able to check whether participants were really processing form in the retention test and form and meaning in the acquisition test as suggested in Finardi (2007). Moreover, the inclusion of interviews generating qualitative data enabled data triangulation, thus expanding Finardi’s (2007) findings which enriched this study with important insights and suggestions concerning this study’s design. Thus, Finardi’s (2007) pilot study proved to be informative and important in validating the tests used in the present study.

CHAPTER 4

RESULTS

This chapter presents the results of the statistical analysis conducted so as to answer the main research question of whether working memory capacity is related to the retention and acquisition of a particular syntactic structure (So+aux+I and Neither+aux+I) in L2 speech. This general research question was further broken down into seven questions. To reiterate, the first research question was whether the retention and acquisition of the target language structure was caused by the treatment given. The second research question was whether the retention test would be less cognitively demanding than the acquisition test. The third question was whether working memory capacity in L2 would correlate with participants' retention of that particular structure in L2 speech. Research question number four was whether working memory capacity in L2 would correlate with participants' acquisition of that particular structure in L2 speech. Research question number five was whether performance in the retention and acquisition tests would also correlate with working memory capacity in L1 and research question number six was whether scores in the working memory capacity test in L1 would correlate with scores in the working memory capacity test in L2. Finally, research question number seven addressed the reported perceptions and strategies used by participants during the performance of the tests used in this study.

This chapter is divided into four sub-sections. Section 1 will present the results of the descriptive statistical analyses of the working memory tests. Section 2 will present the results of the descriptive statistical analyses of the retention and acquisition tests used in this study addressing Hypothesis 1 and 2, which are related to research questions number 1 and 2. Section 3 will present the results of the correlational

analyses, addressing Hypothesis 3 to 6, which address research questions 3 to 6 and section 4 will present the qualitative analyses of the interviews answering research question 7.

4.1 Section 1- Working memory tests

This section presents the results of the descriptive statistical analysis of the working memory tests. Two working memory tests were used in this study, one in L1 (L1 SST) with 50% of participants (N= 23) and one in L2 (L2 SST) with 100% (N=46) of participants, both from the experimental group. Two scores (one strict and one lenient) were calculated for each test by three independent raters, generating six variables (strict and lenient multiplied by 3 raters) for each test (L1 SST and L2 SST).

This section will start by presenting the descriptive statistics for the L1 SST, followed by the L2 SST and then by the averages among the three ratings, finishing with the correlations used to verify inter-rater reliability. The raw scores for the L1 SST as calculated by the three different raters can be seen in Appendix I. Table 4 shows the descriptive statistics for the L1 SST calculated for the three raters.

Table 4

Descriptive Statistics for L1 SST

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
Raters	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
R1 strict	23	18	40	30.652	5.271	-.495	.481	.369	.935
R1 lenient	23	25	43	33.087	4.562	.247	.481	.130	.935
R2 strict	23	14	38	28.435	5.759	-.743	.481	.691	.935
R2 lenient	23	23	42	32.043	4.734	.134	.481	-.013	.935
R3 strict	23	16	40	28.435	6.044	-.352	.481	-.089	.935
R3 lenient	23	21	42	31.130	5.066	-.086	.481	.103	.935
Valid N	23								

For a view of the correlations among raters in L1 see Appendix P. As can be seen in Table 4, all of the strict scores were smaller than the lenient scores and rater 1 (R1) gave the highest scores. Rater 2 (R2) gave the lowest strict scores while rater 3 (R3) the lowest lenient scores. The means in Table 4 were similar and indicate that the scores were similar across raters. In the case of R2 strict and R3 strict, the means are exactly the same. The method used to calculate the average scores can be seen in section 3.8.3 of the Method Chapter. The data is normally distributed, that is, the curve representing the behavior of this group is not peaked (no problems with kurtosis) nor skewed (skewedness), thus resembling the pattern of curve found in other people who live and perform in predictable patterns, following a bell shaped curve. From now on, when I refer to the data as being normally distributed I mean that the distribution of scores was examined for skewedness and kurtosis and was found to be normal in this regard.

Table 5 shows the descriptive statistics for the L2 SST.

Table 5

Descriptive Statistics for the L2 SST

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
R1 strict	46	6	27	16.717	5.076	-.159	.350	-.734	.688
R1 lenient	46	11	30	21.478	4.375	-.012	.350	-.541	.688
R2 strict	46	6	25	14.217	4.858	.403	.350	-.318	.688
R2 lenient	46	11	33	21.065	4.399	.267	.350	.228	.688
R3 strict	46	6	26	14.500	4.943	.376	.350	-.538	.688
R3 lenient	46	9	31	18.804	5.726	.315	.350	-.734	.688
Valid N	46								

To view the raw scores of the L2 SST as calculated by the three raters refer to Appendix J and for a view of the correlations among raters in L2 refer to

Appendix Q. As can be seen in Table 5, the means for the L2 SST were overall lower than for the L1 SST, which might be an indication that the L2 SST was more demanding than the L1 SST. Whereas in L1 the means varied from 28 to 33, in L2 they ranged from 14 to 21. The minimum strict average in L2 was exactly the same for raters 1, 2 and 3 and in the case of the minimum lenient average, the same for raters 1 and 2. Overall the means were similar for the three raters, again, showing consistency among the ratings. By analyzing the Kurtosis and Skewdness figures in Table 5, it can be seen that the data is again normally distributed.

The scores yielded by the three raters were added and divided by three to calculate the averages among them using the formula (R1+R2+R3 divided by 3) for each of the two tests (L1 and L2) and scores (strict and lenient). Descriptive statistics for the averages calculated can be seen in Table 6. As can be seen in Table 6, the data for the averages is also normally distributed.

Table 6

Descriptive Statistics for averages among three raters in L1 and L2

	N	Min	Max	Mean	Std. Dev	Skewness	Std. Er	Kurtosis	Std. Er
average L1 strict	23	19.4	40.1	30.426	5.059	-.194	.481	.153	.935
average L1 lenient	23	20.4	40.5	30.500	5.031	-.109	.481	.068	.935
average L2 strict	46	8.0	26.0	16.196	4.569	.286	.350	-.577	.688
average L2 lenient	46	9.0	29.0	18.978	4.851	.267	.350	-.583	.688
Valid N	23								

The overall means of the L1 SST in Table 4 were also higher than those of L2 SST when calculated by their averages. Results of the analysis of descriptive statistics of the two tests seem to indicate that there was consistency among the three ratings. Nevertheless, so as to make sure that there was inter-rater reliability, other statistical procedures are necessary. In order to verify inter-rater reliability Pearson

Moment Correlations (*rho)* were run among the three ratings. Results of these correlations for the L1 SST can be seen in Table 7.

Table 7

Correlation coefficients for the three ratings of the L1 SST

	R2 strict	R3 strict	R1 lenient	R2 lenient	R3 lenient
R1 strict	.937**	.870**	.952**	.930**	.902**
R2 strict		.922**	.888**	.941**	.898**
R3 strict			.834**	.876**	.953**
R1 lenient				.974**	.920**
R2 lenient					.929**

N=23

** Correlation is significant at the 0.01 level (1-tailed).

As can be seen in Table 7, all the correlations were high and statistically significant at .001, showing that there was, in fact, consistency among the three raters in the L1 SST. The highest correlation was between rater 1 lenient and rater 2 lenient r (23) = .974, $p < .01$ and the lowest correlation was that between rater 1 strict and rater 3 strict r (23) = .870, $p < .01$, though still a strong correlation. Table 8 presents the correlations among the three raters for the L2 SST.

Table 8

Correlation coefficients for the three ratings of the L2 SST

	R1 lenient	R2 strict	R2 lenient	R3 strict	R3 lenient
R1 strict	.853**	.790**	.673**	.798**	.799**
R1 lenient		.721**	.863**	.731**	.829**
R2 strict			.834**	.943**	.801**
R2 lenient				.803**	.763**
R3 strict					.842**

N = 46

** Correlation is significant at the 0.01 level (1-tailed).

The correlations among the raters in L2 were also high, though not as high as in L1 and not for everyone. The correlation between rater 1 strict and rater 2 lenient was moderate r (46) = .673, $p < .01$. The highest correlation in L2 SST was

between rater 2 and 3 strict r (46) = .94, $p < .01$. Again there was inter-rater reliability, though in the case of the L2 SST, the correlation between rater 1 and rater 2 strict r (46) = .790, $p < .01$ was lower than in the L1 SST. Nevertheless, it is possible to conclude, looking at these correlations, that the three raters were fairly consistent, both in the L1 and a little less so in the L2 SST.

4.2 Section 2- Retention and Acquisition tests

This section will present the results of the descriptive statistical analyses of the measures of retention and acquisition of a syntactic structure used in this study. To reiterate, retention of a syntactic structure was operationalized in this study as accurate use of the target language structure (So+aux+I and Neither+aux+I) in a focused, immediate test whereas acquisition was operationalized as accurate use of that structure in an unfocused, delayed test.

Hypothesis 1 predicted that any retention or acquisition of the target language structure taking place in the experiment would be due to the treatment given. A control group (N=50) was used to test Hypothesis 1. Participants in this group were given a pre-test and a post-test (written and focused). Absolutely everyone in the control group scored zero in both the pre and post-test confirming Hypothesis 1, that is, the retention and acquisition of the target language structure observed in this study was due to the treatment given.

Hypothesis 2 predicted that the performance in the retention test would be more accurate than the performance in the acquisition test. A look at the raw scores in Appendix K for these tests seems to confirm this hypothesis. The means of these tests presented in Table 9 (retention strict 6.10 and retention lenient 7.76; acquisition strict

5.02 acquisition lenient 6.25) indicate that the performance in the retention test (both strict and lenient) was in fact more accurate than in the acquisition test, thus, the first part of Hypothesis 2 is also confirmed. To view the graphs for the normal distribution, refer to Appendix T.

Table 9

Descriptive statistics for the retention and acquisition tests

	N	Minimum	Maximum	Mean	Std. Deviation
retention strict	46	1.0	9.0	6.10	2.121
retention lenient	46	3.5	9.5	7.76	1.413
acquisition strict	46	1.0	9.0	5.02	2.380
acquisition lenient	46	1.5	9.5	6.25	2.270
Valid N (listwise)	46				

So as to verify whether the difference in performance between the retention and acquisition tests was statistically significant, a series of parametric (because the data were normally distributed as verified by analyzing the kurtosis and skewdeness) paired samples *t*-tests were run. Results of these tests can be seen in Table 10.

Table 10

Paired Samples t –Tests between retention and acquisition tests

		Paired Dif	t	df	Sig. (2-tailed)
		Mean			
Pair 1	retention strict - acquisition strict	1.08	3.69	45	.001*
Pair 2	retention lenient – acquisition lenient	1.54	5.46	45	.000*

N=46

As can be seen in Table 10, results of the *t*-tests show that in fact the difference in performance between the retention and acquisition tests was statistically significant $t\ (45) = 3.69$, $p < .001$ and $t\ (45) = 5.46$, $p < .001$, respectively, that is, the acquisition test was more demanding than the retention test, as shown by the analysis of means in these two tests which was statistically significant.

4.3 Section 3 – Correlational Analysis

This section will present the correlational analysis of the data so as to answer the main hypotheses posed in this study, that is, whether there is a relationship between working memory capacity in L1 and L2 and the retention and acquisition of a syntactic structure in L2 speech. As explained in section 1, three scores were calculated by three independent raters for the speaking span tests used in this study and according to the results presented in section 1, the ratings were fairly consistent, indicating inter-rater reliability. However, so as to run the correlations to answer the question of whether working memory capacity is in fact related to the retention and acquisition of a syntactic structure in the L2 speech, a decision would have to be made as to which rater should be chosen to run the correlations presented in this section. In a preliminary analysis of the data, correlations were run with all the raters as well as with the averages among the raters and they were fairly similar (Appendix P with correlations among raters in L1 and Appendix Q with correlations among raters in L2). Nevertheless, rater 1 was chosen among the other raters to answer the main hypotheses of this study because she was also the researcher who had collected and analyzed all the data, thus having a more comprehensive and qualitative view of the data. Thus, the correlations between working memory capacity and the retention and acquisition tests in this section refer to the results of the SST as calculated by rater 1 (R1). By way of example, the averages among the raters will also be presented though they will not be considered to answer the research questions.

Hypothesis 3 predicted that there would be a positive and statistically significant correlation between scores of the L2 SST and the retention test (focused).

Because the data were normally distributed, Pearson Moment Correlations were run and because there was evidence for this relationship (Finardi, 2007) it was one-tailed. Table 11 presents the correlation coefficients for the L2 SST and the retention test. To view the scatterplots for this relationship, refer to Appendix U.

Table 11

Correlation coefficients between L2 SST (rater 1) and the retention test

	L2 SST strict	L2 SST lenient
retention strict	.275*	.227
retention lenient	.287*	.283*

N=46

* Correlation is significant at the 0.05 level (1-tailed).

As can be seen in Table 11, Hypothesis 2 is partially confirmed for there were positive and statistically significant correlations between the L2 SST and the retention test - r (46) = .275, $p < .05$ for the retention strict and the L2 SST strict, r (46) = .287, $p < .05$ for the retention lenient and the L2 SST strict, and r (46) = .283, $p < .05$ for the retention lenient and the L2 SST lenient, but there were no statistically significant correlations between the L2 SST lenient score and the retention strict score r (46) = .227, $p > .05$. Though all the other scores correlated, the relationship among them was only weak, corroborating results of Finardi (2007). Nevertheless, if instead of using rater 1 to answer Hypothesis 2, we used the averages among the three raters, there would be statistically significant correlations between the L2 SST and the retention test, though this relationship would still be weak, as can be seen in Table 12. Thus, the use of rater 1 instead of the average among raters or other raters did not change the result.

Table 12

Correlation coefficients between averages in L2 SST and retention test

	average L2 strict	average L2 lenient

retention strict	.275*	.264*
retention lenient	.283*	.289*

N=46

* Correlation is significant at the 0.05 level (1-tailed).

Hypothesis 3 also predicted that individuals rated as higher spans would retain more the target language structure than lower spans. So as to investigate this Hypothesis, the L2 SST scores calculated by rater 1 (R1) were converted into nominal variables using the tertile split extreme groups design in which the sample is divided in three and the middle range is ignored (see section 3.8.5 for extreme groups design). High span individuals were coded as 1, intermediate span individuals were coded as 2 and ignored in the analysis, and low span individuals were coded as 3. That way the assumptions for the Levene Independent samples *t*-tests were met, that is, the test was comparing two means of two independent groups with normal distribution, the dependent variable was interval (retention test), the independent variable nominal (high spans coded as 1 and low spans coded as 3), and there was equality of variance, that is, the scores of the two groups varied equally. Independent samples *t*-tests were run between the retention test and the L2 SST nominal scores to check if this difference was statistically significant. Results of the *t*-tests can be seen in Table 13.

Table 13

Independent samples t-tests between L2 SST strict nominal and retention test

Group Statistics

	L2 nominal strict	N	Mean	Std. Deviation	Std. Error Mean
retention strict	high	16	6.8	1.834	.458
	low	11	5.5	1.572	.474
retention lenient	high	16	8.5	1.263	.316
	low	11	7.5	1.214	.366

Independent Samples Test

		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
retention strict	Equal variances assumed	1.86	25	.074
retention lenient	Equal variances assumed	2.08	25	.047

As can be seen in Table 13, the means for the performance in the retention test did not vary significantly for high (N=16) and low (N=11) span participants, the mean for the high spans was 6.81 for the retention strict score whereas the mean for the low spans in the same test was 5.54. In the case of the retention lenient score, the mean for the high spans was of 8.56 whereas for the low spans it was of 7.54. The assumption of equal variances was satisfied for both the retention strict and the retention lenient scores. The difference in performance between the two groups was not statistically significant for the retention strict test t (25) = 1.86, $p > .05$ but it was for the retention lenient test t (25) = 2.08, $p < .05$), that is, higher spans retained more the target language structure than lower spans but this difference was not statistically significant in the case of the retention strict test. Put differently, higher spans retained more the target language structure than lower spans and this difference was statistically significant for the lenient scores of the retention test. So as to check if this difference was also statistically significant for the lenient scores of the L2 SST, another set of independent *t*-tests was run between the retention test (with both strict and lenient scores) and the L2 SST with lenient scores. Results can be seen in Table 14.

Table 14

Independent samples t-tests between the L2 SST lenient nominal and the retention test

Group Statistics

	L2 nominal lenient tertile	N	Mean	Std. Deviation	Std. Error Mean
retention strict	high	16	6.62	1.668	.417
	low	9	5.88	2.315	.772
retention lenient	high	16	8.43	1.153	.288
	low	9	7.66	1.581	.527

Independent Samples Test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)

retention strict	Equal variances assumed	.92	23	.367
retention lenient	Equal variances assumed	1.4	23	.174

As can be seen in Table 14, the means for the two groups were not very different. The mean for the high (N= 16) span participants was 6.62 for the retention strict score whereas the mean for the low (N= 9) spans was of 5.88. In the case of the retention lenient score, the mean for the high spans was of 8.43 while the mean for the low spans was of 7.66. The assumption of equal variances was met for both scores but the difference in performance was not statistically significant t (23) = .92, p >.05 for the retention strict and t (23) = 1.4, p >.05 for the retention lenient, that is, although higher span participants retained more the target language structure than the lower spans, the difference in their performance was not statistically significant, thus, Hypothesis 3 is partially confirmed. There is a positive and statistically significant relationship between working memory capacity in L2 and the retention of a syntactic structure in L2 speech and although the means for the higher spans were higher than the means for the lower spans in the retention test, the difference in their performance was not statistically significant in the case of the lenient score of L2 SST and the retention strict score. The possible reason why higher spans were not statistically more accurate than lower spans in the lenient score of the L2 SST will be dealt with in the Discussion Chapter.

The most important question pursued by this study was materialized in Hypothesis 4 which predicted (again based on Finardi, 2007) that there would be positive and statistically significant correlations between scores of the L2 SST and scores in the acquisition of a syntactic structure in L2 speech test. Table 15 shows the results of the correlations run to test this Hypothesis. To view the scatterplots for this association, refer to Appendix V.

Table 15

Correlation coefficients between L2 SST (rater 1) and acquisition test

	acquisition strict	acquisition lenient
L2 SST strict	.584**	.688**
L2 SST lenient	.404**	.565**

N=46

** Correlation is significant at the 0.01 level (1-tailed)

As can be seen in Table 15, there were positive and statistically significant correlations between scores on the L2 SST and the acquisition test r (46) = .584, $p < .01$ for the acquisition strict and the L2 SST strict, r (46) = .404, $p < .01$ for the acquisition strict and the L2 SST lenient, r (46) = .688, $p < .01$ for the acquisition lenient and the L2 SST and r (46) = .565, $p < .01$ for the acquisition lenient and the L2 SST lenient, thus, Hypothesis 4 is confirmed. The highest correlation was that between the acquisition lenient score and the L2 SST strict score (.688**), practically a strong correlation. These results again corroborate results found in Finardi (2007). Once more, if instead of using rater 1 to answer Hypothesis 4 we used the averages among the raters, the result would be similar as can be seen in Table 16. In other words, the use of different raters would not have altered the result of the analysis.

Table 16

Correlation coefficients among average raters (L2 SST) and acquisition test

	average L2 strict	average L2 lenient
acquisition strict	.533**	.468**
acquisition lenient	.664**	.596**

N= 46

** Correlation is significant at the 0.01 level (1-tailed).

Hypothesis 4 also predicted that individuals rated as higher spans would acquire more the target language structure than lower spans. So as to verify this Hypothesis, independent samples *t*-tests were run between the acquisition test and the nominal variables of the L2 SST strict scores. Results can be seen in Table 17.

Table 17

Independent Samples t-tests between L2 SST strict nominal and acquisition test

Group Statistics

	L2 nominal strict tertile	N	Mean	Std. Deviation	Std. Error Mean
acquisition strict	high	16	6.31	1.887	.472
	low	11	2.90	2.119	.639
acquisition lenient	high	16	8.06	1.340	.335
	low	11	4.18	2.040	.615

Independent Samples Test

		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
acquisition strict	Equal variances assumed	4.38	25	.000
acquisition lenient	Equal variances not assumed	5.54	25	.000

As can be seen in Table 17, there was a statistically significant difference in performance between the high (N=16) and low (N= 11) span individuals in the acquisition test as shown by their means (6.31 for the high spans in the acquisition strict against 2.90 for the low spans), the mean for the high spans in this test was twice as big as the mean for the low spans. The assumption of equal variances was satisfied for the acquisition strict score but not for the acquisition lenient score. The difference in performance between the two groups was statistically significant t (25) = 4.38, p <.001 for the acquisition strict and t (25) = 5.54, p <.001 for the acquisition lenient. In order to check whether this difference was also statistically significant for the lenient scores of the L2 SST, another set of independent samples t-tests was run. Results can be seen in Table 18.

Table 18

Independent samples t-tests for L2 SST lenient nominal and acquisition test

Group Statistics

	L2 lenient	N	Mean	Std. Deviation	Std. Error Mean
acquisition strict	high	16	6.12	1.708	.427
	low	9	3.77	2.991	.997
acquisition lenient	high	16	7.93	1.237	.309
	low	9	4.77	2.991	.997

Independent Samples Test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
AS Equal variances not assumed	2.16	23	.053
AL Equal variances not assumed	3.02	23	.013*

Acquisition Strict – AS, Acquisition Lenient - AL

Again, as can be seen in Table 18, when calculated with nominal lenient scores, high span individuals (N=16) performed better in the acquisition test than lower (N= 9) span individuals as shown by their means - 6.12 for high spans in the acquisition strict test against 3.77 for the low span individuals and 7.93 for the high spans in the acquisition lenient test against 4.77 for the low span individuals in the same test. Mirroring results of the acquisition test when compared with the L2 SST strict scores, the mean for the high span individuals was twice as big as for the low spans. The assumption of equal variances was not satisfied and the difference in performance was only statistically significant for the acquisition lenient test $t\ (23) = 3.02,\ p < .05$. In the case of the performance of high and low span individuals in the acquisition strict test the difference was not statistically significant $t\ (23) = 2.16,\ p > .05$. Recall that Hypothesis 4 predicted that higher spans would acquire more the target language structure than lower spans. Results of the *t*-tests show that higher spans did in fact perform better than

lower spans in the acquisition test but this difference was only statistically significant for the acquisition lenient score, thus, Hypothesis 4 is partially confirmed. The strict score may have presented less room for variability. The reason why the difference in performance in the acquisition test was only statistically significant for the lenient score will be dealt with in the Discussion Section.

Hypothesis 5 predicted that there would be positive and statistically significant correlations between scores on the L1 SST and scores on the retention and acquisition tests. Table 19 presents the correlations run to test this Hypothesis. To view the scatterplots for this association, refer to Appendix X.

Table 19

Correlation coefficients between L1 SST (rater 1) and retention and acquisition tests

	retention strict	retention lenient	acquisition strict	acquisition lenient
L1 SST strict	.064	.025	.285	.391*
L1 SST lenient	.077	.046	.242	.403*

N=23

* Correlation is significant at the 0.05 level (1-tailed)

As can be seen in Table 19, there were positive and statistically significant correlations only between the acquisition lenient test and the L1 SST r (23) = .391, p <.05 for the acquisition lenient and the L1 SST strict and r (23) = .403, p <.05 for the acquisition lenient and the L1 SST lenient, when calculated by rater 1, though these correlations are weak. Thus, Hypothesis 5 is only partially confirmed. Again, if we had run these correlations using the average among raters, results would be very similar as can be seen in Table 20 below. The correlations are only significant for the acquisition test and are still moderate correlations (.434* and .443*).

Table 20

Correlation coefficients among average raters L1 SST and retention and acquisition tests

	RS	RL	AS	AL

average L1 strict	.133	.087	.333	.434*
average L1 lenient	.128	.085	.343	.443*

N=23

Retention strict – RS, Retention lenient – RL, Acquisition strict – AS, Acquisition lenient- AL

* Correlation is significant at the 0.05 level (1-tailed).

Hypothesis 5 also predicted that higher span individuals (as indexed by the nominal L1 SST variables) would retain and acquire more the target language structure than lower spans. So as to test this Hypothesis, a set of independent samples *t*-tests were run among the retention and acquisition tests and the L1 SST nominal strict scores. Results can be seen in Table 21.

Table 21

Independent samples t-tests for L1 SST strict nominal and retention and acquisition tests

Group Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Retention Strict	9	6.77	1.716	.572
	4	6.75	2.062	1.031
Retention Lenient	9	8.44	1.333	.444
	4	8.75	1.258	.629
Acquisition Strict	9	5.66	2.449	.816
	4	3.50	1.915	.957
Acquisition Lenient	9	7.33	2.345	.782
	4	5.25	1.708	.854

Independent Samples Test

		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
RS	Equal variances assumed	.02	11	.980
RL	Equal variances assumed	-.38	11	.706
AS	Equal variances assumed	1.55	11	.148
AL	Equal variances assumed	1.58	11	.142

Retention strict – RS, Retention lenient – RL, Acquisition Strict- AS, Acquisition lenient – AL

As can be seen in Table 21, the performance of high span individuals (N= 9) did not vary much from that of low spans (N=4) in the retention test when compared with the L1 SST calculated with nominal variables. In fact, the means of high and low spans were similar (6.77 for high spans in the retention strict against 6.75 for low spans and 8.44 for high spans in the retention lenient against 8.75 for low spans).

Both high and low span individuals seemed to perform in a similar fashion in the retention test. The panorama is somewhat different in the acquisition test in which high and low individuals differed more in their performance. While the mean for high spans in the acquisition strict was of 5.66, the mean for the low spans in the same test was of 3.50. In the case of the acquisition lenient, the mean for the high spans was of 7.33 against 5.25 for the low span individuals. The assumption of equal variances was met for all tests. Nevertheless, the difference in performance between the two groups was not statistically significant t (11) = .02, $p > .05$ for the retention strict, t (11) = .38, $p > .05$ for the retention lenient, t (11) = 1.55, $p > .05$ for the acquisition strict and t (11) = 1.58, $p > .05$ for the acquisition lenient. Though the difference in performance was not statistically significant, a tendency towards this direction can be seen in the case of the acquisition test. So as to check if the same panorama emerged with the L1 SST lenient, another set of independent samples *t*-tests was run between the L1 SST lenient nominal scores and the retention and acquisition tests. Results can be seen in Table 22.

Table 22

Independent samples t-tests between L1 SST lenient and retention and acquisition tests

Group Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Retention Strict	4	7.25	1.708	.854
	6	6.33	2.338	.955
Retention Lenient	4	9.00	.816	.408
	6	8.33	1.506	.615
Acquisition Strict	4	6.50	2.082	1.041
	6	3.50	1.761	.719
Acquisition Lenient	4	8.25	1.258	.629
	6	4.83	1.602	.654

Independent Samples Test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
RS Equal variances assumed	.66	8	.523

RL	Equal variances assumed	.80	8	.447
AS	Equal variances assumed	2.46	8	.039*
AL	Equal variances assumed	3.57	8	.007*

N = 23

As can be seen in Table 22, the performance of high (N=4) and low (N=6) span individuals was not very different in the retention test as shown by their means (7.25 for high spans in the retention strict test as opposed to 6.33 for the low spans in the same test and 9.00 for the high spans in the retention lenient against 8.33 for the low spans in the same test). Again, mirroring results of the L1 SST strict *t*-tests, the results for the acquisition tests was different from that of the retention test, that is, high and low spans differed more in their performance in the acquisition test as shown by their means (6.50 for the high spans in the acquisition strict against 3.50 for the low spans and 8.25 for the high spans in the acquisition lenient, almost twice as much as the mean for the low spans in the same test, 4.83). The assumption of equal variances was met for all tests. The difference in performance in the retention strict test was not significant t (8) = .66, and t (8) = .80, for retention strict and lenient, respectively, both at $p > .05$. However, the difference in performance of high and low span individuals in the acquisition test was again statistically significant t (8) = 2.46, $p < .05$ and t (8) = 3.57, $p. < 05$, for the acquisition strict and lenient respectively. Recall that Hypothesis 5 predicted that high span individuals would retain and acquire more the syntactic structure in L2 speech than lower spans. As can be seen in Tables 20 and 21, the means for higher spans were higher than those for lower spans in the retention test but this difference was not statistically significant. Nevertheless, the performance of high and low span individuals in the acquisition test was different and this difference was statistically significant, thus, Hypothesis 5 is partially confirmed.

Hypothesis 6 predicted that there would be positive and statistically significant correlations among scores in the L1 SST and the L2 SST. Table 23 presents

the correlations for the three raters for these tests. To view the graph with this relationship, refer to Appendix Z.

Table 23

Correlation coefficients among scores in the L1 SST and L2 SST for the three raters

	R1 L1 S	R1 L1 L	R2 L1 S	R2 L1 L	R3 L1 S	R3 L1 L
R1 L2 S	.278	.313	.322	.327	.428*	.422*
R1 L2 L	.330	.383	.305	.369	.351	.388
R2 L2 S	.462*	.482*	.495*	.501*	.593**	.574**
R2 L2 L	.455*	.492	.391	.462*	.396	.456*
R3 L2 S	.324	.378	.390	.4218	.475*	.472*
R3 L2 L	.252	.296	.277	.317	.408*	.423*

N = 23 L1 and N = 46 L2
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

R- rater, L1- L1 SST, L2 – L2 SST, S- strict, L- lenient

As can be seen in Table 23, there were statistically significant correlations between the strict scores in L1 and L2 for rater 1, rater 2 (.462* and .495*) and rater 3 (.428*, .593** and .475*). There were also statistically significant correlations for the lenient scores between rater 2 (.462*) and rater 3 (.456* and .423*). Though moderate, there were statistically significant correlations between scores in the L1 SST and the L2 SST, thus, Hypothesis 6 is confirmed. Once more, if we ran the correlations among the averages in ratings, results would be similar as can be seen in Table 24.

Table 24

Correlation coefficients between averages among raters in L1and L2 SST

	average L2 SST strict	average L2 SST lenient
average L1 SST strict	.441*	.415*
average L1 SST lenient	.471*	.442*

* Correlation is significant at the 0.05 level (1-tailed)

A look at Table 24 shows that using different raters for the analysis would not have changed the result of the analysis since there was inter-rater reliability.

4.4 Section 4 – Qualitative Analysis

This section will present the results of the qualitative analysis of the interviews conducted before the retention test and after each of the four tests administered in this study following the order in which the tests were administered: retention test, acquisition test, L2 working memory capacity test and L1 working memory capacity test. The interviews were in L1 and though they were recorded, they were not fully transcribed but rather coded according to topics, so as to allow tabulation and triangulation.

4.4.1 Interview before Retention Test

Before the retention test, the researcher asked participants some questions so as to collect biographical data to construct the acquisition test and also to make them at ease before starting the actual test. The meeting started in an informal way and the researcher did not read the questions but rather asked them naturally, as if they were having a normal conversation so as to get to know each other. The questions asked in the interview before the retention test were translated and coded according to topic and participant. A summary of participants' answers can be seen below. For a complete view of the inventory of participants' answers to these 10 questions, refer to Appendix B.

1) How long have you been studying English?

50% said they had been studying for less than a year, 17%s said they were studying for about a year and 33% said they had studied for more than a year, though not continually.

2) Why do you study English?

68% said they were studying English to speak fluently, 20% said they wanted to understand what people said (listening) and 12% said they needed to read for academic or professional reasons.

3) Which of the four skills (reading, speaking, writing, listening) is the most difficult skill in you opinion?

70% said it was speaking, 25% said it was listening and 5% said it was reading.

4) How old are you?

48% were in their early twenties, 12% were in their late twenties, 12% were 18 or 19 years old, 12% were in their late thirties, 14% were in their forties and 2% were in their early fifties. The minimum age was 18 and the maximum 53 with a mean of 35 and an average of more than 50% in their twenties.

5) Do you practice English outside the class? How often? How?

60% said they practice English outside the class, mainly listening to songs and watching films. 40% said they do not practice English outside the class.

6) Where do you live?

All participants said they lived in the metropolitan area of Florianopolis.

7) Where do you work?

52% of participants work at UFSC, the rest work for different companies (such as Celesc, Digitro, Udesc, CCAA, among otherss)

8) Do you speak another foreign language?

28% of participants speak some Spanish, the rest do not speak another foreign language.

4.4.2 Interview after the Retention Test

And after the Retention Test the researcher asked participants the following questions, also in L1:

Did you think this test was hard? Why?
Over 90% of participants said that the test was hard because they had to pay attention to the verb and whether the sentences were affirmative or negative so as to use the formula correctly.

Did you use or try to use any strategies to do the test? Which one(s)?
Over 90% of them said they tried to check if the sentence was affirmative or negative first and then tried to figure out what was the auxiliary verb to insert in the formula. They also said they did not pay attention to the meaning of the sentence, only the form so as to answer correctly.

As can be seen by the answers (for a full view refer to Appendix B, questions 9 and 10 in the inventory) provided by participants, the Retention Test was perceived as being difficult because of the computation required to produce the correct grammatical structure and most participants tried to pay attention to the form of the sentence only (as opposed to paying attention to form and meaning) to answer the test.

4.4.3 Acquisition Test Interview

After the acquisition test the researcher (again, in L1) asked twenty-six participants what they had thought about that test, whether it was more or less difficult

than the retention test and why. The researcher also asked them whether they had tried to use any strategies while doing that test. Not all participants did the interview after the acquisition test because some of them were waiting outside the class to do the acquisition test and in these cases, the researcher decided to collect only the primary data which, in this case, was the acquisition test, so as to avoid making participants wait outside the room more than absolutely necessary. Nevertheless, the researcher made sure that more than half of the population (N=26) did the interview so as to have an idea of participants' perceptions on the acquisition test.

Because the interviews carried out after the acquisition test were shorter, the answers will be summarized in what follows. All participants said they thought the acquisition test was difficult, even more so than the retention test because they had to pay attention to the verb and also to the meaning so as to agree or disagree correctly in the acquisition test. Most of them said they tried to pay attention to whether the sentence was affirmative or negative first but could not because they had to focus on the correct verb to use, which again was difficult because they also had to pay attention to the meaning. In short, all of them said that the acquisition test was more difficult than the retention test because they had to think about too many things at the same time (affirmative or negative, verb tense, meaning). Most of them also said that the acquisition test was more difficult than the retention test because in the former they had to think about the meaning, sometimes translating the sentence first (so as to decide whether they agreed or not) before processing the response form correctly.

4.4.4 L2 Speaking Span Test

As previously mentioned in the beginning of this section, all the interviews were recorded in the L1. These interviews were not fully transcribed but

rather coded and then translated to the L2 so as to allow triangulation. Because there was more variation in participants' answers regarding the strategies used for the L2 SST than for the retention and acquisition tests, their coded answers are included in this section in full. To reiterate, in the end of the L2 SST, the researcher asked participants what they thought about that test, more specifically, the researcher asked them whether they thought the test was difficult and why. All of them said the L2 SST was by far the hardest and most frustrating test because they simply could not memorize all the words in the correct order to form sentences. The researcher then asked them whether they had tried to use any strategies during the execution of that test. Reports of participants who admitted using strategies for the L2 SST were transcribed (for a full view refer to the transcriptions of the L2 SST in Appendix L), translated and can be seen in what follows:

P = Participant

P1 – said that when she saw a word that she did not recognize immediately she blocked and could not remember the other words
P3 – said it was easier to form sentences with words that were either frequent or known
P4 – said it was easier to form sentences with words that were either frequent or known
P5 – said it was easier to form sentences with words that were either frequent or known
P7 – tried to revise words mentally before beginning to make sentences
P10 – tried to form sentences with the words that were easier, ignoring the more difficult ones. She said that it was easier to make sentences with the first words that appeared on the screen
P11 – asked to do the test again and said she was very worried about her performance and found the test very demanding. She said she felt very anxious while doing the test because there was no time to translate, memorize and form sentences

P13 – repeated the words silently when they appeared on the screen, tried to form a mental image of the easier ones and then tried to start by the difficult ones and not by the last one which was the one he remembered

P14 – started with the ones she remembered

P16 – started to make sentences before the question mark appeared, the researcher kept asking him to wait for the question mark to appear. He usually started forming sentences after the third word appeared, probably because he felt he could only memorize three. He said he tried to ignore the 4th, 5th and 6th words since he knew he wouldn´t be able to remember them so decide to concentrate on the first 3 words instead

P17 – tried to memorize the 3 first words

P18 – tried to form mental images, when started by the last word forgot the others

P19 – tried to memorize the 3 first words

P20 – tried to memorize 2 first words since the last ones to appear were fresher in the mind

P37 – tried to make sentences mentally while the words appeared and before the question marks appeared on the screen

P41 – tried to associate the words while they appeared on the screen but said that when a word he did not know appeared he blocked and forgot the others

P46 – tried to form a story with all the words, for example, in the trial with the words *CAR, DOOR, PEN, DISK,* he imagined a dog inside a car, grabbing a disk (in Portuguese disco means LP record) while listening to music

The L2 SST was the most demanding test according to participants' feedback in which they reported feeling anxious after doing that test, again mirroring results of Finardi (2007). The reason to conduct the interview is that in Finardi (2007) the researcher suspected, based on participants' reaction, that the L2 SST was demanding but since the researcher did not conduct an interview in Finardi (2007), no conclusions could have been reached at that point. The researcher asked them whether they felt intimidated by the lab or the computer and the participants said that it was not the test environment but the test itself that was stressing because they did not have time to think while doing the test and forgot the words in the test and this may have

contributed to their anxiety for they associated the effects of the test to problems in their memories. Some of them said that the worst part of the test was leaving the room with the impression that their memory was not working right since they could not form sentences with all the words in the test although the researcher had told them that this result was normal and in fact expected.

Regarding the internal difficulty of the test, when asked why the tests had been difficult (question 9 and 10, Appendix B) participants said that some words were easier to remember than others, either because they were more frequent (*dog, car, pen*) or because it was easier to form a mental image of them. Some participants said they tried to memorize the first three words because they thought they could not make sentences with more than three, so they concentrated on the first three words and did not try to memorize the others, especially on the sets with 5 and 6 words. Others tried to connect the words forming a sentence but said it was difficult because there was no time between the presentation of words in the screen to do that. Still others tried to form mental images of the words but said this strategy was more or less difficult depending on the word, that is, whether the word was concrete or abstract. The words they had most difficulty with were: *mouth* (some of them formed sentences as if it were month), *arm* (some formed sentences as if it were gun, again, in Portuguese gun is *arma*), *gift, spoon* and *tool*. Practically no one formed sentences with the words *seat, brain* and *crowd.* For a comprehensive view of answers to this test, refer to Appendix L with the full transcriptions of the L2 SST.

4.4.5 L1 Speaking Span Test

Mirroring results of the L2 SST, there was more variation in terms of strategies reported for the L1 SST than for the retention and acquisition tests

(Appendices R and S, respectively). Therefore, those participants' reports using a strategy for the L1 SST were transcribed, translated and are shown below. For a complete view of the L1 SST transcriptions, refer to Appendix M.

P = Participant

P1 – concrete words are easier to remember than abstract ones

P2 – tried to memorize first three words and said concrete ones were easier to memorize than abstract ones

P4 – concrete words are easier to use in shorter sentences

P7 – tried to associate words while they appeared, in L2 could not do this because had to translate first

P9- in L2 tried to remember the words even if not in the correct order, in L1 tried to remember the correct order which, as he found out, made the L1 SST more difficult than the L2 SST

P12- tried to make shorter sentences but said that in L1 it was more difficult because the words were longer

P15 – tried to memorize words in pairs and in the set of 5 concentrated only on the first 3 words

P16 – tried to memorize only first 3 words

P17- tried to repeat the words silently in sequence while they were being presented in the screen

P18- said that the L1 SST was as difficult as the L2 SST, tried to memorize first 3 words and said that words with too many syllables or vowels are harder to memorize, she said that the following words in the L1 SST were difficult for her: *telhado, hóspede, cérebro.* Also said that abstract words were difficult too.

P19 – said that this test was as difficult as in L2 and maybe the fact that she had taken a painkiller the day before had interfered with her performance. She said that it was easier to memorize words that were more frequent and that could be made into a mental image

P20 – said that the L1 SST was easier than the L2 SST but that it was difficult to form sentences with words like *teatral* and *decreto*

P21 – said that both tests were difficult but for different reasons. In L2 he formed simple sentences such as "I like…", or "I have…" but in L1 he tried to form more

complex sentences and as a consequence, the sentences in L1 were longer, causing him to forget more words than when he just made simple, short sentences
P22 – said that concrete words were easier to memorize

Half of the participants did not agree to do the L1 SST because, as reported by them, they were tired of doing tests and it was the end of the semester for them. When asked whether the L1 SST was easier than the L2 SST participants said it was not so much so, in fact, participants said that though the words were in their L1, still they could not remember them when they started to form sentences and this created an extra concern since in the L1 SST they did not have the excuse that the words in the test were difficult for them because they were in L2. Most of them said they expected the test to be easier than it was and that though the L1 SST was a bit easier than the L2 SST, it was still very frustrating and demanding. Some participants (N=3) said that both tests (L1 and L2 SST) were equally difficult, the rest (N = 20) said that the L2 SST was more difficult than the L1 SST.

One possibility why the L1 SST proved more difficult than expected by the researcher may be that the words used in the L1 SST were not as frequent (*azulejo)* as the ones used in the L2 SST (*book, pen, etc)*. Moreover, the words in the L2 SST were shorter (usually one, sometimes two syllables) than the words in L1 (sometimes up to 4 syllables as in the case of *exilado*) and in the L1 SST there were abstract and infrequent words (*decreto*) and adjectives (*exilado, nublado, teatral*). According to participants' feedback, the most difficult words to form sentences in the L1 SST were *decreto* and *teatral*.

As can be seen in the reports of participants, all the tests were difficult, some more than others, following this order of difficulty: the L2 SST was the hardest test followed by the L1 SST, followed by the acquisition test which, in turn, was

followed by the retention test. In general terms, the L2 SST was perceived as being difficult mainly because participants could not memorize the words in the correct order and still make sentences because they had to translate the words. The L1 SST was difficult because the words were not as easy as the ones used in the L2 SST and because the sentences in L1 were longer and more complex. The acquisition test was difficult because participants had to process both form and meaning (sometimes after translating) so as to decide whether they agreed or disagreed with the sentence before responding, and finally, the retention test was difficult because participants had to check whether the sentence was affirmative or negative and then calculate the correct auxiliary verb to insert in the formula, processing the form of the sentence. There was more variation in terms of strategies used for the memory tests than for the retention and acquisition tests and in general the memory tests were more difficult than the retention and acquisition tests.

4.5 Summary of hypotheses and results

This section presents a summary of the hypotheses and results of this study.

Table 25

Summary of hypotheses and results

Hypotheses	**Results**	**Confirmed or rejected**
1) There will be neither retention nor acquisition of the TLS without treatment.	All control participants scored zero in the pre and post-test	Confirmed No control participant learned the TLS without treatment
2) Performance in the retention test (RT) will be better than in the acquisition test (AT)	RT means (strict and lenient) were higher than those of the AT and the difference was statistically significant	Confirmed The AT was more difficult than the RT perhaps because participants had to process both meaning and form in the AT

3) There is a positive and statistically significant correlation between scores in the L2 SST and the RT Higher spans retain more than lower spans	There were positive and statistically significant correlations between scores of the L2 SST and the RT, except for the L2 SST lenient score and the RT strict score	Partially confirmed WMC in L2 is only weakly related to the retention of the TLS. The difference between high and low spans is not statistically significant for the RT strict, it is significant only for the RT lenient when compared with the L2 SST strict scores
4) There is a positive and statistically significant correlation between scores in the L2 SST and AT Higher spans acquire more than lower spans	There were positive and statistically significant correlations between scores of the L2 SST and the AT	Confirmed WMC in L2 is related to the acquisition of the TLS. The difference between high and low spans is statistically significant, except for the AT strict and the L2 SST lenient
5) There is a positive and statistically significant correlation between scores in the L1SST and the RT and AT Higher spans retain and acquire more than lower spans	There were no significant correlations between scores of L1 SST and scores of the RT but there were positive and statistically significant correlations between scores of the L1 SST and the AT	Partially confirmed The acquisition of a TLS is weakly related to WMC in L1 The difference between high and low spans in L1 was not statistically significant for the retention test but it was statistically significant for the acquisition test when compared with the L1 SST lenient scores
6) There is a positive and statistically significant correlation between measures of WMC in L1 and L2	There were statistically significant correlations between scores of the L1 SST and the L2 SST	Confirmed There is a moderate relationship between WMC assessed in terms of an L1 and L2 SST
7) What strategies are used in the tests and what are the reported perceptions of participants regarding the difficulty of the tests used in this study	Strategies: Retention – process form Acquisition- process meaning first and then form L2 SST – produce simple sentences L1 SST – memorize 3 first words	Perceptions about difficulty: The most difficult test was the L2 SST, followed by the L1 SST, followed by the Acquisition Test and finally the Retention Test.

CHAPTER 5

DISCUSSION

The aim of this chapter is to present the discussion of the results of this study so as to answer the general research question of whether working memory capacity is related to the retention and acquisition of a syntactic structure (*So+aux+I* and *Neither+aux+I*) in L2 speech. With that objective, the discussion in this chapter is organized in the same sequence as that of the hypotheses raised in this study.

To reiterate, seven hypotheses were raised in this study. The most important goal pursued by this study was to find confirmation for Hypotheses 3 and 4 which concerned the relationship between working memory capacity assessed in terms of an L2 SST and the retention and acquisition of the target language structure in L2 speech. Hypothesis 3 predicted that there would be statistically significant correlations between scores in the L2 SST and scores in the retention test and was partially confirmed because there were no significant correlations between the strict score of the retention test and the lenient score of the L2 SST. Hypothesis 4 predicted that there would be statistically significant correlations between scores in the L2 SST and the acquisition test and it was confirmed. Hypotheses 1 and 2 concerned the treatment and instruments employed in this study and were both confirmed. Hypotheses 5 and 6 were secondary and concerned the relationship between working memory capacity in L1 and the retention and acquisition of a target language structure in L2 speech and the relationship between working memory

capacity in L1 and L2, respectively. Hypothesis 5 was partially confirmed and Hypothesis 6 was confirmed. Hypothesis 7 was of a qualitative nature and concerned participants' reported perceptions on the tests used in this study. In what follows, results of these hypotheses will be discussed in face of the literature reviewed and in the order in which the hypotheses were raised in this study.

5.1 Treatment

Hypothesis 1 predicted that there would be neither retention nor acquisition of the target language structure in L2 speech without treatment. This Hypothesis was raised based on the assumption that in EFL classes, such as the ones used in this study, most (if not all) of the contact students have with L2 is in the EFL class itself, rendering the acquisition of a specific target structure outside the class unlikely. In a pilot study, Finardi (2007) had found the same result for Hypothesis 1, but because of the small number of control participants she had in that study (N=8), she was unable to come to firm conclusions regarding the need for a control group to test that Hypothesis and decided, instead, following suggestions of the committee who read her pilot study, to have a control group as large as the experimental group in this study to test Hypothesis 1.

Results of the pre and post-test for target language structure acquisition in the control group (section 4.2), which did not receive treatment, corroborated results in Finardi (2007). Participants in this study, who belonged to EFL classes, did not retain, nor acquire the target language structure incidentally outside the classroom and without instruction. Had this been a study in which acquisition is tested with a global measure of

accuracy in free speech, or a study in which participants belong to different contexts, such as ESL classes, the panorama would probably have been different, and a control group would be more necessary so as to confirm possible effects of treatment.

5.2 Performance in the retention and acquisition tests

Hypothesis 2 predicted that participants' performance in the retention test (focused) would be more accurate than in the acquisition test (unfocused and communicative). This Hypothesis was raised based on the assumption and evidence in Finardi (2007) that participants would have to process mainly the form of the sentence so as to answer the retention test correctly whereas in the acquisition test they would have to process both form and meaning after deciding whether they agreed or disagreed with the sentences heard to respond to the test adequately. It was also assumed, again based on Finardi (2007), that this double processing (form and meaning plus agree or disagree) imposed by the acquisition test would be likely to tax working memory capacity more than the single processing (form to agree) assumed to take place during the retention test.

Results of the statistical analysis (section 4.2) conducted to verify this hypothesis show that in fact, this was the right direction to be taken, that is, the acquisition test was more cognitively demanding, as shown by its lower means, than the retention test and this difference in means was statistically significant. These results corroborate Finardi's (2007) and were expected in face of the cognitive and linguistic processing assumed to take place during each of these tests.

Regarding the linguistic processing of the target structure investigated in this study, it is important to highlight that this structure is considered linguistically complex because it involves verb movement (White, 1992b) and auxiliary verb ellipsis (omission of one or more words in a sentence), that is, movement and agreement of auxiliary verb. Moreover, based on cross linguistic analysis (for example, Gass & Schachter, 1989; White, 1992b) it is possible to suggest that this structure may be even more complex for L2 speakers whose L1 does not involve auxiliary movement in agreement, as is the case of the participants (Brazilian Portuguese speakers) in this study. In Portuguese (L1) agreement involves main verb repetition and it does not require auxiliary verb ellipsis or movement. Therefore, according to linguistic accounts of syntactic processing (for example Flynn, 1987, 1989; Gass & Schachter, 1989, White, 1991a; 1992b) the target language structure form investigated in this study may be considered linguistically complex since it involves parameters resetting from Portuguese (L1) to English (L2).

Moreover, the target language structure is considered linguistically complex because it involves linguistic computation with verb movement as suggested by Weckerly, Wulfeck and Reilly (2004) who investigated the acquisition of tag questions, a syntactic structure whose processing can be said to be similar to that of the target language structure investigated in this study. They claimed that though tag questions are linguistic devices frequently used by children who are familiar with their pragmatic function, tag questions are complex. They claimed that tag questions are complex, among other reasons, because though their production places relatively few demands on the speaker in terms of motor output (only two words), they involve the analysis of a number of components of the stimulus clause, perhaps holding some of this information in working memory, and then

synthesizing and transforming these features into tag questions. Similar to the target structure investigated in this study, tag questions require the use of an auxiliary verb (in this and in Weckerly, Wulfeck & Reilly's study: *do*, *be*, or *can*) and half of the main clause sentences used in this study and in Finardi (2007) were in the affirmative, and half were in the negative form.

According to Weckerly, Wulfeck and Reilly (2004) the analysis of tag question production offers a number of measures of some of the fundamental elements of English morphology, such as agreement marking and auxiliary selection, along with measures of subject selection and polarity, as well as the simultaneous processing and coordination of these components. The overall number of correctly produced tag questions can be considered a measure of how well the various tag features were synthesized and coordinated in the response. In this sense, the production of tag questions offers "tests" of both linguistic knowledge and language processing. This study goes a step further to suggest that the acquisition of the target language structure investigated in this study, measured in terms of the production of the syntactic rule required to agree in English, is a good test of both language processing in L2 and working memory capacity.

Thus, linguistic and cross linguistic analysis of the target language structure investigated in this study predict that the processing of this structure is linguistically complex because it involves auxiliary movement and ellipsis and, perhaps, more importantly, because the acquisition of this structure by Portuguese speakers learning English involves parameter resetting since this structure is processed with different parameters in L1 and L2.

Again, it is important to highlight that the linguistic account of L2 processing brought to bear in this study can only be used as a hypothesis to help explain the data. The only way to test whether a certain parameter in L1 affects processing in L2 is to use at least two different L1s, one resembling and another one differing from the parameter being investigated in L1. That type of rationale and methodology was not used in this study and so the linguistic account used here, though very interesting and possibly correct, can only be taken as speculative in nature and suggestive for further research.

Nevertheless, if the information processing and linguistic accounts are correct, then there should be statistically significant correlations between measures of working memory capacity and the retention and acquisition of this syntactic structure in short responses in L2 speech since these constructs (working memory capacity and the retention and acquisition of this syntactic form) are believed to operate with controlled processes that require attention for its execution. I will return to this point later on in the discussion in this chapter. Meanwhile, assuming that the form of the target language structure investigated is linguistically complex, it would not be too far fetched to assume that when forced to process syntactically complex structures in sentences for both meaning and form, learners would be under an even greater processing load. Again, if this account is correct, it would be logical to expect stronger correlations between working memory capacity and the acquisition of this syntactic structure, as compared to the correlations found between working memory capacity and the retention of this structure, since working memory capacity would be more required when learners have to process both meaning and form. That is exactly the pattern of results yielded in this study.

Data triangulation and results of the qualitative analysis confirm that participants thought the acquisition test was more difficult than the retention test because in the former they had to think about the meaning of the sentence, while manipulating the form of the response whereas in the retention test participants only had to focus on the form of the sentence so as to respond correctly. Results of the correlational analyses also show that working memory capacity is more related to the performance in the acquisition test than to the retention test. These results can be taken as evidence that during the acquisition test participants were using more attention and cognitive control (as shown by the strong correlations) from working memory capacity than in the retention test in which their working memory capacity was only weakly required (as shown by the weak correlations). The relationship between working memory capacity assessed in terms of an L2 SST and the retention of a target language structure will be discussed in more depth in what follows.

5.3 WMC in L2 and retention of the target language structure

Before addressing the issue of whether working memory capacity assessed in terms of an L2 SST is related to the retention of a syntactic structure in L2 speech, a caveat must be made. The term WMC in L2 has been used in this study to refer to working memory capacity as measured by an L2 SST. Whether this test refers to working memory capacity alone or to working memory capacity and L2 proficiency level confounded will be

discussed later on in this chapter when the results from the L1 and L2 SST are addressed in section 5.6. Meanwhile, the term WMC in L2 refers to results of the L2 SST.

Hypothesis 3 predicted that there would be a positive and statistically significant correlation between working memory capacity (assessed in terms of an L2 SST) scores and scores of the retention test. Moreover, it predicted that participants with more working memory capacity, rated as higher spans, would retain more the target language structure than those participants with less working memory capacity, rated as lower span individuals.

Once more, this Hypothesis was made in face of Finardi's (2007) correlational results which showed that scores on the L2 SST were related to the scores of the retention test: L2 SST strict and retention strict r (48) = .296, $p < .001$, L2 SST lenient and retention strict r (48) = .311, $p < .05$, L2 SST strict and retention lenient r (48) = .263, $p < .05$ and L2 SST lenient and retention lenient r (48) = .265, $p < .05$.

Correlational results of the present study show that this pattern was reliable across studies (Finardi, 2007 and the present study), except in the case of the correlation between the L2 SST lenient and retention strict scores which were non-significant in this study. Mirroring results of Finardi (2007), the other correlations in this study were statistically significant and weak: L2 SST strict and retention strict r (46) = .275, $p < .05$, L2 SST strict and retention lenient r (46) = .287, $p < .05$ and L2 SST lenient and retention lenient r (46) = .283, $p < .05$. Results of the t-tests show that the difference in performance of high and low spans in the retention test did not reach statistical significance in the case of the retention strict score and the L2 SST lenient score, the same scores which did not correlate. This finding requires discussion.

One possibility to explain the lack of correlations and statistical significance for the difference in performance of high and low span individuals in the retention strict and L2 SST lenient scores is to look at the scoring criteria adopted in this study for these tests. The scoring criterion for the strict score of the retention test does not allow variation in interpretation. In the retention test there are only two possibilities of scoring: completely correct when the target language structure (*So* / *Neither*) and the auxiliary verb are correct, and partially correct when *either* the target language structure *or* the auxiliary verb are correct. The panorama is different and there is much more room for interpretation and variation in the case of the L2 speaking span test (SST) scoring criterion, especially in the case of the L2 SST lenient score. The criterion for the strict score of the L2 SST was to assign one point for grammatically correct sentences that had been formed with the words of the test in the correct order. In the lenient score of the L2 SST half a point was assigned for sentences which were either grammatically correct but with the words of the test in the wrong order or to sentences with the words in the right order but which were only partially grammatically correct. It is important to highlight the fact that the responses in the retention test were short responses whereas those in the L2 SST were full sentences which naturally encompassed more vocabulary and syntactic variation, thus allowing more room for scoring interpretation. In face of this characteristic of the L2 SST lenient scoring criterion, it was suggested in this study that the lack of correlation between the strict score of the retention test and the lenient score of the L2 SST might have been affected by the scoring criteria used for these tests, once the retention strict was the strictest score while the L2 SST lenient score was in the other pole, probably the most lenient (and open to interpretation) score in this study.

One way to verify whether this account is correct is to look at other interpretations of the L2 SST lenient score. As previously mentioned in the Method Chapter, because of the variability in scores interpretation in the speaking span test, especially in the lenient score of the speaking span test, three raters analyzed the data of the speaking span tests, though only results of rater 1 were used to answer the questions posed in this study for reasons offered elsewhere in the Method Chapter.

In order to check whether the explanation offered in this section to account for the lack of correlations between the retention strict and the L2 SST lenient scores is correct, the scores generated by the other two raters will be analyzed in what follows. If, as suggested, the lack of correlations were affected by the variability in interpretations of the L2 SST lenient scores, there should be statistically significant correlations between the retention strict scores and the L2 SST lenient scores generated by different raters. Indeed, when we look at the correlations between the retention strict score and the average among the three raters (Table 11), this is the case and there is statistical significance r (46) = .264, $p < .05$. Although there are no statistically significant correlations between the lenient scores generated by rater 2 and the retention strict scores, there are statistically significant correlations for the scores generated by rater 3 for the same test r (46) = .309, $p < .05$.

If we had used the three raters' scores (instead of only the scores generated by rater 1) to answer the third research question, the first part of Hypothesis 3 would have been confirmed, that is, there would have been statistically significant correlations between scores in the retention test and scores in the L2 working memory test. Nevertheless, there would still not have been statistically significant differences in the performance of high and low span individuals when compared with the scores of rater 2 t (18) = .80, $p > .05$ or rater 3 t (24) = 1.92, $p > .05$. Thus, the lack of correlations between the retention strict and the

L2 SST lenient scores can be explained by the variability in the interpretation of the L2 SST lenient score, while the lack of statistical significance for the difference in performance of high and low span individuals in these tests cannot. Nevertheless, since the number of participants rated as high and low spans was small, it is possible to suggest that with larger samples this result could have been different.

Another possibility to explain this result is to look at the cognitive processes involved in these two tests. Retention of a syntactic structure was operationalized in this study as accurate use of the target language structure in a focused, immediate test in which participants had to provide short responses in L2 speech agreeing with the sentences heard using the target language structure to do so. It was suggested in this study that in the retention test participants could respond correctly by processing only the form of the sentences. Due to the little cognitive effort assumed to be necessary to perform on this test (at least when compared to the other tests used in this study), it is possible to suggest that individual differences in working memory capacity might not have emerged as much in this test as in other more cognitively demanding tests (such as the acquisition test).

This suggestion was made based on two findings in Finardi (2007). The first finding is related to the researcher's observation, during the pilot study, that participants often started responding before the researcher had finished reading the sentence with which participants had to agree. Finardi (2007) explained this behavior by suggesting that participants were not paying attention to the meaning of the sentence when the researcher was reading it, but instead were concentrating only on the form of the sentence, that is, whether it was affirmative or negative and which was the auxiliary verb required to respond to it appropriately. Based on this hypothesis, Finardi (2007) suggested the use of interviews after the retention test (for results see section 4.4.2) so as to check why participants were

responding before the researcher had finished reading the sentences with which they had to agree.

This suggestion was followed in this study and the qualitative analysis of the interviews conducted after the retention test (section 4.4.2) confirms Finardi's (2007) interpretation of this behavior. When asked what kinds of strategies they had used to do the retention test, most participants said they paid attention to the beginning of the sentence so as to figure out whether the sentence was affirmative or negative in order to use the correct structure (So or Neither). They also said that the information they needed to respond correctly (So or Neither plus auxiliary verb) was always in the beginning of the sentence so they did not have to listen or to think about the whole sentence so as to respond to the prompt correctly.

Because participants' attention was not doubly taxed by having to focus on meaning and form in the retention test, since it was possible to do this test only by focusing on form, it was assumed that their working memory capacities would not be stretched to the limit in the retention test and thus, correlations would be significant but not strong. Both the quantitative and the qualitative data in this study confirm this hypothesis. A comparison of means showed that in fact the retention test was much easier (as shown by the higher means) than the acquisition test in which participants had to focus on both meaning and form to respond adequately (section 4.2). Results of the correlational analysis (section 4.3) show that working memory capacity assessed in terms of an L2 SST is only weakly related to the performance on the retention test. Moreover, the difference in performance of high and low span individuals was not statistically significant in the case of the retention strict and the L2 SST lenient scores perhaps because the lenient score of the L2 SST did not allow as much individual differences in working memory capacity to emerge in the strict

score of the retention test as it did in the lenient score of the retention test which considered not only correct answers but also attempts to form correct sentences (view scoring criterion for retention test at section 3.4.2). Finally, during the interviews conducted after the retention test (section 4.4.2) participants claimed that this test was the easiest one because they did not have to translate or think about the meaning of the sentence but simply pay attention to the form of the sentence (in the beginning) so as to use the target language structure correctly. Based on this evidence, the conclusion arrived at in this study is that working memory capacity, measured with an L2 SST is only weakly related to the retention of the target language structure in L2 speech because the target language retention test required participants to process only the form of the sentences, perhaps not taxing working memory capacity to its limit. When it comes to the acquisition of the target language structure, the panorama that emerges is somewhat different in terms of the strength of association between working memory capacity and the acquisition of the target language structure, as will be discussed in the following section.

5.4 WMC in L2 and acquisition of the target language structure

One of the greatest challenges posed in this study was to find confirmation for Hypothesis four which predicted that there would be positive and statistically significant correlations between scores in the L2 SST and scores in the acquisition test. Moreover, Hypothesis four predicted that individuals with more working memory capacity rated as

higher spans would acquire more the target language structure than those participants with less working memory capacity, the lower spans.

Again, this hypothesis was raised in face of Finardi's (2007) results for the relationship between the L2 SST and the acquisition test: acquisition strict and L2 SST strict r (48) = .681, $p < .01$, acquisition strict and L2 SST lenient r (48) = .693, $p < .01$, acquisition lenient and L2 SST strict r (48) = .686, $p < .01$ and acquisition lenient and L2 SST lenient, the highest (and a strong) correlation r (48) = .708, $p < .01$. Results of this study (section 4.3) corroborate results of Finardi (2007) since all the correlations were statistically significant, though in this study this relationship was not as strong as in Finardi (2007). In this study all the correlations were moderate though the correlation between the acquisition lenient score and the strict score in the L2 SST was practically a strong correlation r (46) = .688, $p < .01$, the other correlations in this study were: acquisition strict and L2 SST strict r (46) = .584, $p < .01$, acquisition strict and L2 SST lenient r (46) = .404, $p < .01$ and acquisition lenient and L2 SST lenient r (46) = .565, $p < .01$. Unlike the result yielded for the retention strict and the L2 SST lenient, there was a statistically significant correlation between the strict score of the acquisition test and the lenient score of the L2 SST, perhaps because both tests (acquisition and L2 SST) were more demanding than the retention test, regardless of the scoring criteria adopted.

One result that merits discussion is the finding that in both Finardi (2007) and in this study, two of the strongest correlations found were those between the acquisition lenient and the L2 SST strict scores (r (48) = .686, $p < .01$ and r (46) = .688, $p < .01$ in Finardi, 2007 and this study, respectively). Not only were these correlations strong but also practically the same across studies. The question of why working memory capacity,

measured in terms of a strict score in the L2 SST is more related to the lenient score of the acquisition test demands scrutiny.

One possible explanation for the aforementioned question may lie within the cognitive processing involved in those two tests and is reflected in those scoring criteria (section 3.4.2 retention and 3.4.3 acquisition). Whereas the strict score of the working memory test is believed to capture the capacity to engage in controlled processes more than the lenient score, perhaps the same rationale does not hold for the acquisition test. During the acquisition test participants had to think about whether they agreed or no with the sentences and then had to process the form of the sentences correctly. In that sense, it would be possible to process only meaning or only form in the lenient score of the acquisition test whereas in the strict score both form and meaning would have to be processed. Since participants first had to decide whether they agreed or disagree with the sentences before attempting to process the correct form, it was not possible to bypass meaning in the acquisition test. Participants could bypass the form (in the lenient score of the acquisition test) but not meaning. In that sense, since form could be bypassed in the lenient score but not in the strict score, it is possible to suggest that the strict score of the acquisition test perhaps focuses more on the form whereas the lenient score of the acquisition test taps more meaning processing. The weak correlations found in this study between the retention test and the working memory test showed that processing the form of the sentence was not demanding enough to tax working memory capacity to its limit. What seems to be more demanding, in terms of working memory capacity, is the processing of meaning, at least in the case of the sentences used in this study, thus the higher correlations between working memory capacity and the lenient score of the acquisition test.

The second part of Hypothesis four predicted that higher spans would acquire more the target language structure than lower spans. Results of the *t*-tests showed that high span individuals indeed acquired more the target language structure than low span individuals and that this difference was statistically significant, except for the acquisition strict and the L2 SST lenient scores. Mirroring the discussion in the previous sections concerning the variation in interpretation in the L2 SST lenient score and so as to check whether this lack of statistical significance can also be accounted for, in the case of the acquisition strict score, by a variation in interpretation of the L2 SST lenient score, a look at other raters' scores is again called for.

Results of *t*-tests between the acquisition strict score and the lenient score of the L2 SST generated by rater 2 show that this difference was not statistically significant $t(18) = 1.33$, $p > .05$ for rater 2 but was statistically significant for rater 3 $t(24) = 2.65$, $p < .05$. Thus, if we had used the scores generated by rater 3, instead of using scores generated by rater 1, Hypothesis 3 and 4 would have been completely confirmed. The analysis of the scores generated by other raters points to the conclusion that the variability in interpretation of the lenient score of the L2 SST may account for part of the results found in this study. Thus, despite the high inter-rater reliability yielded in the present study (as shown by the strong correlations among raters, in Appendix Q), the lenient score of the SST still shows variability and sensitivity to subjective interpretation.

Based on the finding that the variation in interpretation of the lenient score of the L2 SST can affect the results of this and future studies, caution is recommended when interpreting results of studies which use the lenient score for the speaking span test since this score has proved to be indeed lenient and open to subjective interpretation. One way to safeguard against possible shortcomings when using this score is to develop more

objective criteria for its interpretation. I will return to this issue in the suggestions for further research. After discussing results of the memory and acquisition tests in terms of the scoring criteria used, a more cognitively oriented explanation is offered in what follows, discussing the possible cognitive processes involved in the execution of the acquisition test.

In this study, the acquisition of a syntactic structure was understood as the ability to use that particular structure in short responses in L2 speech, in contexts other than those in which the structure was practiced (that is, in sentences in which they had to agree only as opposed to sentences with which they could either agree or no). Recall that practice of that particular structure was operationalized in this study as the use of that particular structure in a focused test in which other structures were not possible. Moreover, the context of the practice was very limited and narrow since participants were given no choice but to agree with the sentences heard, using the target language structure to do so. The way in which the acquisition test was designed guaranteed that participants used the target language structure in different contexts, in this case, in sentences with which they could either agree *or* no, using any structures they wished to disagree. Thus, because participants were able to use a syntactic structure in a communicative test which represented a different context than that in which the structure was learned and practiced, it was assumed that that particular structure had been acquired and that the particular syntactic rule they had learned, had been successfully generalized to other contexts than those in which it was practiced.

Another aspect related to the acquisition test that merits discussion in face of the results found in this study is that it was assumed that so as to respond correctly to the sentences in the acquisition test, participants would necessarily have to process both form and meaning, whereas in the retention test participants could respond to the sentences by only processing the form. The double processing (meaning and form) assumed to take

place in the acquisition test was also assumed to be attention consuming (in terms of working memory capacity). Results of both Finardi (2007) and this study show that indeed, the acquisition test was more demanding than the retention test (as shown by the comparison of means). Furthermore, scores of the L2 speaking span test were found to be more related to scores in the acquisition test (as shown by the stronger correlations) than to scores in the retention test. Put differently, working memory capacity assessed in terms of an L2 SST is more related to the acquisition of a target language structure than to its retention, at least, insomuch as these constructs are operationalized as they were in this study.

According to the account of second language acquisition reviewed in this study, language acquisition involves the transfer of items from the rule-based to the memory-based system, and vice-versa (Skehan, 1998). The rule-based system is believed to operate with controlled processes, which, in turn, use up attention from working memory capacity. The syntactic structure investigated in this study is considered a rule and so its acquisition should tax working memory capacity since both operate with controlled processes. Results of this study are thus aligned with the theory of language acquisition reviewed.

It is possible to suggest, based on the dual-code account of language acquisition presented here, that with more practice and use, there would be enough memory instances of this target language structure stored in memory to win the race against the algorithm. That way, when sufficient memory instances for this syntactic structure were stored in memory, perhaps learners would be using the memory-based system to produce it, instead of using the rule-based system. It is also possible to infer, based on the account of L2 acquisition brought to bear in this study (Skehan, 1998), that only when items are

transferred from one system to the other we can consider this the ultimate stage of acquisition of that particular structure. In this study, however, the focus was on the acquisition of a syntactic rule by the rule-based system, rather than its ultimate acquisition which would entail its transfer to the memory-based system. Thus, results of this study can be regarded as evidence for the first step in the acquisition process, which involves the acquisition of an item by a specific memory system, before that item can be transferred (if it is) from one system to the other. Though methodologically challenging, it would be interesting to investigate, in future studies, how the transfer of items from one system to the other is done. I will make some suggestions for this in the Suggestions for Further Research Section.

Ullman (2001) suggests that in L1 processing, vocabulary use relies more on declarative memory whereas syntax use relies on procedural memory. Moreover, procedural memory is believed to rely, to a greater extent, on automatic processes. In the case of L2, Ullman claims that L2 grammar will be processed in declarative memory, probably by means of controlled processes. The acquisition of a syntactic structure in L2 was assumed to rely on controlled processes (in working memory) in this study. Results of this study point to the conclusion that both the retention and acquisition of a syntactic structure in L2 speech are related to working memory capacity in L2. Moreover, results show that the acquisition of a syntactic structure in L2 is also related to working memory capacity in L1. In other words, the acquisition of a syntactic structure in L2 speech does seem to rely on controlled processes in working memory, whether working memory capacity is measured with a SST in L1 or in L2.

The next section will address the relationship between working memory capacity (assessed in terms of an L1 SST) and the retention and acquisition of a syntactic

structure in L2 speech. Again, the discussion of whether the L1 and L2 SST are different tests for the same construct or different tests altogether will be discussed in the last section when results of the L1 SST and L2 SST are addressed. Meanwhile, the term WMC in L1 refers to results of the L1 SST.

5.5 WMC in L1 and retention and acquisition

Hypothesis 5 was exploratory in nature and predicted that there would be positive and statistically significant correlations between working memory capacity, assessed in terms of an L1 SST, and scores on the retention and acquisition tests. It also predicted that higher spans would retain and acquire more the target language structure than lower spans. Results showed that there were statistically significant correlations only between the acquisition lenient and the L1 SST strict scores r (23) = .391, $p < .05$ and between the acquisition lenient and the L1 SST lenient scores r (23) = .403, $p < .05$. Again, mirroring results of the L2 SST, the acquisition lenient score held the highest correlations.

Regarding the difference in performance of high and low span individuals in the L1 SST strict scores, results show that the performance of high span individuals (N= 9) did not vary much from that of low spans (N=4) in the retention test. In fact, the means of high and low spans were similar (6.77 for high spans in the retention strict against 6.75 for low spans and 8.44 for high spans in the retention lenient against 8.75 for low spans). Both high and low span individuals seemed to perform in a similar fashion in the retention test.

The panorama is somewhat different in the acquisition test in which high and low span individuals differed more in their performance. While the mean for high spans in the acquisition strict was 5.66, the mean for the low spans in the same test was 3.50. In the case of the acquisition lenient, the mean for the high spans was 7.33 against 5.25 for the low span individuals. However, the difference in performance between the two groups was not statistically significant in the retention or acquisition tests. Though the difference in performance was not statistically significant, a tendency towards this direction can be seen in the case of the acquisition test and the L1 SST strict score.

In the case of the lenient score of the L1 SST, again higher and lower spans did not differ much in the retention test as shown by their means (7.25 for high spans in the retention strict test as opposed to 6.33 for the low spans in the same test and 9.00 for the high spans in the retention lenient against 8.33 for the low spans in the same test). Again, mirroring results of the difference in performance in the L1 SST strict test, results of *t*-tests for the acquisition test were different in L1 lenient, that is, high and low spans differed more in their performance in this test as shown by their means (6.50 for the high spans in the acquisition strict against 3.50 for the low spans and 8.25 for the high spans in the acquisition lenient, almost twice as much as the mean for the low spans in the same test, 4.83). The difference in performance of high and low span individuals in the retention test was not significant. However, their performance in the acquisition test was different and this difference was again statistically significant when compared against the L1 SST lenient scores.

Recall that Hypothesis 5 predicted that high span individuals would retain and acquire more the syntactic structure in L2 speech than lower spans. Indeed, higher spans retained and acquired more the syntactic structure than lower spans but this

difference was not statistically significant for the retention test. Nevertheless, the difference in performance of high and low span individuals in the acquisition test was statistically significant, thus, partially confirming the second part of Hypothesis 5.

Though there were positive and statistically significant correlations between scores in the L1 SST and the acquisition lenient strict r (23) = .391 and lenient r (23) =.403, scores both at $p < .05$, these correlations were still weaker than those found between the L2 SST and the acquisition test scores (both strict and lenient). In the case of the L2 SST, there were positive and significant correlations not only between the acquisition test, but also the retention test. In the case of the acquisition test, and so as to compare with results of the L1 SST, the correlation between the L2 SST strict score and the acquisition strict scores was r (46) = .584, $p < .01$, the correlation between the L2 SST strict and the acquisition lenient scores was r (46) = .688, $p < .01$, the correlation between the L2 SST lenient and the acquisition strict scores was r (46) = .404, $p < .01$ and the correlation between the L2 SST lenient and acquisition lenient scores was r (46) = . 565, $p < .01$.

Miyake and Friedman (1998) found that working memory capacity (assessed in terms of a listening span task in L1) was a significant component of L2 aptitude and contributed to L2 working memory capacity. Their results further indicate that the effect of L1 working memory on syntactic comprehension in Japanese was mediated by L2 working memory. Moreover, they claimed that in basic levels of proficiency domain-specific knowledge (L2 knowledge) was more important whereas in more advanced levels of L2 proficiency general factors such as working memory capacity were more important and that L2 processing in advanced levels draws from the same pool as L1 processing.

When compared against results in Miyake and Friedman (1998), it is possible to suggest that results of this study point to the conclusion that working memory

capacity in L1 was less related to the acquisition of a syntactic structure in L2 speech than L2 working memory capacity because the basic level group analyzed in this study required more L2 knowledge than working memory capacity for this type of processing. Moreover, it is possible to suggest that L1 working memory processing was not drawing from the same pool as L2 working memory because of the basic level of proficiency in L2 of the group analyzed in the present study. The question of whether working memory capacity should be measured in L1 or in L2 will be further elaborated in the next section that deals specifically with the issue of working memory capacity in L1 and L2.

Besides the basic level of proficiency of the group analyzed in this study, another possible explanation for the stronger association between the L2 SST and the retention and acquisition tests (as opposed to the L1 SST and the same tests) is that in the L1 SST there was probably less cognitive load (and maybe a floor effect) than in the L2 SST since the processes involved in the grammatical encoding phase of the Formulator (Levelt, 1989) are believed to be controlled in L2 (Fortkamp, 2000), but automatic in L1 (Levelt, 1989). Because grammatical encoding in L1 is automatic it does not require control (from working memory capacity). Because the L1 SST was less cognitively demanding than the L2 SST, differences in the retention and acquisition of syntactic structure in L2 speech did not correlate so strongly with scores in the L1 SST as they did in the case of the L2 SST. Put differently, the weak correlations found between scores in the L1 SST and the acquisition test shows that the processes involved in the performance of the L1 SST are not related to the processes involved in retaining a structure in the L2 and are only weakly related to the acquisition of this structure in L2.

That being said, it is possible to suggest that working memory capacity (in L1 and in L2) constrains the acquisition of a syntactic structure in L2 speech by limiting the

amount of controlled processing available to process meaning and form, necessary for the acquisition of this syntactic structure in L2 speech. In the same vein, it is possible to suggest that the retention of a syntactic structure in L2 speech which requires processing the form only does not engage participants in as much controlled processing as the processing of both meaning and form (in the acquisition test), thus, the lack of correlations between the retention test and the L1 SST.

The fact that in the L2 SST there were statistically significant correlations may be an indication that the L2 SST is not a measure of working memory capacity alone but perhaps a measure of working memory capacity and L2 proficiency level (which in this case can be translated into processing efficiency in the processing component of the working memory test) conflated. The next section will deal with this issue and discuss results of the speaking span tests in L1 and L2. Moreover, next section will discuss the issue of whether the speaking span tests in L1 and L2 are two tests for working memory capacity or different tests altogether.

5.6 Working memory capacity in L1 and L2

Before addressing the issue of working memory capacity in L1 and L2 it is important to have the following pieces of evidence in mind: Miyake and Friedman (1998) claimed that in advanced L2 learners L2 processing draws from the same pool as L1 processing. Harrington and Sawyer (1992) found no difference in reading spans between

L1 and L2. Osaka and Osaka (1992, cited in Maurits, W., Bosch, P., & Hugdahl, K. 2006) corroborated results of Harrington and Sawyer (1992) producing significant correlations between L1 and L2 working memory assessed with the reading span test. Nevertheless, Fortkamp (1999) found no significant correlations between L1 and L2 working memory when measured with a speaking span test.

As becomes evident in the aforementioned account, there are very few studies using complex spans to measure working memory capacity in L1 and in L2 and results concerning the relationship between L1 and L2 working memory capacity are not stable across studies and I would claim, across proficiency levels and working memory measures. Given the mixed results concerning this relationship, I would claim that perhaps if we compare results of studies using the same proficiency level in L2 and the same working memory measures, differences would disappear. Because of the impossibility to compare results of studies using the same proficiency level and working memory measures, the discussion brought to bear in this study for the relationship between working memory capacity in L1 and L2 can only be taken as one more piece of evidence that must be compared with caution and integrated with results of other studies which used different measures of working memory and different L2 proficiency levels.

Hypothesis 6 predicted that there would be positive and statistically significant correlations between measures of working memory capacity in L1 and L2. Recall that three raters calculated the strict and lenient scores of the two tests but only the scores produced by Rater 1 were used to answer the research questions and hypotheses raised in this study since Rater 1 (the researcher) was also in charge of data collection and the only one with access to qualitative data concerning the speaking span tests.

Thus, considering only the scores generated by Rater 1, Hypothesis 6 is not confirmed for there were no statistically significant correlations between measures of working memory capacity in L1 and L2. Nevertheless if we had used the scores generated by Rater 2, there would have been statistically significant correlations for all measures of working memory capacity in L1 and L2 except in the case of the L1 strict and L2 lenient scores. For the L1 strict and L2 strict there was a correlation of r (23) = .495, $p < .05$; for L1 lenient and L2 strict there was a correlation of r (23) = .501, $p < .05$; and for L1 lenient and L2 lenient there was a correlation of r (23) = .462, $p < .05$. There would also have been statistically significant correlations, and in this case, between all measures of working memory capacity in L1 and L2 when calculated by Rater 3 r (23) = .475, $p < .05$ for L1 and L2 strict; r (23) = .472, $p < .05$ for L1 lenient and L2 strict; r (23) = .408, $p < .05$ for L1 strict and L2 lenient and r (23) = .423, $p < .05$ for L1 lenient and L2 lenient.

Due to the variation in results produced by the three raters in this study, it is difficult to come to firm conclusions regarding the relationship between working memory capacity when measured in terms of speaking span tests in L1 and L2. The variation in the results produced by different raters, mainly concerning the lenient scores of the working memory tests, suggests that caution should be exercised when analyzing results of lenient scores in other studies as this measure has proved to be open to subjective interpretation and variation despite the high inter-rater reliability reported (section 3.8.3) (for averages among raters in L1 see Appendix P and for averages in L2 Appendix Q). Thus, even though there was a high inter-rater reliability, the scoring criteria for the lenient score needs further refining and results for the lenient score, careful interpretation.

That having been said, I turn now to the discussion of possible ways to interpret the mixed results yielded by this study in relation to measures of working memory

capacity in L1 and L2. The question that the reader is probably anxiously waiting to be answered is that of whether there is such a thing as a working memory capacity in L1 and another working memory capacity in L2. Given the results produced by the L1 SST and L2 SST tests used in this study, it is not possible to answer that question with an assertive yes or no. It is possible, however, to suggest, again based on results of this study, that there is a relationship between the two measures of working memory capacity, thus corroborating results of Harrington and Sawyer (1992) and Osaka and Osaka (1992, cited in Maurits, W., Bosch, P., & Hugdahl, K. 2006) for the reading span test. It is also possible to claim that the performance in the L2 SST is more related to the retention and acquisition of a syntactic structure in L2 speech than the L1 SST, corroborating suggestions of Miyake and Friedman (1998) for this level of proficiency. This idea will be further developed in what follows.

Recall that Miyake and Friedman (1998) suggested that in basic levels of proficiency domain specific knowledge (L2 knowledge) was more important for processing whereas in advanced levels of proficiency domain free variables (such as working memory capacity) played a more important role in the processing. If we analyze results of this study against Miyake and Friedman's (1998) suggestion that in the processing involved in basic levels L2 knowledge is more important than cognitive factors, then it makes sense to think that the retention and acquisition of a syntactic structure in L2 speech in basic levels such as the one investigated in this study would be more related to the performance on the L2 SST (which involves more domain specific knowledge, that is, L2 knowledge) than to the performance in the L1 SST - which can be said to be a cognitive (domain free) and not a linguistic (domain specific) test.

Another possible reason why the L2 SST is more related to the L2 speech retention and acquisition than the L1 SST is that the L2 SST may conflate working memory

capacity and proficiency level (or processing efficiency in the processing component of the span test) in L2. In a forthcoming study, Finardi and Weissheimer (in press) compared results of the L2 SST across two proficiency levels. Overall they found that the scores for the basic level group were much lower than those for the intermediate group. A comparison of means showed that the difference in performance in the L2 speaking span test for the basic and intermediate groups was statistically significant for the strict score but not for the lenient score, though it almost reached significance. Again, we see that the lack of significance is found with the lenient score, which may point to the conclusion that a more objective criteria have to be developed for this score.

Finardi and Weissheimer (in press) explained their results in face of the distinction between automatic and controlled processes claiming that in the basic level learners used more controlled processes than intermediate learners and that for them the L2 SST required more control than for the intermediate learners who had more automatized procedures in L2 speaking. If the L2 SST was more challenging for the basic level learners than for the intermediate level learners it might be because the L2 SST confounds working memory capacity with proficiency level. One way to disambiguate this hypothesis is to compare the performance in both the L1 SST and L2 SST across different L2 proficiency levels. Unfortunately, that was not possible either in Finardi and Weissheimer (in press) who used only one test (L2 SST) or in this study (only one proficiency level) and so this account has to be taken as speculative in nature.

Put together, results of Miyake and Friedman (1998) and Finardi and Weissheimer (in press) seem to suggest that in basic levels of L2 proficiency, the performance in the L2 SST would be more related to the processing in L2 speaking tasks than the performance in the L1 SST, because the L2 SST (and the L2 speaking task) require

more specific knowledge (L2) than the L1 SST. Moreover, considering different proficiency levels, as suggested by Finardi and Weissheimer (in press), advanced learners would perform better in the L2 SST than basic learners because in basic levels of proficiency learners have less domain specific knowledge (L2 knowledge) and thus need more control (from working memory) to produce sentences in the L2.

So far, the only answer this study can give in an assertive way is that the L2 SST is more related to the retention and acquisition of a syntactic structure in the L2 speech than the L1 SST and that the two working memory tests are somewhat related, though the relationship between the two tests when compared with their lenient scores is still subjective and problematic (despite the high inter-rater reliability reported in section 3.8.3). Finally, it was suggested in this study that the reason why the L2 SST is more related to the retention and acquisition of a syntactic structure in L2 speech than the L1 SST may be that the L2 SST conflates working memory capacity with L2 proficiency level in the processing component (L2 speaking) of the working memory test. If we use the processing-efficiency view of working memory capacity to explain these results, we can conclude that the domain-specific task of speaking an L2 may be more automatized in more proficient learners and that may have caused the pattern of results borne out in this study. Again, one way to disentangle this hypothesis would be to have longitudinal studies with different proficiency levels and working memory tests in L1 and L2, which, unfortunately, were beyond the scope of this study.

Thus, results of this study are mixed and seem to partially corroborate Harrington and Sawyer's (1992) and Osaka and Osaka's (1992, cited in Maurits, W., Bosch, P., & Hugdahl, K. 2006) results in that there was a relationship between measures of working memory capacity in L1 and L2 when analyzed with the scores produced by

Rater 3. The fact that different raters produced different results points to the need of further ellaborating on the scoring criteria for the speaking span test, especially, as pointed out elsewhere, in the case of the lenient score. If we had used only the scores produced by Rater 1, for example, then Fortkamp's (1999) results would have been partially corroborated for there were no significant correlations between most measures of L1 and L2 speaking span test.

Finally, suggestions in both Miyake and Friedman (1998) and Finardi and Weissheimer (in press) seem to fit in well with results of this study, that is, the processing involved in acquiring a syntactic structure in L2 speech in basic levels was more related to the processing involved in the L2 SST than in the L1 SST, perhaps, as suggested by Miyake and Friedman (1998), because both tasks involve domain specific knowledge (L2) whereas the L1 SST involves more cognitive factors (working memory capacity). Moreover, though this study did not seek to analyze the performance of the basic level group against that of an advanced group, it is possible to suggest, based on Finardi and Weissheimer (in press), that more advanced learners would have shown less variability in scores of the L1 and L2 SST because they would rely more on cognitive factors (working memory capacity) and less on domain specific knowledge (L2) to perform in the working memory tests. Again, this account has to be taken as speculative.

As it is, the only assertive answer this study can give in relation to the question of whether working memory capacity in L1 is related to working memory capacity in L2 is that those two constructs (if indeed they are two), are weakly related in the case of basic level learners and when assessed in terms of a speaking span test. Results of this study seem to point to the conclusion that the L2 SST may confound cognitive factors such

as working memory capacity with L2 knowledge in which case the L1 SST would be a purer working memory capacity measure than the L2 SST.

5.7 Participants' perceptions of tests

Except for the pre-test, four tests were used in this study in the following order: a focused test was used for target language structure retention, an unfocused test was used for target language structure acquisition and two speaking span tests were used for working memory capacity in L1 and L2. After each of the four tests an interview was conducted so as to check participants' perceptions of the tests and whether they had tried to use any strategies to perform the tests.

Results of the qualitative analyses of the interviews showed that the memory tests were found to be more challenging than the language tests. The L2 was the most challenging test, followed by the L1 SST, the acquisition test and the retention test. Participants confirmed that in the retention test they were processing the form whereas in the acquisition test they were processing both form and meaning. Some participants reported that they found the L1 SST as difficult as the L2 SST because the words in the L1 SST were more difficult than those in the L2 SST. Whereas the words included in the L2 SST were all monosyllabic and concrete nouns, the words in the L1 SST included adjectives and abstract nouns, besides words with more than one syllable. Moreover, another aspect which made the L1 SST more difficult than expected was the fact that because learners had a vast vocabulary in L1 and knew all the words in the test very well, they formed longer and more complex sentences than those in the L2 SST.

In terms of the strategies used in the tests, there was not a lot of variation. In the retention test most participants tried to pay attention to the beginning of the sentence so as to figure out what was the correct auxiliary verb to insert in the formula *So+aux* or *Neither+aux.* In the acquisition test participants had to wait for the whole sentence so as to respond in a meaningful way, that is, agreeing or disagreeing with the sentences heard according to their real situations. Most participants said it was hard to pay attention to the form, they first paid attention to the meaning so as to know whether they agreed or not with the sentence, later trying to use the formula correctly either to agree or disagree with the sentences heard. Regarding the memory tests, there was more variation in terms of the strategies used; most participants tried to memorize the first words so as to be able to make sentences with at least the first three words that appeared on the screen and some tried to visualize the words or associate them.

The qualitative analysis of the interviews enabled the researcher to confirm the Hypothesis raised for the cognitive processing required in the tests used in the study. More specifically, it enabled the researcher to conclude that during the retention test participants were processing mainly the form whereas in the acquisition test they were processing both form and meaning and regarding the memory tests, it enabled the researcher to see that, at least with this population, the main difference between the two working memory tests was in terms of how much automatized knowledge participants had in the processing component of the working memory test since the two tests were related but one correlated more with the performance on the retention and acquisition tests in L2 speech.

CHAPTER 6

FINAL REMARKS, LIMITATIONS, SUGGESTIONS, AND IMPLICATIONS

6.1 Final Remarks

The main objective of this study was to investigate the extent to which working memory capacity was related to the retention and acquisition of a syntactic structure in L2 speech. Departing from information processing theory, more specifically, dual process theories, it was assumed that the acquisition of a syntactic rule by the rule-based system would use controlled processes and attention which is limited in working memory capacity. Moreover, based on linguistic accounts of language processing, it was assumed that the target language structure investigated (agreeing with *So+aux+I* and *Neither+aux+I* in short responses in L2 speech), would be complex (due to verb movement and agreement) and difficult to acquire since the processing of this language structure by Portuguese speakers involved parameter resetting.

Based on these assumptions, it was hypothesized that working memory capacity scores would correlate with scores in the retention and acquisition tests. In order to test this general research question, four instruments of data collection were used in this order: a retention test, an acquisition test, a speaking span test in L2 and a speaking span test in L1 and ninety-six basic learners of English as a foreign language volunteered to participate in this study, fifty comprising the control group and forty-six the experimental group. So as to address this main research question, seven hypotheses were raised in this study, six of a quantitative nature and one of a qualitative nature (Dornyei, 2007).

Hypothesis 1 concerned the treatment given and predicted that there would be no retention or acquisition of the target language structure without treatment. Hypothesis 1 was confirmed and it was suggested that a control group may play a bigger role in study designs in second language classes, as opposed to foreign language classes as is the case of the present study, or in studies that use global measures of accuracy rather than target language use, again, as was the case of the present study.

The second Hypothesis concerned the target language tests used in this study and predicted that the acquisition test would be more demanding than the retention test. This Hypothesis was raised in light of Finardi's (2007) study which aimed, among other things, at piloting these tests. A comparison of means in Finardi (2007) showed that the acquisition test was more demanding than the retention test and Finardi (2007) suggested that it was because during the retention test participants were processing mainly the form of the sentences whereas in the acquisition test they were processing both form and meaning. Following suggestions of Finardi (2007), interviews were conducted in this study with participants after all the tests so as to gather participants' perception on the tests to triangulate the data. Results of both quantitative (comparison of means) and qualitative analyses (interviews) show that Hypothesis 2 is confirmed, that is, the acquisition test was more demanding than the retention test and the reason for this difference is that the acquisition test taxed participants' cognitive system more than the retention test by forcing participants to process both meaning and form so as to answer the questions.

Hypothesis 3 concerned the relationship between working memory capacity in L2 and the retention of a syntactic structure in L2 speech and predicted a positive and statistically significant correlation between working memory capacity (assessed in terms of a L2 SST) scores and the retention test. Moreover, Hypothesis 3

predicted that higher spans would acquire more the target language structure than lower spans. This Hypothesis was only partially confirmed for though there were positive and statistically significant correlations between L2 SST scores and scores in the retention test, these correlations were weak. Moreover, the difference in performance of high and low span individuals in the retention test was only statistically significant for the lenient score of the retention test and the strict score of the L2 SST. These results were explained in terms of the variability in the scoring criteria for the lenient score of the L2 SST and the little room for variability in the case of the strict score of the retention test.

Finding support for Hypothesis 4 was the main challenge faced in this study since this hypothesis concerned the relationship between working memory capacity (assessed in terms of a L2 SST) and the acquisition of a syntactic structure in L2 speech. Hypothesis 4 predicted a positive and statistically significant correlation between scores of the working memory capacity test in L2 and the acquisition test. Moreover, it was hypothesized that higher spans would acquire the target language structure more than the lower spans. Hypothesis 4 was confirmed since there were positive (and practically strong .688**) correlations between scores in the L2 SST and the acquisition test and the difference in performance of high and low span individuals in the acquisition test was statistically significant, except for the strict score of the acquisition test and the lenient score of the L2 SST. The lack of statistical significance for this measure was explained in terms of the variability of the lenient scoring criteria for the L2 SST and the processing of form in the lenient score as opposed to form and meaning in the strict score.

Hypothesis 5 was exploratory (it was not tested as the other ones in Finardi, 2007) in nature and concerned the relationship between working memory capacity in L1 and the retention and acquisition tests used in this study. It predicted that

there would be positive and statistically significant correlations between scores of the working memory capacity test (L1 SST) and the retention and acquisition tests. Moreover, it predicted that higher spans would retain and acquire more the target language structure than lower spans. This hypothesis was only partially confirmed for though there were positive and statistically significant correlations, these were only between the L1 SST and the acquisition test and even so, they were weak, indicating that working memory capacity in L1 is not related to the retention of this target language structure and is only weakly related to its acquisition.

Based on the weak correlations found between scores in the L1 SST and the acquisition test it was suggested that though working memory capacity in L1 was related to the acquisition of that particular syntactic structure in L2 speech, it could not account for it alone. Other variables (perhaps the linguistic complexity of the target language structure processing) were at play and working memory capacity in L1 played only a limited role in the acquisition of this structure in L2 speech. These results were also explained in terms of the difference between the two working memory capacity tests. Recall that in this study working memory capacity limitations were assumed to reflect limitations in the processing efficiency of the processing component of the working memory span test. Thus, it was suggested, that working memory capacity, when measured in terms of an L2 SST, may confound working memory capacity with processing efficiency (L2 knowledge). The only clear result borne by this study in that regard is that working memory capacity (be it in L1 or in L2) is in fact related to the acquisition of a syntactic structure in L2 speech; though working memory capacity in L1 is only weakly related and working memory capacity in L2 is strongly related to it, perhaps because the L2 SST confounds working memory capacity in L2 and proficiency level at the processing component of the working memory test. In other words, there

seems to be an overlap between L2 proficiency level and the performance in the tests used in this study but it is clear that there is a significant covariance between working memory capacity (be it in L1 or in L2) and the acquisition of a syntactic structure in L2 speech, and that the correlation between the acquisition test and the working memory test in L1 is evidence of that.

One reason why working memory capacity in L1 may not be related to the retention of a syntactic structure in L2 speech has to do with the way in which retention was operationalized in this study. Recall that the retention of the target language structure required processing only the form of the sentence which may not have taxed working memory capacity enough to allow as much individual differences in working memory capacity to emerge in the L1 SST as in the L2 SST.

The last quantitative hypothesis concerned the relationship between working memory capacity in L1 and in L2 and predicted a positive and statistically significant correlation between scores in the L1 and in the L2 SST. This hypothesis was confirmed for there were positive and statistically significant correlations but they were moderate indicating that the relationship between working memory capacity in L1 and L2 is moderate. These results were explained in terms of the processing assumed to take place in these tests (more L2 knowledge in L2 SST and more cognitive in the L1 SST) and again in terms of the processing efficiency view of working memory limitations, suggesting that the L2 SST may conflate working memory capacity and L2 proficiency level in the processing component of the working memory test, that is, participants who were more proficient in the domain-specific task of orally producing sentences in L2 would perform better in the working memory test in L2.

Finally, the last research question and hypothesis was of a qualitative nature and concerned participants' perceptions of the tests used in this study, predicting

that they would think that the tests increased in difficulty following this order: retention test, acquisition test, L1 SST and L2 SST. This hypothesis was raised in face of Finardi (2007) who suggested that in the retention test participants would have to process mainly the form to answer the questions correctly whereas in the acquisition test they would have to process both form and meaning. This assumption was confirmed by the interviews with the participants as was the prediction that the tests would increase in difficulty following the aforementioned order. However, contrary to prediction, some participants said that they thought that the L1 SST was as difficult as the L2 SST because the words in the L1 SST were more difficult than those in the L2 SST, thus yielding more complex sentences. Results of the qualitative analysis were very important to confirm assumptions and triangulate the data (Dornyei, 2007).

The most important finding produced by this study is that working memory capacity is related to the acquisition of a syntactic structure in L2 speech. Moreover, results seem to indicate that the acquisition of the target language structure investigated in this study is complex (requiring the processing of both meaning and form besides verb movement and parameter resetting) and cognitively demanding since it requires control, from working memory.

This piece of research departed from studies on the relationship between working memory capacity (assessed in terms of an L2 SST) and L2 speech production measures (fluency, accuracy, complexity and lexical density) (for example, Bergsleithner, 2007; Finardi & Prebianca, 2006; Finardi, 2007; Fontanini et. al 2005; Fortkamp, 2000; Guara Tavares, 2008; Mendonca, 2003; Weissheimer, 2007) and a model of L2 learning based on dual-process theory (Skehan, 1998) to suggest that perhaps working memory capacity was not only involved in the production of L2 speech but also in its acquisition. In light of Skehan's model of L2 acquisition, it was

suggested that the acquisition of a syntactic structure by the rule-based system would use controlled processes and attention, which were limited in working memory capacity. What these studies showed is that the connection between working memory capacity and L2 speech production had already been established in a systematic way (for example, Bergsleithner, 2007; Finardi & Prebianca, 2006; Finardi, 2007; Fontanini et. al 2005; Fortkamp, 2000; Guara Tavares, 2008; Mendonca, 2003; Weissheimer, 2007). Skehan (1998), Swain (1985, 1995) and others (for example Ellis, 2003) had also called the attention to the importance of production for acquisition but there was still a gap between production, acquisition and working memory. This study aimed at filling in this gap by making the connection between working memory, production and acquisition by suggesting that if, as claimed by Skehan and company, production affected acquisition, and if, as claimed by Fortkamp and company, working memory capacity affected L2 speech production, then it would be reasonable to expect that working memory capacity also affected L2 speech acquisition.

Results of this study point to the conclusion that working memory capacity (be it in L1 or in L2) is related to the acquisition of a syntactic structure in L2 speech but it does not explain the whole picture, perhaps the complexity of the linguistic item being acquired and the proficiency level also interact in this process. Nevertheless, the role of working memory capacity mediating the acquisition of the syntactic structure in L2 speech was clearly demonstrated and represents the greatest contribution of this study.

6.2 Limitations of the study and suggestions for further research

This study represents an attempt to systematically examine the relationship between working memory capacity and the acquisition of a syntactic structure in L2 speech. Although it was piloted and theoretically and methodologically based on existing literature in the field, the literature reviewed did not deal specifically with the relationship between working memory capacity and the acquisition of the target language structure investigated here. As expected, this work has several limitations which will be highlighted in what follows, with a list of suggestions for future research endeavors.

The first set of limitations that must be acknowledged in this study concern the working memory tests. The first limitation is the sample size for the L1 SST. Recall that whereas all 46 participants in the experimental group took the L2 SST, only half of them, that is, 23, agreed to take the L1 SST. The small sample size for the L1 SST may have affected the results of this study since there was little room for variation in terms of individual differences in working memory capacity in such a small sample size. Another limitation that may have affected the results of the working memory tests is the scoring criteria adopted for the lenient score of this test. Three raters were used to guarantee maximum reliability in the scores. Raters were instructed to give half a point to sentences which were either grammatically correct but that used the word in the wrong order or that were not completely grammatically correct but that had used the word in the correct order. The problem, it seems, resides on what each rater considers to be grammatically correct, especially for this level of proficiency. Though there was high inter-rater reliability, the lenient score of the working memory tests still proved to be problematic and open to subjective interpretations.

Still regarding the working memory tests, another limitation that must be acknowledged is that the tests were not counter balanced for practice effects. Ideally, one group of participants should do the L1 version first and another group the L2 version first but this was not done in this study because the main research question concerned the relationship between the L2 SST (which was piloted in Finardi, 2007) and the acquisition test and so the data produced by these tests were the most important for this study and had to be protected against possible mortality rate.

The second set of limitations is not concerned with the working memory tests but with the target language structure tests. As suggested in Chapter 2 with the linguistic accounts of syntactic processing reviewed in this study, UG methodology regarding parameter resetting in L2 acquisition requires at least two different L1s and one L2. The two L1s have to be different, one resembling and another one not resembling the parameter being investigated in L2 so as to make claims for L2 processing or acquisition. Results of this study were discussed as being affected by the complexity of the target language structure investigated and its difficulty in acquisition for Portuguese speakers whose parameters differed from the L2 (English parameters to agree). Nevertheless, a control L1 with parameters resembling those in L2 was not used and so this suggestion has to be taken as speculative in nature.

Finally, the last limitation that must be addressed is the fact that though the model of L2 acquisition adopted in this study was Skehan's (1998) dual-code account of language learning, acquisition was operationalized in much narrower terms in this study. Skehan claims that acquisition is enabled through practice and happens with the transfer of items from the rule-based system to the memory-based system. Acquisition in this study was understood to comprise only the first stage of this process, that is, the acquisition of a particular syntactic item by the rule-based system before (if at all) this item is lexicalized or to use Skehan's terminology, "transferred" to the memory-based system. That having been

said, it is important to bear in mind that the question of how items are transferred from one system to another is theoretically interesting though methodologically difficult to falsify.

Based on these limitations, the following suggestions are made for future research endeavors:

1) Use larger sample sizes to allow statistical variation in terms of individual differences in working memory capacity;

2) Use more than one measure of working memory capacity and in more than one language;

3) Counter balance tests to safe guard against possible practice effects;

4) Use two L1s, one with the same parameter and another one with a different parameter from that being investigated in L2;

5) Have more longitudinal studies to investigate the strength of the target language acquisition (over longer periods of time) and its relation to global interlanguage development;

6) Devise methodologies to investigate the lexicalization of language so as to be able to further investigate the transfer of items from one system to the other;

7) Use more than one proficiency level and working memory capacity tests in L1 and in L2 to analyze variations in working memory capacity related to proficiency level and test (L1 and L2) to better understand the relationship between working memory capacity in L1 and in L2 and its interaction with proficiency level in L2.

6.3 Implications for L2 speech acquisition and teaching

Despite the overriding quantitative nature of this study (Bachman, 2005; Brown, 1988), an attempt was made to include a somewhat mixed research methodology (Dornyei, 2007) to enable insights of a qualitative nature to feed data analysis and triangulation. This design was not by chance and reflects the researcher's approach to life and science. While it is important to study the leaf anatomy in detail, the knowledge produced by this analysis has to be incorporated into the larger picture, that of the woods. The leaf/wood metaphor extends to other aspects of my approach to life, such as that of researcher/teacher. Though I think any information (research) is important in and of itself, I place greater value in the knowledge which stems from its appropriation, which can be understood as information + meaning/experience.

The *information* contained in this study may become relevant *knowledge* for teachers and researchers interested in how people learn (or no) a foreign language, more specifically, how people may come to speak a foreign language fluently. It is to those that this last section is dedicated. A last word before I attempt to draw pedagogical implications for this study: I embarked on this research endeavor with one question, namely - what is the role of working memory capacity in the acquisition of a syntactic structure in L2 speech – and finished it with many questions, to name a few:

1) If working memory capacity alone cannot explain the acquisition of a syntactic structure then what other variables (apart from the ones assumed in this study) can be at play?

2) Does working memory capacity mediate only the acquisition of rules by the rule-based system or does it also mediate the lexicalization of language by the memory-based system? If so, is working memory capacity also involved in the transfer or items from one system to the other?

3) Since working memory capacity, though not alone, affects the performance and acquisition of speech in L2, how can teachers help students with small working memory capacities overcome their limitations?

4) If the acquisition of the syntactic language structure investigated involved parameter resetting in L2, how can teachers help their students reset this parameter?

Unfortunately, I do not have answers to these questions. What I have and humbly offer are some hints, based on my experience as researcher and L2 teacher. The first suggestion I have is that other variables that may affect the acquisition of a syntactic structure in L2 speech are: the linguistic complexity of the structure being acquired, whether it involves parameter resetting in L2 or not, and processing conditions.

Translated into classroom practice, I suggest that when the aim is to teach a complex syntactic structure that requires parameter resetting, the teacher should, in a first moment, focus on form, calling learners' attention to the difference of the grammatical structure in L2 explicitly. White, Spada, Lightbown and Ranta (1991), for example, studied how input enhancement or a focus on form affected the acquisition of question formation in English of French 10-12 year-old speakers in intensive programs

in Canada. According to the aforementioned authors, a focus on form yielded immediate and positive results on syntactic accuracy and what is more important, learning was not lost over the 5-week period before follow-up testing. French and English differ in their parameters to question formation and White et al. concluded that input enhancement and focus on form is both beneficial and necessary to drive language development beyond a certain level (Swain, 1985). White et al. (1991) suggest that a focus on form may benefit L2 learners in two ways: by helping learners to perceive structures that they would otherwise miss in naturalistic input by making the structure more salient thus sensitizing learners to aspects of L2 that are different to those in the L1 and by helping learners "unlearn" incorrect analysis of L2 by supplying negative evidence about forms which are not possible in the target language.

Another pedagogic suggestion to teach complex syntactic structures involves teachers reducing the processing burden by not requiring, at least in a first moment of focus on form, meaning processing from students. Once the form of the target structure is acquired (that is, not requiring controlled processes and attention for its execution), teachers can use focused tasks (Ellis, 2003) in which meaning is processed but with a focus on certain grammatical structures. Finally, in a third and last phase of acquisition, teachers should implement tasks (Skehan, 1996; 1998) that require learners to process meaning; thus moving, from a focus on form to a focus on meaning in the course of language acquisition. Skehan (1998) suggests the use of tasks for L2 learning, the difference in what I am proposing is that perhaps the task should be the last moment of learning, at least in the case of syntactic structures that require parameter resetting in L2.

In regards to processing conditions, Bygate (2001b) and Finardi (2008) suggest that repeating a task may enable learners to focus on different aspects of L2

performance. In terms of L2 speaking, learners may focus on one or more aspects of L2 speech performance, namely: complexity, fluency, accuracy or lexical density. Guara-Tavares (2008) suggests the use of planning as a performance condition to foster L2 speech development. Skehan (1996; 1998) also recommends a healthy diet of different tasks and different task conditions to allow learners to focus on different aspects of language learning.

Regarding the third question, that of how teachers can help students with small working memory capacities to overcome their limitations, Weissheimer (2007) suggests, and I agree, that two actions are beneficial in that respect: teaching strategies to lexicalize language and teaching metacognitive strategies. If learners lexicalize certain aspects of language, they can devote their attentional capacity to process other aspects of language (syntax being one) that may not be lexicalized. The latter suggestion put forward by Weissheimer is also related to the amount of attention learners have to devote to language processing; if they learn to be strategic, they may have more resources to allocate to different aspects of language processing.

Skehan (1998), Ellis (2003), Bygate (2001b) and Swain (1985) would probably agree production is necessary for learning and that a healthy diet of tasks and different task conditions may call learners' attention to different aspects involved in speech production. Moreover, through the production with tasks, learners may notice certain aspects of the linguistic structure or item being learned (Schmidt, 1994), thus preparing the cognitive system to acquire this item or structure in future encounters.

This study departed from information processing theory to explain L2 learning assuming that some parts of language acquisition could be understood in terms of general learning models. Recognizing its limitations, dual-process theories were brought to bear in this study to explain the specific acquisition of a syntactic structure

by the rule-based system. Moreover, acknowledging that the linguistic complexity of syntactic structures may affect their acquisition, linguistic accounts of language processing were also reviewed and used as a suggestive parameter for comparison. The pedagogical implications mentioned in this section reflect this multifaceted view of language learning.

In sum, the main goal of this study was to better understand the relationship between working memory capacity and the acquisition of a syntactic structure in L2 speech, contributing, in that sense, to the literature of cognitive psychology in general and L2 acquisition in particular. The pedagogical implications offered above are to be seen as suggestive, rather than prescriptive. Though more studies are necessary to scrutinize the relationship between working memory capacity and different aspects of L2 acquisition, this study represents a first and necessary step to investigate this issue, thus contributing to the area of L2 learning in general and L2 speech learning in particular.

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Appendix A – Consent form

A pesquisa de aprendizagem de segunda língua envolve uma série de métodos dentre os quais a gravação em áudio. Todos os dados fornecidos na pesquisa são absolutamente sigilosos e os participantes da mesma não são identificados em nenhum momento da pesquisa, seus nomes são omitidos durante a análise de dados. A participação nesta pesquisa não acarreta, de maneira alguma, prejuízo ou privilégio na disciplina cursada, sendo a participação na mesma, totalmente independente e desvinculada da disciplina cursada. O participante pode, a qualquer momento, desistir de participar da pesquisa, bastando, para tanto, informar o pesquisador a fim de que não utilize seus dados.

Por ter lido, compreendido e concordado com a informação acima descrita, assino, abaixo autorizando minha inclusão como participante nesta pesquisa de doutorado entitulada "A memória de trabalho e a aquisição de uma estrutura sintática na produção oral em L2" realizada pela doutoranda da pós-graduação em Inglês da UFSC, Kyria Finardi.

Appendix B – Inventory answers interview before retention test

Q1 – How long have you been studying English?

A- less than a year B – about a year C – more than a year D – other

Q2 – Why do you study English?

A – to speak fluenty B – to listen better C- academic reasons D – other

Q3 – Which of the four skills is the most difficult skill in your opinion?

A – speaking B – listening C – reading D – writing

Q4 – How old are you?

A – early 20's B – 18/19 years old C – late 30's D – 40's E – early 50's

Q5 – Do you practice English outside the class? How often? How?

A – yes, songs, films B – no

Q6 – Where do you live?

A – Metropolitan area of Florianopolis B - other

Q7 – Where do you work?

A – UFSC B – different companies near UFSC

Q8 – Do you speak another foreign language?

A – some Spanish B – no

And after the Retention Test and all the other tests (Acquisition Test, L2 SST, L1 SST) the researcher asked participants questions 9 and 10

Q9 – Did you think this test was hard? Why?

A – yes B – no

Q10 – Did you use or try to use any strategies to do the test? Which one(s)?

A – check affirmative/ negative B – no

Coded answers interview before retention test

Part.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	A	A	B	C	A	A	A	A	A	A
2	A	A	A	D	B	A	B	B	A	A
3	B	A	A	B	A	A	A	B	A	A
4	A	B	B	A	B	A	B	A	A	A
5	C	A	A	D	B	A	A	B	A	A
6	A	D	B	A	B	A	A	B	A	A
7	C	A	A	D	A	A	B	A	A	A
8	A	B	B	D	A	A	B	B	A	A
9	A	A	A	A	B	A	B	B	A	A
10	B	A	A	C	A	A	A	A	A	A
11	C	A	A	E	A	A	A	B	A	A
12	A	A	C	B	A	A	A	B	B	B
13	C	B	A	D	B	A	B	B	A	A
14	A	A	B	A	A	A	A	B	A	A
15	C	A	A	D	A	A	B	B	A	A
16	C	A	B	A	B	A	B	B	A	A
17	A	A	A	D	A	A	A	B	A	A
18	C	B	A	A	A	A	B	B	A	A
19	A	C	A	B	B	A	A	A	A	A
20	B	B	A	A	A	A	B	B	A	A
21	A	C	A	A	B	A	B	B	A	A
22	C	A	A	A	A	A	A	B	A	A
23	A	B	B	D	B	A	A	A	A	A
24	C	A	A	B	A	A	B	A	A	A
25	A	A	A	A	B	A	A	B	A	A
26	A	A	A	D	A	A	A	B	A	A
27	C	A	A	A	A	A	B	B	A	A
28	C	A	A	B	A	A	A	B	A	A
29	A	A	C	A	B	A	A	A	A	A
30	A	A	A	D	A	A	A	B	A	A
31	C	B	B	A	B	A	A	B	A	A
32	B	A	A	A	B	A	A	B	A	A
33	A	A	A	A	A	A	A	B	A	A
34	B	C	A	C	B	A	B	B	A	A
35	A	A	A	A	A	A	A	A	A	A
36	C	A	C	A	A	A	B	B	A	A
37	C	C	A	E	A	A	A	B	A	A
38	A	A	A	A	B	A	B	A	A	A
39	B	B	A	D	A	A	B	B	A	A
40	A	A	B	D	B	A	A	B	A	A
41	A	A	A	A	A	A	A	A	A	A
42	D	A	B	C	A	A	B	B	A	A
43	C	C	A	E	B	A	A	A	A	A
44	A	A	A	A	A	A	B	B	A	A
45	B	A	B	D	A	A	A	A	A	A
46	A	B	A	C	A	A	B	B	A	A

Appendix C– Memory Tips

Dica de memória 1

Manipule a informação que quer gravar!

Tente memorizar as seguintes palavras em um minuto sem olhar o que vem depois. Após um minuto escreva-as num papel a fim de constatar quantas palavras gravou.

PEA / FARMER / STOOL / RESEARCHER / GRAPE / ARMCHAIR / MANGO / MANAGER / WARDROBE / BED / DUCK / PEACH / SHARK / CAT / DENTIST / DOLPHIN/

Agora tente organizar essas palavras de acordo com a categoria à qual elas pertencem:

furniture, fruit, animal e profession. Deverá haver 4 palavras para cada categoria.

Agora tente memorizar novamente as palavras nessas 4 categorias. Após um minuto veja quantas conseguiu gravar.

Você deve ter gravado mais palavras na segunda vez, isso ocorre porque ao colocar as palavras em categorias você está ajudando seu cérebro a organizar, manipular informação. Agora não são 16 palavras, mas 4 categorias e essas 4 categorias ajudam a "chamar" as palavras pertencentes a cada grupo.
Conclusão, sempre que possível, manipule (categorizando, pensando num exemplo, associação, contrário, etc) a informação que quer gravar. Quanto mais trabalhar nela, mais vai lembrar, para o cérebro o que vale é o ditado:

"No pain, no gain" ou seja, sem esforço, não há ganhos...

Espero que essa dica te ajude, na semana que vem tem mais!!!!!

Dica de memória 2

Outra estratégia que se pode usar para gravar um número limitado de palavras (até 10) é a produção de imagens bizarras. Quanto mais concretas e discrepantes as imagens, mais fácil para seu cérebro gravar. Uma técnica muito usada é gravar, primeiramente, 10 palavras que rimem com os 10 primeiros números. Essa lista deverá ser gravada permanentemente. Tente gravar (visualizando na mente) as seguintes palavras que rimam com os números em inglês.

1 – Bun (pãozinho redondo)
2 – Shoe
3- Tree
4- Door

5- Hive (colméia)
6- Sticks (galhos)
7 – Heaven (paraíso, céu)
8 – Gate (portão)
9 – Wine (vinho)
10 – Hen (galinha)

Após ter gravado essas palavras, basta acrescentar 10 outras que queria gravar, pode ser sua lista de supermercado ou 10 palavras novas em inglês, ao lado de cada palavra já gravada, fazendo uma imagem mental. Por exemplo, se quiseres gravar a palavra TIE (gravata) em inglês, tente associa-la com BUN, fazendo um imagem, talvez um pãozinho usando uma gravata. Quanto mais estranha a imagem mental, melhor. Tente gravar agora as seguintes imagens:

1- bun / tie
2- shoe / bee (abelha)
3- tree / skirt (saia)
4- door / smile (sorriso)
5- hive / cigarette
6- sticks / bridge
7- heaven / phone
8- gate / window
9- wine / hat (chapéu)
10- hen / necklace (colar)

Agora veja se ao lembrar a primeira palavra (bun) a segunda vem direto à mente (tie).... se vier, então a técnica deu certo. Se não conseguires provavelmente terás que fazer um esforço para criar uma imagem mental para as figuras acima. Good luck!!!

Dica de memória 3

1) Leia as palavras abaixo e circule todas as que não souberes o significado em Português.

FILE CROWD FLAG BAND KING BREAD TOOL SEA MIND BATH PAIR SEAT DATE BEER SKY SPOON MAIL BRAIN TOY COAT BOAT BUY GIFT TEA BOSS CITY MOON POEM FACE PRISON LIGHT HONEY TEAM BEACH EARTH WIFE POWER WORLD SUMMER NURSE TRUCK ACTRESS HEAD DRESS PLANT ISLAND MOUTH GUY

2) Procure a tradução para as palavras circuladas acima no dicionário e escreva-as no espaço abaixo, juntamente com a tradução.

Ex.: File – arquivo

3) Após uma semana veja quantas palavras ainda lembra somente decorando com a tradução.... se lembrar de poucas, não se preocupe, a dica de memória 4 lhe ensinará algumas técnicas mais eficazes do que a simples tradução para gravar vocabulário!!! Até lá!!

Dica de memória 4

1) Na dica de memória 3 eu pedi que você traduzisse as palavras abaixo. Agora veja quantas delas você lembra a tradução. Circule as que não lembra.

FILE CROWD FLAG BAND KING BREAD TOOL SEA MIND BATH PAIR SEAT DATE BEER SKY SPOON MAIL BRAIN TOY COAT BOAT BUY GIFT TEA BOSS CITY MOON POEM FACE PRISON LIGHT HONEY TEAM BEACH EARTH WIFE POWER WORLD SUMMER NURSE TRUCK ACTRESS HEAD DRESS PLANT ISLAND MOUTH GUY

2) Use algumas das técnicas de associação que recebeste para gravar as palavras que circulaste. O resultado agora deve ter sido melhor do que a simples tradução. Tente usar técnica de formar imagens mentais bizarras associando palavras. Por exemplo, tente imaginar um (boat – barco) numa (moon – lua)... se conseguires fazer uma imagem mental com as duas palavras vais conseguir lembrar pois a imagem é tão bizarra que seu cérebro registra.

Appendix D– Pre-test

Instruction – Completem as frases iniciando com So ou Neither.

Pre-test

1) I work near here. _____
2) I can't speak Japanese. _____
3) I've got a dog. _____
4) I can cook very well. _____
5) I'll stay in next weekend. _____
6) I don't like cats. _____
7) I didn't go out last night. _____
8) I've been to Camboriú. _____
9) I won't study tonight. _____
10) I haven't got an MP3 player. _____

Appendix E - Focused Test - Retention

Instruction – Concordem com as seguintes frases usando So or Neither**.**

1) I'm Brazilian.
2) I don't like cats.
3) I went out last night.
4) I'm not an astronaut.
5) I didn't see a film yesterday.
6) I love chocolate.
7) I can speak Portuguese fluently.
8) I have a black car.
9) I can't speak Chinese.
10) I don't have a cat.

Appendix F – Unfocused Test – Acquisition

Instruction – Concordem ou não com as seguintes frases, dependendo do que for verdadeiro para você.

1) I don't have a million dollars.
2) I've already been to Canasvieiras.
3) I can speak four languages.
4) I can't speak Chinese.
5) I'm not Brazilian.
6) I can't speak Portuguese.
7) I'm going to travel tonight.
8) I don't have friends.
9) I'm going to take a shower tomorrow.
10) I don't study Russian.

Appendix G - Words in the L2 Speaking Span Test

Trial 2	Trial 2	Trial 3
BOSS	ARM	SPOON
ISLAND 2	COURSE 2	BANK 2
TEA	GUY	DATE
MOUTH	POINT	GAS
SPORT 3	TRAIN 3	SKY 3
BABY	COW	CAR
IDEA	FIRE	DOOR
MOVIE	SHOE	PEN
SPACE 4	KEY 4	DISK 4
TAXI	SNOW	BIRD
GIFT	OIL	SEAT
CLOCK	DOOR	BATH
WOMAN	BOAT	GIRL
FISH 5	TOY 5	CLUB 5
MILK	ART	STREET
LUNCH	BOX	BED
WINDOW	FLOOR	MIND
MONEY	ROCK	MAIL
PROBLEM	COAT	BEER
PARTY 6	BOOK 6	PAIR 6

Appendix H - Words in the L1 Speaking Span Test

Trial 1	Trial 2	Trial 3
2 Telhado	2 Memória	2 Nublado
Notícia	Correio	Laranja
3 Futebol	3 Estrela	3 Remédio
Abóbora	Suborno	Cadeira
Cimento	Mochila	Pássaro
4 Carroça	4 Exilado	4 Direção
Decreto	Leitura	Caderno
Estádio	Natação	Lâmpada
Hóspede	Armário	Bondade
5 Azulejo	5 Gráfica	5 Planeta
Polícia	Viveiro	Bordado
Cérebro	Palhaço	Teatral
Amizade	Avental	Aquário
Lixeira	Relógio	Cerveja
6 Estação	6 Cozinha	6 Besouro
Chinelo	Papelão	Redação
Perfume	Assalto	Cortina
Galinha	Beliche	Maestro
Tesouro	Matéria	Suporte
Revista	Inverno	Estrada

Appendix I – Raw scores L1 SST

The table below shows the raw scores for the L1 SST as calculated by the three different raters. In that table the 99,0 value refers to missing participants, that is, those participants who did not do the L1 SST.

Participant	R1S	R1L	R2S	R2L	R3S	R3L
1	31,0	32,0	23,0	28,0	23,0	30,0
2	34,0	35,0	31,0	33,0	32,0	34,0
3	26,0	27,0	26,0	27,0	26,0	26,0
4	99,0	99,0	99,0	99,0	99,0	99,0
5	99,0	99,0	99,0	99,0	99,0	99,0
6	99,0	99,0	99,0	99,0	99,0	99,0
7	99,0	99,0	99,0	99,0	99,0	99,0
8	25,0	29,0	18,0	26,0	16,0	21,0
9	99,0	99,0	99,0	99,0	99,0	99,0
10	99,0	99,0	99,0	99,0	99,0	99,0
11	32,0	34,0	29,0	33,0	30,0	32,0
12	39,0	42,0	38,0	42,0	37,0	39,0
13	99,0	99,0	99,0	99,0	99,0	99,0
14	22,0	26,0	21,0	25,0	20,0	23,0
15	99,0	99,0	99,0	99,0	99,0	99,0
16	99,0	99,0	99,0	99,0	99,0	99,0
17	99,0	99,0	99,0	99,0	99,0	99,0
18	99,0	99,0	99,0	99,0	99,0	99,0
19	31,0	32,0	29,0	31,0	30,0	30,0
20	99,0	99,0	99,0	99,0	99,0	99,0
21	40,0	43,0	37,0	41,0	40,0	42,0
22	99,0	99,0	99,0	99,0	99,0	99,0
23	99,0	99,0	99,0	99,0	99,0	99,0
24	29,0	29,0	27,0	28,0	29,0	29,0
25	99,0	99,0	99,0	99,0	99,0	99,0
26	99,0	99,0	99,0	99,0	99,0	99,0
27	27,0	31,0	27,0	31,0	25,0	28,0
28	34,0	35,0	34,0	35,0	35,0	35,0
29	24,0	28,0	23,0	28,0	25,0	29,0
30	99,0	99,0	99,0	99,0	99,0	99,0
31	99,0	99,0	99,0	99,0	99,0	99,0
32	99,0	99,0	99,0	99,0	99,0	99,0
33	30,0	32,0	30,0	32,0	29,0	31,0
34	99,0	99,0	99,0	99,0	99,0	99,0
35	36,0	37,0	33,0	36,0	34,0	35,0
36	99,0	99,0	99,0	99,0	99,0	99,0
37	99,0	99,0	99,0	99,0	99,0	99,0
38	33,0	35,0	31,0	34,0	26,0	31,0
39	30,0	35,0	28,0	34,0	32,0	35,0
40	34,0	35,0	33,0	35,0	32,0	34,0
41	30,0	32,0	28,0	31,0	29,0	31,0
42	99,0	99,0	99,0	99,0	99,0	99,0
43	31,0	34,0	29,0	33,0	23,0	28,0
44	36,0	37,0	33,0	35,0	33,0	35,0
45	33,0	36,0	32,0	36,0	31,0	35,0
46	18,0	25,0	14,0	23,0	17,0	23,0

Appendix J – Raw scores L2 SST

The table shows the raw scores calculated by the three raters for the L2 SST. There are no missing values for the L2 SST, that is, the 46 experimental participants took the L2 SST.

Participant	R1S	R1L	R2S	R2L	R3S	R3L
1	20,0	23,0	15,0	23,0	15,0	20,0
2	23,0	25,0	11,0	19,0	10,0	21,0
3	17,0	18,0	10,0	14,0	9,0	14,0
4	9,0	15,0	6,0	14,0	7,0	10,0
5	21,0	28,0	15,0	25,0	16,0	29,0
6	12,0	17,0	11,0	21,0	12,0	13,0
7	20,0	30,0	15,0	28,0	14,0	16,0
8	9,0	22,0	6,0	21,0	8,0	14,0
9	13,0	19,0	11,0	18,0	11,0	14,0
10	22,0	24,0	21,0	24,0	21,0	24,0
11	17,0	21,0	14,0	20,0	15,0	18,0
12	19,0	23,0	19,0	23,0	19,0	21,0
13	14,0	20,0	11,0	19,0	9,0	13,0
14	20,0	25,0	17,0	25,0	20,0	21,0
15	10,0	18,0	11,0	20,0	11,0	12,0
16	16,0	17,0	10,0	17,0	11,0	13,0
17	17,0	21,0	14,0	20,0	16,0	18,0
18	16,0	21,0	13,0	19,0	13,0	20,0
19	20,0	21,0	21,0	23,0	21,0	24,0
20	18,0	23,0	21,0	28,0	17,0	22,0
21	22,0	25,0	20,0	25,0	20,0	22,0
22	17,0	19,0	9,0	15,0	8,0	11,0
23	12,0	20,0	12,0	20,0	12,0	22,0
24	13,0	17,0	13,0	18,0	12,0	15,0
25	15,0	21,0	15,0	21,0	15,0	19,0
26	18,0	24,0	12,0	21,0	11,0	19,0
27	21,0	23,0	11,0	18,0	14,0	19,0
28	24,0	28,0	22,0	27,0	22,0	28,0
29	20,0	26,0	14,0	23,0	20,0	29,0
30	27,0	27,0	25,0	26,0	25,0	26,0
31	16,0	21,0	12,0	20,0	11,0	17,0
32	13,0	16,0	13,0	17,0	14,0	16,0
33	16,0	18,0	14,0	17,0	14,0	15,0
34	15,0	19,0	14,0	19,0	17,0	18,0
35	21,0	28,0	19,0	27,0	18,0	27,0
36	25,0	29,0	25,0	33,0	26,0	28,0
37	8,0	11,0	6,0	11,0	7,0	9,0
38	6,0	15,0	6,0	18,0	6,0	10,0
39	24,0	25,0	17,0	22,0	19,0	24,0
40	9,0	17,0	11,0	19,0	12,0	12,0
41	10,0	18,0	10,0	18,0	11,0	19,0
42	12,0	19,0	15,0	23,0	13,0	14,0
43	19,0	23,0	15,0	22,0	16,0	18,0
44	19,0	25,0	20,0	25,0	18,0	25,0
45	23,0	28,0	21,0	28,0	22,0	31,0
46	11,0	15,0	11,0	15,0	9,0	15,0

Appendix K– Raw scores focused and unfocused tests

Participant	Focused strict	Focused lenient	Unfocused strict	Unfocused lenient
1	3,0	6,0	5,0	7,0
2	9,0	10,0	8,0	9,0
3	8,0	9,0	5,0	5,0
4	4,0	7,0	1,0	2,0
5	7,0	9,0	6,0	7,0
6	8,0	9,0	6,0	7,0
7	5,0	8,0	3,0	6,0
8	7,0	9,0	2,0	5,0
9	2,0	5,0	3,0	4,0
10	5,0	7,0	8,0	9,0
11	7,0	9,0	4,0	6,0
12	8,0	9,0	6,0	8,0
13	5,0	8,0	1,0	2,0
14	7,0	9,0	6,0	7,0
15	7,0	9,0	5,0	6,0
16	9,0	10,0	8,0	9,0
17	7,0	9,0	7,0	9,0
18	3,0	7,0	2,0	4,0
19	9,0	10,0	8,0	9,0
20	6,0	8,0	7,0	8,0
21	5,0	8,0	4,0	7,0
22	1,0	4,0	5,0	5,0
23	4,0	6,0	2,0	3,0
24	3,0	6,0	2,0	3,0
25	5,0	8,0	6,0	7,0
26	8,0	9,0	7,0	9,0
27	9,0	10,0	9,0	10,0
28	7,0	9,0	7,0	9,0
29	9,0	10,0	4,0	6,0
30	6,0	8,0	6,0	8,0
31	2,0	5,0	4,0	6,0
32	9,0	10,0	8,0	9,0
33	6,0	8,0	7,0	8,0
34	7,0	8,0	5,0	7,0
35	9,0	10,0	9,0	10,0
36	6,0	7,0	7,0	9,0
37	6,0	7,0	1,0	2,0
38	4,0	6,0	1,0	2,0
39	7,0	8,0	7,0	9,0
40	6,0	7,0	5,0	6,0
41	7,0	9,0	6,0	7,0
42	4,0	7,0	1,0	3,0
43	8,0	9,0	4,0	7,0
44	7,0	9,0	7,0	8,0
45	6,0	8,0	4,0	7,0
46	4,0	7,0	2,0	3,0

Appendix L – L2 SST transcriptions

1) I don't boss / I love island / I like tea / I very mouth / I want a baby / I'm woman / I go taxi / I don't like milk / I'm arm / I'm free / I open the door / I read book / I don't know date is today / My car is black / My dog is very beautiful / The girl study brain / What's the name the street
*Bloqueio quando aparece uma palavra que não sei, aí já não lembro das outras.

2) I have a boss / I live in an island / I drink tea / I have a mouth / I do sport / I was a baby / I have a idea / I have a wife / I have a gift / I drink milk / I went to a party / I don't know arm / I don't know course / I have a point / I take a train / I have a cow / I don't like snow / I see a door / I see a book / I have a spoon / I went to a bank / I have a date / I need gas / I have a car / I need a pen / I see a bird / I see a girl / I drink beer

3) My boss is bored / Island is beautiful / I like tea / I don't practice sport / I don't have baby / I have idea / I go with the taxi / I don't know gift / I hate milk / I don't have money / I don't know arm / The guy is beautiful / The point is difficult / I don't have fire / I don't know snow / I don't have oil / I like art / I don't have box / I don't know spoon / The date is important / I have car / I have pen / I have dog / I am a bird / The teacher is small
*Quando as palavras são bem conhecidas fica mais fácil.

4) I don't know boss / Florianopolis is island / I drink tea / I don't know mouth / I practice sport / I have a baby / I think idea / I watch a movie / I take a taxi / I don't know gift / I have a baby / I drink coffee with milk / I'm a woman / I go to the party / My arm is long / Of course! / This guy is beautiful / I listen to rock'n'roll / I don't know spoon / My money have in the bank / My niver is the date / I have a dog / My pen is blue / My car is black / Disk I .... / I'm a girl / The street in front of my house / I drink beer
*Quando as palavras são bem conhecidas fica mais fácil.

5) I don't know boss / I know island / I like tea / The mouth is October / Baby is beautiful/ Boss I don't know / Taxi is expensive / Woman is beautiful / Milk is good / I don't arm / I don't know course / Guy is beautiful / I don't know cow / I don't know fire / Open the door / I don't know toy / The book on the table / Bank is expensive / Spoon I don't know / I love date / My car is beautiful / I love dog / I love disk / I am a girl / I love club / I don't know beer /
* Quando as palavras são bem conhecidas fica mais fácil

6) I don't know what is boss / I work in an island / I drink chá / I have two kinder / I go to movies / I like space / I go work with taxi / I take gift to my house / I drink milk / I go to party / I'm arm / I course English / I don't take train / I don't take court / I have sky / In my house is fire / The door is green / Oil is bad / Barco the boat is danger / I read book / The art is beautiful / I don't say spoon / The bank is old / Yesterday the date is 10 / The bar is new / Sky is old / The car is old/ The dog is mine / The pen is blue / Bird is red / The bath is cold / The beer is good /

7) The island is beautiful / The boss is big / The beer is ice/ Sport is great / Mouth is big / Space is great / The baby's nice / The movie is art / The taxi is fast / Gift is ugly / Woman is beautiful / Fish is fast / I have party / Window is life / The arm is fire / Course is great / The train is long / The guy is big / Cow is big / Fire is hot / Snow is ice / The door is open / The boat is great / Oil is life / The book's on the table / The coat is green / Spoon is cool / Bank is big / Sky is great / Car is fast / Dog is big / Pen is blue / Disk is hard / Bird is fly / The club.... / Pair is true / Beer I like /
*Revisou as palavras mentalmente antes de iniciar as frases

8) I have a boss / I stay an island / I drink tea / I have mouth / I get a taxi / I eat fish / I drink milk / I see window / I have arm / I don't know course / I see a guy / I don't know train / I see mountain / I see cow / I fire fight / I like snow / I stay near door / I read book / I don't know spoon / I stay at bank / I don't know gas / I have a car / I don't like dog / I have a bird / I see a girl /

9) Island is good / Boss I don't know / Mouth September / Sport I like / Space is big / Movie I love you / Baby I have / Woman is pretty / Milk drink / Lunch delicious / Summer night? No, I don't know / She's course / I don't know train / I don't know guy / I don't know key / I don't know shoe / Door open / Toy I don't know / Read book / Box is sport / Coat I don't know / I have a bank / Scarlet car / Gas is car / Dog is beautiful / Disk I don't know / I visit that club / The girl is pretty / Street is crowded / Bed I don't know /

10) My boss is ugly / I am in island / I don't like tea / I don't have baby / I never have a taxi / I ate fish yesterday / I don't like milk / I don't have arm / My boss is nice guy / Fire is hot / Today is snow / I am near the door / I like art / I don't know spoon / I'm going to bank / The sky is beautiful / I have a car / My pen is blue / I see a bird / I don't like beer
*Tentou gravar as palavras mais fáceis e ignorar as que não lembrava. A primeira era mais fácil lembrar mas quando começava a fazer frases esquecia das outras.

11) I live in an island / My big boss is Manuel / I don't practice sport / I love movie / I don't have space in my house / I love to eat fish / I have a problem / I don't go party / My arm is I don't know / I don't know train / My shoe is yellow / I go to boat show is São Paulo / I love dance rock / I don't know bank / I love see sky / I don't go a club / My dog is bad / I don't love beer /

12) My boss is ugly / I like the island / I drink tea / I like the baby / I picture the movie / I eat fish / I'm a woman / I drink milk / I open the window / I don't know course / I don't know arm / I don't remember guy and train / Fire wall / Oil is bad / I sing rock / The book is mine / I don't know spoon / I go to the bank / I don't know sky / Today is a date / I drive car / I like my dog / I'm a girl / I go to the club / I see a bird / I don't drink beer
*Tentava fazer frases mentalmente ao ver as palavras mas viu que essa estratégia náo funciona porque perdia as outras

13) I have a boss / I don't know island / I like tea / I don't know mouth / I like team / I don't idea / I like movie / I like team / I like fish / I like woman / I have a problem / I like party / I don't know lunch / I like milk / I don't have money / I work with arm / I don't know guy / I travel with train / I have a point / I lost my key / I have a fire / I don't know cow / I have a door / I have a toy / I like to see a window / I have a book / Coat I don't know / I don't know spoon / I have a bank / I have sky / I have a date / I don't know the words car dog shoes I lost / I know a girl / I go to a club / I have a god ah esse foi no outro / I don't know a pair / I go to a street / I have a bed / I receive mail /
*repetia as palavras enquanto apareciam, tentou imaginar as mais fáceis e começar pelas que não sabia e não pelas últimas

14) I don't love my boss / I live in the island / I love tea / I don't have a baby / I don't idea / I have a problem / I love party / I don't know arm / I don't the meaning of course / I have a shoe / I don't have a book / I don't know spoon / I went to the bank / I don't know what date is today / I don't have a car / I want a bath / I'm a girl / I love walk in the street / I love beer /
*começou pelas que sabia e tentou fazer frases mentalmente enquanto as palavras apareciam na tela mas acha que isso não funcionou pois esquecia das outras

15) I don't boss / I don't tea / I have a mouth / I have a baby / I don't like idea / There's a space / I eat fish / I don't have money / I have a problem / Open the windows / I'm a guy / I mark a point / I walk a train / Take a fire / I eat a cow / I'm the maninthebox / I read the book / I don't spoke spoon / I go a bank / I don't remember date / My car is gas / I have a car / I don't have a dog / I lose my pen / I lose my disk /

16) I like my boss / I have seen island / I like tea / I play sports / I don´t have baby / I don´t have idea about / I see a movie / I get the taxi / I fish in the fish / I like the milk / I have a lunch / I open the window / I have the money / It´s not a problem / Sick in my arm / Where´s the guy / It is the point / Where´s the train / Where´s the cow ? / It´s a fire / Where´s my shoe? / Where´s the key? / Snow…. Where´s my snow? / Open the door / Have the boat / Where´s the toy? / It´s beautiful art / Floor… / Where´s the book ? / Where´s the spoon? / Where´s the bank ? / The date is agree / The beautiful sky / Where´s my car? / Where´s the dog?/ Where´s the pen? / Where´s the disk ?/ Beautiful bird / A pretty girl / I am in the club / The city is crowded / The bad man / Invite mail / Pair work
* foi falando quando as palavras apareciam, não esperou o ponto ???

17) The boss is beautiful / The island is green / Tea is good / I don't understand mouth / The idea is good / The movie is funny / The taxi is yellow / The fish in on the ocean / The milk is cold / The ocean is cold / The arm is danger / The guy is good / I didn't understand train / The fire is hot / The oil is blue / The flower is yellow / The door is big / I don't understand spoon / The bank is big / The date is today / The gas is blue / The car is big / The pen is blue / The girl is beautiful / The seat is big / The street is large / The bay is big /
*Tentou gravar apenas duas ou três para fazer frases, a partir da Segunda bateria mas apenas tentou gravar as palavras que sabia.

18) My boss is very good / This island is beautiful / This tea is delicious / I don't know mouth / I don't remember boss / This movie is the best / This tea is delicious / This woman is wonderful / This fish is delicious / I go to the party / I need the money / I like to drink milk in the morning / I go to the party next week / I like this course / This guy is beautiful / I don't remember point / This train is very good / Where's the key? / This toy is very beautiful / Close the door / I like to go in the boat / I don't remember oil / The book is on the table / Floor is clean / The bank is close / The spoon is big / I don't remember date / The sky is beautiful / Car is big / The dog is danger / The pen is on the table / The bird is in the sky / I like to go at the club / Now I take to bath / The street is large / I don't know pair / I like to drink beer /
*tentou formar imagens mentais, quando começava pela última esquecia das outras

19) The island is beautiful / My boss is boring / My favorite sport is volley / I don´t like tea / The space is big / The fish is good / I´m a woman / I like milk / I have lunch everyday / I don´t have money / I like party / I don´t know course / I have arm / This point .. / I lost my key / I have a toy / The book is beautiful / I don´t remember snow / I have a book / I like art / I have money in the bank / Sky is beautiful / I have a car / I have a dog / This pen is here / The bird is fly / The girl is beautiful / The street is noisy / My mind terrible / My bed comfortable /
* tentou lembrar das primeiras, quando começava pela útlima esquecia mais

20) The boss is ugly / I have a black tea / My mouth is stinking / The baby is nice / I have an idea / The taxi is coming / I have a gift / Fish is swimming / The milk is white / My arm is long / The guy is OK / The big cow / The fire is burning / não dá pra concentrar no erro / The snow is cold / The door is open / Art is interesting / The floor is ugly / The bank is great / I don't know spoon / I have a date / The sky is beautiful / I have my car / The dog is thin / The girl is pretty fun / The street is dangerous / Beer is so good /
*tentou gravar as 2 primeiras pois as ultimas ficavam mais recentes na cabeça

21) The island is big / I like tea / The sport is… / I like movie / I don´t know space / The woman is fat / I don´t know problem / I love milk / I don´t know course / I don´t like arm / Guy is big / I like toy / The shoe is small / I love book / The sky is blue / Girl is beautiful / The club is nice / I don´t know beer / The street is long

22) The island is big / The boss is dangerous / I like sport / The tea is ice / The mouth is big / I love baby / Space is big / He give me a gift / The taxi is dangerous / I go to the party / I have a problem / The milk is ice / I don´t know course / I don´t have arm / The train is dangerous / The guy is beautiful / The cow is big / The fire is dangerous / I love toy / The window is open / The boat is dangerous / I love rock / I have a I don´t know coat / I don´t know spoon / The bank is open / The sky is blue / I don´t know date / I have the car / I love dog / I have a pen / The disk is open / I go to the club / My bath is good / I drink a beer / I go to the bed /

23) I like a boss / I go to island / I love a tea / I don´t have a baby / I like movie / I go to the taxi / I don´t have woman / I don´t have money / I go to the party / I don´t have arm / I don´t know course / I see the guy / I don´t know shoe / I don´t like oil / I close to the door / I like rock / The book is on the table / Going to bank / I like sky

/ I have a car / I have a dog / I have a pen / I go to the club / I am a girl / I have a mail /

24) I have a boss/ My name's island / I don't know tea / I have a sport / I go a baby / I have a movie / I have a clock / I don't know man / I have a problem / I have a arm / I make a course / I have a guy / My cow is yellow / I don't know snow / I have a dog / I like arts / I like spoon / I don't know bank / I have a date / My car is yellow / I am a girl / I don't know street / I go a club

25) My boss is a nice guy / I live in a island / I like tea / My mouth is big / I have a baby / It's a good idea / Last night I went to the movie / I have a gift for you / I'm a woman / I like fish / I have no money / My window is white / My arm is big / Nice guy/ Point is black / Train is fast / The cow is black / The fire is hot / Snow is cold / The boat is in the sea / I read a book / My spoon is white / My bank is near of here / I have a date / My car is gas / My car is black / I have a dog / My pen is blue / I like birds / I have a seat / I love street / I like beer /
* tentou fazer frases enquanto via as palavras

26) I'm a boss / I go island / I drink a tea / The mouth is October / I don't remember the word / I have a baby / The word is big / I have a woman / I fish / I wear a dress / I have a problem / I go a party / The window is closed / I have a lunch / I drink milk / I have a arm / My son is a guy / The cow is black / The door is closed / The toy is in a car / I have a boat / I have a book / The door is open / I go a bank / I don't say spoon / The date after now is / I have a dog / I have a car / I have a pen / I go a club / I have a beer / I don't a pair

27) I'm not a boss / I live in a island / I like to drink tea / This mouth is October / The space is blue / I have three babies / I have a good idea / My woman is a teacher / I like fish / I went to a party yesterday / I have no money / I get a problem / My arm is long / The boy is a guy / My key is on the table / The cow is black / The child has a toy / The book is on the table / I love rock / I have blue coat / This spoon is on the table / The bank is opened / The sky is blue / The date today is October 17 / I have 3 dogs / My car is black / In UFSC there is no club / I have a bath today / I like beer / My pair is a woman / The mail is empty

28) I live on island / I don't know boss / I like pizza very much / Have a good idea / I watched movie last night / I have a fish / I go to the party / I have a money / I don't have a problem / Course of the river is very .... / I 'm a guy / I have a key / Be a cow / Open the door / I have a toy / The book's on the table / I have a coat / I gone to the bank / The sky..... forgot / I have a car / I have a dog / I have a disk / I have a pencil / I go to the club / I have a girl / I take a bath / I walk in the street / I drink the beer /

29) I don't know boss / I live island / I drink a tea / The mouth October / I go to movie / I go to space / A good idea / I drive a taxi / A beautiful woman / I don't know gift / I have a problem / I course of UFSC / What's point? / The cow is beautiful / I have a key / I have a toy / I drink the oil / I write a book / I don't know coat / I don't know spoon / I go to the bank / I bought gas / I drive a car / I have a dog / I have a disk / I go to the club / I have a....

30) I know boss / UFSC stay in the island / I like tea / I hate baby / I have idea / I like movie / I take a taxi / I like fish / I need to lunch / I don't know arm / Of course ! / I am a guy / I have to take the train / I have a shoe / I have a key / I have an old cow / I like snowboard / I like rock / I have a box / I don't know spoon / I have to go to bank / I like the sky / I date of today / I have to a car / I have to a pen / I have to a dog / I have to a disk / Go a club / I walk in the streets / I go to the bed /

31) I hate my boss, I go out island yesterday, I like sport , I love tea, I like baby, I love action movie, I like fish, I go out party at night, I sitting next to window, don´t remember course, I like by train, don´t remember cow, I love tennis shoes, I hate oil, I love floor, I go to bank, I don´t remember sky, I like pen, I like go out club, I send mail, I don´t know mind,

32) I don´t know the meaning of boss, I live in an island, I like herbal tea, I play sport, I don´t have baby, I like go to cinema, I don´t know idea, I take a taxi, I don´t like milk, I don´t have money, The woman is beautiful, I don´t like arm, of course my horse, I like the guy, I don´t know cow, I lost my key, I don´t know shoe, I have oil in my hair, foi barco na outra né, I don´t know the meaning of snow, I went to bank yesterday, the date is 17 today, sky is the TV in my house, I drive my car, I have a dog, I have one pen, My room have the door, pink, I´m have sleep, I don´t have girl, I live in the street, I like beer drink

33) Estratégia – tenta fazer associações mentais enquanto as palavras estão aparecendo na tela, quando aparece uma palavra que ele não sabe em inglês quebra a estória, ele imaginou no trial o cachorro dentro do carro, pegando o disco e ele escutando música.

I don´t know boss, I live in island, I don´t know team, I don´t baby, I don´t know tea, idea e I like to visit the space, I by taxi, is 7 oclock, I look for a woman, I wait a fish, I drink milk, I´m looking for more party, I`m looking for window, I have no money, I don´t know arm, I don´t know am, have a course, My father has a cow, today is fire, I don´t know oil, this is a box, I don´t like floor, I like music, I don´t know spoon, I have a bank last week, word one is date, I have car, I have a dog, the dog is a pen, I listen music, I look a girl, I kiss a girl, but the girl is a terceira palavra, I live in the Street Douglas Seabra, I sleep in my bed,

34) Estuda arquitetura, parecia tenso e não iniciava as frases imediatamente, estava tentando gravar as palavras primeiro.
My boss is born / I live in this island / I love tea / I have taxi / Milk is white / The window is blue / I have arm / I don't know course / The guy are crazy / The train is green / The cow is .... the color of the cow is brown / Fire is orange / My shoe is blue / I don't know snow / The boat is broke / Art is beautiful / The book's in the table / The band is near the dog / is near the bank / This date is my... this date is important / The sky is blue / Car is red / My dog is... / I'm talking with a girl / The bird is green / The street is my street /

35) I live in an island / I like to drink tea / My favorite sport is volleyball / The baby is in the room / My favorite movie is Pearl Harbour / The fish is blue / The clock is in the wall / I drink milk / I like money / My arm is straight / The guy is gorgeous / The cow is a animal / The snow is white / Oils is a black / The book is on the table / The bank is open / My first date went in Florianopolis / The gas are polluted / The car is red / The bird is in the sky / The girl are beautiful / The street are straight and long / The mail....
*Tentou fazer frases a medida que as palavras apareciam, antes do ponto de interrrogação

36) I don't know boss / I like island / I drink tea / I have baby / I have idea / I drink milk/ I like lunch / I have money / I am problem / I have arm / I like course / I don't know guy / I have point / Go to train / I have cow / I like fire / I don't know snow / The book's on the table / I don't know spoon / I go to the bank / I like date / I like car / I have pen / I have disk / I like bird / Go to the street /

37) I don't know boss / I love island / I drink coffee / I love my baby / I see movie in the ?? / I go taxi / I like... / I don't know Murphy / I don't know movie / I train beautiful / My side are is your / I don't know toy / I go bank / I like date my niver / I love sky / I go car / I have pen / My bird is dead / I street car /

38) My boss is boring / I live on island / I drink tea / I hurt my mouth / I have a baby / I have idea / I watch the movie / I have a taxi / I don't like eating fish / I drink a milk / I don't have money / It's a big problem / I don't remember arm / I don't know what's the meaning of.... esqueci a palavra / The guy is cool / I is next to the point / Have a cow / I lost my key / I don't have fire / I never see / I open the door / I lost my book / I have a boat / I go to bank / I don't know what's the meaning of spoon / The sky is... / I don't know date / I have car / I have a pen / I have a disk / I have a dog / I'm a girl / I'm a bad girl / I drink a beer /

39) The boss is bad / The island is great / I like tea / I like sport / The mouth is right / The baby are scream / The movie is great / The taxi is yellow / The fish is good to eat / The milk is white / The lunch is at 20 oclock / The arm is bad / I like course / The guy is tall / The fire is red / The key is stay on my wallet / Snow are white / The boom is terrible / The book is on the table / The arm is terrible / the cow is terrible too / the spoon is on the table / The bank stay on Mauro Ramos / The date is great / The skin are black / The car is yellow / The dog are hungry / The pen is black / The things talk / The bird sings / The club are crowded / The streets are black / The mirror stay in front of /
*pensou em frases enquanto via as palavras, associando-as

40) My boss is ugly / I live in island / I drink a tea / I don't have baby / I see a movie / I had a good idea / I have a taxi / I have a gift for my girlfriend / The woman in Floripa is beautiful / I drink milk / I have a lunch / I go in the party this week / I don't arm / I couse, my course is sistema de informação / I'm gay, guy / I don't know point / I don't know cow / In my farm there is a cow / I don't know snow / I don't have toy / I don't know boat / Art is alguma coisa / The book's on the table / I don't know spoon / I work in the bank / To date yesterday / My woman is gas / My

car is blue / My pen I have almost pen / I birth in the cinco de abril / The fest in the club / That girl is beautiful / That street is trash / The beer is in the mountain /

41) My boss is boring / The Arvoredo island is beautiful / I go to the grocery store to buy a box of tea / I don't have a baby / It's a good idea / I go to see the movie/ I go to my house with taxi / The woman is very tall / I have lunch/ The house wave the window / I don't like milk / I don't remember / I have arm / You is a guy young / The train is fast / I don't understand tool / I use tennis shoe / My key is silk / I don't understand snow / The car with oil/ The boat is very passenger não passeio / The book's on the table / Art is... / I don't understand spoon / My bank is BB Banco do Brasil / The date of my birthday is in September / The gas is utility with car.../ The car is beautiful / The pen is blue / The bird is yellow / The seat I don't know / The gift I don't remember / Sky lightning white / My street is noisy / I have a mail account /

42) I don't know boss / Island is very beautiful / I like tea / This mouth is October / Space is very beautiful / The taxi is yellow / Woman is very interesting / I like fish / I don't money / The window is ... open the window / I don't understand arm and course / The guy is playing football / The train is very fast / Cow is eating / I don't understand snow / The oil is black / I don't understand art / The book's open / I don't understand snow / The bank open at 10 o'clock / The date my birthday... no my father's no... my date my father's... no my father's birthday is February 15 / My car is black / The dog is dangerous / The disk is on the chair / The bird is yellow / The girl is very pretty / My street is very safe / I love my bed / I like beer / My mail

43) I don't know boss / Floripa island is beautiful / I don't tea / I don't baby / I lunch Friday / I like look space / I take taxi / I don't know gift/ I love milk / I lunch lunch everyday / I window every day my home / I don't much problem / I don't know arm course / My class much guys / Floripa three points no.. I don't know point / I don't know cow / I don't know fire / I don't know shoe / I don't know oil / I make art cenica / I don't know spoon / Florianopolis there are banks / My birth date is 26 June e esqueci das outras / I have much pen / The dog is big / Street crowded / Treat bad boys / I have mail yahoo /

44) I don't know boss / I live in island / I drink tea / I don't know boss / I love babies / I have idea / I take a taxi / I love milk / I go a party / I love lunch / I have a cold in the window / I don't know course / The train is old / I don't know snow / I don't know toy too / The cow in boat / I don't know spoon / I go a bank / The blue sky / I don't know car / I love dog / Girl... I love bird / Bird / I don't know bed /

45) The island is big / The boss is beautiful / This sport is nice / The tea is hot / My baby is beautiful / I am a woman / The taxi is small / I have very problems / The milk is hot / The course is big / Train is large / Fire is hot / I have very toy / I try boat / I have very books / I went to bank / I don't know spoon / The sky is blue / I don't know gas / I don't have car / I love my dog / My pen is blue / I am young girl / I like to go club / My street is long / I love see the email

46) I don´t know boss / I live island / I play sport / I play sport in the mouth / I don´t have baby / Beautiful woman is my mother / I go to school in taxi / I drink milk / I´m course… I don´t know arm / I´m course English / My brother is very pretty guy

/ I don´t have my key / My book is in fire / I open the door / I´m I don´t have oil / My book is very big / I like rock / I don´t know spoon / Tomorrow I will go at the bank / Sky is blue / I don´t know gas / I don´t have car / My dog is very good / Bird is beautiful / I love the girl / I like beer / I go in street

47) I have a boss / I live in island / I like tea / I go to Paraguay in next month / I like baby / I go to movie / I like taxi / I love woman / I like fish / I like milk / I have a lunch / Close the window / I have a money / I´m go to party / I like arm / I don´t know course / I know point / I like train / I like cow / Don´t know fire / I like shoe / I have a ring / I like oil / I don´t know boat / I have a toy / Open the door / Errei / I like arts / I have box / Go to bank / Like a gas / Sky is window is blue / Love a car / I have a pen / I like disk / I like a bird / I love a girl / Go to club / Go to street / I like bed / My mind is very well / I like beer /
* Usou associação enquanto as palavras apareciam, quando aparecia uma palavra que não sabia travava e errava a seqüência

48) I live island / I have boss / I love tea / I don´t know sports / I love baby / I love movie / I´m woman / I don´t like fish / I love party / I don´t have money / I don´t know key / I don´t know cow / I don´t like toy / I love rock / I don´t have much book / I don´t know spoon / I love sky / I don´t pen, my pen / I have girl, no I´m a girl / I´m go to my house / I don´t like beer /

Appendix M– L1 SST Transcriptions

1) Minha casa tem um telhado / Eu ouvi uma boa notícia / Eu gosto de assistir futebol / Eu adoro comer abóbora / Na cidade tem muitas carroças / Eu li um decreto de lei / Eu gosto de ir no estádio / O banheiro é de azulejo / Eu leio notícia / Meu cérebro funciona / Eu jogo o lixo na lixeira / O trem sai da estação / Eu adoro perfume / Eu calço o chinelo / Eu vejo televisão / Eu leio revista / Eu tenho uma boa memória / Eu mando carta pelo correio / A estrela azul é bonita / O chefe suborno.... / A mochila é cor de rosa / Ele foi exilado / Eu gosto de leitura / Eu faço natação / A gráfica é de livros / Eu visitei um viveiro / Eu uso avental / Eu vejo a hora no relógio / Eu adoro a cozinha / A caixa é de papelão / Eu durmo no beliche / Eu tenho um armário no quarto / Eu vi um palhaço no circo / Eu trabalho em casa / O tempo está nublado / Eu comi uma laranja / Eu tomei remédio hoje / Estou sentada na cadeira / Estou indo na direção certa / A lâmpada está acesa / A pessoa tem grande bondade / Meu caderno está escrito / Eu escrevo de caneta / Eu adoro ir ao teatro.. teatral... / Adoro tomar cerveja / Na grama tinha um besouro / Eu gosto de escrever redação / Meu quarto tem uma cortina / A orquestra tinha um maestro / Eu vi um pássaro no céu /

*Gravou as palavras concretas com mais facilidade do que as palavras abstratas

2) O telhado está molhado / As notícias não são boas / O futebol brasileiro é bom / A abóbora é um legume que eu gosto de comer / O cimento é usado na construção / A carroça ainda é um meio de transporte de muita gente / Decreto é algo que ajuda e atrapalha, depende / Polícia existe a civil e a militar / A amizade é algo que a gente conquista / Felicidade é algo que tá... / A estação existe a estação de trem e de ônibus / Chinelo havianas eu adoro usar / A gente está fazendo um teste de memória / O correio estava em greve até 2003 / Mochila suborno / Suborno é algo que a própria palavra já diz que é ilegal / Exilado é algo que eu não desejo a ninguém / Leitura é algo bom / Existe a gráfica Grafotel que fica em Seara / O telhado da casa está molhado / O palhaço é algo que diverte as pessoas / O viveiro é onde os passarinhos vivem / Cozinha é o lugar onde a gente cozinha / Assalto é algo que ninguém gosta de sofrer / O dia hoje tá nublado / Eu adoro suco de laranja / Remédio é algo que as pessoas tomam sem prescrição médica / Cadeira é onde eu estou sentada / Pássaro voa / Direção da minha empresa é o Roberto / Caderno é onde a gente escreve / Lâmpada tá ali / Teatral não sei uma frase com teatral / Besouro é um animal / Direção... perigosa / Maestro é quem rege a orquestra / Estrada é onde a gente dirige /

*Tentou gravar as primeiras, concreto mais fácil do que abstrato

3) Minha casa tem telhado / A notícia é ruim / Eu gosto de abóbora / O cavalo puxa a carroça / O hotel tem hóspede / Minha casa tem azulejo / è feita de cimento / Eu leio revista / Eu fiz o teste de memória / Coloquei uma carta no correio / O céu tem estrela / Não aceito suborno / Eu uso mochila / Eu faço natação / Meu livro está no armário / Os pássaros estão no viveiro / Minha casa tem cozinha / O céu está nublado / Minha blusa é laranja / Eu tomo remédio / Eu estou sentada na cadeira / O pássaro está voando / Eu escrevo no caderno / A lâmpada está acesa / O peixe está no aquário / Eu tomo cerveja / Ele prestou suporte à empresa /

4) Eu subi no telhado / A notícia não foi boa / Eu joguei futebol ontem / Eu comi abóbora hoje / O cavalo puxa a carroça / O decreto não foi bom para o povo / Meu hóspede vai chegar amanhã / O azulejo é azul / A polícia prendeu os bandidos / Meu chinelo é branco / Eu li a revista toda / Eu fiz um canja de galinha ontem / Minha memória é boa / Eu vou receber notícias pelo correio / A estrela é azul / O suborno não é legal / Minha mochila tá pesada / Meu pai está exilado / Minha leitura foi boa / Vou fazer natação hoje a tarde / A gráfica produz livros / Meu avental está sujo / O relógio está dando as horas / Eu adoro a minha cozinha / Vou dormir no meu beliche esta noite / O céu está nublado / A laranja é doce / Não tomei meu remédio hoje / A cadeira é macia / A direção está pesada / Vou escrever no meu caderno uma nota / O planeta terra é redondo / Minha encenação teatral vai ser na 5a feira / O besouro é um bichinho muito bonitinho / Vou fazer minha redação sobre uma maçã
* A palavra concreta é mais fácil pois a frase é mais curta

5) Todas as casas tem telhado / As notícias de hoje não são boas / Futebol é o esporte nacional / A abóbora é um alimento ricom em vitaminas / O cimento é muito utilizadona construção civil / A carroça é um meio de transporte que não se usa mais / Os hóspedes geralmente ficam nos hotéis / A amizade une as pessoas / O azulejo desta sala é azul / O tesouro está escondido / A galinha botou ovos / O vestido da menina é azul / Minha memória não está muito boa / O correio eletronico é muito utilizado na internet / Suborno é o mal do Brasil / A mochila está muito carregada / A leitura é boa para a memória / A natação é um ótimo exercício / O país, o Brasil, já teve muitos exilados / O relógio está atrasado / O palhaço trabalha no circo / O avental é usado pela cozinheira / O inverno foi muito rigoroso este ano / O assalto está se tornando corriqueiro / O beliche é muito alto / O dia hoje está nublado / A laranja está na mesa / O preço do remédio está muito caro / A cadeira está confortável / A bondade é uma virtude / A lampada está apagada / O aquário tem peixes / A cerveja está gelada / A mesa é presa pelo suporte / A parede é de madeira
*Não usou nada

6) Meu telhado tá quebrado / As notícias não são boas / O futebol do Brasil é bom / Eu não gosto de abóbora / O decreto estava errado / A polícia é importante / A amizade é verdadeira / O azulejo estava quebrado / A galinha estava agitada / Minha memória não é muito boa / Esqueci de enviar a carta pelo correio / A estrela estava brilhante / O operário sofreu suborno / Minha mochila estava furada / O presidente foi exilado / Esqueci de fazer natação / O palhaço é engraçado / Meu avental estava sujo / A cozinha estava suja / O inverno é muito frio / Hoje tava nublado / Minha caneta é laranja / O remédio é ruim / O pássaro é bonito / A cadeira tava quebrada / Fui na direção errada / Meu caderno tava rasgado / Há muita bondade no mundo / O planeta tá doente / Sou do signo de aquário / Não gosto de besouro / O maestro toca muito bem / Não tenho tesouro /

*Tentou associar

7) O telhado está sujo / A notícia veio em boa hora / Eu gosto de futebol / Eu comi abóbora / Eu vi uma carroça / O decreto está dado / O hóspede chegou / Meu azulejo está sujo / A polícia chegou / Eu vi uma lixeira / Eu peguei o trem na estação / A galinha cantou / Minha memória está fraca / Eu fui para o correio / Eu vi estrelas / O

menino subornou o outro / Eu faço natação / Meu armário tá bagunçado / Fui na gráfica / Visitei um viveiro / O palhaço me fez rir / Comi na cozinha / Sofri um assalto / Perdi minha mochila / O dia está nublado / Tomei um suco de laranja / Tomei remédio / Sentei na cadeira e / Vi uma pássaro / Fui na direção / Comprei um caderno / Troquei a lâmpada / Não tenho bondade / Vi o planeta / Comprei um aquário / Não gosto de besouro / Comprei uma cortina /

*Associou enquanto via as palavras, no inglês não conseguiu pois traduziu

8) Eu subi no telhado / Eu assisti a notícia / Eu gosto de futebol / Eu gosto de abóbora / Eu mexi com cimento / Eu vou de carroça / Eu fiz um decreto / Eu fui hóspede de alguém / Eu assentei o azulejo / Eu vi a polícia / Eu tenho amizade / Estamos na estação de inverno / Eu usei chinelo / Eu tesouro... não sei... encontrei um tesouro / Eu olhei a revista / Eu tenho boa memória / Eu fui ao correio / Eu vi a estrela do céu / Eu tinha um suborno / Eu tenho mochila / Eu fui exilado / Eu tenho uma gráfica / Eu vi uma mulher de avental / Eu saí da cozinha / Hoje está nublado / Comi uma laranja / Eu tomei remédio hoje / Hoje eu vi um pássaro / Eu sentei na cadeira / Eu tenho boa direção / Eu abri o caderno / Eu moro no planeta terra / Eu fiz bordado / Eu tenho um aquário / Eu mexi no besouro / Ascendi uma lâmpada

9) O telhado é da casa / A mesa é bonita / Olhei o jogo de futebol / Eu comi uma abóbora / Eu não gosto de cebola / A carroça tem 4 rodas / O decreto é de lei / O hóspede é da minha casa / O azulejo da casa é branca / Eu tenho um amigo da polícia / Tenho uma grande amizade por ele / (è o lixo ou a lixeira? Eu associei e agora não lembro...) O lixo está na lixeira / È um decreto de lei / A estação é de trem / A casa é feita de cimento / Eu tenho um tesouro / O tesouro tem moedas / Eu estou fazendo um teste de memória / Meu correio está lotado / A estrela está no céu / A polícia aceita suborno / Eu tenho uma mochila / O exilado está na ilha / Eu fiz uma leitura hoje / Eu tenho um armário / Eu tenho um viveiro de cachorros / Minha mãe usa avental / A parede é feita de concreto / Eu não quero ir para o inferno / Eu tenho dinheiro / A galinha era do último bloco / O tempo tá nublado / Eu gosto de laranja / Eu tomo remédio / Eu tô sentado na cadeira / O pássaro voa / Eu subo na direção / Eu tenho um caderno / Eu liguei a lâmpada / Eu tenho bondade no coração / Eu vivo no planeta terra / Eu tenho um aquário / Eu não bebo cerveja / (tinha uma palavra estranha... arial...) não lembro o que é arial / Não gosto de besouro / Eu dou suporte técnico / Eu faço esporte /
*No de inglês tentou falar em qualquer ordem e no L1 forçou mais a ordem

10) O telhado estragou / A última notícia do jornal / Eu gosto muito de comer abóbora / Cimento, eu utilizei muitos sacos para a construção da minha casa / Futebol... eu não gosto de futebol / Eu recebo muitos hóspedes no verão / Estádio, eu fui uma vez só em cada estádio / Lixeira, nesse novo projeto estou tendo muito problemas com as lixeiras / Amizade, é a coisa mais importante da maturidade / Azulejos, eu pretendo reformar o meu banheiro do apartamento / Eu não gosto de comer galinha / Revista, eu adoro ler revistas / Tesouro, todo mundo quer encontrar um / Eu tenho problemas de memória / Correio é uma coisa... é um veículo muito importante / Mochila serve para viagens / Preciso arrumar meu armário / Natação é um esporte que eu gostaria de continuar / Mochila serve para pequenas viagens / Eu não saio sem o meu relógio / Eu uso avental para trabalhar na cozinha / Gráfica, eu preciso fazer uma encomenda de mais blocos de notas na gráfica / Chinelo, eu ando

sempre em casa com chinelos / Onde eu nasci o inverno é bastante rígido / Eu costumo economizar papel / Laranja é minha fruta preferida / O céu hoje está nublado / Os pássaros são lindos / Não posso esquecer de tomar meu remédio / Bondade é uma qualidade que a gente busca em todas as pessoas / Eu não gosto de tomar cerveja / Aquário é olhar um aquário nos dá a sensação de higiene mental / Acho muito bonita a profissão de maestro / Preciso trocar as cortinas /

11) O telhado é grande / A notícia é curta / O futebol é legal / A abóbora é amarela / A carroça é levada pelos bois / O decreto saiu ontem / O hóspede é muito chato / O azulejo é colorido / A polícia prende os ladrões / A estação é longe / O chinelo é amarelo / Minha memória é curta / O correio é longe / A estrela tá no céu / O deputado aceitou o suborno / O cantor foi exilado / A leitura faz bem para o intelecto / A gráfica é de meu pai / O viveiro tem galinhas / O dia tá nublado / O suco é de laranja / O remédio é para dor de cabeça / O pássaro tem asas / A direção está com problema / A lâmpada tá apagada / O planeta é terra / O borbado é feito de bilro / O besouro morde / A cortina é de seda /

12) Tem um gato no telhado / Uma notícia nova / Tem futebol hoje / A abóbora nem sei o que é / Faltou cimento para a construção / A carroça é lenta / Houve um decreto / O azulejo é azul / A polícia prende o bandido / Estação de trem / A revista é nova / A galinha morreu / O tesouro é valioso / Memória tá fraca / Correio abre as 8 / Um estrela no céu / Eu dei suborno para o policial / O chinelo (mochila?) é azul / O político foi exilado / Fiz uma boa leitura / Natação é um esporte saudável / A gráfica é do meu pai / Onde tá o cinzeiro? / A cozinha é apertada / Onde tá o isqueiro? / O tempo tá nublado / Quero comer uma laranja / Vou tomar o remédio / Vou sentar na cadeira / O pássaro está voando / Qual direção que eu vou? / O caderno é azul / Eu tenho bondade / Quero tomar cerveja / Escrevo uma redação / Estrada tem muitas curvas /
*tentou fazer frases mais curtas mas não conseguiu

13) O telhado caiu / A notícia era boa / O futebol foi ontem / A abóbora era gostosa / A carroça é deste cavalo / O estádio era grande / O hóspede era bom / A lixeira era grande / O polícia era legal / O cimento era duro / A estação era quente / A galinha era ensopada / A revista é boa / O decreto é de hoje / A memória é legal / O correio é eficiente / O suborno é do homem / A mochila é minha / A estação é verão / O exilado foi o homem / O armário foi bem grande / A gráfica é minha / O avental é rosa / O viveiro tem passarinho / Cozinha é grande / O inverno é frio / O boliche é legal / Hoje tá nublado / A laranja tá gostosa / O remédio é ruim / A cadeira é legal / O pássaro é bonito / A direção é do automóvel / O caderno é meu / A bondade é legal / Aquário é do peixe / Cerveja é gelada / Cozinha é grande / O besouro é pequeno / A estrada é longa / O telhado é de.... o telhado é laranja /

14) O telhado é preto / A notícia é legal / O futebol é melhor que a notícia / A abóbora é amarela / O cimento é cinza / A carroça tem roda / O hóspede é branco / A polícia é preta / A lixeira é roxa / São 4 estações / O chinelo a gente usa no pé / A memória é difícil / O correio vem para casa / A estrela tá no céu / O suborno é fácil / A mochila usa nas costas/ Exilado da capela / Literatura é uma forma de livro / O armário tá em casa / A gráfica é preta / O viveiro tem passarinho / O avental a gente

usa na frente / O relógio no pulso / O céu é nublado / A laranja é de comer / O remédio é ruim / A cadeira é pra sentar / Pássaro é melhor que remédio / A direção é para a direita / A lâmpada a gente acende / O caderno é para escrever / O bonde a gente toma / O bordado é a mulher que faz / Teatral... / Minha abóbora é escura / A cerveja vai bem no verão/ O besouro é um bicho pequeno / O maestro rege a orquestra / O tesouro seria bom eu achar / A estrada nós vamos para a frente /

15) Eu subi no telhado / Eu vi a notícia / Eu não gosto de abóbora / Não gosto de futebol / Não sei mexer no cimento / Eu não decretei nada / Eu não andei de carroça / Eu nunca fui no estádio / E eu acho que a última é hipótese / Minha casa tinha azulejo / Eu corri da polícia / Eu tenho um cérebro / Eu não vi as duas últimas / Eu comi galinha / Fui na estação / Eu achei um tesouro / Minha memória é ruim / Eu fui no correio / Eu vi uma estrela / Eu nunca subornei / Eu tenho uma mochila / Nunca fui exilado / Tenho um armário / Gosto de leitura / Eu uso relógio / Eu uso avental / Eu não tenho viveiro / Fez muito frio no inverno / O dia tá nublado / Eu comi laranja / Eu tomei remédio / Eu tô sentada na cadeira / Eu vi um pássaro / Eu tenho direção / Eu tenho um caderno / Eu sou.... eu tenho bondade / Eu tenho liberdade / Eu vi um teatral / Eu moro num planeta / Eu tenho um aquário / Eu escrevi uma redação / Eu tenho um besouro / Andei numa estrada /
*Tentou gravar de duas em duas ou quando tinham 5 somente as 3 primeiras

16)O telhado está quebrado / Eu recebi uma notícia boa / Essa é minha semana de jogar futebol / Eu não gosto de abóbora / Reboco se faz com cimento / Quem puxa a carroça é o cavalo / Eu vi o novo decreto do governo / Eu vou para o estádio do jogo do Flamengo / O azulejo está rachado / A polícia subiu o morro / A próxima estação é o verão / Seu perfume é bom / Tô conhecendo minha memória / Eu sei os ceps pelos correios / Eu vi uma estrela de natal / Eu nunca passei por suborno / Meu tio já foi exilado político / Eu pratico natação / Vou imprimir meu currículo na gráfica / Eu não cozinho com avental / Eu gosto de andar de veleiro / Eu já dormi em beliche / Já sofri assalto / O tempo não está nublado / Eu gosto de suco de laranja / Hoje eu tomei remédio para dor de cabeça / Eu já tive um pássaro / Eu nunca perdi direção / Eu tenho dois cadernos / Eu estudo usando lâmpada / Eu moro no planeta terra / Minha mãe não sabe fazer bordado / Eu assisti um peça teatral / Eu não tenho medo de nenhum besouro / Eu gosto de escrever redação / Essa cortina faz barulho /
*Tentou gravar as 3 primeira

17) O gato subiu no telhado / A notícia foi horrível / O futebol estava ruim ontem / A abóbora rachou / O cimento estava fraco / A carroça quebrou / O decreto foi atendido / O estádio estava cheio / A polícia chegou cedo / O cérebro tá complicado para raciocionar / A amizade é fundamental na vida / O azulejo é azul / A estação fica longe daqui / O meu chinelo é azul / O perfume é muito bom / Minha memória está fraca hoje / O correio atrasou / A estrela tá muito brilhante e bonita / Minha mochila é vermelha / O exilado fugiu / A natação estava ótima hoje / A leitura foi muito boa / A gráfica apronta os trabalhos rápido / O viveiro está cheio de pássaros / O palhaço é engraçado / Meu relógio parou / A cozinha está suja / O beliche está desarrumado / O meu armário está uma bagunça / O céu está nublado / A sobremesa do RU era laranja / O remédio é fundamental / A cadeira está quebrada / O pássaro fugiu / A direção da universidade parou / Meu caderno está no fim / O planeta é redondo / A aula foi teatral / A cerveja é bom de vez em quando / O aquário está cheio de água e peixes / O besouro é muito feio / Minha cortina é laranja / Não

gosto de fazer redação / O maestro foi magnífico hoje / A estrada estava movimentada /
*Tentou ir repetindo as palavras mentalmente em sequencia.

18) O telhado é grande / A notícia foi trágica / O time de futebol ganhou / O cimento é usado nas construções / A abóbora é grande / A carroça é puxada por bois / O hóspede foi inconveniente / O azulejo é azul / A polícia é agressiva / O lixeiro é grande / A estação é grande / O chinelo é amarelo / A galinha tem filhotes / A memória é boa / O correio é no centro / A estrela é amarela / O suborno é ruim / A memória é grande / O exilado é um homem / A janela é amarela / O gráfico é em pizza / O viveiro é grande / A cozinha é grande / O papelão é amarelo / O viveiro é no centro / O telhado é marrom / O tempo tá nublado / A laranja é gostosa / O remédio é amargo / A cadeia é grande / O pássaro é verde / A direção é por ali / A cadeira é estofada / O planeta é azul / O aquário está cheio / O planeta... não.... / O besouro é preto / A cortina é bonita / A estrada é grande /

*Achou dificuldade igual em L2, tentou gravar as 3 primeiras ou as 3 mais fáceis, palavras que tem muita vogal ou sílabas diferentes é mais difícil gravar, por exemplo telhado, hóspede, cérebro e também as abstratas

19) O telhado é vermelho / As notícias foram ótimas / Meu filho joga futebol / Adoro abóbora / Precisei de cimento para fazer o piso em casa / Passou uma carroça na frente da rua de casa / Decreto.. não sei decreto / Azulejo é azul / A lixeira ta cheia / As polícias estão na frente de casa / A estação ta cheia / O chuveiro ta quebrado / O chinelo ta no guardaroupa / A amizade é uma boa coisa para as pessoas / Correio fica perto de casa / A estrela ta brilhando no céu / Meu filho ganhou uma mochila nova / Meu filho vai fazer natação / Meu primo foi exilado / O armário ta bagunçado / Tô esperando a gráfica me mandar resposta / O avental é branco / Tenho um viveiro lá no horto / Cozinha ta suja / O que você fez foi um papelão / O céu tá nublado / Adoro a cor laranja / Preciso tomar o remédio / Tô sentada na cadeira / Tem um pássaro lindo voando no céu / Direção... não sei direção... / Tô terminando meu caderno / As pessoas precisam ter um pouco mais de bondade no coração / Moramos no planeta terra / O bordado ficou lindo / O aquário tá cheio de peixes / Adoro tomar cerveja / O besouro é preto / A redação tá bonita / A estrada é longa / Não sei suporte /

*Dificuldade é igual ao L2, ela tomou relaxante muscular ontem, fica mais fácil as palavras que dá para visualizar e também as palavras que são mais freqüentes no dia-a-dia dela.

20) O telhado da minha casa caiu / Aconteceu uma notícia no jornal / Eu joguei futebol / Comi abóbora / Minha casa é de cimento / Eu joguei futebol no estádio / O azulejo do banheiro caiu / A polícia prendeu alguma pessoa / Não lembro se tinha banheiro ou não / A minha estação é o verão / A galinha fica no galinheiro / Tô testando minha memória / Chegou uma carta pelo correio / Tem estrela no céu / Alguém aceitou o suborno / Eu não tô exilado / Eu gosto de leitura / E não gosto de natação / Tem bastantes gráficas em Floripa / Eu tô usando relógio / Eu não tenho beliche em casa / Eu joguei papelão fora / Minha cozinha tá suja / O céu tá nublado / Comi uma laranja / Tomei remédio/ Sentei na cadeira / Vi um pássaro / Tem direção

no colégio / Existe bondade / Eu já fiz um bordado / Fui tentar fazer uma frase com teatral e esqueci o resto e não consegui fazer / Tenho medo de besouro / Andei pela estrada / O transito estava congestionada /
*Esse teste é mais fácil para formular frase mas algumas palavras são difíceis para formular frases como teatral, decreto

21) O telhado é alto / A notícia é rápida / Futebol é um bom esporte / A abóbora é grande / Carroça precária / Decreto grande / O estádio é pequeno / O azulejo é bonito / A polícia é rápida / A lixeira é suja / Estação de trem / Chinelo pequeno / A galinha é bela / Memória é boa / O correio é ágil / A estrela é longe / O tesouro é grande / A mochila é boa / Exilado do país / Uma leitura ideal / A gráfica... sei lá.. foi / Cozinha é grande / Papelão é forte / Assalto é errado / Inverno é frio / O céu está nublado / Eu gosto de laranja / Remédio age rápido / A cadeira é alta / Pássaro acho que foi a palavra, não lembro / Direção foi ruim / A terra é grande / O planeta é distante / Teatral a ação / Besouro é um inseto / Tesouro é alto / redação... mastro... lembro das palavras mas se eu quiser fazer frases esqueço...
*No inglês fazia frases quaisquer, mais simples pois as palavras eram mais simples, no portugues, como sabia as palavras tentava elaborar frases maiores e daí esquecia do resto

22) O telhado está molhado / A notícia está quente / Joguei futebol / Gosto de abóbora / Cimento duro / O estádio está cheio / O decreto foi revogado / O azulejo está sujo / A polícia é corrupta / Perdi o chinelo / Não gosto de galinha / Tua memória está boa / O correio atrasou / Gosto de estrela / Não ofereceu o suborno / Tenho uma mochila / Eu fui exilada / Gosto de leitura / Tenho uma gráfica / Vou ao viveiro / Estou na estação / Estou na cozinha / Tenho papelão / Fui assaltada / O tempo está nublado / Gosto de laranja / Tenho um remédio / O pássaro voa / Tenho uma cadeira / Fui em direção / Tenho um caderno / Troquei a lâmpada / Caneta é grande / Algo é teatral / Tenho um besouro / Estou na redação / Tenho uma cortina /
* *palavras concretas são mais fáceis

23) Subi no telhado, li uma noticia no jornal, joguei futebol, comprei cimento, comi uma abobora, subi na carroça, li um decreto, chegou um hospede, troquei o azulejo da casa, chamei a policia, peguei o trem na estação, comi uma galinha com farofa, li uma revista, tinha perfume..., fui no correio, tive um lapso de memória, o policial fez um suborno, eu usei a mochila, meu cantor favorito foi exilado, fui no circo, tinha um palhaço, usei avental na cozinha, tinha um viveiro de passaros, sai uma matéira no jornal, era inverno, tinha um beliche na casa, a cozinha era vermelha e o papelão era sem cor, o ceu estava nublado, a laranja estava doce, eu tomei remedio, a minha cadeira é quebrada, tinha um passaro na janela, tem um caderno bonito, nosso planeta é imenso, fiz uma peça teatral, o besouro é um inseto,

Appendix N – Instruction and examples for target language structure

Instruction – We use So + aux verb to agree with affirmative sentences and Neither + aux verb to agree with negative sentences. The auxiliary verb has to agree with the sentence heard, for example:

1) I like football – So do I.
2) I can't play tennis – Neither can I.
3) I am not Argentinian – Neither am I.
4) I don' t like cats – Neither do I.
5) But I love dogs – So do I.
6) Next week I'll travel to Curitiba – So will I.
7) I've never been to Recife. Neither have I.
8) I can't cook very well – Neither can I.
9) But I can sing and dance – So can I.
10) I'd like to have an ice cream – So would I.

Appendix O – Instructions for the L2 speaking span test

Você vai fazer um teste de memória no computador. Você verá palavras no meio da tela e deverá tentar guarda-las. As palavras aparecerão em grupos de 2, 3, 4, 5 e 6 palavras. No final de cada grupo você verá um ponto de interrogação para cada palavra que apareceu naquele grupo e daí deverá tentar falar frases em inglês com cada palavra, na ordem em que a palavra apareceu. Caso você nao se lembre do significado de uma palavra mas lembre da sua ordem de apresentação, você poderá montar frases do tipo

I don't know X.

Você deve começar a falar assim que ver os pontos de interrogação. Você fará dois grupos de 2, 3, 4, 5, e 6 palavras sem valer, só como prática. Após esses três grupos você fará mais três de teste e esse teste será gravado. Tente fazer frases simples.

Appendix P –Correlations among raters in L1

Correlations

	R1 L1 SST strict	R1 L1 SST lenient	R 2 L1 SST strict	R 2 L1 SST lenient	R 3 L1 SST strict	rater 3 L1SST lenient
R1 L1 SST strict	1	.952**	.937**	.930**		.902**
R 1 L1 SST lenient	.952**	1	.888**	.974**	.834**	.920**
R 2 L1 SST strict	.937**	.888**	1	.941**	.922**	.898**
R 2 L1 SST lenient	.930**	.974**	.941**	1	.876**	.929**
R3 L1 SST strict	.870**	.834**	.922**	.876**	1	.953**
R 3 L1SST lenient	.902**	.920**	.898**	.929**	.953**	1

**. Correlation is significant at the 0.01 level (1-tailed).

Appendix Q – Correlations among raters in L2

	R1 L2 SST strict	R 1 L2 SSt lenient	R 2 L2 SST strict	R 2 L2 SST lenient	R 3 L2 SST strict	rater 3 L2 SST lenient
R1 L2 SST strict	1	.853**	.790**	.673**	.798**	.799**
R1 L2 SSt lenient	.853**	1	.721**	.863**	.731**	.829**
R2 L2 SST strict	.790**	.721**	1	.834**	.943**	.801**
R2 L2 SST lenient	.673**	.863**	.834**	1	.803**	.763**
R3 L2 SST strict	.798**	.731**	.943**	.803**	1	.842**
R3 L2 SST lenient	.799**	.829**	.801**	.763**	.842**	1

Appendix R – Transcription Retention test

1.	S+am	S+do	S+did	S+am	S+did	S+am	S+can´t	S+have	S+can´t	S+don´t
2.	S+am	N+don´t	S+did	N+am	N+did	S+am	S+I am	S+have	N+can´t	S+have
3.	S+am	N+do	S+did	N+am	N+did	S+love	S+can	S+have	N+can	N+have
4.	S+am	N+do	S+did	N+am	N+did	S+love	S+can	S+have	N+can	N+?
5.	S+am	N+do	S+did	N+am	S+did	S+do	S+can	S+have	N+can	N+do
6.	S+am	N+do	S+did	N+am	N+did	S+love	S+can	S+have	N+can	N+do
7.	S+am	N+like	S+did	N+am	N+did	S+am	S+can	S+can	N+can´t	N+don´t
8.	S+am	N+do	S+did	N+am	N+did	S+like	S+did	S+have	N+did	N+did
9.	S+am	N+do	N+did	N+am	N+did	S+do	S+can	N+have	N+can	S+do
10.	S+am	N+did	S+go	N+am	S+didn´t	S+love	S+speak	N+have	N+speak	N+have
11.	S+am	N+do	S+did	N+am	N+did	S+am	S+am	S+am	N+can´t	N+do
12.	S+I am	N+do	N+did	N+am	N+did	S+am	S+can	N+do	N+can´t	S+do
13.	S+am	N+don´t	S+did	N+am	N+did	S+am	S+can	S+have	S+can´t	N+don´t
14.	S+am	S+don´t	S+did	S+am	N+did	S+do	N+do	S+have	N+can	N+have
15.	S+I am	N+don´t	S+did	N+not I	N+didn´t	S+love	S+can	S+have	N+can´t	N+don´t
16.	S+am	N+don´t	S+did	N+am	N+didn´t	S+am	S+can	S+have	N+can	N+do
17.	S+am	N+do	N+went	N+am	N+did	S+love	S+speak	S+have	N+can	N+do
18.	S+am	N+do	S+did	N+am	S+did	S+am	N+can	S+have	N+can	N+do
19.	S+I am	N+I so	N+can I	N+can	S+I am	N+can	S+I am	S+I am	N+can´t	N+can
20.	S+am	N+do	S+did	N+am	N+did	S+am	S+speak	S+have	N+can	N+do
21.	S+am	N+do	S+did	N+am	N+did	S+do	S+speak	S+have	N+can	N+can
22.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+do	N+can	N+do
23.	S+am		S+did	N+am	N+did	S+do	S+can	S+have	N+can	N+have
24.	S+am	N+don´t		N+am	N+	S+am	S+am	S+am	N+can´t	S+am
25.	S+I am	N+do	S+did	N+am	N+did	S+love	S+speak	S+have	N+can	N+do
26.	S+am	N+like	S+went	N+am	N+see	S+love	N+can	S+have	N+can	N+have
27.	S+am	S+do	S+did	S+am	N+did	S+do	S+can	S+do	N+can	N+do
28.	S+am	N+do	S+did	N+am	N+did	S+love	S+can	S+have	N+can	N+have
29.	S+am	S+am	N+did	S+am	N+am	S+am	S+am	N+am	N+am	N+am
30.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+do	N+can	N+do
31.	S+am	N+do	N+did	N+am	N+did	S+love	N+can	S+have	N+can	N+do
32.	S+am	N+can	S+did	N+am	N+did	S+am	N+can	S+am	N+can	N+did
33.	S+can	N+can	S+can	N+can	N+can	N+can	S+can	N+can	No havent	S+can
34.	S+am	N+like	S+went	N+am	S+did	S+love	S+speak	S+have	N+can	S+don´t
35.	S+am	N+do	S+did	N+am	N+did	S+love	N+can	S+have	N+can	N+can
36.	S+do	N+do	S+went	N+do	N+did	S+do	S+can	S+have	S+can´t	N+do
37.	S+I am	N+did	S+am	N+ am	N+am	S+I am	Me too	S+I am	N+than	N+have
38.	S+am	N+do	S+did	N+am	N+did	S+do	S+can	S+have	N+can	N+do
39.	S+am	N+do	S+do	N+am	N+do	S+am	S+can	S+am	N+can	N+do
40.	S+am	S+do	N+did	S+am	S+did	S+do	S+can	N+have	S+can	S+do
41.	S+I am	N+do	I+n did	N+am	S+did I	S+I love	S+I can	N+I have	I neither	N+I
42.	S+am	N+do	S+did	N+am	N+did	S+do	S+can	S+have	N+can	N+do
43.	S+am	N+do	S+do	N+am	N+did	S+am	N+can	S+have	N+can	N+do
44.	S+am	N+do			N+do		S+can		N+can	
45.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+do	N+can	N+do
46.	S+am	S+don't	S+did	N+am	N+am	S+am	S+am	S+am	N+am	N+do
47.	S+I am	N+do	N+do	N+am	S+did	S+am	S+am	S+am	S+can	N+do
48.	S+am	N+am	S+did		S+did	S+am	S+am	S+can	N+can	N+do
49.	S+am	N+do		N+am	N+do	S+do	S+can	S+have	N+can	N+do
50.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+do	N+can	N+do
51.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+have	N+can	N+have
52.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+do	N+can	N+do
53.	Nadia	No								
54.	S+I am	N+do	S+went	N+do	N+did	S+I	S+can	S+I	N+I	N+I
55..	S+am	N+do	OK	OK	OK	S+do	S+can	S+have	N+can	N+have
56..	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+have	N+can	N+do
57.	S+am	N+do	S+did	N+am	N+did	S+do	N+can	S+have	N+can	N+do

58.	S+I I	N+do	S+II	N+I I	N+I I	S+Im I	S+can	S+have	N+can	N+do
59.	S+am	N+do	N+did	N+am	N+did	S+do	N+can	S+have	N+can	N+do
60.	S+am	N+do	N+did	N+am	N+did	S+do	S+can	S+have	N+can	N+do
61.	S+am	N+do	N+go	N+am	N+do	S+do	S+do	Me tôo	N+can	N+do
62.	S+do	N+do	S+did	N+do	S+did	S+do	S+do	S+do	S+did	N+do
63.	S+am	N+can	S+don´t	N+can	N+did	S+am	N+can	S+do	N+can	N+can
64.	S+am	N+do	S+did	N+am	N+did	S+am	N+can	S+have	N+can	N+do

Appendix S – Transcription Acquisition Test

1) so do I 2) so have I 3) I can´t 4) I am 5) I can 6) X 7) I am not 8) I do 9) so I am 10) so I don´t

1) n+ do I 2) I haven´t 3) I can´t 4) s+can I 5) I am 6) I can 7) I`m not go 8) I have 9) I go 10) I do not

1) s+do I 2) s+have I 3) I can´t 4) n+can I 5) yes, I am 6) I can 7) I don´t 8) I do 9) s+do I 10) neither do I

1) s+do I 2) I don´t 3) I don´t 4) n+can I 5) I am 6) I can 7) I don´t 8) s+do I 9) I do 10) n+do I

1) I`m not 2) I don´t already been 3) I don´t can´t speak 4) s+I´m not 5) I am 6) s+am I 7) s+I am too 8) s+I have 9) n+I don´t take a shower tomorrow 10) I don´t study

1) n+ do I 2) s+did I 3) I can´t 4) I can´t 5) I am 6) I can 7) XX 8) I have 9) I am 10) n+ am I

1) n+have I 2) n+have I 3) I don´t 4) n+can I 5) I am 6) I can speak Portuguese 7) n+ I go to travel 8) I have 9) I don´t go to take a shower 10) n+study I

1) n+do I 2) I don´t have been to Canasvieiras 3) I don´t 4) I don´t 5) I am 6) I´m speak Portuguese 7) I don´t 8) I have 9) so do I 10) n+do I

1) I do 2) I haven´t 3) I´m not 4) so can I 5) so am I 6) I do 7) I´m not 8) I have 9) I go 10) so do I

1) I´m not 2) I´m not 3) I`m speak one language 4) I can´t 5) yes, I am 6) I speak Portuguese 7) I`m not 8) I have friends 9) I am 10) I don´t study

1) n+have I 2) s+have I 3) I can´t 4) n+can I 5) I am 6) I can 7) I´m not 8) I have a lot 9) s+going I 10) n+study I, n+do I

1) s+have I 2) I am 3) I can´t 4) s+can I 5)I am 6) I can 7) I´m not 8) I have 9) s+am I 10) n+do I

1) neither do I 2) so have I 3) I can´t 4) neither can I 5) I am 6) I can 7) I´m not 8) I have 9) so do I 10) neither do I

1) n+do I 2) I´m not 3) I can´t 4) n+can I 5) I am 6) s+can I 7) I don´t 8) I have 9) s+do I 10) n+do I

1) n+do I 2) I haven´t 3) I can´t 4) n+can I 5) I am 6) I can 7) I´m not 8) I have 9) s+am I 10) n+do I

1) n+do I 2) s+have I 3) I can´t 4) n+can I 5) I am 6) I can 7) I´m not 8) I have 9) s+am I 10) n+do I
1) n+I 2) s+have I 3) I can´t 4) n+I 5) I am 6) I can 7) I can´t do 8) I have 9) I do 10) n+I

1) s+have I 2) s+have I 3) n+can I 4) n+can I 5) I am 6) I can 7) n+am I 8) I have 9) s+do I 10) n+do I

1) n+do I 2) s+have I 3) I don't 4) n+can I 5) I am 6) I can 7) I don't go to travel 8) I have 9) s+am I 10) n+do I

1) I don't 2) I have 3) I do 4) I'm too 5) I am 6) I do 7) I don't 8) I haven't 9) I have 10) I don't

1) I'm not 2) I haven't 3) I don't speak 4) I can't 5) I am 6) so speak I 7) I am 8) I haven't 9) I haven't 10) I'm not

1) n+do I 2) I haven't 3) I can't 4) n+can I 5) I am 6) I can 7) I don't 8) I do 9) I don't 10) n+ do I

1) n do I 2) s have I 3) but I don´t can´t speak 4) neither can I 5) but I am 6) but I can 7) but I am not 8) but I have many friends 9) but I take today 10) n do I

1) I do 2) I have 3) neither can I 4) n can I 5) I am 6) I can 7) neither can I 8) I do 9) I am 10) n do I

1) s I´m I 2) so am I 3) but I´m not 4) but I can´t 5) but am I 6) but I am 7) but I´m not 8) but I do 9) but I am 10) n I am

1) n do I 2) s have I 3) n can I 4) s can I 5) I am 6) I can 7) n am I 8) I do 9) I am 10) n do I

1) n do I 2) s have I 3) I not 4) n can I 5) I am 6) I am 7) I´m not 8) I have 9) I´m not 10) n do I

1) n+am I 2) so do I 3) neither I 4) so do I 5) am I 6) am I 7) neither do I 8) I´m I 9) am I 10) neither do I

1) I am 2) me too 3) I´m not 4) I can´t 5) too 6) I can 7) I´m not 8) me too 9) me too 10) me too

1) so am I 2) I haven´t 3) I can´t 4) neither can I 5) I am 6) I can 7) I´m not 8) neither do I 9) so do I 10) neither do I

1) neither do I 2) so have I 3) I´m not 4) neither can I 5) I am 6) I can 7) I´m not 8) I have 9) so do I 10) neither do I

1) neither do I 2) so have I 3) I can´t 4) neither can I 5) I am 6) I can 7) I`m not 8) I have 9) so am I 10) neither do I

1) neither have I 2) so have I 3) I can´t 4) neither can I 5) I am 6) I can 7) I´m not 8) I have 9) I´m not, I´m gonna take a shower today 10) neither am I

1) so I don´t 2) I haven´t 3) I can´t 4) so I can´t 5) I am 6) I can 7) I don´t 8) I have 9) I`m too, so am I 10) so am I

1) neither do I 2) so have I 3) so can I 4) neither can I 5) neither can I 6) I can 7) I am not 8) I have 9) so am I 10) neither do I

1) neither do I 2) I don´t 3) I don´t 4) neither do I 5) I do 6) I do 7) I´m not 8) I do 9) I do 10) neither do I

1) so have I 2) I haven´t (mesmo) 3) I can´t 4) I can´t 5)I am 6) I can 7) I´m not 8) I do 9) I`m not going 10) neither do I

1) I have 2) I am 3) I don´t 4) I don´t 5) I am 6) I´m not 7) I don´t 8) I am 9) I am 10) I am

1) neither do I 2) neither have I 3) neither can I 4) so can I 5) so am I 6) so can I 7) neither am I 8) neither have I 9) so am I 10) so do I

1) neither do I 2) so have I 3) neither can I 4) neither can I 5) I am 6) I can 7) neither am I 8) I do 9) so am I 10)neither do I

1) neither do I 2) so am I 3) so can I 4) so can I 5) I am 6) I can 7) I do 8) I do 9) I do 10) neither do I

1) neither do I 2) so am I 3) I can´t 4) so can I 5) I am 6) I can 7) I`m not 8) I do 9) so am I 10) so do I

1) neither do I 2) I do 3) neither can I 4) neither can I 5) I am 6) neither can I 7) I´m not 8) I do 9) so am I 10) neither do I

1) so do I 2) so am I 3) I can´t 4) so I can 5) I am 6) I can 7) I don´t 8) so I do 9) so am I 10) so I do

1) neither do I 2) so have I 3) so can I speak two 4) neither can I 5) I am 6) I can 7) neither go I 8) neither have I 9) so am I 10) neither am I

1) so do I 2) so have I 3) I can´t 4) neither can I 5) I am 6) I can 7) I am … not 8) neither do I 9) so go I 10) neither do I

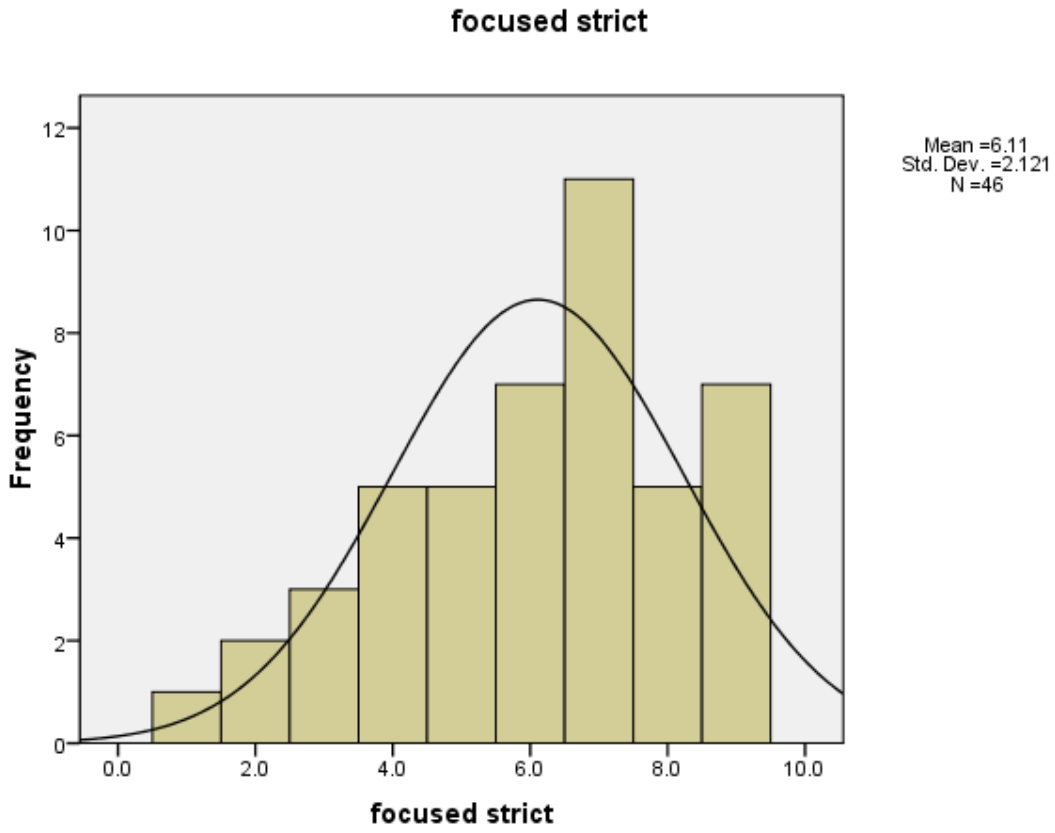
1) neither do I 2) so have I 3) I can´t 4) neither can I 5) I am 6) I can 7) so am I 8) I do 9) I am 10) neither do I

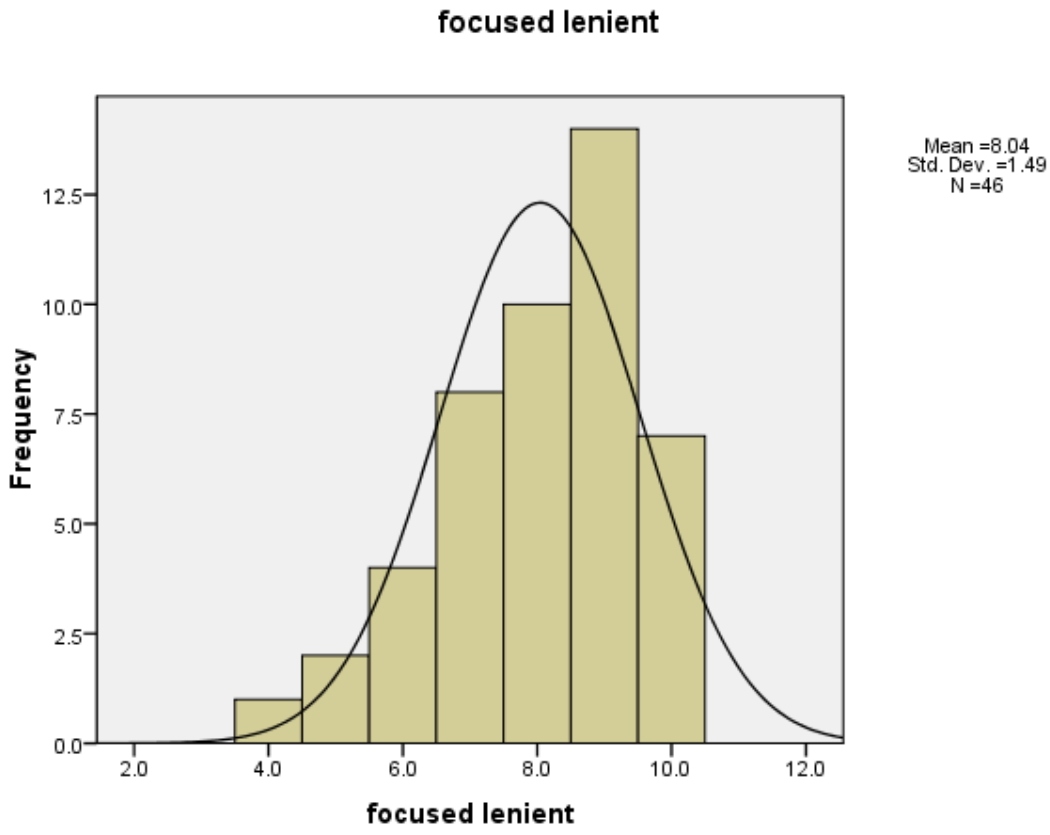
1) neither do I 2) so have I 3) so can I 4) neither can I 5) I am 6) I can 7) so am I 8) I do 9) so am I 10) so do I

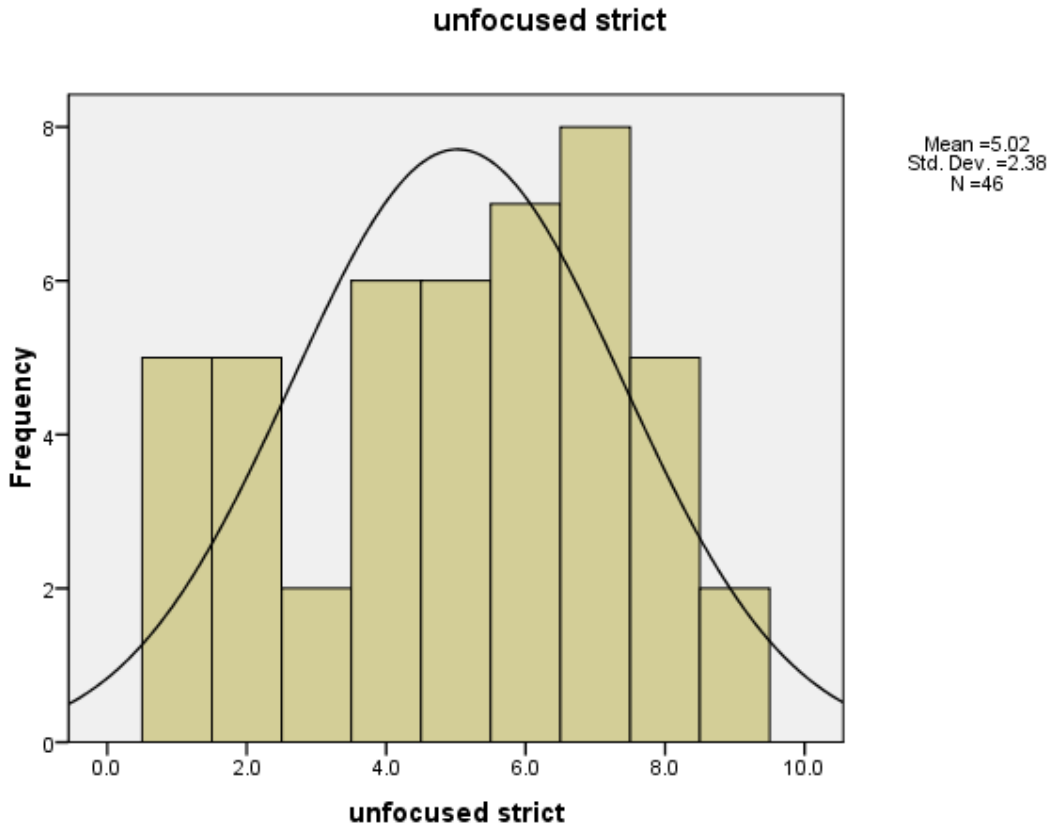
1) me too 2) so do I 3) neither do I 4) neither can I 5) I am 6) I can 7) I´m not 8) I have 9) so do I 10) neither do I

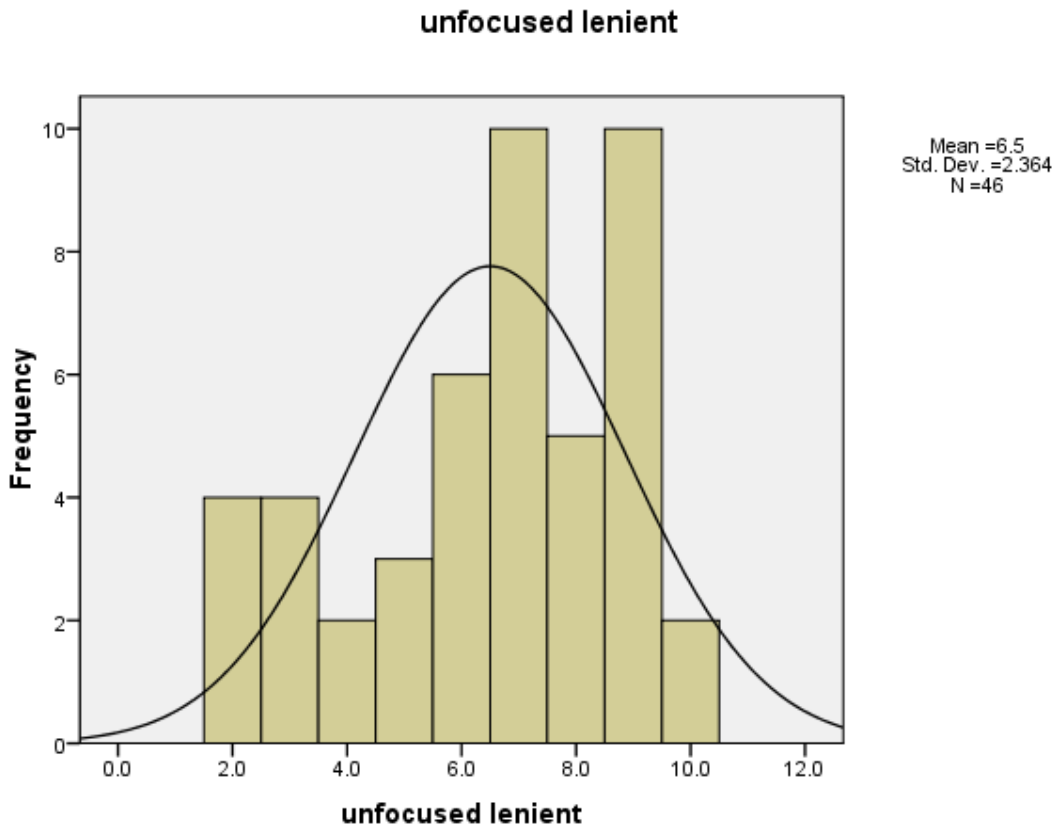
1) neither do I 2) so did I 3) neither can I 4) neither can I 5) I am 6) neither do I 7) neither do I 8) I have 9) so do I 10) so do I

Appendix T – Normal distribution curve for retention and acquisition tests

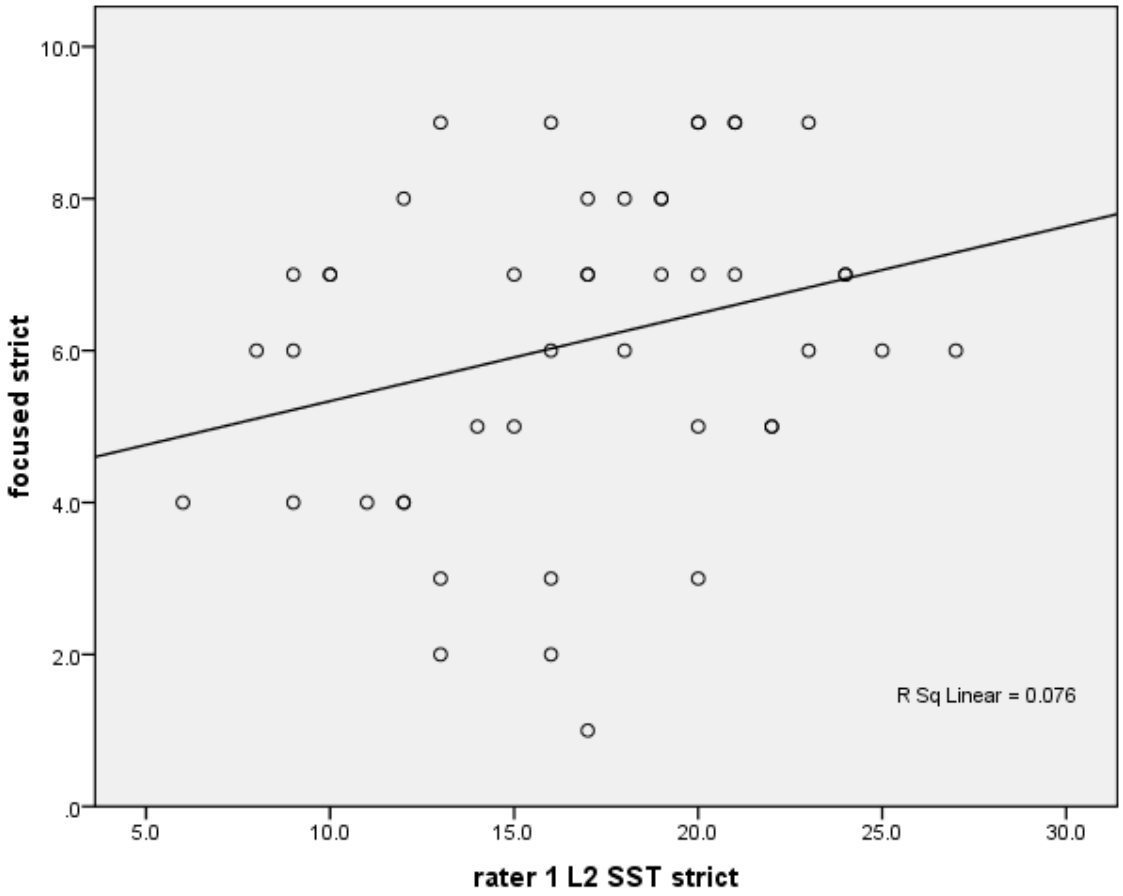


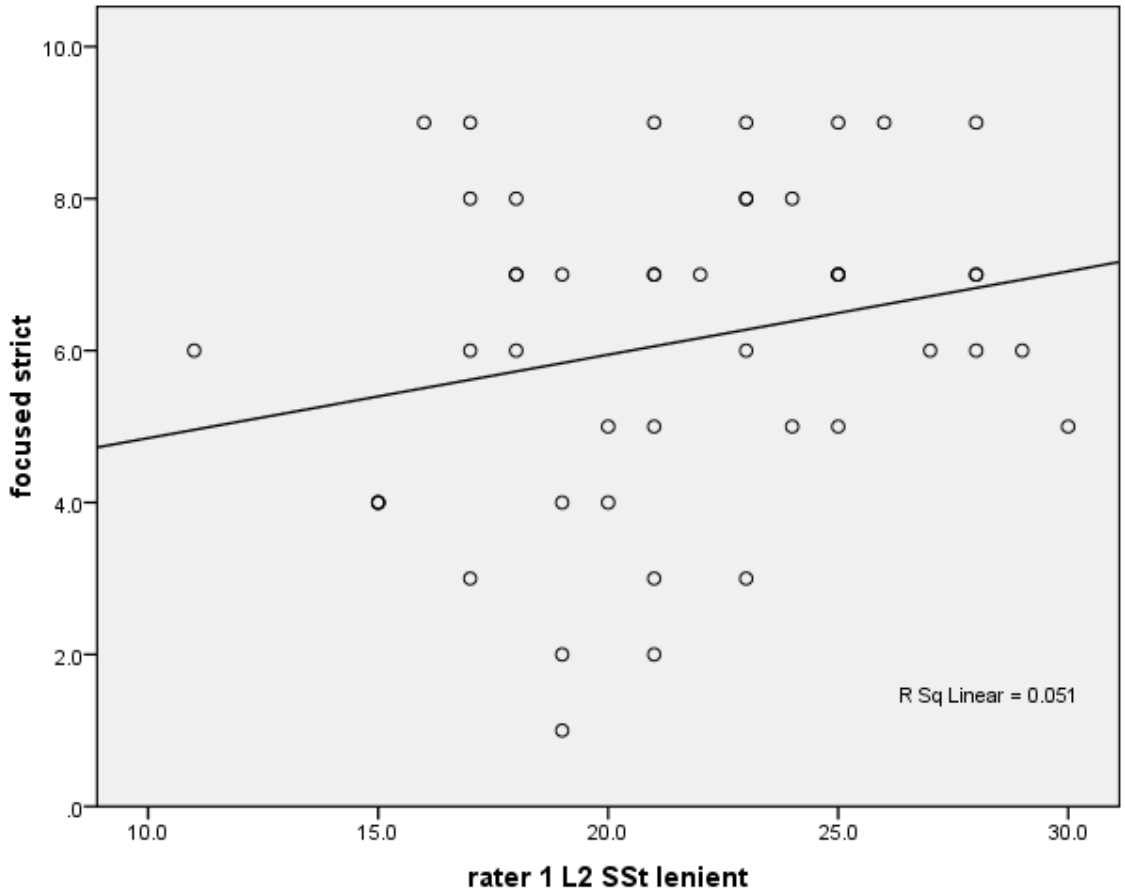

focused lenient
Mean =8.04
Std. Dev. =1.49
N =46
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
2.0
4.0
6.0
8.0
10.0
12.0
focused lenient

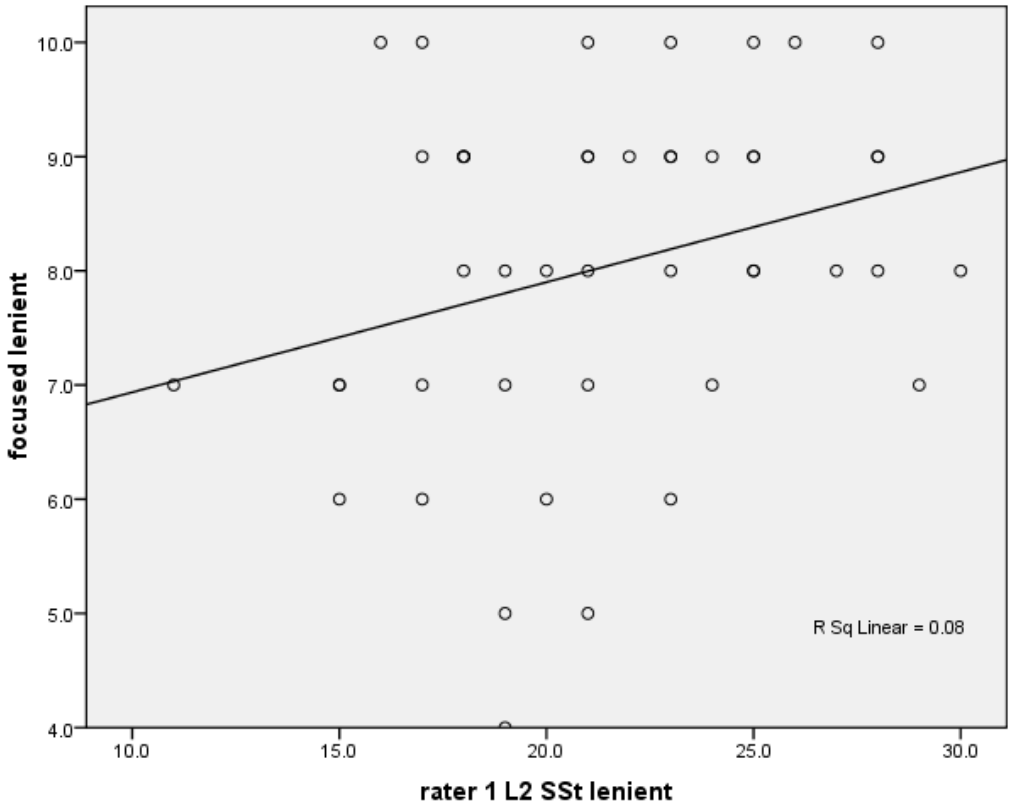

unfocused strict
Mean =5.02
Std. Dev. =2.38
N =46
Frequency
0
2
4
6
8
0.0
2.0
4.0
6.0
8.0
10.0
unfocused strict

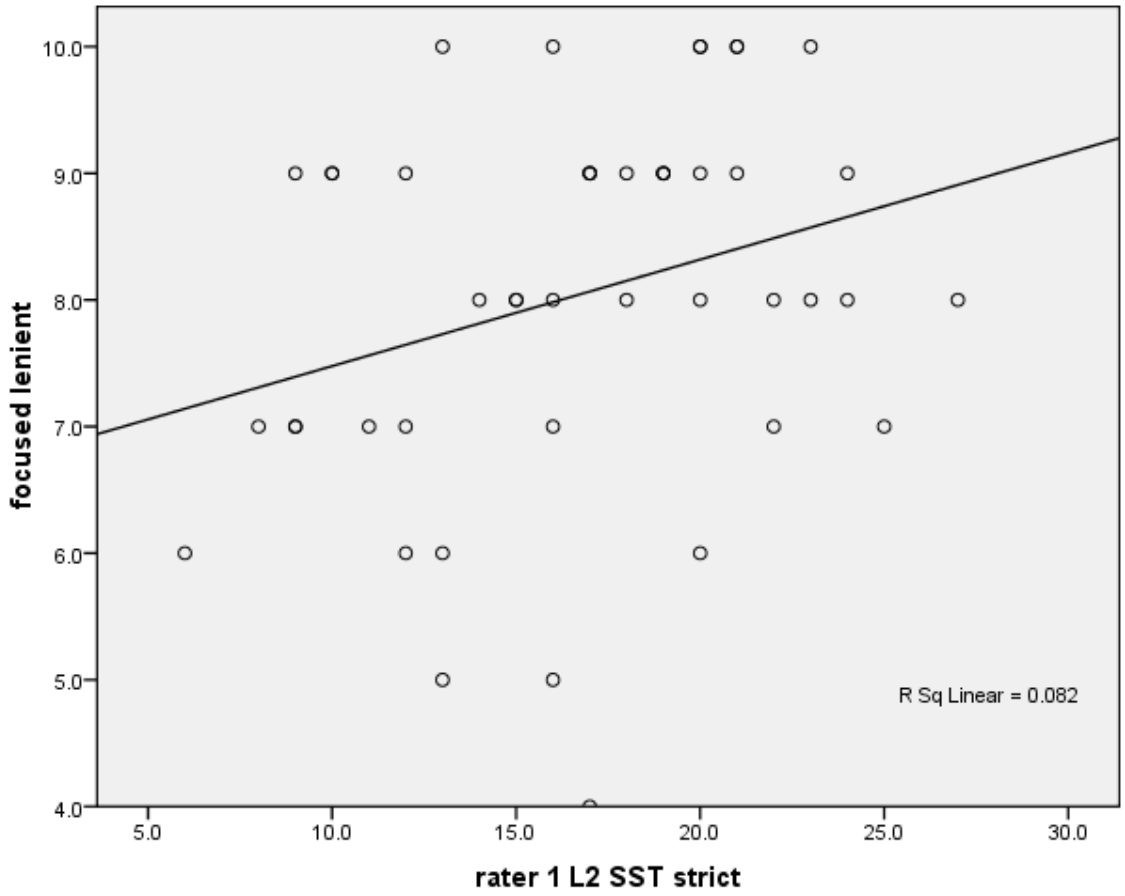

unfocused lenient
Mean =6.5
Std. Dev. =2.364
N =46
Frequency
0
2
4
6
8
10
0.0
2.0
4.0
6.0
8.0
10.0
12.0
unfocused lenient

Appendix U – Scatterplot correlation L2 SST and the retention test

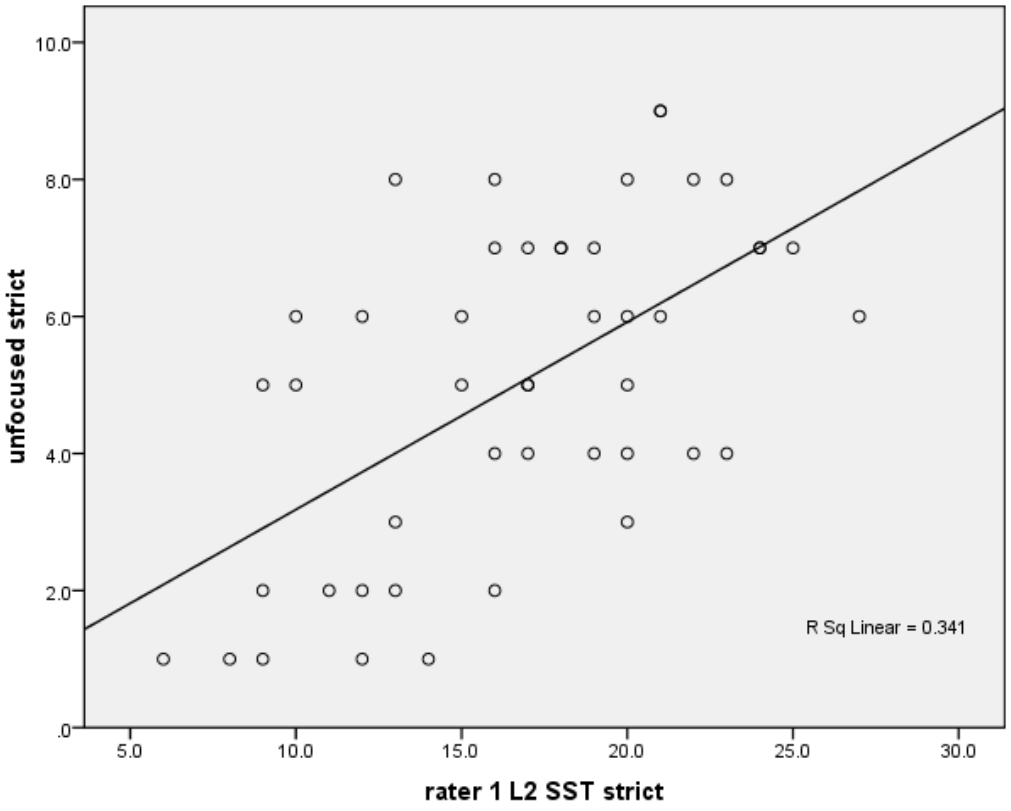

10.0
8.0
6.0
4.0
2.0
.0
focused strict
5.0
10.0
15.0
20.0
25.0
30.0
rater 1 L2 SST strict
R Sq Linear = 0.076

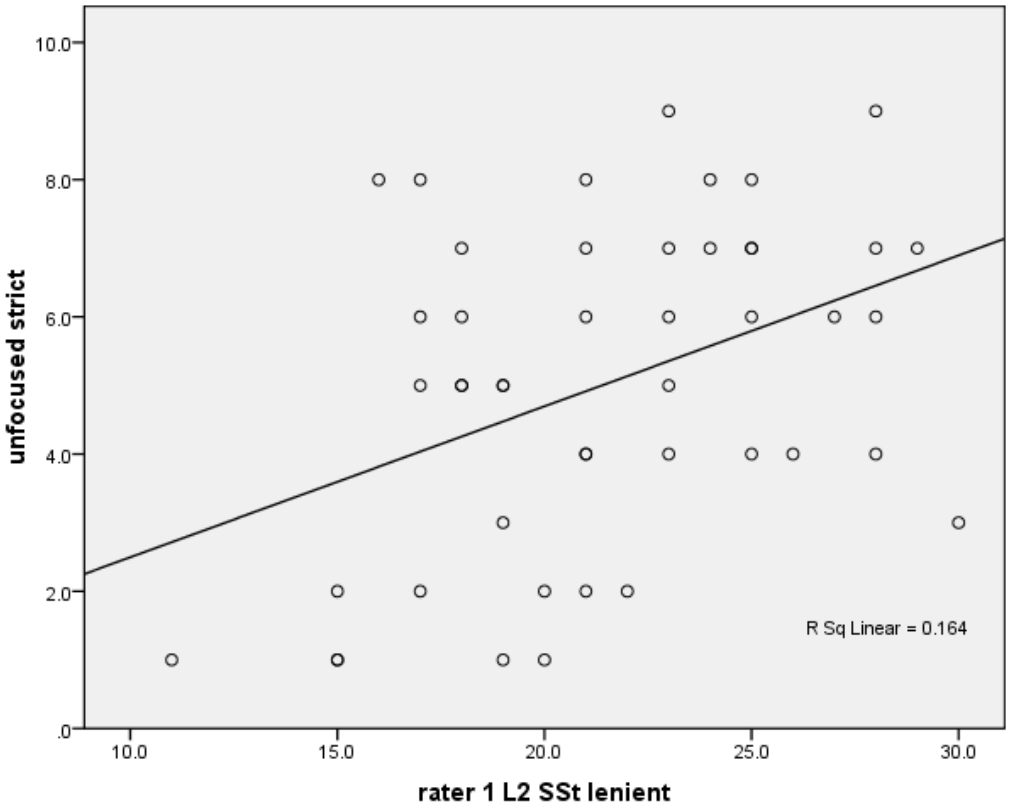

focused strict
rater 1 L2 SSt lenient
R Sq Linear = 0.051
10.0
8.0
6.0
4.0
2.0
.0
10.0
15.0
20.0
25.0
30.0

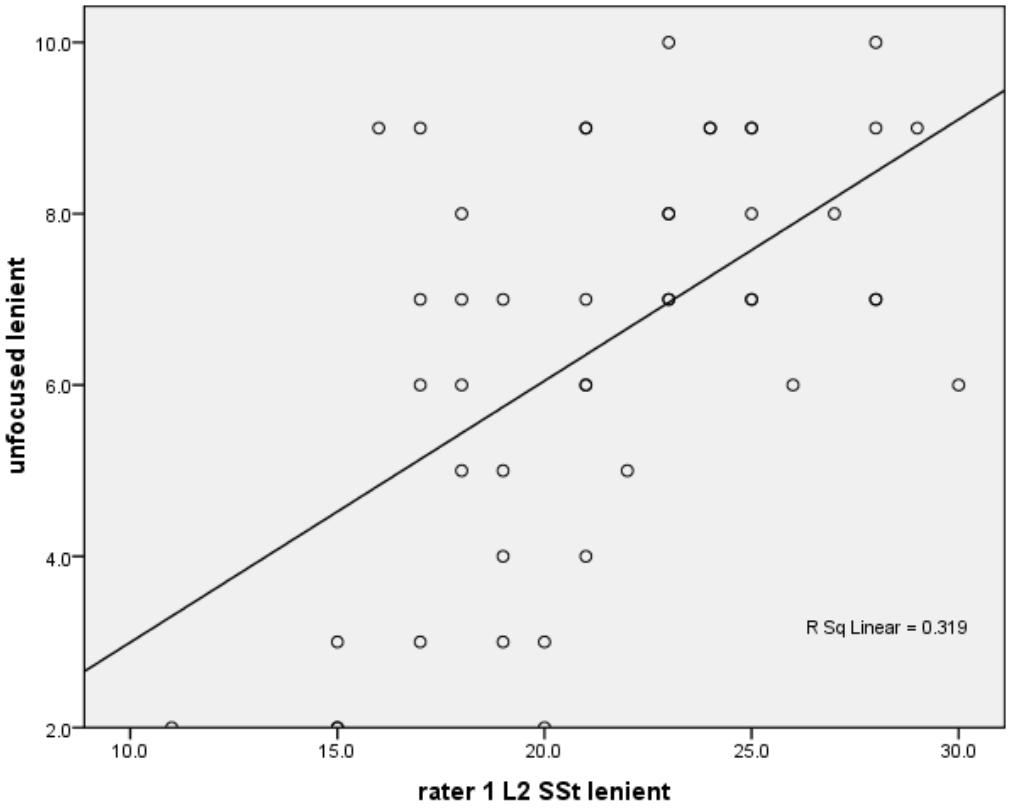

focused lenient
rater 1 L2 SSt lenient
R Sq Linear = 0.08
10.0
9.0
8.0
7.0
6.0
5.0
4.0
10.0
15.0
20.0
25.0
30.0

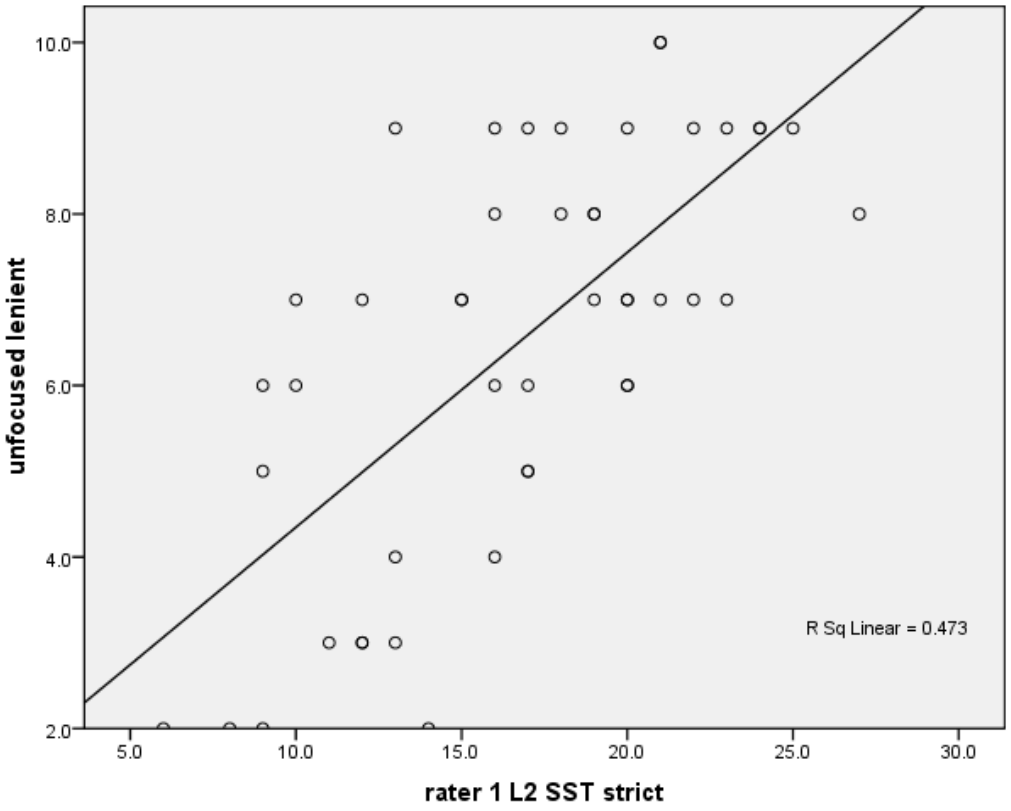

focused lenient
rater 1 L2 SST strict
R Sq Linear = 0.082
10.0
9.0
8.0
7.0
6.0
5.0
4.0
5.0
10.0
15.0
20.0
25.0
30.0

Appendix V – Correlation L2 SST and Acquisition test

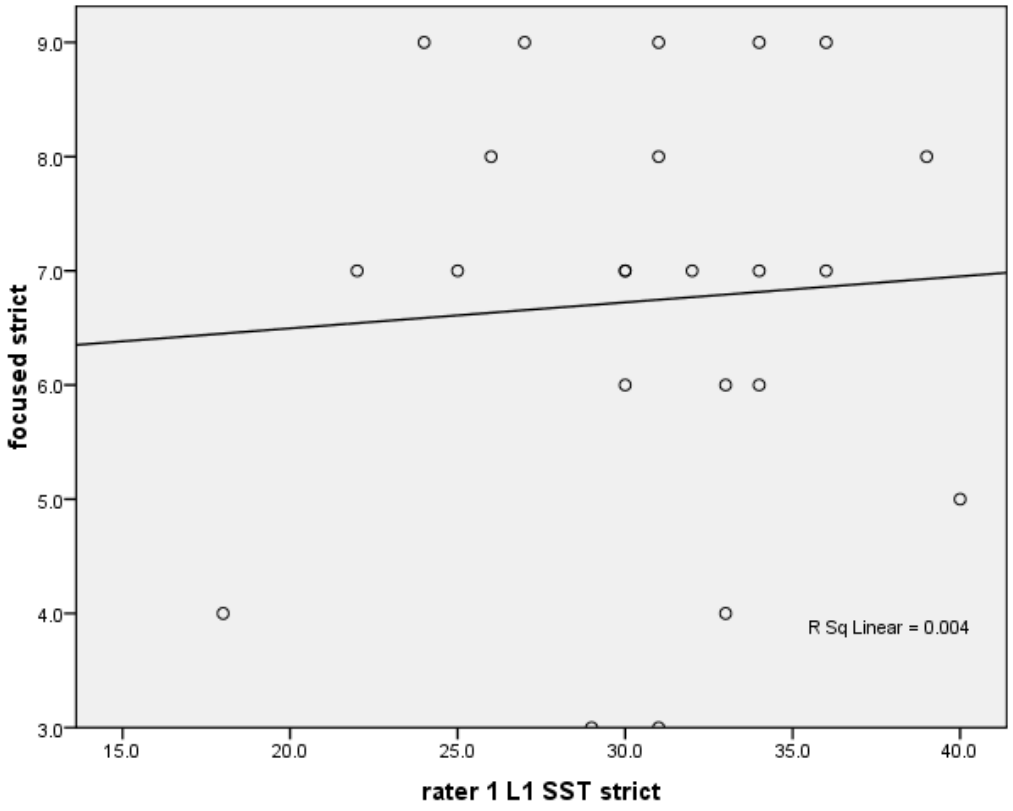

unfocused strict
rater 1 L2 SST strict
R Sq Linear = 0.341
10.0
8.0
6.0
4.0
2.0
.0
5.0
10.0
15.0
20.0
25.0
30.0

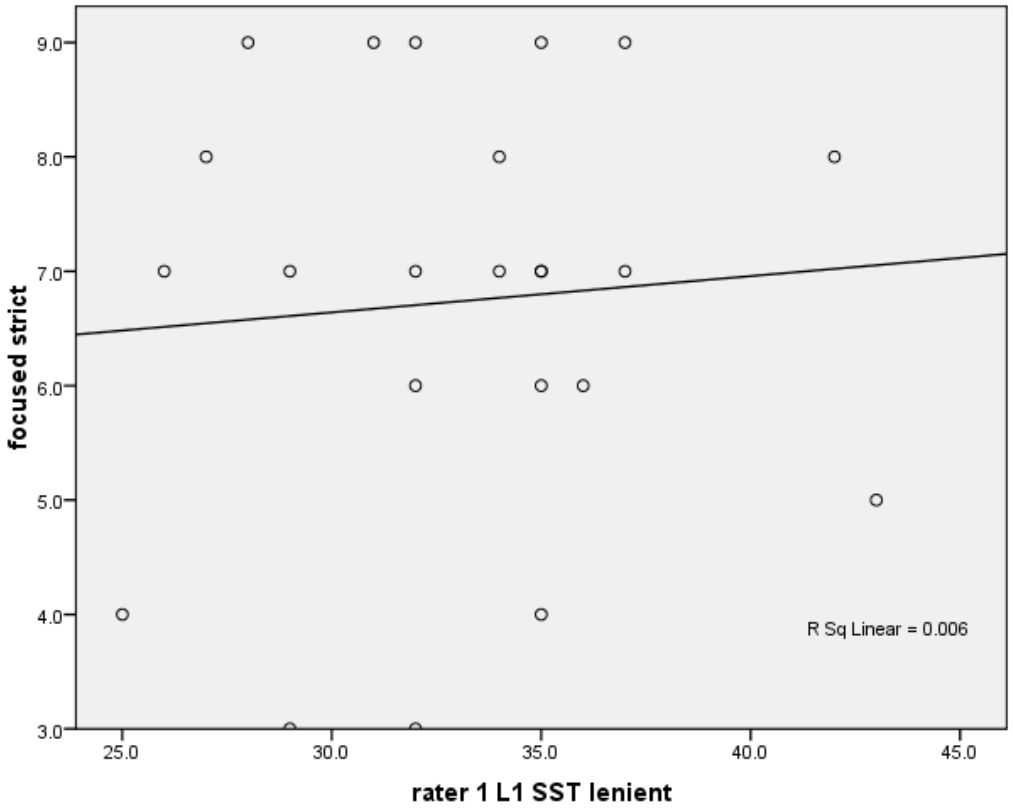

unfocused strict
rater 1 L2 SSt lenient
R Sq Linear = 0.164
10.0
8.0
6.0
4.0
2.0
.0
10.0
15.0
20.0
25.0
30.0

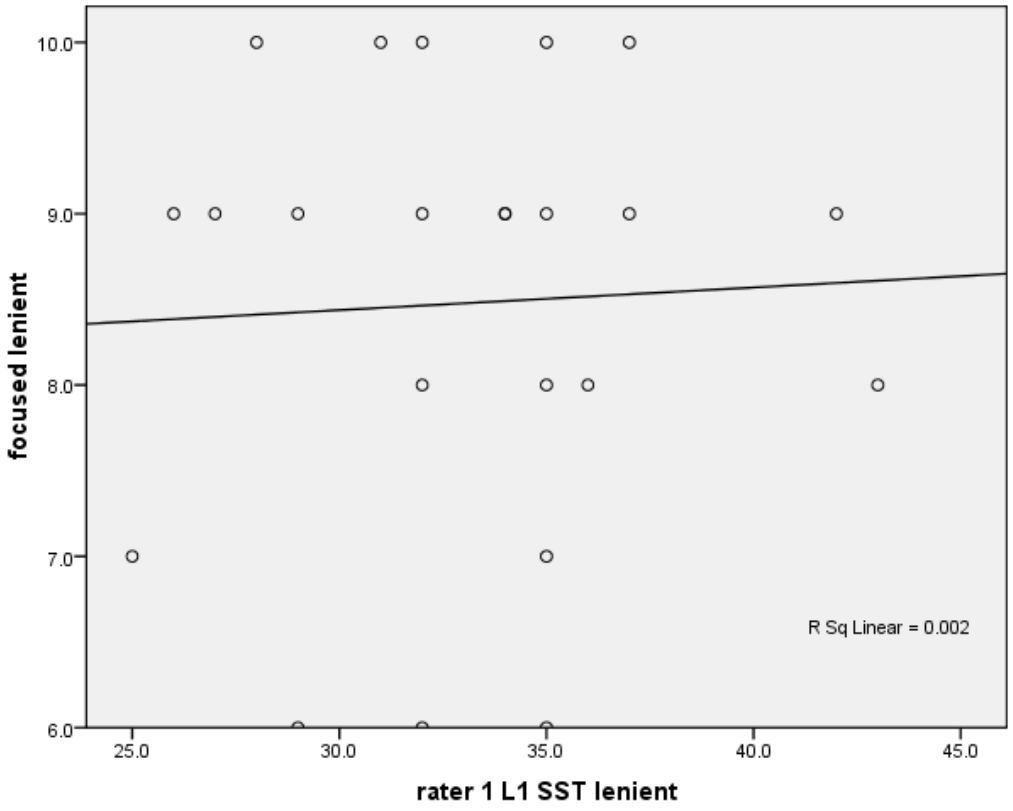

unfocused lenient
rater 1 L2 SSt lenient
R Sq Linear = 0.319
10.0
8.0
6.0
4.0
2.0
10.0
15.0
20.0
25.0
30.0

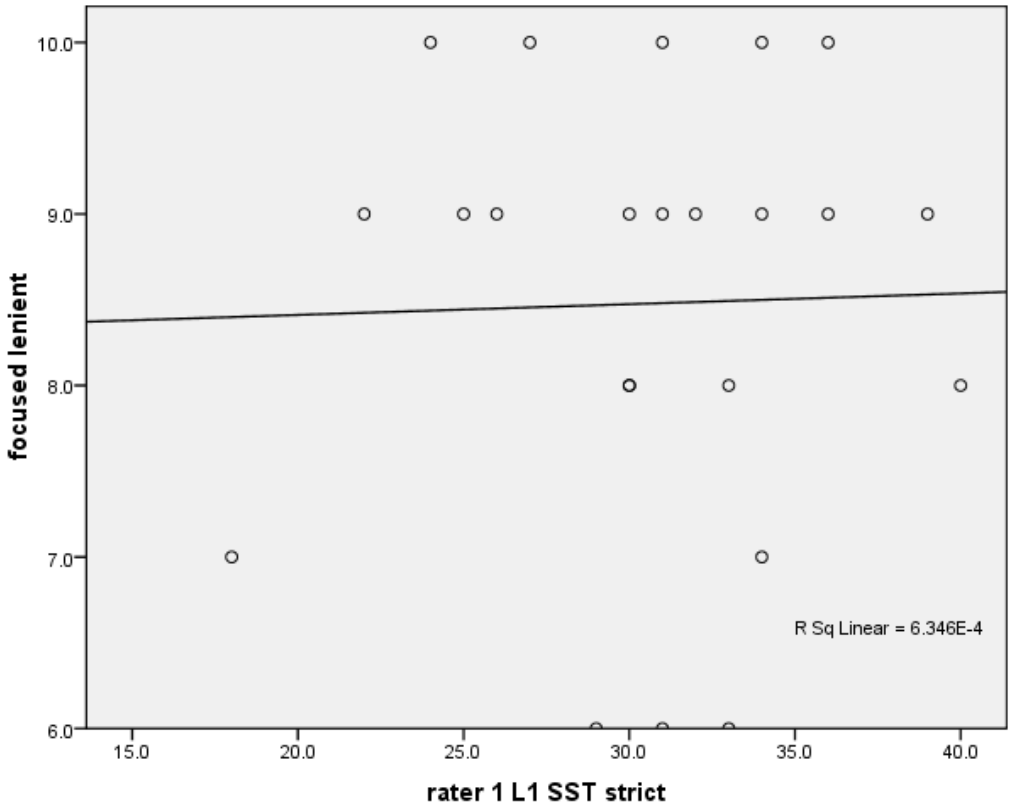

unfocused lenient
rater 1 L2 SST strict
R Sq Linear = 0.473
10.0
8.0
6.0
4.0
2.0
5.0
10.0
15.0
20.0
25.0
30.0

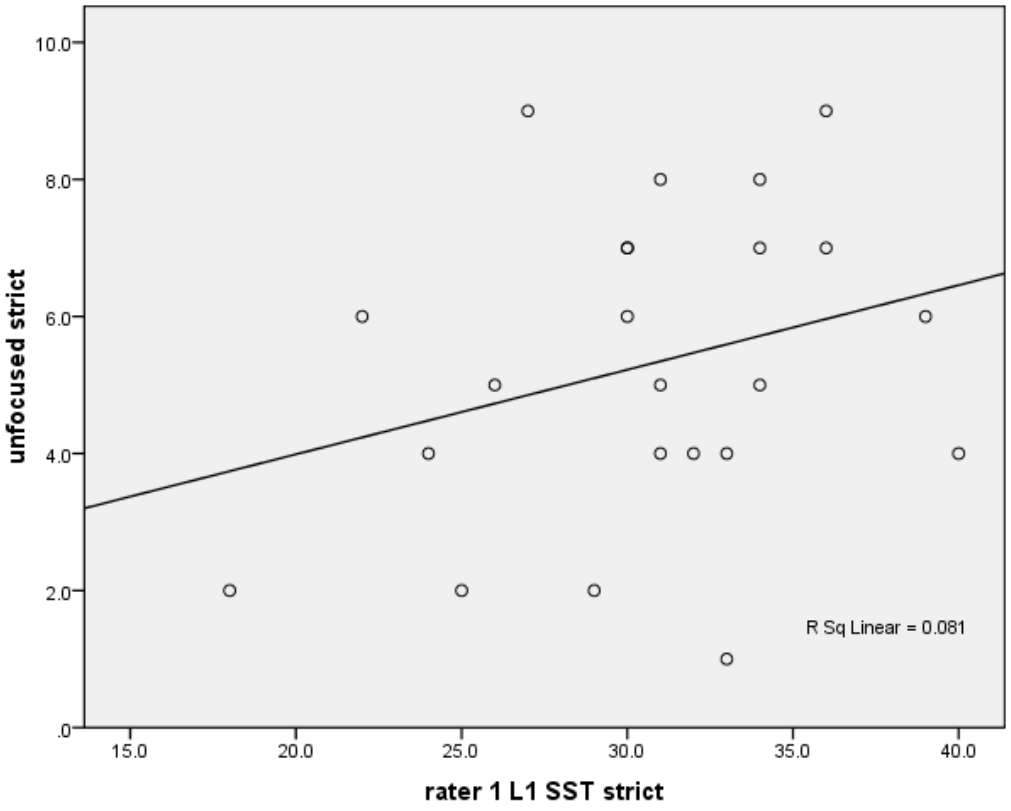
Appendix X – L1 SST and retention and acquisition tests

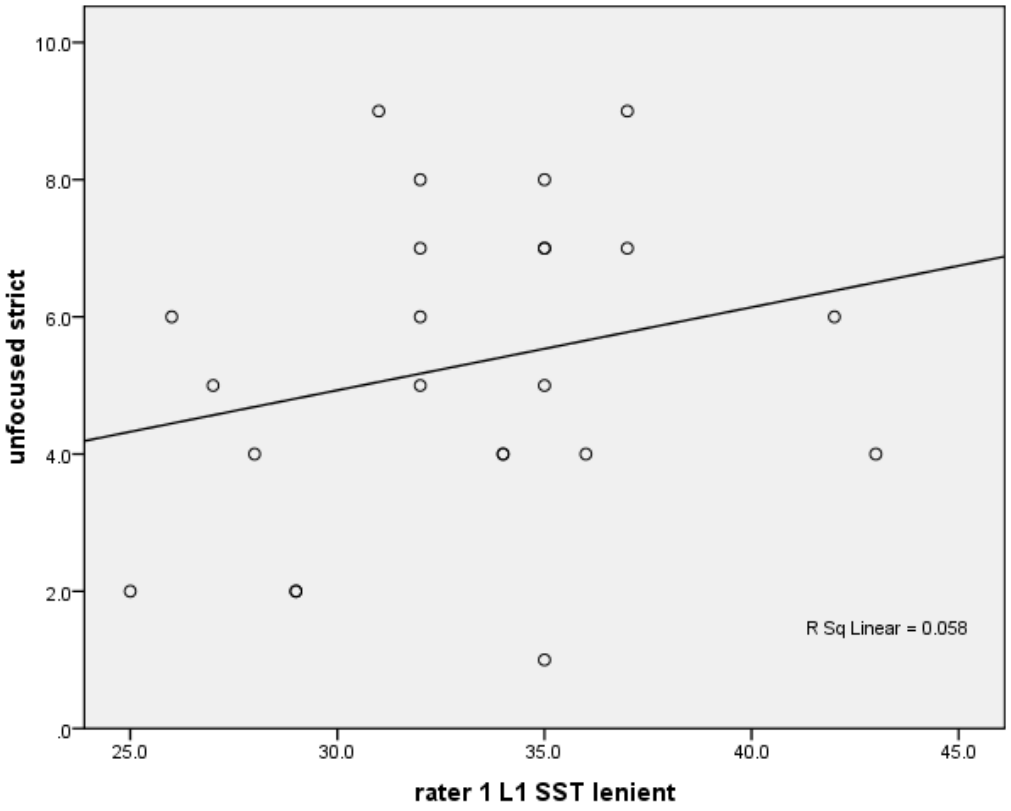

focused strict
9.0
8.0
7.0
6.0
5.0
4.0
3.0
15.0
20.0
25.0
30.0
35.0
40.0
rater 1 L1 SST strict
R Sq Linear = 0.004

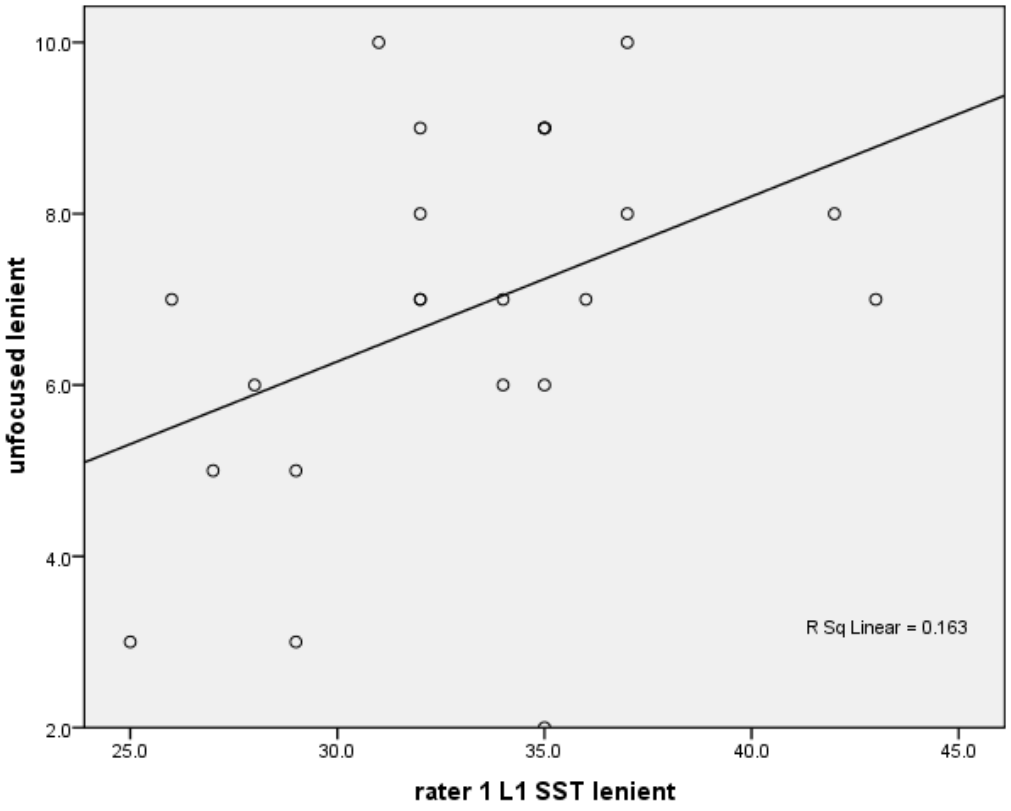

focused strict
9.0
8.0
7.0
6.0
5.0
4.0
3.0
25.0
30.0
35.0
40.0
45.0
rater 1 L1 SST lenient
R Sq Linear = 0.006

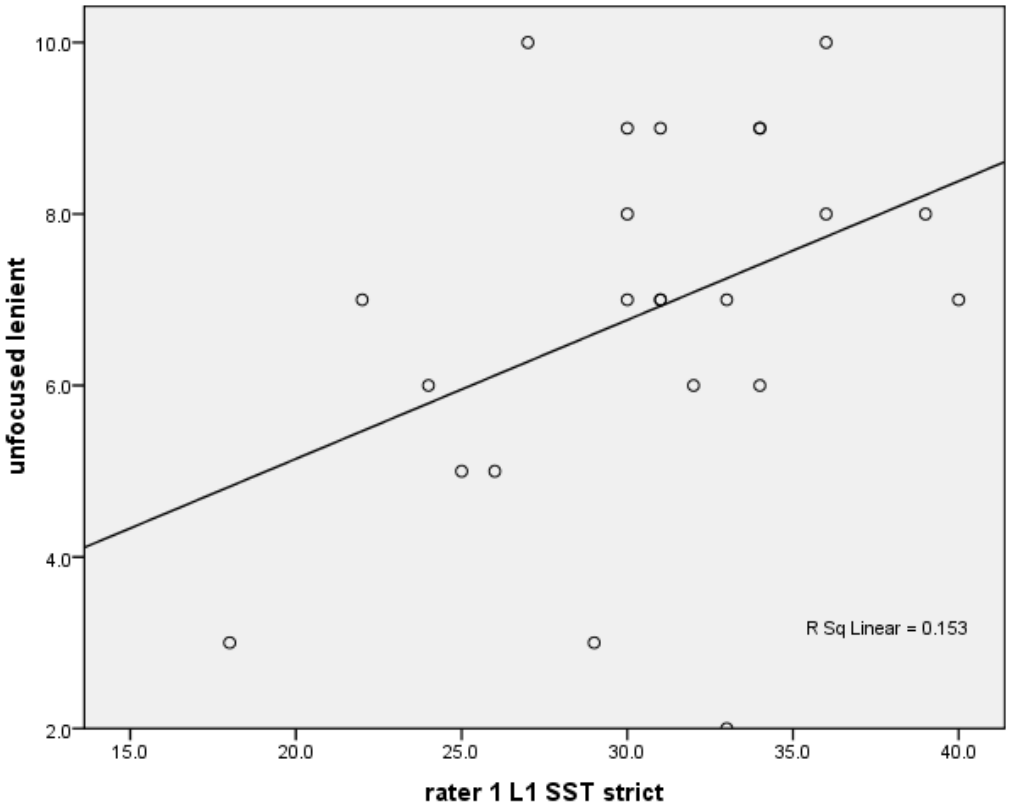

focused lenient
10.0
9.0
8.0
7.0
6.0
25.0
30.0
35.0
40.0
45.0
R Sq Linear = 0.002
rater 1 L1 SST lenient


focused lenient
10.0
9.0
8.0
7.0
6.0
15.0
20.0
25.0
30.0
35.0
40.0
R Sq Linear = 6.346E-4
rater 1 L1 SST strict


unfocused strict
10.0
8.0
6.0
4.0
2.0
.0
15.0
20.0
25.0
30.0
35.0
40.0
rater 1 L1 SST strict
R Sq Linear = 0.081


unfocused strict
10.0
8.0
6.0
4.0
2.0
.0
25.0
30.0
35.0
40.0
45.0
rater 1 L1 SST lenient
R Sq Linear = 0.058


unfocused lenient
rater 1 L1 SST lenient
R Sq Linear = 0.163
10.0
8.0
6.0
4.0
2.0
25.0
30.0
35.0
40.0
45.0


unfocused lenient
rater 1 L1 SST strict
R Sq Linear = 0.153
10.0
8.0
6.0
4.0
2.0
15.0
20.0
25.0
30.0
35.0
40.0

Appendix Z – Correlations 3 raters for the L1 SST and L2 SST