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SYNTACTIC PRIMING EFFECTS DURING THE ORAL PRODUCTION OF ENGLISH AS L2

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Esta dissertação foi julgada adequada para obtenção do Título de "Mestre(a) em Inglês: Estudos Linguísticos e Literários", na área de concentração Estudos Linguísticos e Literáriose aprovada em sua forma final pelo Programa de Pós-graduação em Inglês: Estudos Linguísticos e Literários da Universidade Federal de Santa Catarina.

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To all my beloved family members and friends.

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"Neither can embellishments of language be found without arrangement and expression of thoughts, nor can thoughts be made to shine without the light of language". (Cicero)

ABSTRACT

In the field of psycholinguistics, a topic of great discussion among researchers concerns in the organization of syntactic systems in bilingual individuals. In the psycholinguistic perspective, the oral syntactic production is a complex process, which involves four main stages, according to Levelt's (1989) proposal: the pre-verbal message conception, the syntactic and phonological formulation of the message, its oral articulation and the monitoring, by the speaker, of the coherence between the pre-verbal message and its articulation, through processes of language comprehension (Mota, 2010). Concerning second languages, a critical component is that of the syntactic formulation, which depends on procedural knowledge to guarantee fluency, both in processing and in oral production (Ullman, 2001). In this context, the syntactic priming paradigm has been extensively explored. Syntactic priming is the cognitive phenomenon in which speakers tend to reuse syntactic constructs in the production of subsequent new sentences (Bock, 1986). In turn, this repetition has a facilitating effect on syntactic processing, which has implications for the understanding of how syntactic structures are represented and stored (Hartsuiker, 2004). In L1, syntactic priming effects during production are associated with the automatic nature of processing and implicit knowledge. In L2, however, we still know little about the nature of these effects as well as about how bilinguals represent and store syntactic structures. Adopting the syntactic priming paradigm, the present study aimed at investigating syntactic processing in the oral production of Brazilian Portuguese late learners of English as L2, in order to determine if syntactic priming effects can be detected within the L2. To do so, thirty-one participants performed an oral sentence production task in English, which contained four experimental conditions and the use of active and passive voices with and without repetition of the main verb was manipulated. The participants also performed an oral sentence production task in the active and passive voice that served as a baseline to detect their individual preferences in the use of verbal voices. The results demonstrated a complex interaction between the syntactic priming effect and the individual tendency to reuse the syntactic structure in L2. The results also showed a greater production of the passive voice structure in the experimental conditions in comparison to the baseline. Furthermore, the effects of syntactic priming were mainly found in conditions 3 and 4, which were both related to the passive voice, the less frequent structure.

The results in condition 3 indicated an interaction of syntactic priming effects and the repetition of the head of the structure (i.e. verb), meaning that verb repetition boosted syntactic priming effects when structure (i.e. passive voice) and verb were repeated (lexical boost). These findings are in line with previous studies (Segaert et al. 2011; Bernolet et al. 2013) within the syntactic priming paradigm and show that syntactic priming effects are more likely to occur when the head of the structure and the less frequent structure are repeated. Taken together, the results of this study provide evidence for syntactic priming in English as L2, mainly in the passive voice structure.

Keywords: psycholinguistics; syntactic priming; L2; syntactic processing.

RESUMO

Na área da psicolinguística, um tema de grande discussão entre pesquisadores diz respeito à organização de sistemas sintáticos em indivíduos bilíngues. Na perspectiva da psicolinguística, a produção oral é um processo complexo, que envolve quatro etapas principais, segundo a proposta de Levelt (1989): a concepção da mensagem pré-verbal, a formulação sintática e fonológica da mensagem, sua articulação oral e o monitoramento, pelo falante, da coerência entre a mensagem pré-verbal e sua articulação, através de processos de compreensão da linguagem (Mota, 2010). Em relação a L2, um componente crítico é o da formulação sintática, que depende do conhecimento procedimental para garantir a fluência, tanto no processamento quanto na produção oral (Ullman, 2001). Nesse contexto, o paradigma de priming sintático tem sido amplamente explorado. O priming sintático é o fenômeno cognitivo no qual os falantes tendem a reutilizar construtos sintáticos na produção de novas sentenças subsequentes (Bock, 1986). Por sua vez, essa repetição tem um efeito facilitador no processamento sintático, o que tem implicações para a compreensão de como as estruturas sintáticas são representadas e armazenadas (Hartsuiker, 2004). Em L1, os efeitos do priming sintático durante a produção estão associados ao processamento automático e ao conhecimento implícito. Em L2, no entanto, ainda sabemos pouco sobre a natureza desses efeitos, bem como sobre como os bilíngues representam e armazenam estruturas sintáticas. Adotando o paradigma de priming sintático, o presente estudo teve como objetivo investigar o processamento sintático na produção oral de aprendizes tardios do inglês como L2, a fim de determinar se efeitos de priming sintático podem ser detectados na L2. Para tanto, 31 participantes realizaram uma tarefa de produção oral de sentenças em inglês, que continha quatro condições experimentais, nas quais o uso da voz ativa e da voz passiva, bem a repetição ou não do verbo foram manipulados. Os participantes também realizaram uma tarefa de produção oral de sentenças na voz ativa e passiva (baseline), que serviu como base para detectar suas preferências individuais no uso de vozes verbais. Os resultados demonstraram uma interação complexa entre o efeito de priming sintático e a tendência individual de reutilizar a estrutura sintática em L2. Os resultados mostraram uma maior produção da estrutura verbal passiva nas condições experimentais em comparação com o baseline. Além disso, os efeitos do priming sintático foram encontrados principalmente nas condições 3 e 4, ambas relacionadas à

voz passiva, estrutura menos frequente. Os resultados na condição 3 indicaram uma interação do efeito de priming sintático e a repetição do verbo, ou seja, a repetição do verbo (impulso lexical) juntamente com a repetição da estrutura (voz passiva) ampliou os efeitos do priming sintático. Assim como corroboram estudos anteriores (Segaert, 2011; Bernolet, 2013) no paradigma de priming sintático e demonstram que os efeitos de priming sintático são mais aparentes quando há repetição do verbo e da estrutura sintática menos frequente. Sendo assim, os resultados deste estudo fornecem evidências para o priming sintático em inglês como L2, principalmente na estrutura de voz passiva.

Palavras-chave: psicolinguística; priming sintático; L2; processamento sintático.

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND SYMBOLS

BP – Native Speakers of Brazilian Portuguese (nonnative speakers of English)
CEFR – Common European Framework of Reference for Languages
CEPSH/UFSC – Comitê de Ética em Pesquisa com Seres Humanos
CDA- Categorical Data Analysis
DP – Declarative/Procedural
ERP/EEG – Event-Related Potentials/Electroencephalogram
fMRI – Functional Magnetic Resonance Imaging
L1 – First Language
L2 – Second Language
LabLing – Laboratório da Linguagem e Processos Cognitivos (Laboratory of Language and Cognitive Processes)
M – Mean
ms – Milliseconds
N – Number of Participants
NP- Noun Phrase
SD – Standard Deviation
SE- Standard Error

TABLE OF CONTENTS

CHAPTER I
INTRODUCTION

In the psycholinguistic literature, various phenomena related to the processing and the oral production of sentences have been scope of interest among researchers. Speech production in the L2, for instance, can be influenced by various factors, including priming effects. Priming is a well-established topic with many accounts in the literature (Bock, 1986; Branigan, Pickering, Liversedge, Stewart and Urbach, 1995; Branigan, 2007; Hartusuiker, Pickering & Veltkamp, 2004). According to Branigan (2007) priming occurs when a stimulus facilitates or interferes in the processing of a subsequent structure of the same or a related stimulus. Syntactic priming is the phenomenon by which the processing of a syntactic structure facilitates the processing of the same or a similar structure based on repeated exposure to the target structure (Branigan, 2007). Syntactic priming effects (detected by means of faster reaction times and better accuracy in the processing of a syntactic structure previously used) may provide information about mental representation of syntactic structures in language (Branigan et al., 1995).

The effects of syntactic priming have been studied in the last decades in psycholinguistics, both in L1 and L2 (Bock, 1986; Branigan, 2007; Hartsuiker et al., 2004; Schoonbaert, Hartsuiker & Pickering, 2007). Tagarelli, Mota & Rebushat (2015) believe that syntactic priming in L1 reveals automatic processes and implicit knowledge. However, it is still not well understood how syntactic priming effects occur in the L2, given that, at least for late learners, a considerable amount of knowledge is believed to be of a declarative nature, which engages explicit processes (Tagarelli, Mota & Rebushat, 2015). Likewise, syntactic priming may reflect other individual differences on L2 speakers' processing and oral production.

In light of the above, the aim of the present study is twofold: to investigate whether there are syntactic priming effects during sentence production within the L2 and to investigate if these effects are related to lexical repetition.

In this study, syntactic priming effects are investigated through an oral sentence production task in an adult population of speakers of English as L2, native speakers of Brazilian Portuguese (BP). The experimental design of this study is based on a previous study conducted by Segaert (2011) with Dutch native speakers. The target structure investigated in the present study is the passive voice, which is the target structure used before in recent studies conducted at the Laboratory of Language and Cognitive Processes (LabLing), at the Federal University of Santa Catarina (UFSC) on syntactic priming effects (e.g. Santos, 2017; Kuerten, 2017; Felicio, 2018; de Jesus, 2018). Therefore, I decided to follow the same line of studies conducted at LabLing, using the same structure, in the modality of L2 production, which is different from the previous studies in this context. Other experiments have been conducted with the passive voice as target structure. However, most of these studies have focused on L1 production (e.g. Segaert, Menenti, Weber & Hagoort, 2011; Teixeira, 2016), L1 comprehension (e.g. Kuerten, 2017; de Jesus, 2018) and L2 comprehension (e.g. Santos, 2017; Felicio, 2018). To the best of my knowledge, to date, no studies have investigated the effects of syntactic priming during the oral production of sentences by native speakers of BP in English L2.

1.1 SIGNIFICANCE OF THE STUDY

Syntactic priming has been investigated from different perspectives in the psycholinguistic literature on both first and second language. It has been researched regarding first and second language comprehension (e.g. Weber & Indefrey, 2009; Tooley & Traxler, 2010), and language production (e.g. Bock, 1986; Branigan et al., 1995; Bock & Griffin, 2000; Hartsuiker et al., 2004). Syntactic priming was also investigated in recent studies within Brazilian Portuguese (BP) monolinguals (e.g. Teixeira, 2016; Kuerten, 2017; Kramer, 2017; de Jesus, 2018). However, it is necessary to investigate whether syntactic priming effects affect the oral production of L2 speakers as well as if these effects benefit the oral production of this population.

Furthermore, there is a debate in psycholinguistics studies concerning syntax in L2. Some researchers on syntactic priming

paradigm (e.g. Hartsuiker et al., 2004) investigate whether syntactic systems are shared or independent on bilinguals. According to the DP model (Ullman, 2001) the act of learning, using and storing language lays on two memory systems: the *declarative memory system*, which is responsible for learning and retrieving semantic information, in which the knowledge learned is considered to be at least partly explicit; and, the *procedural memory system*, which is responsible for learning and retrieving rules as well as other cognitive skills and it is considered to be of an implicit nature (Ullman, 2001). The DP model is well established in L1 research and it makes predictions for how these systems are enhanced in L2 learning and processing. However, it still is unclear how these memory systems are engaged in L2 language production. The debate on whether L2 syntax is shared or independent in bilinguals has been at the center of psycholinguistics studies on bilingualism due to the complexity of this discussion. In this context, accounts from recent studies (Hartsuiker & Bernolet, 2017; Hartsuiker et al., 2004) make claims for a bilingual syntactic system in which syntactic representations are shared between languages. Thus, syntactic processing in L2 has been a fruitful scope of research considering that it is a very complex cognitive task.

With this in mind, this study may contribute to the discussion on the nature of syntactic structures' representations in L2 late learners. Furthermore, this study might be significant to the research of English L2 teaching in Brazil as well as it may offer some pedagogical implications concerning the teaching of syntactic structures to Brazilian Portuguese-English learners. This study may also contribute with new data to the area of psycholinguistics of bilingualism especially concerning the influence of syntactic priming effects in the oral production of L2 speakers.

1.2 ORGANIZATION OF THE PRESENT STUDY

This work is organized into 5 chapters. Chapter 1 introduced this research by presenting the phenomenon investigated. In chapter 2, the theoretical background to the study is presented, by focusing on syntactic processing within the priming paradigm in psycholinguistic studies. In chapter 3, I present the method of the study as well as its

research questions and hypotheses. I also include a description of the instruments and the research design of the experiment conducted. In chapter 4, the results and the discussion of this study are addressed. Last, in chapter 5, I summarize the findings, suggest directions for further research, and consider pedagogical implications of this research.

CHAPTER II
REVIEW OF LITERATURE

The purpose of this section is to review the theoretical framework in which this research is based on by addressing the main concepts investigated. For that, I first present an overview of syntactic processing accounts in L2, and then I focus on syntactic priming studies and accounts found in the literature that support the discussion. I also provide insights on oral production in L2 and, last, I bring a description of passive voice structure in English.

2.1 HOW DO BILINGUALS PROCESS SYNTACTIC INFORMATION?

Maybe one of the most intriguing questions in psycholinguistic studies of bilingualism concerns how bilinguals represent and process language in their mind, that is, do bilinguals have a single system for both languages or separate systems for each one? (Hartsuiker et al., 2004). This question has taken part in a hot debate in the field and many different assumptions and claims have been made on this realm. In this section, I review some accounts related to how bilinguals process syntactic information.

Grosjean (1998) claims that experimental research with bilingual speakers faces some methodological and conceptual issues because in this type of research many variables have to be taken into account and controlled for. In addition, individual differences may also interfere and trigger variability in results, which could be one of the reasons why studies on the same topic report conflicting results (Grosjean, 1998). Despite the challenges inherent to research with bilinguals, researchers have made an effort to understand how bilinguals process and represent syntax in the brain.

As mentioned in the introduction, the DP model (Ullman, 2001) posits that the act of learning and using language relies on two memory systems: the declarative and the procedural system. The declarative system is mainly responsible for retrieving lexical items and it is assumed to be of an explicit nature. On the other hand, the procedural

system is responsible for storing rules and grammatical features and it is assumed to be of an implicit nature (Ullman, 2001). According to the DP model L1 speakers rely on these two systems when using language. However, how L2 speakers enhance these systems is a question that still unanswered. According to Ullman (2001) early L2 learners tend to rely more on the procedural system in terms of grammar, that is, they learn implicitly. However, late L2 learners count on the declarative system for learning grammatical features, that is, they tend to learn grammar in an explicit way. Ullman (2001) stated that this happens with late learners considering the fact that the procedural memory system function decreases as we age (Ullman, 2001).

Hartsuiker et al. (2004) proposed that bilinguals share syntactic information between languages. This assumption is based on an earlier model presented by Pickering and Branigan (1998). Hartsuiker et al. (2004) claims that syntactic structures are represented in combinatorial nodes that consist of syntactic properties (e.g. verb, noun), which are connected to lemma nodes (representation for each word) in a single representation from both languages. However, according to Hartsuiker et al. (2004) the extent to which bilinguals' syntactic information is shared between two or more language depends on how similar these representations are in these languages.

The assumption that syntactic representations could be shared across languages later evolved into an account for a shared-syntax model for late bilinguals, which was first proposed by Hartsuiker and Bernolet (2017). According to Hartsuiker and Bernolet (2017), bilinguals indeed share syntactic information, however not to the same level. That is, according to the authors, depending on learners' development, language representations may be more or less integrated. Hence, the syntactic representations of late learners may be shared with increasing proficiency. Based on previous research, Bernolet and Hartsuiker (2018) developed a model of syntactic development for late learners of a second language consisting of five stages. These stages are represented in Figure 1.

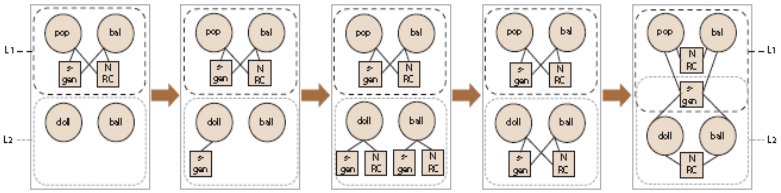


Figure 1. Model of syntax development for late L2 learners (Bernolet and Hartsuiker, 2018, p.208)

The model tries to summarize the learning trajectories of late L2 learners using as example the pair English-Dutch and the syntactic structure in English s-genitive (e.g. the boy's doll) and the post-modified noun phrase (the ball that is red) structures that can be used with *pop* (doll) and *bal* (ball), which are Dutch nouns. The first panel shows the first stage of structures' acquisition, the model assumes that in the first stage words are represented in the mind without being properly connected to syntactic structures. In this stage, speakers tend to transfer L1 structures to the L2 and L2 comprehension is driven by L1 syntactic preferences, because the L2 syntactic representations are not formed yet. According to Bernolet and Hartsuiker (2018), the second panel shows the second stage of the development of L2 syntactic representations, after a few numbers of exposure to the structure, the learner starts to build 'item-specific' representations of the L2 syntactic structures (Bernolet & Hartsuiker, 2018, p. 209).

Panel 3 represents stage 3 of the model, in which it is assumed that L2 syntactic representations develop separately from L1 syntactic representations. Bernolet and Hartsuiker (2018) state that in stage 3 (and also in stage 4), syntactic information starts to become more abstract in the L2, whereas, first, syntactic representations are connected to the L2 lexicon and afterwards syntactic structures are acquired in the L2. When learners reach stage 4, as represented in panel 4, they start to have more integrated syntactic representations, mainly on structures that are more frequent in the L2. In the last stage, represented in panel 5, learners are highly proficient in the L2. Likewise, they have achieved a satisfactory level of syntactic development in the L2. Bernolet and Hartsuiker's model assumes that some syntactic structures are shared between languages, however not all, considering that L2 syntactic structure that do not exist in the L1 or when there is no equivalent correspondent in

the L1 continue to have specific representations in the L2. Thus, their model claim for syntactic abstractness in the L2 to be related to the proficiency of learners as well as that some syntactic structures are integrated with the L1, meaning that, during the processing of L1 or L2, these structures might be activated for both languages (Bernolet & Hartsuiker, 2018, p.210). The claims of Bernolet and Hartsuiker (2018) are in line with Van Gompel and Arai (2017) who claim that the more fluent the speakers more integrated will be their syntactic representation in L1 and L2. (Van Gompel & Arai, 2017, p 6).

In order to make claims for the shared-syntax account in bilinguals, various studies (e.g. Hartsuiker & Bernolet, 2017) have investigated how syntactic representations are elicited in late L2 learners by means of the syntactic priming paradigm, a construct that is addressed in the next section.

2.1.1 Syntactic priming effects

Over the past years, various studies (Bock, 1986; Bock & Griffin, 2000; Branigan, Pickering & Cleland, 1999; Branigan, 2007; Segaert et al., 2011) have investigated the *syntactic priming* phenomenon (also sometimes called *structural priming* or *syntactic persistence*). According to Pickering and Branigan (1999) syntactic priming is the phenomenon in which previous exposure to a syntactic structure facilitates the processing of another with the same or similar form, which results in a faster time of processing of the subsequent utterance (Pickering & Branigan, 1999, p.136). The first researcher to demonstrate experimental evidence for syntactic priming was Bock, in 1986, in a study that is now seminal in the area.

Bock's (1986) experiments have raised some issues that have been widely discussed in the last decades. She states that a form that has been recently used is more likely to be used than an alternative form, meaning that, the most recent structure has its syntax highly activated in the brain, because of the previous production of the same structure (Bock, 1986). That is, people tend to repeat recently heard or spoken syntactic structures to provide new information. For instance, if you hear a sentence such as '*The president gave the congress a speech'*, you are more likely to say '*The girl gave the boy a flower'*, than an

alternative meaning-equivalent '*The girl gave a flower to the boy'*, when describing a picture of a girl handing a flower to a boy.

Likewise, Bock (1986) points out that syntactic priming effects were shown to be relatively automatic, in the sense that the repetition of syntactic structures occurred without conscious intention. In her study, speakers repeated prime sentences and afterwards described target pictures which were semantically unrelated to the prime sentences. Results showed that speakers tended to use an active description of the target picture after an active prime structure and a passive description after a passive prime structure (Bock, 1986).

According to Branigan (2007), priming occurs between sentences that have similar phrase structures, that is, shared syntax, but differ in meaning. Thus, implying that syntactic priming is independent of semantic information. Branigan (2007) states that by examining which expressions prime which expressions, we can draw inferences about the nature of syntactic representation, that is, syntactic knowledge. Pickering and Branigan (1998) suggest that syntactic priming can be employed as a method that allows us to investigate the nature of syntactic representations and syntactic processing.

After Bock's (1986) initial findings, several researchers started to investigate the nature of the phenomenon and its linguistic implications in more depth. For instance, Branigan et al. (1995) concluded that syntactic priming occurs within production, within comprehension, and between comprehension and production. The effects of syntactic priming has been widely used as a tool to investigate the processing in a variety of different populations. For instance, bilingual speakers' production (Bernolet, Hartsuiker & Pickering, 2007 and Kim & McDonough, 2008), bilingual speakers' comprehension (Branigan, Pickering & McLean, 2005; Santos, 2017 and Felicio 2018), childhood linguistic representations (Teixeira, 2016) and dyslexic children (Kuerten, 2017).

As stated above, syntactic priming arises as a method that allows us to investigate syntactic processing on language production and comprehension. Though syntactic priming studies are being well employed in the last few years, some questions remain to be investigated, as for instance, what are the nature of structures that can be primed or to what extent is prime long-lived on the speakers' mind. Therefore, new accounts on syntactic priming are worth to be implemented, in order to better fulfill these research gaps.

In the next section, I present some theoretical assumptions built on research results within the syntactic priming paradigm.

2.1.2 Theoretical accounts of syntactic priming

To account for findings related to L1 syntactic priming, researchers have posited different theories. Pickering and Branigan (1998) stated that nodes for individual lexical items are linked to combinatorial nodes, which allow these items to be combined in a sentence. According to Pickering and Branigan (1998) these lexical items and combinatorial items remain activated for several seconds during production, which within the priming paradigm are enhanced when there is a lexical repetition between prime and target sentences. Pickering and Branigan (1998) claim for a *residual activation* theory, in which the most recent form might be more likely to be used in the production of a new utterance. Another important claim supported by Pickering and Branigan (1998) accounts for a *lexical boost* theory, which considers that the magnitude of priming effects increases in instances where there is lexical (e.g. noun or verb) repetition between prime and target sentences.

Some interesting findings are found in the literature. For instance, Ferreira and Bock (2006) reviewed evidence on the functions of syntactic priming demonstrating its main functions. One of the functions of syntactic priming stated by them suggests that syntactic priming may increase fluency, considering the fact that practicing a skill provides efficiency in performance. According to Ferreira and Bock (2006), in line with this, Smith and Wheeldon (2001) claimed that priming helps to decrease speakers' processing effort, which may lead to a more fluent speech (Ferreira & Bock, 2006).

Another function of syntactic priming enlightened by Ferreira and Bock (2006) demonstrates evidence for the *implicit learning* theory, which is revealed in syntactic priming experiments. Bock and Griffin (2000) consider *implicit learning* as an unconscious process that involves complex and abstract knowledge, which may happen incidentally as some tasks are being performed. Other studies have addressed the question of whether priming is long lasting and leads to

implicit learning, or if it decays over time (e.g. Branigan et al., 1999). However, Ferreira and Bock (2006) state that by evidence observed in Bock and Griffin (2000) priming may persist after many intervening sentences in experimental conditions, which shows an implicit learning function of syntactic priming due to long-lasting changes on speakers' performance.

Another observation provided by Ferreira and Bock (2006) emphasizes that syntactic priming may generate *inverse preference* effects, that is, the learning process reflected in syntactic priming tasks may enhance the production of the less frequent structure that tend to be more used in the course of an experiment. In line with that, a number of studies (Bock, 1986; Bock & Griffin, 2000; among others) also have shown that structures that were less preferred or less common demonstrated greater syntactic priming effects than more frequent structures in the language.

As suggested by the theoretical framework reviewed above, I can state that syntactic priming has its ground well stablished in the literature, especially in L1, and it is a fruitful method to investigate both syntactic production and comprehension. Thus, the next sections bring an overview on the main syntactic priming accounts in both L1 production and comprehension and L2 comprehension and production.

2.1.3 What do we know about syntactic priming in L1 production?

Many studies (Bock, 1986; Cleland & Pickering, 2003; Corley & Scheepers, 2002; Hartsuiker & Kolk, 1998; Pickering & Branigan, 1998; Segaert et al., 2011; Smith & Wheeldon, 2001) have shown evidence of priming effects on L1 sentence production. These studies have investigated how priming affects choice of a structure during the production of a target sentence.

As mentioned above, Bock (1986) was the first to claim for evidence within the priming paradigm in sentence production. She conducted a series of experiments in English L1, employing a syntactic priming paradigm that demonstrated syntactic repetition in natural speech. Bock (1986) hypothesized "that the procedures responsible for the creation of a sentence's structure can be activated or strengthened by use" (p.360), which allowed her to assume that syntactic priming may reflect the activation of the most recent structure.

Inspired by the study of Bock and her colleagues (Bock, 1986; Bock & Loebell, 1990; Bock, Loebell & Morey, 1992). Hartsuiker and Kolk (1998) conducted a study in which they attempted to obtain syntactic priming in speech production with transitive (*e.g.*, the lioness protects the cubs) and datives (*e.g.*, the baker sells the lady a bread) in Dutch as L1. They applied three experiments with the priming paradigm. Hartsuiker and Kolk (1998) succeeded in finding priming effects in datives. However, they failed in finding priming effects in transitive sentences, which Hartsuiker and Kolk (1998) hypothesized, are due to cross-linguistic differences between Dutch and English, since other studies (Bock, 1986; Bock et al., 1992) found evidence for priming effects with transitive sentences, mainly with passives in English.

Smith & Wheeldon (2001) also investigated syntactic priming effects in sentence production in a series of six experiments using picture description tasks. Their aim was to investigate syntactic persistence in online processing. Their results have shown that participants produced sentences faster on targets when they were preceded by a syntactically similar prime. Smith & Wheeldon (2001, p.158) findings provide support for the view that syntactic priming may reduce the processing costs for the speaker as well as the facilitation effect of prime sentences speeded the planning of a new sentence with the same structure (Smith & Wheeldon, 2001).

Segaert et al. (2011) also conducted a study with two experiments following the syntactic priming paradigm in Dutch. They investigated syntactic priming effects in response tendencies, that is, "the frequency of speakers choosing one structure over an alternative structure" (p.1) and response latencies, which may be related to "the speed of sentence production" (p.1) for passive and active sentences in a picture description task. They found evidence for syntactic priming on response tendencies for passives, whereas in the response latencies there was only evidence for syntactically repeated actives. Segaert et al. (2011) state that syntactic priming increases the frequency of the less frequent construction (i.e. passive) and decreases the response latency of the more frequent construction (i.e. active) in Dutch language.

Teixeira (2016) investigated syntactic priming effects on speech production in Brazilian Portuguese. Based on Segaert et al. (2011),

Teixeira (2016) aimed at investigating the occurrence of syntactic priming in speech production of Brazilian Portuguese in both adults and children and to analyze the difference in the production of passive sentences in this population. She used a similar approach of Segaert et al. (2011) in which participants were asked to describe pictures using one sentence. She found significant syntactic priming effects in Brazilian Portuguese, since the prime increased the production tendencies of passive structures in the target for both adults and children. However, the group of adults produced fewer passive sentences than the group of children. Teixeira (2016) stated that these results might be related to the fact that more experienced speakers of a language tend to be less sensible to syntactic priming effects. However, it can also suggest that children were more likely to learn implicitly the passive structure during the experiment, because this structure is not completely acquired in children's natural production.

As stated above, research on syntactic priming has already offered important insights into the nature of syntactic representation and processing. However, Branigan (2007) states that syntactic priming effects may occur in any context, which involves language production and suggests that further research on priming effects mainly on children and other special populations might be profitable in order to understand how language is represented and processed by different populations, especially with bilingual speakers.

As mentioned before, syntactic priming has been used in different modalities. Thus, in the next section I briefly review some studies in L1 comprehension.

2.1.4 What do we know about syntactic priming in L1 comprehension?

As stated above, syntactic priming occurs not only during sentence production but also during language comprehension. Branigan (2007) states that the relevant information about a syntactic form is the same in both production and comprehension, likewise, priming effects may be found in both production and comprehension. However, some procedures involved in producing a syntactic form must be different from the procedures involved in comprehending it. Not many studies on comprehension are found in the literature, even so some claims are made

by researchers (e.g. Branigan et al., 1995; Branigan, 2007; Van Gompel & Arai, 2017) suggesting that the facilitation provided by syntactic priming usually manifests itself as faster reading time of a target sentence after a prime sentence, meaning that priming may reduce processing cost.

Branigan et al. (2005) investigated if there were priming effects in comprehension using a picture-matching task in order to solve ambiguity. In their study, four experiments were conducted in a population of English native speakers. Participants first read an ambiguous sentence such as '*The policeman prodding the doctor with the gun'*, and then two pictures related to the ambiguous expression were shown. To solve the ambiguity, participants should select one of them. In their study, some experiments had the same verb between prime and target sentences and others had different verbs between prime and targets. Their results were significant when prime and target shared the same verbs, whereas the verbs were different between prime and target they were no significant results.

Traxler, Tooley and Pickering (2014) investigated syntactic priming during sentence comprehension in two eye-tracking experiments in a population of 40 native speakers of English in order to verify ambiguity resolution, using as target structures reduce-relative sentences such as '*The defendant examined by the lawyer was unreliable*' and main-clause sentences such as '*The defendant examined the globe but was unreliable*'. Their results corroborate previous results for priming effects when the verb was repeated in both prime and target sentences. However, they noticed that priming occurred when the verb was repeated, but it did not require the first noun to be repeated (Traxler, Tooley & Pickering, 2014).

Fine and Jaeger (2016) investigated the cumulative effect of syntactic primes on subsequently processed sentences by means of 3 self-paced reading experiments in which 88 native speakers of English took part via amazon's crowdsourcing platform. In their study, subjects read sentences in a self-paced moving window in which ambiguous sentences such as *'The soldiers warned about the dangers conducted the midnight raid'* and unambiguous sentences such as *'The soldiers who were warned about the dangers conducted the midnight raid'* and answer to yes/no question between trials. Fine and Jaeger (2016)

claimed for cumulative syntactic priming effects both with and without lexical overlap. That is, they interpreted their results, as priming on comprehension not to be dependent on verb repetition only (Fine & Jaeger, 2016).

Santos (2017) explains that Tooley and Traxler (2010) state that most studies on syntactic priming in comprehension (e.g. Branigan et al. 2005) found significant results only when there is a lexical repetition (*e.g.* a noun or a verb), which provides evidence in favor of the *lexical boost* accounts. This suggests that in language comprehension priming effects may need the lexical repetition to happen or that in comprehension priming effects may be less robust. However, studies of priming on comprehension are more recent (e.g. Pickering & Branigan, 1999) than studies on production, which does not allow researchers to claim for conclusive assumptions.

In a study conducted at LabLing, Kuerten (2017) investigated sentence processing in dyslexic children by means of syntactic priming. She used a self-paced reading task in order to test cumulative effects of syntactic priming in sentence comprehension of active and passive voice. Her results suggest that dyslexics had a stronger syntactic priming for passive than for active sentences. She also showed that the experimental group had reduced reading time in comparison to the control group. Her findings provide evidence for implicit learning theory, since the dyslexic children could benefit from syntactic priming effects by processing the passive voice faster in the experimental task.

De Jesus (2018), in a study also conduct at LabLing, investigated whether syntactic priming effects could be detected in language comprehension, by means of event-related (EEG/ ERPs) technique, regardless of lexical boost effects. She investigated syntactic priming during a silent reading task using the active and passive structures without verb repetition to see whether structure repetition only would play a role in sentence comprehension; however, her results demonstrated that lexical repetition would be necessary for syntactic priming effects in comprehension (de Jesus, 2018).

Considering the context of investigation of the present study, that is of language production and the targeted population refer to Brazilian Portuguese speakers of English as L2. In the next section, I present some reasons for syntactic priming being an interesting source for L2 research and I bring some accounts of syntactic priming results in L2 studies found in the literature.

2.1.5 Why is syntactic priming interesting to L2 research?

In the last 15 years, many researchers have shown interest in understanding the underlying mechanisms of syntactic priming as well as the circumstances in which syntactic priming is more likely to occur. Syntactic priming has been used to investigate cognitive processes and linguistic effects in a variety of populations in both L1 and L2, within-language and cross-languages. However, why syntactic priming is interesting for L2 studies is a key question that one could raise. According to Branigan (2007), syntactic priming raised "important insights into the nature of syntactic representations and processing" (p. 13), which may provide evidence on how syntactic structures are acquired by L2 learners. Moreover, according to Ferreira and Bock (2006) syntactic priming may reflect an implicit learning process that occurs independently of explicit memory processes, meaning that this implicit and autonomous process evoked by syntactic priming may enhance learning in L2 (Kim & McDonough, 2008, p. 152). Likewise, evidence from the literature (Filgueras, Park & Pandza, 2013) demonstrates that syntactic priming may facilitate L2 development by strengthening the knowledge of representations learners already have and by facilitating the acquisition of more abstract representations in the L2. For instance, some studies suggest that priming effects are boosted when verbs are repeated from prime to target (e.g. Hartsuiker & Pickering, 2008) which could lead to the learning of a new structure. De Bot (1996) also suggests that syntactic priming may encourage the automatic retrieval of linguistic forms. Likewise, according to Jackson (2018), research in syntactic priming within and between languages could shed light on the extent to which syntactic priming may be effective for facilitating L2 learning. Jackson (2018) also emphasizes that the investigation of syntactic priming may help in the understanding of whether priming can facilitate the acquisition of new structures in the L2, that is, if it may help in the reinforcement of abstract representation in the L2 (Jackson, 2018). In addition to that, researchers have also shown evidence for syntactic priming in more natural contexts, for example, in classroom-based research (e.g. Kim & McDonough, 2008),

which also allows us to think to each extent syntactic priming may help in the L2 learning process.

In sum, syntactic priming raises as fruitful method to be explored by L2 researchers in order to fulfill important open questions in this realm. Moreover, research on syntactic priming may help us to understand how bilinguals process and produce language and how these processes are similar or not from the L1 domain. Thus, in the two subsections I review recent studies in L2 comprehension and production.

2.1.6 Syntactic priming effects in L2 comprehension

As already mentioned above, the magnitude of syntactic priming effects can be found in both production and comprehension. In the bilingual domain, the investigation in L2 comprehension is even more recent than in L1 comprehension. According to Felicio (2018), the first researchers to demonstrate results in L2 comprehension were Weber and Indefrey (2009) who investigated the passive voice structure in English-German bilinguals' comprehension. Their study investigated to which extent these structures are shared between first and second language.

Weber and Indefrey (2009) conducted two experiments, with English-German bilinguals. The first experiment followed a similar design of studies conducted during comprehension in L1 and participants were tested in two self-paced reading tasks both within language (L2-L2) and between languages (L1-L2). Besides that, Weber and Indefrey (2009) also conducted an fMRI experiment in order to investigate the brain activation of both languages during task performance. They found evidence for syntactic priming effects both within and between languages, mainly when the verb was repeated, which may corroborate for the account of shared representations in bilinguals' mind- the shared-syntax model- at least in part, considering that lexical repetition was required to priming effects to be robust. The fMRI experiment showed that sentences were activated in the brain in the same areas in both languages, again supporting the shared-syntax account. After Weber and Indefrey's (2009) study various other researchers investigated syntactic priming in L2 comprehension (Kidd, E., Tennant, E., & Nitschke, S., 2015; Branigan & Pickering, 2016; Wei, Boland, Cai, Yuan & Wang, 2018), Next I review three recent accounts on this modality. The two first were conducted at LabLing with different

language pairs and the last one investigated the language pair Chinese-English. These studies were chosen because demonstrate a variety of languages in which syntactic priming evidence might occur.

In the context of the LabLing, Santos (2017) investigated within and cross-linguistic influence of syntactic priming effects in BP native speakers of French L2 by means of a self-paced reading task. Her results found evidence for priming within French as L2, but no across languages. Her results suggested also being dependent of verb repetition, which supports lexicalist approaches.

In the same context, Felicio (2018), in a self-paced reading task, investigated the effects of cross-linguistic syntactic priming in Brazilian-Portuguese (L1) and English (L2) during the comprehension of sentences in the passive voice. Her results demonstrated a reduction in the reading time of the *by*-preposition, in condition 1, in which prime and target sentences shared translation equivalents as well as the same syntactic structure. These results were interpreted as evidence for the shared-syntax account for L1 and L2.

Wei et al. (2018) investigated syntactic priming persistence during online L2 comprehension of reduced relative clauses with two self-paced reading experiments among adult Chinese-speaking learners of English. Their first experiment found evidence for a long-lived facilitation effect on language processing, because priming occurred even when prime and target were separated with lag conditions. Their second experiment corroborates the results of some studies with comprehension in L1 in which the persistence of priming effects is due to verb repetition (Wei et al., 2018).

To summarize, studies on syntactic priming in L2 comprehension have already shed light on some aspects of L2 processing. However more investigation is needed in order to have a better understanding of how processing occurs during comprehension in L2 and, more specifically, of how specific syntactic structures with unique features for each language are processed in different languages.

In the next section, I review some studies of syntactic priming in L2 speech production.

2.1.7 Syntactic priming effects in L2 production

Although most research on syntactic priming has concentrated on syntactic priming in L1, the understanding of how priming effects may occur in bilinguals has also drawn the attention of some researchers (Hartsuiker et al., 2004; Bernolet et al., 2007; Schoonbaert, et al., 2007). Likewise, the debate concerning the way in which bilinguals acquire and represent their second language's syntax is part of the discussion.

In the last years, the numbers of studies within the syntactic priming in L2 has increased significantly. These studies can be found in a variety of languages, structures and type of experimental tasks employed. Syntactic priming effects in L2 can be investigated within L2 or between L1- L2 and vice-versa. Studies within L2 consider only the L2 as target language as well as between language studies, investigate syntactic priming across L1 and L2. Table 1 summarizes the main studies in L2 production in the last two decades found in the literature and brings an overview of these studies. In this section, I review only five of these studies because of the number of studies found in the literature. The criteria used for selecting the studies reviewed in this section considered the L2 investigated in the study, which should be or should include English, and/or the structure exploited in the research, in which the preference was for the passive voice structure.

Table 1
Summary of main studies on syntactic priming in production in L2 in the last two decades.

Study/Year	Language	Structure investigated	Type of task used	Results
Hartsuiker, Pickering and Veltkamp (2004)	Between: Spanish-English	Passives	Describing cards to each other in a dialogue game.	The recent use of a structure in one language led to repetition of that structure in another language.
McDonough (2006)	Within: English	Dative constructions	Dialogue interactions	Syntactic priming involved prepositional datives only. Priming did not occur with double-object datives, maybe because these L2 participants did not have had complete knowledge of the constraints on dative alternation.
Desmet and Declercq (2006)	Dutch learners, within: English	Relative clause attachments	Sentence completions	Relative clause attachments can be primed from Dutch to English in Dutch–English bilinguals. This is the first demonstration of cross-linguistic priming of syntactic information that is not directly linked to lexical entries and favors the interactive view of bilingual syntactic processing.

Bernolet, Hartsuiker and Pickering(2007)	Between: Dutch, English, and German	Relative clauses.	Picture description.	The authors found priming within Dutch and within English as a 2nd language. An important finding is that priming occurred from Dutch to German which both have verb-final relative clauses; but it did not occur between Dutch and English, which differ in relative-clause word order. The results suggest that word-order repetition is needed for the construction of integrated syntactic representations.
Salamoura and Willians (2007)	Between: Greek and English	Verb argument	Oral sentence completion task.	The authors obtained cross-language syntactic priming when there was an overlap of syntactic structure and order of thematic roles between prime and target. It also showed that the magnitude of priming did not differ when the L1 prime and L2 target verbs were translation equivalents or when they differed, suggesting that priming did not exploit the translational links between L1 and L2 verb lemmas when there is a prime-target delay.
Schoonbaert, Hartsuiker and Pickering (2007)	Between: Dutch-English Within: English	Transitive and dative sentences	Picture description.	Experiment 1 showed priming within English, and found that this priming was boosted by lexical repetition. Experiment 2 showed priming from Dutch to English, and found that this priming was boosted when prime and target used translation-equivalent verbs. However, this boost was weaker than the lexical boost in Experiment 1. They interpreted these results in terms of an integrated model of lexical-syntactic representation.
Kim and McDonough (2008)	Korean learners Within: English	Passives	Picture description	EFL learners produced more passives when their prompts had the same verb that previously occurred in the researcher's passive sentence. This study demonstrated that L2 learners produce more passives when they are prompted by verbs that occurred in their interlocutor's preceding passives.
Shin and Christianson (2009)	Between: Korean-English	Dative sentences in English and dative sentences in Korean	Sentence recall	The results revealed that structural priming across languages occurred when both languages shared syntactic structure, independent of argument order. Cross-linguistic argument-order-independent structural priming in Korean and English prepositional dative structures was observed, providing evidence for shared bilingual syntactic processing occurring at the abstract, functional level within a two-stage grammatical encoding process.
Chen, Jia, Wang, Dunlap and Shin (2013)	Between: Chinese and English	Passive	Picture description	Results revealed that cross-linguistic syntactic priming occurred in Chinese and English passive sentences, regardless of production of primes or comprehension of primes and language direction (L1–L2 or L2–L1). Our findings indicate that word-order similarity between languages is not necessary for cross-linguistic structural priming, supporting the view of a two-stage model of language production.

Biria and Golestan (2013)	Iranian learners within English	Indirect questions	Picture description	Experiment 1 showed that priming resulted in increased production of the target structure by the Experimental groups as compared with production by the control groups. Experiment 2 showed that the rate of production of the target structure remained significantly higher for participants in the Experimental groups one day later.
McDonough, Trofimovich and Neumann (2015)	Thai learners of English	Relative clauses	Priming modeling sentences.	Some students received information-exchange activities that provided models of the target structures (e.g., primes), while other students received activities without any models. Students who did priming activities produced significantly more relative clauses and adverbial clauses overall than did students who carried out the activities without models, but there was no difference in their production of passives.
Kootstra and Doedens (2016)	Dutch–English	Dative	Listening sentences and describing pictures	They found effects of cross-language structural priming and verb bias on syntactic choice, some of which were influenced by the participants' language dominance. In addition, they found cumulative forms of structural priming, leading to cross-language priming effects between experimental blocks. They discuss these results in terms of models on the representation of lexical and syntactic information in bilinguals, and point out how the observed effects can be related to experience-based mechanisms of language use and contact-induced language change.
Hartsuiker, Beerts, Loncke, Desmet and Bernolet (2016)	Between and within L2: Dutch, English French German	Relative clause attachment	Written task (completing sentences fragments)	The experiments tested whether structural priming within a language differs from priming between languages and whether priming between a first and second language differs from priming between two different second languages. Structural priming was always as strong within- as between-languages and priming between a first and a second language was always as strong as priming between two-second languages. These findings support accounts that assume syntax is shared across languages.

Hartsuiker et al. (2004) used syntactic priming to investigate bilinguals' syntactic representations and to understand whether these

representations are shared between languages in a study with Spanish-English bilingual participants. Their findings suggest that bilinguals share syntactic representations whenever these representations are similar. However, it is interesting to understand how similar syntactic structures have to be to share a representation.

Among these lines, Bernolet et al. (2007) studied syntactic priming representations in speech production in bilinguals across languages. They conducted a series of five experiments to investigate if bilinguals share syntactic representations in Dutch, English and German noun phrases and if these representations are specified for language and for word order of relative clauses. Their results provide evidence for cross-linguistic priming, between Dutch and German, whereas no cross-linguistic priming was found between Dutch and English. Bernolet et al. (2007) findings suggest that cross-linguistic priming effects may occur only when prime and target have the same word order.

Schoonbaert, Hartsuiker and Pickering (2007) conducted four experiments in order to investigate to what extent bilinguals have a single integrated representation of syntactic information. They found evidence for syntactic priming within L1 (Dutch), within L2 (English), from L1 to L2 and from L2 to L1. Moreover, their results have shown that when prime and target used translation-equivalent verbs, priming effects were stronger. However, according to them, these strengthening only occurred when primed from L1 to L2. Schoonbaert et al. (2007) account supports the view that bilinguals share syntactic representations between languages (p.168), which corroborates Hartsuiker et al. (2004) findings.

Shin and Christianson (2009), in a study with Korean and English dative sentences, investigated structural priming in production across languages. Their results have shown that syntactic priming may occur when both languages share a syntactic structure, which is in line with Schoonbaert et al. (2007) results. Hence, Shin and Christianson (2009) findings provide evidence for "shared bilingual syntactic processing occurring mainly at the functional level" (p.179), that is, syntactic priming happened mostly when the syntactic structure was similar or shared between L1 and L2.

Chen et al. (2013) aiming at investigating the role of word order in cross-linguistic structural priming in production between Chinese

(L1) and English (L2) conducted two experiments. Chen et al. (2013) investigated if cross-linguistic syntactic priming occurred between Chinese and English passive sentences, which differ in word order. They found evidence for priming effects in both directions, from L1 to L2 and from L2 to L1. However, Chinese to English (L1-L2) priming occurred more frequently than the other way around. Their results provide evidence for cross-linguistic syntactic priming between Chinese and English, despite the difference in word order in passive sentences in both languages.

In sum, the studies reviewed in this section have investigated syntactic priming in L2 production from different perspectives. Most research in L2 reviewed in this section provide evidence for syntactic priming effects within and between languages. In addition, some studies (Hartsuiker et al., 2004) demonstrated syntactic priming effects mainly when syntactic structures shared the same word order between languages. However, syntactic priming effects were found even when languages did not share the same word order (Chen et al.; 2013). Nonetheless, there is still a lack of understanding about the nature of L2 processing and syntactic priming. Thus, inspired by the studies of Segaert and colleagues (2011), the present study investigated syntactic priming effects in L2 production in a population of Brazilian Portuguese (BP) speakers of English as L2. This study aimed at understanding whether and how effects of syntactic priming are affected by individual differences during speech production in English as L2 in this context. The following section provides an account on speech production in L2 in the literature.

2.2 HOW DO BILINGUALS PRODUCE LANGUAGE?

Before answering this question, I would like to state that the present study is not about speech production itself. The main objective of the present study was to investigate whether there were syntactic priming effects during sentence production within the L2. Therefore, an explanation of speech production in L2 is necessary.

To explain speech production in L2, we first need to understand how we acquire and produce language in L1. Mota (2010) states that according to Levelt (1989), the act of speaking involves a series of processes and stages. Levelt's model comprises three stages for

language production: conceptualization, formulation and articulation. Figure 2 shows how language is produced according to Levelt's (1989) model. The processing components are represented in boxes and ellipses show knowledge stores.

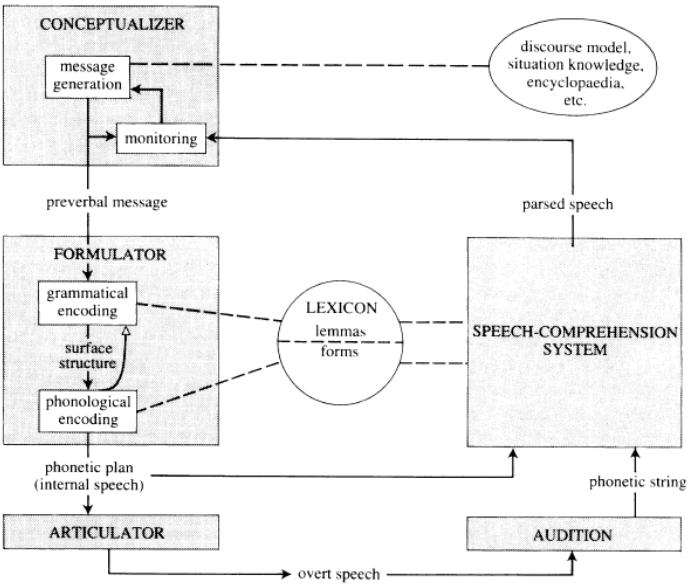


Figure 2. Levelt's Speech production (Levelt, 1989: p.09)

In the stage of *conceptualization*, we employ conceptual processes, which include an intention to speak. These conceptual processes depend on some factors, such as the speaker's motivation or even the knowledge shared between speakers. In the stage of *formulation*, speakers have to access words that convey these concepts, to recover grammatical features that fit with these words and to build a grammatical structure on their mind and to encode the message into linguistic features. In the stage of *articulation*, phonetic planning takes place and activates the articulation system to be performed in words and

sentences. Last, the stage of *speech comprehension* takes place, in which feedback may occur and any speech mistakes may be found by the speech-comprehension system that allows the speaker to monitor the product of the speech. However, Mota (2010) states that monitoring may occur during all phases of the speech production process. Mota (2010) emphasizes that these processes are incremental and that the speaker of L1 is unware of them because they are part of the speaker's implicit knowledge. Thus, despite the automaticity of the act of speaking, it evokes a series of complex processes that need to be carried out before the output is delivered into words and sentences (Mota, 2010).

On the other hand, in the bilingual domain, we can think that the level of complexity of speaking may be even more critical, since the speaker has also to select in which language the message has to be delivered. Due to this complexity of L2 speech production, Mota (2010) explains that De Bot (1992) adapted Levelt's (1989) model to L2 speech production, which is the most popular and well-accepted explanation for L2 speech production so far.

In De Bot's (1992) model, language selection takes place in the *conceptualization* stage, because it is in this stage that the communicative situation is stated and the preverbal message planning takes place. In the next stage, the speaker uses language-specific items to produce linguistic features. Mota (2010) explains that an important claim of De Bot's model suggests that grammatical and phonological encoding of L1 and L2 elicit different procedures. De Bot (1992) hypothesized that L2 speakers produce two speech plans at the same time: one for the language being used a certain moment and another for the active language, which is not being used, but still activated. Hence, the encoding of both languages allows the speaker to code switch when necessary (Mota, 2010).

Mota (2010) also explains how the mental lexicon of an L2 speaker is organized in De Bot's (1992) model, which follows Paradis (1985) claims for one conceptual store for both languages and two semantic stores that are connected to the conceptual store. That is, the lexical items are stored separately for each language, but the conceptual store is language independent (Mota, 2010).

As stated above, De Bot's model is so far the most well stablished model to L2 speech production, but not without criticism, considering that some questions remain unanswered. For instance, if syntactic

representations are activated for both languages during speech production, as stated in the model, proficient bilinguals will have at least two words available for each concept, which may be demanding for the cognitive system. How the speaker's system handles this demand is still unknown (Mota, 2010).

As the last aspect to be reviewed in this chapter, I provide next a description of the passive voice in English, which is the target structure chosen for the investigation of syntactic priming during L2 speech production in the present study.

2.3 DESCRIPTION OF THE PASSIVE VOICE IN ENGLISH

In the present study, the target structure used to investigate syntactic priming effects during L2 sentence production is the passive voice. The passive voice was chosen to be the target structure in this study because it has been recently used in the studies conducted at Labling (Santos, 2017; Kuerten, 2017; De Jesus, 2018; Felicio, 2018). Therefore, I decided to follow the same line of studies conducted at LabLing, using the same structure, however in the modality of L2 production, which is different from the previous studies in this context. The passive voice was also selected as target structure since some studies have adopted this structure in their experiments (Bock, 1986; Hartsuiker et. al, 2004, Segaert et.al, 2011, among others) due to the fact that it is considered a less frequent structure in English when compared to the active voice. Furthermore, some observations in the literature suggest that syntactic priming might be reflected in less frequent structures due to *inverse-preference* effects (Ferreira & Bock, 2006). Thus, this section aims at providing a general description of the passive voice in English.

According to Maclin (1992) transitive verbs (verbs that take direct objects) in English can usually be used in two ways: as active verbs and as passive verbs. Whether using an active verb or a passive verb, the information in the sentence is the same; however, it differs in the order it is presented in the sentence. Thus, the emphasis in this two kind of sentences is different. In an active sentence, the focus of the sentence is in the subject, as in the examples below in sentence (1), whereas in a passive sentence the subject receives the action instead of

acting as represented in (2). The passive voice is generally used when the agent is unknown or unimportant. Passives sentences not always express the agent of the action that can be omitted, but when it is mentioned, the agent appears in the sentence after the preposition *by* as in (2). According to Ferreira (1994), passives are commonly used in scientific writing. Ferreira (1994) states that although passives do occur in both oral and written discourse, passives are less common than actives in English (Ferreira, 1994).

The passive verb is formed by a form of *be* (that determines the tense) + the past participle of the main verb.

(1) Mary is completing the experiment.

(2) The experiment is being completed (by Mary).

O'Grady and Archibald (2016) states that whereas the agent serves as a subject of an active clause as in (3), it is not always expressed in the majority of passive sentences in English as in (4), meaning that passive constructions involve a major reduction in the importance of the agent. Another consideration provided by O'Grady and Archibald (2016), is that the noun phrase (NP) that is usually the direct object of the corresponding active sentence serves as subject in the passive sentence. This can be observed in the examples below in which the NP *'the painting'* functions as direct object in the active sentence represented in example (3), and as subject in the passive sentence as in (4) (O'Grady & Archibald, 2016, p. 169)

(3) The thief stole the painting.

(4) The painting was stolen.

Jaeger and Snider (2007) claim that the passive voice is considered a complex structure because of the grammatical features that comprise the structure and due to its word order considered non-canonical that is less frequently used in comparison to the active voice structure (Jaeger & Snider, 2007).

In a study about how speakers process the passive voice structure, Ferreira (1994) investigated native speakers choice when using whether a passive or an active sentence. She found out that passive sentences take about one second longer to be formulated than actives, which Ferreira (1994) suggests that considering Levelt (1989) assumptions on speech production, passives would take more time to be produced than actives, because passives are formulated in two stages and actives are formulated in one (Ferreira, 1994). Considering that, the passive voice is more difficult to be processed and produced for native speakers of

English, which could allow us to think that it might be even more demanding to be processed in the cognitive system of a bilingual speaker.

As demonstrated above, several studies have investigated syntactic priming effects from different perspectives in different languages and domains. However, a better understanding of how syntactic priming effects may benefit L2 speakers would provide insights to L2 researchers and classroom setting. Thus, the present study attempts to contribute to the existing literature regarding syntactic priming to try to shed light in this realm. To do so, in the next chapter I present the method employed to investigate priming effects in BP-English bilinguals.

CHAPTER III
METHOD

This chapter presents the methodological procedures that were adopted in this study. The chapter is organized into 7 sections. In section 3.1, the research questions and hypotheses, which lead this research, are presented. In section 3.2, the profile of participants who took part in the study is described. The instruments of data collection are presented in section 3.3. Section 3.4 portrays the general research design adopted. In section 3.5, data collection procedures are explained. The pilot study carried out prior the current study is described in section 3.6. Last, in section 3.7, general procedures for data analysis are described.

3.1. OBJECTIVES, RESEARCH QUESTIONS, AND HYPOTHESES

The main objective of the present study was to investigate whether there were syntactic priming effects during sentence production within the L2. The specific objective was to investigate if these effects were related to lexical access.

Based on the objectives presented above, the present study pursues three research questions:

Research Question 1: Are there syntactic priming effects during the oral production of sentences in English as L2? If so, which syntactic structure may benefit from syntactic priming: the active voice or the passive voice structure?

Research Question 2: If syntactic priming effects are found during the production of sentences, are these effects related to verb repetition?

Research Question 3: Is syntactic processing independent of lexical repetition?

In order to answer the research questions presented above and supported by the literature of syntactic priming (e.g. Bock, 1986; Pickering & Branigan, 1999), the following hypotheses were addressed:

Hypothesis 1: There are syntactic priming effects on the oral production of sentences in English as L2. These effects will be stronger for the passive voice structure than for the active voice.

Evidence shows that syntactic priming effects can be detected in both L1 and L2. For instance, Segaert et al. (2011) show that in L1 syntactic priming effects are enhanced in less frequent structures during

production. Likewise, in L2 studies, Kim and McDonough (2008); Biria and Golestan (2013) show that in L2, syntactic priming may increase the production of less frequent structures. Based on Branigan, Pickering, Stewart, & McLean (2000) and Schoonbaert et al. (2007), I expect to find evidence of syntactic priming within English L2 during production. In addition, based on Segaert et al. (2011) and Kim and McDonough (2008), I expect to find stronger syntactic priming effects in the two passive voice conditions: condition 3, which consists in a passive prime with verb repetition in the target and condition 4, in which the structure is repeated between prime and target, however the verb is different.

Hypothesis 2: Syntactic priming effects during the production of sentences in the passive voice in English as L2 are related to verb repetition.

According to the residual activation theory, syntactic priming effects are boosted when the head of the construction is repeated (i.e. verb, noun), in this study, the head of the construction is a verb. In line with this, Branigan (2007), concerning the mechanisms underlying syntactic priming, states that Branigan et al. (2000), based on Levelt et al. (1999) model of combinatorial nodes, suggested that syntactic priming depends on the activation of syntactic representations, which are stored in combinatorial nodes that are once again activated in the processing of a subsequent structure if considered relevant. This assumption may enhance syntactic priming due to cognitive economy. By that, I can assume that after a passive voice prime with the head of the construction (i.e. verb) repeated, it is more likely that the activation of the recent used structure (i.e. passive) in combination with the verb repetition would boost the production of this structure. Therefore, I expect to find syntactic priming effects in condition 3, which consists in a passive prime with verb repetition in the target.

Hypothesis 3: Syntactic processing is independent of lexical repetition.

Some studies (Pickering & Branigan, 1998; Hartsuiker et al., 2004) have shown that participants produced more target structures when prime and target had identical lexical items due to the lexical boost. On the other hand, McDounough and Mackey (2008) found that syntactic priming was stronger when participants produced the target structure with new lexical items in the L2. Likewise, Ferreira and Bock

(2006) reported that structural priming may occur even when an initial prime and a target sentence share the same syntactic structure, however, have different heads (i.e. verb). If so, the two conditions with no lexical repetition (that is, condition 2 and condition 4) may also benefit from syntactic priming effects.

To appraise the objectives of this study, a behavioral experiment was conducted with a group of Brazilian Portuguese (BP) speakers of English as L2. Participants' profile is described in the following subsection.

3.2 PARTICIPANTS

Thirty-one participants (ten males) took part in the study. Hence, thirty-one participants ranging from 18 to 52 years old were considered for analysis in the study. The mean age of the group was 24.4 years (SD = 7.32).

Participants were recruited through advertisement on the webpage of the Federal University of Santa Catarina (UFSC) and invitations sent to undergraduate programs of the same university. This study was approved by the Ethics Committee of UFSC (*Comite de Ética em Pesquisa com Seres Humanos-CEPSH*) under the CAAE number 77367317.5.0000.0121. No control group was used for this study, as the objective was to contrast individual performance with and without a priming paradigm. All participants signed a consent form prior to participation in the study (see Appendix A). Besides the consent form, participants answered a biographical and language experience questionnaire (see subsection 3.3.1 and Appendix B) and they took a proficiency test (see subsection 3.3.2), to ensure they had the level of proficiency in English required for participation in the study, which was advanced C1 or C2 according to the Common European Framework of Reference for Languages (CEFR) (see subsection 3.3.2 for the assessment of proficiency).

According to the information participants provided in biographical and language experience questionnaire the biographical questionnaire (see subsection 3.3.1 and Appendix B), with respect to education, 17 participants were undergraduate students from the Federal University of Santa Catarina (UFSC), 11 of them reported having finished undergraduate studies and 3 of them were graduate students at UFSC. Regarding instruction in their L2, the mean age participants

reported starting learning English as L2 was around 10 years of age and most of them considered themselves proficient in English around the age of 18 years. They reported using English occasionally in the university or at work; they also reported a minimum of 2 hours of daily exposure to the L2 throughout movies, TV series, among others. Regarding proficiency, all participants took an online level test Exam English (see subsection 3.3.2), which demonstrated their proficiency in English was equivalent to C1 and C2 of the Common European Framework of Reference for Languages (CEFR). Participants also provided self-evaluation concerning proficiency and most of them reported being very good at speaking. In relation of experience abroad, 8 participants reported having lived more than 3 months in an English-speaking country. Information regarding participants' profile is summarized in Table 2.

Table 2
General information regarding participants' profile.

Participant	**Age**	**Gender**	**Level of English**	**Starting age of L2 learning**	**Reported time living abroad**	**Average daily timing exposure to the L2**
01	26	F	C1	15	0	2
02	24	M	C2	14	0	3
03	23	F	C1	11	0	5
04	18	F	C2	8	0	5
05	19	F	C2	8	3 years	5
06	23	F	C2	14	1 year	3
07	22	M	C1	10	0	5
08	19	M	C1	16	6 months	3

09	25	F	C2	7	0	6
10	25	F	C2	6	0	1
11	18	M	C2	6	0	8
12	37	M	C2	14	6 months	2
13	19	M	C1	11	0	5
14	23	F	C2	14	0	6
15	23	M	C1	19	5 months	4
16	22	F	C2	6	0	2
17	29	F	C2	10	1 year	1
18	19	F	C2	6	1 year	3
19	18	M	C2	6	0	2
20	42	F	C2	10	0	1
21	20	F	C1	13	0	5
22	28	F	C2	7	0	4
23	23	F	C2	11	0	6
24	33	M	C2	12	0	6
25	22	F	C1	14	0	5
26	18	F	C2	10	0	4
27	52	F	C2	10	2 years	2
28	23	F	C1	12	0	2
29	26	F	C2	12	0	4
30	19	F	C2	12	0	3
31	21	F	C2	7	0	5

N:31	**M= 24,41 (SD= 7,32)**	**Number of males 10.**	**C1 level: 9; C2 level:22**	**M=10,53 (SD=3,38)**	**8 lived abroad**	**M= 3,8 (SD=1,77)**

3.3 INSTRUMENTS FOR DATA COLLECTION

Three instruments for data collection were used in this study: (1) a biographical and language experience questionnaire, (2) a proficiency test and (3) a syntactic priming oral production task. The instruments are presented in the following subsections.

3.3.1 Biographical questionnaire and language experience questionnaire

After signing the consent form (see Appendix A), participants filled in a questionnaire that has already been used in previous studies (Toassi, 2012; Wisintainer, 2016; Felicio, 2018) carried out at the Laboratório da Linguagem e Processos Cognitivos (LabLing) (see Appendix B). The questionnaire is divided into 2 sections. The first section refers to general information regarding sex, age, nationality, level of schooling and occupation. The second part is a language experience questionnaire, which aims to collect participants' information regarding their linguistic experience, such as how they have learned English, the frequency and use of the language, the duration of language learning, the instruction received and the experience of language use in an English speaking country. The questionnaire was available to the participants on the computer through Google Forms platform[1].

3.3.2 Proficiency test

[1] The questionnaire was stored and synchronized on Google Drive via the researcher account.

In order to be included in the study, participants were required to take an online grammar and vocabulary test available on the website Exam English[2]. The test consists of 15 multiple-choice questions and classifies test takers' level of proficiency according to the Common European Framework of Reference for Languages (CEFR) level (from A2 to C2). The same test was used in recent studies with BP speakers of English (Wisintainer, 2016; Felicio, 2018) at LabLing. Based on the proficiency test, participants selected as advanced speakers of English as L2 (C1 or C2 levels) were included in the study. Participants were also asked to rate their L2 performance in the Language questionnaire (see Appendix B) regarding several skills (reading, writing, listening, speaking, general proficiency) on a 7-point scale ranging from very bad to Excellent. Most participants rated themselves as very good in most of skills.

3.3.3 The syntactic priming oral production task

This experiment aimed at investigating syntactic priming effects in English L2 during an oral sentence production task, using a picture description paradigm. In the task, transitive verbs and pictures were manipulated in two target structures: passive and active voice, in order to check whether the production of a prime structure would enhance the production of a subsequent sentence with the same structure. Menenti et al. (2011) first conducted this task in an fMRI study with native speakers of Dutch and Segaert et al. (2011) adapted it to a study with L1 speakers of the same language. Teixeira (2016) also adapted this task in a study with L1 speakers of Brazilian Portuguese (BP). This experiment was adapted from Segaert et al.'s (2011) to be conducted in a population of BP speakers of English as L2. It follows the path of other studies carried out at LabLing regarding syntactic priming effects (Santos, 2017; Kuerten, 2017; Felicio, 2018; de Jesus, 2018).

The syntactic priming oral production task consisted of two parts: a baseline and a syntactic priming part. The baseline part consisted of 48 pairs of trials. Each trial consisted of a filler and an experimental stimulus. There were 48 colored pictures with intransitive filler verbs, which showed one actor performing an action and a given intransitive

[2] http://www.examenglish.com/leveltest/grammar_level_test.htm
Accessed on: September, 2018.

verb to describe the action. These pictures were intercepted with 48 grayscale pictures with 48 transitive verbs, which depicted two actors performing an action and a given transitive verb to describe the action. In the baseline part, participants were instructed to describe the pictures with the verbs given by naming both actors in the pictures where two actors were shown. In this part of the task participants did not receive instructions to use a specific structure as long as this part of the task served to measure participants' natural preference for active or passive voice structure. In the baseline, each participant produced 96 sentences. Figure 3 portrays an example of a trial in the baseline part and possible outcomes.

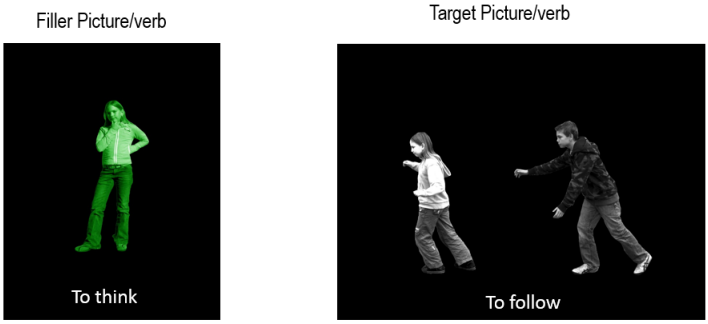
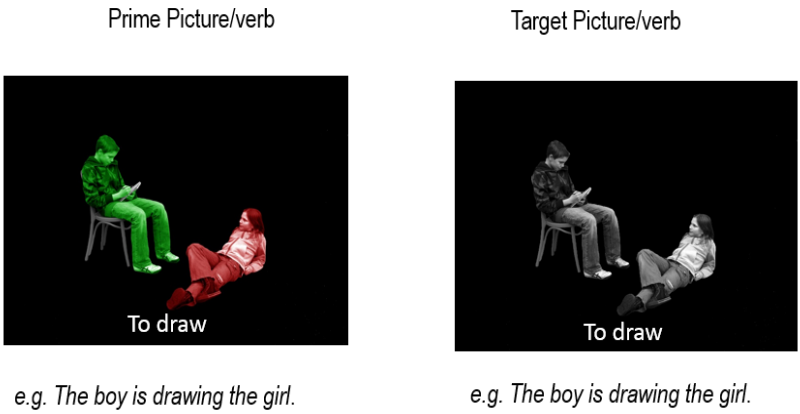


Figure 3. Baseline trial

The syntactic priming part of the task consisted of 313 pictures with verbs. The syntactic priming part consisted of 80 pairs of experimental trials. Each trial consisted of a prime picture followed by a target picture. Primes were pictures where actors (which could be a man or a woman, and could be on the right or left side in the picture) were

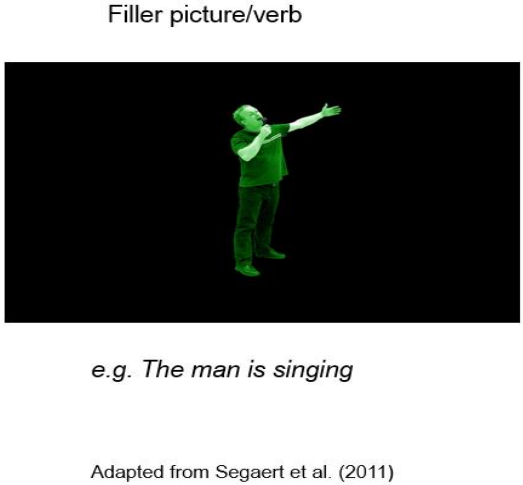
color-coded. Participants were instructed to start the sentence with the person colored in green, which may require either a passive or active voice sentence according to stimuli manipulation. For instance, if the verb given was *to pay* and the picture shows a woman in green receiving money and a man in red giving her the money, the elicited answer would be: *'The woman is being paid by the man*'. Targets were pictures in which actors were depicted in grayscale. In this case, participants could produce a transitive sentence in the preferred structure, which could be either a passive or active voice sentence.

There were 160 pictures containing transitive verbs, 80 of these pictures were prime pictures depicting one actor in green and one in red and manipulated for the order of precedent in the sentence in two target structures: 40 pictures elicited sentences in the passive voice and 40 pictures elicited sentences in the active voice. The other 80 pictures were target pictures depicting two actors in grayscale; therefore, participants could produce either an active or a passive sentence. The other 153 pictures contained intransitive verbs, which served as fillers (see Appendix C for experimental and filler verbs). Each trial was intercepted with fillers that varied from 1 to 3 intransitive verbs and pictures (colored in green, red or grayscale) containing one actor performing an action. For instance, if the given verb was to *sing* and the picture shows a boy, a possible outcome would be: '*The boy is singing'*. In the syntactic priming, each participant produced 313 (153 filler and 160 experimental) sentences. Figure 4 portrays an example of a trial in the syntactic priming part and possible outcomes and Figure 5 illustrates an example of a filler.



Adapted from Segaert et al. (2011)

Figure 4. Syntactic priming trial

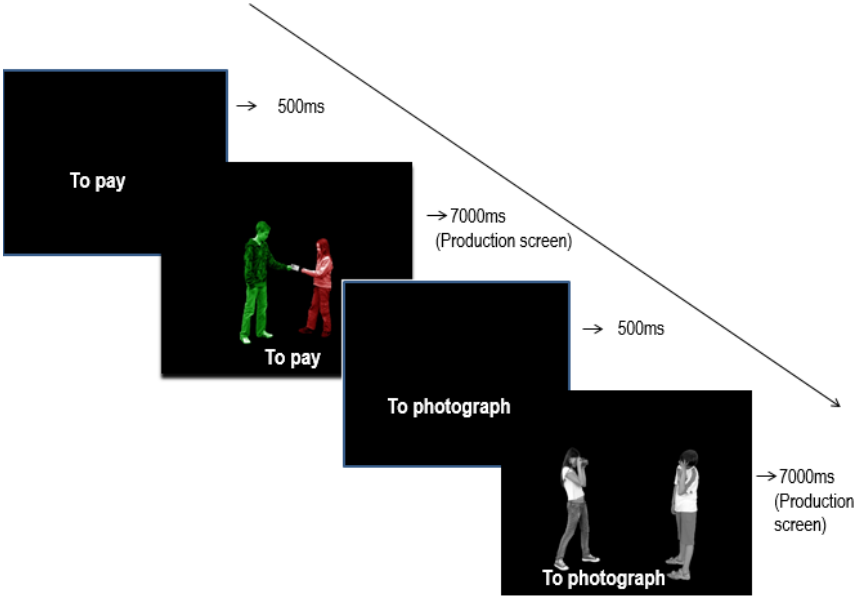


Adapted from Segaert et al. (2011)

Figure 5. Filler picture

The 80 experimental trials consisted of 4 conditions. Each condition consisted of 20 trials. Each trial consisted of prime followed by a target. Prime pictures were color-coded to elicit either an active voice structure or a passive voice structure according to the condition. Condition 1 consisted of 20 trials with prime pictures eliciting active voice sentences and verb repetition in the target picture. Condition 2 consisted of 20 trials with prime pictures eliciting active voice sentences and no verb repetition in the target picture. Condition 3 consisted of 20 trials with prime pictures eliciting passive voice sentences and verb repetition in the target picture. Condition 1 consisted of 20 trials with prime pictures eliciting passive voice sentences and no verb repetition in the target picture (see 3.4 for a full task design's description).

Participants' task consisted of describing pictures with one sentence. If actors are colored, participants were asked to start the sentence mentioning the person colored in green. If actors were not depicted in color, participants could start the sentence as they preferred. The sequence of the task consisted in the presentation of an English language transitive verb in the infinitive depicting in white in the center of a black screen for 500ms. After that, participants saw two actors (a man and a woman or a boy and a girl) performing the action represented by the verb given and the verb was presented again on the same screen for 7000ms. Participants had to produce the sentence while the picture was shown on the screen, that is, they had 7000ms to produce their sentence. If participants did not produce their sentence during the time given, the software would advance for the next frame and this sentence would not be taken into account for analysis. After producing a sentence, participants could press the space bar on the keyboard so that the next stimuli could appear allowing participants to perform the task quicker. Figure 6 illustrates the sequence of presentation of a trial.



Adapted from Segaert et al. (2011)

Figure 6. Presentation of a trial

The stimuli of this experiment consisted of 34 English transitive verbs randomly organized in 4 conditions and 43 intransitive filler verbs (see Appendix C). The list of verbs and the pictures used in this study were gently provided by Katrien Segaert. The stimuli for this study were coded to the English language by the researcher and a research assistant in March and April of 2018. The syntactic priming oral production task was programmed in E-*prime 2.0* software (Psychology Software Tools, Pittsburgh, PA). The stimuli (verb followed by a picture) were shown on a DELL XPS 8700 computer with a DELL 23-inch widescreen monitor. First participants were shown a verb in the middle of the screen for 500ms, after that, a picture with the same verb previously shown were presented for 7000ms, on the same screen participants produced sentences orally while they verb and the picture is on the frame. Participants used a HM-6 microphone to perform the task. Participants' responses were recorded by means of E-*prime 2.0* data collection. The next section provides details on the research design.

3.4 RESEARCH DESIGN

In order to test the hypotheses previously mentioned in this study, the research design follows a similar design of previously conducted studies (Menenti et al., 2011; Segaert et al., 2011; Teixeira, 2016) within the syntactic priming paradigm in oral production. As mentioned above, the task and design of this study were adapted from Segaert et al.(2011). Therefore, four experimental conditions were used and are described in Table 3.

Table 3
Experimental conditions

Condition 1	**Prime**	**Active voice**	**Verb repetition**	**To lift**
	Target	Active voice	Verb repetition	To lift
Condition 2	**Prime**	Active voice	No verb repetition	To help
	Target	Active voice	Verb repetition	To feed
Condition 3	**Prime**	Passive voice	Verb repetition	To pay
	Target	Passive voice	Verb repetition	To pay
Condition 4	**Prime**	Passive voice	No verb repetition	To follow
	Target	Passive voice	No verb repetition	To draw

After the pilot study, some adjustments were made in the design of this research. Therefore, the next two subsections describe, respectively, the design of the first version of the experiment (the one applied in the pilot study) and the second version of the design, which was used in the current study.

3.4.1 First version of the experiment

In the first version of this task, each condition contained 16 trials. These conditions were randomized across the experiment, resulting in

64 trials interspersed by 130 fillers. Thus, participants saw the 4 conditions randomized and counterbalanced with filler pictures, ranging from 1 to 3 fillers across the experiment. As a result, each participant were asked to produce 258 sentences. Two lists of stimuli presentation were created aiming at better counterbalance of verbs, that is, each verb appeared in all four conditions at least once as a prime and once as a target. Participants had 5000ms to produce each sentence. This version of the task was used in the first pilot study; however, it needed to be reviewed considering the feedbacks given by participants in the pilot study as well as the researcher's observation during the data collection sections. Thus, in order to fulfill the research objectives of this study, a second version of the experiment was designed and it explained in the next subsection.

3.4.2 Second version of the experiment

In the second version, a baseline part was introduced in the task, which contained 48 transitive verbs followed by pictures intercepted with 48 intransitive verbs followed by pictures. In the second version, the number of trials per condition was also increased, consisting in 20 trials per condition. Conditions and items were randomized[3] across the experiment, resulting in 80 trials interspersed by 153 fillers. Thus, participants saw the 4 conditions randomized and counterbalanced with filler pictures, ranging from 1 to 3 fillers across the experiment. As a result, each participant was asked to produce 96 sentences in the baseline part and 313 sentences in the syntactic priming part. A single list of stimuli presentation was created, thus all participants saw the stimuli in the same order. Table 4 illustrates an instance of the sequence of verb presentation in the baseline and Table 5 displays an instance of the sequence of verb presentation in the syntactic priming part of the task.

[3]Conditions and items were randomized using the online resource of https://www.random.org/lists/.

Table 4
Baseline verb presentation.

Intransitive verb	To dance
Transitive verb	To comfort
Intransitive verb	To drive
Transitive verb	To follow

Table 5
Syntactic priming verb presentation.

Prime	**Condition 2**	Transitive verb	To lift
Target	**Condition 2**	Transitive verb	To wet
Filler	**Filler**	Intransitive verb	To sneeze
Filler	**Filler**	Intransitive verb	To drink
Prime	**Condition 4**	Transitive verb	To assist
Target	**Condition 4**	Transitive verb	To transport

3.5 PROCEDURES

The data for this study started to be collected in the end of August of 2018 and it finished in the beginning of October of 2018. The experiment took place at an experimental cabin at the Laboratory of Language and Cognitive Processes (LabLing) at the Federal University of Santa Catarina (UFSC) in one individual session per participant. Before starting the experiment, participants were asked to read and sign a term of free and informed consent form (see appendix A), which contained information about the purposes of the study. Then, the participants filled in the biographical questionnaire and language experience questionnaire. After that, they took the online proficiency test and next, participants performed the syntactic priming oral production task. Upon the beginning of the task, participants received instructions about how to perform the task both orally and written on a

computer screen. To make sure that participants were familiar with the task, a practice session, consisting of 6 trials, was provided before starting the experimental session.

After the practice session was finished, participants were left alone to conduct the experimental session, which was divided in two parts: the baseline part, which took between 10 to 15 minutes and the syntactic priming task, which took between 25 to 30 minutes. Between the two parts of the task, participants were given a short break, which varied from 2 to 4 minutes, during the break they could also drink water since the task required oral production. All tasks were performed on a Dell XPS computer with a Dell 23-inch widescreen monitor. In the syntactic priming oral production task participants used a microphone to perform the task and responses were recorded by means of the E-prime 2.0 software for later transcription[4], coding and analysis. In total, each session lasted between 45 to 60 minutes per participant, divided as follows: 15 minutes for the questionnaire and proficiency test, and 35 to 45 minutes for the syntactic priming oral production task.

The next section provides a description of the pilot study.

3.6 PILOT STUDY

The first pilot study was carried out in the months of May and June of 2018 at LabLing.. The objective of the pilot study was to test the instruments and procedures planned, and, if necessary, to review the experimental design and procedures. The data for the pilot was collected with 10 participants, including 3 men and 7 women, who were graduate students from Graduate Programs at UFSC and all had advanced proficiency in English. Participants signed the consent form upon participation in the study. Each participant was asked to produce 258 sentences based on pictures with correspondent verbs. During the pilot, I monitored the syntactic priming task through another computer screen outside the experimental cabin, while participants were completing the experimental session. Both my observations and the feedback provided by the participants indicated some methodological problems, which

[4] All sentences recorded during the experiment were stored in the researcher account on Google Drive for later transcription.

required a review in the design and programming of the syntactic priming oral production task. Among these problems, I noticed the necessity of clarifying written and oral instructions. Participants also reported that the time given to produce their sentences was short in some instances. In this version of the experiment, they had 5000ms to produce each sentence. Another adjustment needed was the inclusion of a baseline part in the task in order to measure participants' individual preference for the either passive or active structure. Adjustments in the experiment was included increasing the number of trials per condition from 16 to 20 trials per condition in order to have more robust data for analysis. Thus, a second version of the experiment was designed and programmed.

The second pilot study was conducted in August of 2018 with 5 participants which were also graduate students from Graduate Programs at UFSC and all had advanced proficiency in English. Participants signed the consent form upon participation in the study. In this version of the task, each participant was asked to produce 96 sentences in the baseline part and 313 sentences in the syntactic priming task. Participants had 7000ms to produce each sentence. In this version of the task, only spelling mistakes in the instructions and verbs of the experiment were reviewed. No other changes were necessary after the second pilot study. The instruments and procedures were then ready for the experimental data collection.

3.7 DATA ANALYSIS GENERAL PROCEDURES

After data were collected, the responses to the biographical and language experience questionnaire as well as the raw results of the syntactic priming oral production task were compiled. Before starting the analyses, participants' sentences were transcribed and manually coded as active or passive. Responses were considered for analysis only if the correct structure was used in the prime picture. Responses were coded as 0 for incorrect prime sentences, 1 for actives and 2 for passives. The data were organized in charts in excel to be analyzed quantitatively using mixed-effects linear models in R-package. In relation to the statistical tests, T-tests and ANOVAs were used to compare individual preferences among participants. The next chapter provides details about data analysis and present the results as well as the discussion of the data obtained from the experimental task.

CHAPTER IV
RESULTS AND DISCUSSION

This chapter presents the results of the present study and discusses whether there are syntactic priming effects during oral sentence production in English as L2. The experiment was carried out with a group of 31 Brazilian speakers of English as L2. The chapter is divided into 3 sections. Section 4.1 presents the pre-processing procedures conducted before analyses. Section 4.2 describes the analyses of the data. Finally, section 4.3 presents the discussion regarding the results of this study.

4.1 DATA PRE-PROCESSING

This section describes the steps and procedures the data went through after collection. Sentences were transcribed and coded as 0 for active sentences and 1 for passive sentences. Next, the data was cleaned and the criteria used for that was to check whether participants used or not the voice suggested in prime pictures, for instance if the prime picture required a sentence in the passive voice and the participant produced a sentence in the active voice, the target response was not considered for analyses. Sentences in which participants did not finish their sentences were also excluded from data analyses. The total of sentences excluded were 1.75% (26 out of 1488) in the baseline task and 0.6% (15 out of 2480) in the syntactic priming task. Table 6 shows the number of sentences considered for analyses in the baseline and in each of the four conditions.

Table 6
Data considered for analyses.

Condition	**Number of valid sentences**
Baseline	1462
Condition 1	616
Condition 2	617
Condition 3	619
Condition 4	613

After cleaning the data, that is, excluding the sentences which did not follow the criteria required for the study, two tables with the information collected were built in the excel to be later analyzed in the R-package. The first table covered information concerning the baseline, in which there was no experimental manipulation and columns contained participant's number and voice used. The second table comprised information concerning the syntactic priming task and columns considered the variables to be later analyzed, which were: participant's number, order, condition, item, voice, verb repetition or not and participant's response. After this, both tables were integrated in a single one to be analyzed in the R-package (R Development Core Team, 2005). The next section provides the details concerning the steps of data analyses.

4.2 ANALYSES OF THE DATA

The experiment employed in this study aimed at investigating syntactic priming effects during oral production in English as L2. The target structures investigated were the active and the passive voice. However, the structure of interest was the passive voice. A baseline task was applied in order to determine participants' preference for either the active or the passive structure before being exposed to the syntactic priming experimental manipulation. This section presents a description of the results in the four experimental conditions in comparison to the baseline, which was included in the statistical model as an intercept. The analyses were performed using the statistics software package R (R Development Core Team, 2005) for experimental science. The analyses were conducted by means of mixed logit models, which include random effects, such as subject and item effects. Repeated-measures ANOVAs were carried out in order to determine the model that best fitted the data of this study.

Although ANOVA is a broadly spread method, the mixed logit models were chosen as statistical method to be adopted, because the type of data of this study requires categorical data analysis (CDA). According to Jaeger (2008, p.437), "logit models are well-suited for the analysis of binomially distributed categorical outcomes (i.e. any event that occurs with the same probability at each trial)". This is the case of the current data, since participants responses' could be in the 'active' or

‘passive’ voice, which leads to a binary categorical dependent variable (active and passive). Moreover, Baayen, Davidson and Bates (2008, p. 399) state that one of the advantages of “mixed-effects modeling is to bring effects that unfold during the course of an experiment into account and to consider other potentially relevant covariates as well”. Furthermore, mixed logit models have been employed in several studies concerning syntactic priming in production, such as Bernolet and Hartsuiker (2010) and Segaert et al. (2011).

The data in this study were analyzed using Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) in the lme4 package, calculated with the function glmer in R package (version 3.4.2 available at: https://CRAN.R-project.org/package=lmer4).

The analysis was conducted from different perspectives, in order to see which variables could influence the results: 1) Context 1, using the baseline as a fixed factor as well as considering subjects and items as random effects; 2) Context 2, excluding the baseline and dividing the experiment per quartile; and 3) context 3, excluding the baseline, comparing the conditions and including order as a factor.

In context 1, the analysis aimed at testing the conditions of the study in contrast with the baseline and possible random effects for subjects and items. Then, in context 2, the analysis was carried out per quartile to better understand the results. Last, in context 3, a separate analysis was done considering only the conditions as well as including the order of items as a factor to find out if it could influence the results. The results are presented and explained in detail in the following section.

4.3 RESULTS AND DISCUSSION

The baseline contained 1462 target answers (sentences). Of these, 1325 were in the active voice and 137 were in the passive voice. These numbers show participants’ tendency to use the active voice more frequently than the passive voice without experimental manipulation of stimulus. These numbers change significantly after the syntactic priming task, in which the total number of target sentences was 2465, with 1967 sentences in the active voice and 498 in the passive voice. Figure 07 displays the comparison of passive voice in the baseline and the syntactic priming task. The X-axis shows the baseline and the syntactic priming task, whereas Y-axis displays the proportion in percentages of passive voice answers in the target.

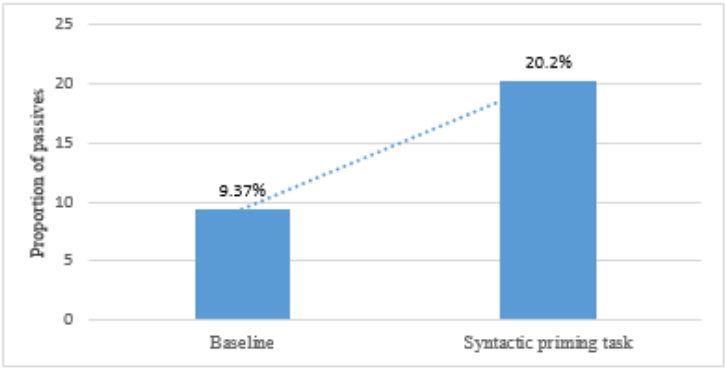


Figure 7. Comparison of responses from baseline to syntactic priming task

As illustrated above in Figure 07, there number of passives voice responses in the syntactic priming task (20.20%) was generally higher than in the baseline (9.37%). Likewise, the number of passive voice constructions in each condition of the syntactic priming task was higher than in the baseline. Figure 8 displays the proportion of passive voice responses in comparison to the baseline per condition. The X-axis displays the baseline on the left as well as each of the four condition, labeled with their respective type of prime, whereas the Y- axis shows the proportion of passives in each condition. Figure 08 demonstrates that the number of passive voice constructions were higher in all conditions than in the baseline.

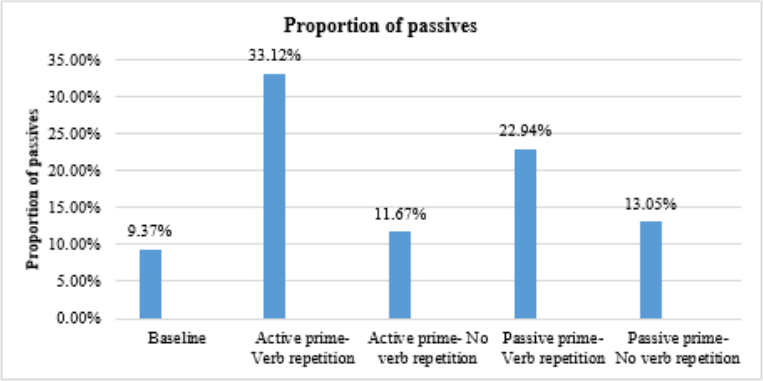


Figure 8. Response tendency results: the proportion of passive sentences per condition

In order to answer research question 1 (RQ1), which asked: "are there syntactic priming effects during the oral production of sentences in English as L2? And if so, which syntactic structure may benefit from syntactic priming effects: active voice or passive voice structure?", the generalized linear-mixed model fit by maximum likelihood (Laplace Approximation) in R- package was employed. For that, several models[5] were tested in order to see the most suitable model to analyze the data (for complete model's formula, see Appendix E). Two models were suited for the data; and the one with less experimental noise, according to ANOVA, was considered the best-fitted model. Table 7 summarizes the results of response tendencies according to the statistical analysis in R, including items and participants as random effects as well as the baseline as the intercept (For complete analyses, see Appendix E).

Table 7
Summary of fixed effects in the mixed logit model with the baseline as intercept.

Predictor	Estimate	Standard error (SE)	*Z- value*	*P- value*
Intercept (Baseline)	-2.87	0.26	-10.72	<.001***
Active prime- Word repetition	1.88	0.14	13.06	<.001***
Active prime- No word repetition	0.22	0.16	1.37	=1
Passive prime- Word repetition	1.22	0.14	8.32	<.001***
Passive prime- No word repetition	0.45	0.16	2.81	<.01**

In Table 07, the levels of statistical significance are represented as *p*-value. The intercept (baseline) value was statistically significant (<.001) as well as condition 1 (p = <.001), condition 3 (p = <.001) and condition 4 (p = <.01). Only condition 2 (active prime- No word repetition) was not statistically significant ($p = 1$). With respect to the active voice, condition 2 ($p = 1$) was the most unlikely condition to demonstrate results. Nonetheless, condition 1 (active prime- word

[5] Several models were employed taking into account as many as possible variables; however, some of them failed to converge the data of this study. The complete models run in the analyses as well as ANOVAs are attached in the appendices.

repetition), demonstrated a high number of passive voice constructions, which was statistically significant (p = <.001). Contrary to what was expected, this result shows that active primes did not affect the response tendencies when the verb was repeated from prime to target in comparison to the baseline. Concerning condition 3 (passive prime- word repetition), the number of passive voice constructions was statistically significant (p = <.001), which was expected since primes were in the passive voice and the verb was repeated. This result demonstrates that passive primes affected the response tendencies when the verb was repeated from prime to target in comparison to the baseline. Last, considering condition 4 (passive prime- no word repetition), the number of passive voice constructions was statistically significant (p = <.01) in comparison to the baseline, although in a lower number than in condition 3. This result shows that passive primes did affect the response tendencies, even when the verb was not the same from prime to target.

Thus, the above presented results support hypothesis 1 (H1), which predicted that there would be syntactic priming effects in the oral production of sentences in English as L2 and that the structure that would benefit from the syntactic priming would be the passive voice. Hence, the results reported above show that when comparing the results of the syntactic priming task with the baseline results, there was a greater production of passive voice sentences in the experimental conditions, which were mainly found in Condition 3 and 4, both related to the passive voice. These results are in line with Segaert et al. (2011) who claimed for a larger effect of syntactic priming in less frequent structures (i.e. the passive voice).

Research question 2 (RQ2) asked: "If syntactic priming effects are found during the production of sentences, are these effects related to verb repetition?". In order to answer this question, the same analysis reported above was used. Likewise, Figure 09 displays a comparison between condition 3 (passive prime- word repetition) and condition 4 (passive prime- no word repetition).

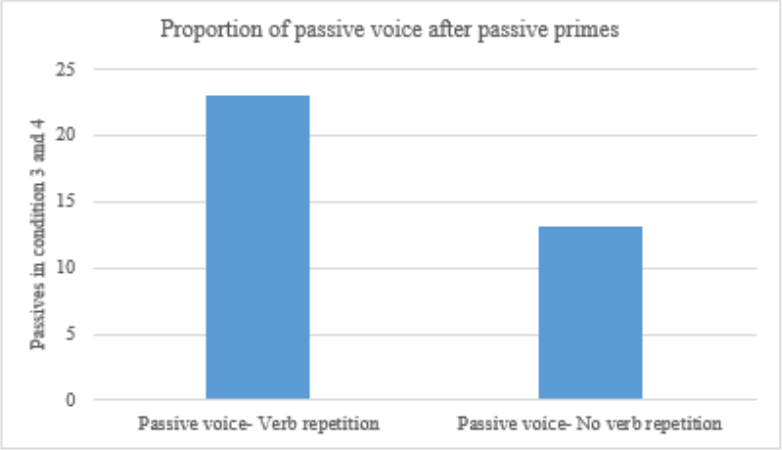


Figure 9. Comparison of the proportion of passive sentences in condition 3 and 4.

As illustrated in Figure 09, and confirmed by means of the linear-mixed models analysis previously presented, syntactic priming effects were stronger in condition 3 than in condition 4. In this sense, the prediction of hypothesis 2 (H2) that "Syntactic priming effects during the production of sentences in the passive voice in English as L2 are related to verb repetition" is supported by the results. Hence, considering that there was a significant result in condition 3, in which there was a verb repetition between prime and target, it is possible to state that syntactic priming effects are more robust when there is a repetition of structure and verb. The results of condition 3 are in line with previous studies in L1 (e.g., Branigan et al., 2000; Cleland & Pickering, 2006) that claim that syntactic priming effects benefit from lexical repetition between prime and target. These results also support Segaert et al. (2011) and Bernolet, Hartsuiker and Pickering (2013) findings for syntactic priming effects on responses tendencies when the head of the structure (i.e. the verb) is repeated.

Concerning research question 3 (RQ3), which asked: "Is syntactic processing independent of lexical repetition?", the results previously reported by means of linear-mixed models partially confirm hypothesis 3, which predicted that syntactic processing is independent of lexical repetition. Whereas results of condition 4, in which the syntactic structure was shared between prime and target, without verb repetition between prime and target were statistically significant (p= <.01). This is

in line with previous studies (e.g. Segaert et al. 2011) which demonstrate that the magnitude of syntactic priming may appear even when it is not helped by lexical repetition between prime and target, that is, without the influence of lexical access. However, as Figure 09 displayed the proportion of passives in condition 3, in which there was a verb and structure repetition, participants' tendency to produce a passive, was higher than in condition 4, in which there was structure repetition only. These results demonstrate that syntactic priming in L2 are more likely to occur when the less frequent structure is repeated as well as the head of the construction (i.e. verb).

On the other hand, a close look on the results is needed in order to raise other issues regarding this assumption. Hence, Figure 10 displays a comparison of passive voice responses in the conditions with active primes: condition 1 (active prime- Verb repetition) and condition 2 (active prime- No verb repetition).

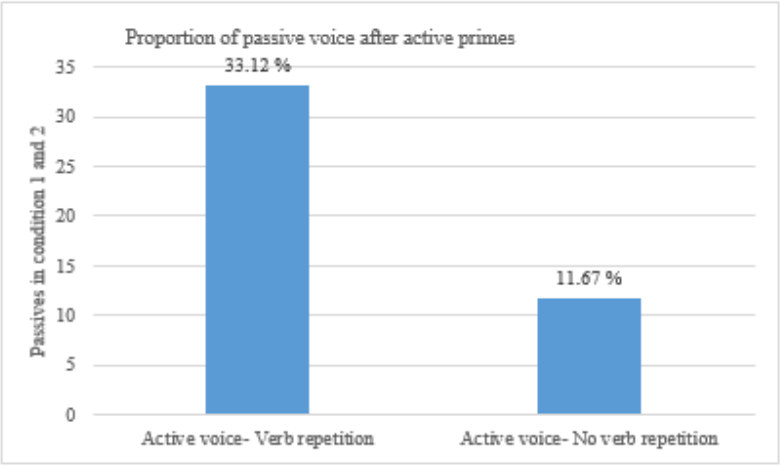


Figure 10. Comparison of the proportion of passive sentences in condition 1 and 2.

As illustrated on Figure 10, condition 1, in which the active voice and the verb were repeated from prime to target, had a strong degree of preference for the passive voice in participants' responses when compared to condition 2, in which the active voice was repeated, but the verb was not repeated from prime to target. This can be interpreted as

evidence that the repetition of verb and structure in condition 1 boosted the more complex structure, the passive voice. Besides that, with respect to actives, the results of condition 1 also support previous findings (Segaert et al., 2011) that show a ceiling effect for the active voice.

On the other hand, in condition 2, participants' preferences were higher for the active voice, which was expected, considering that switching structure and verb from prime instances to targets can be more cognitively demanding for L2 speakers (Ullmann, 2001). According to Levelt and Kelter (1982), syntactic persistence, that is, the use of the same structure reduces processing costs for the speaker, which might be the case here since the active voice triggered results in condition 2.

Nonetheless, a question remains concerning the results found in condition 1. First, these results can be taken as support for H3 (which predicted that syntactic processing is independent of lexical repetition) because there was no lexical boost between prime to target in condition 1, as we can see in Figure 10. Besides, these results are in line with H1 (which predicted that the structure that would benefit from the syntactic priming would be the passive voice and not the active voice), since the active voice did not influence participants' responses on targets, when there was repetition of the active voice and the same verb from prime to target. In order to better explore the results reported in this study, a second analysis with linear-mixed model was run.

In context 2, as previously mentioned, a second analysis was carried out per quartile. That is, the experiment was divided into 4 quartiles and the baseline was not considered for the analysis, since this model aimed at testing the conditions only, as well as to determine if the high number of passive voice responses in condition 1 could mean a cumulative syntactic priming effect in the course of the experiment. Thus, the experiment was divided into 4 quartiles and the statistical model run for this analysis considered participants and items as random effects in the generalized linear-mixed model fit by maximum likelihood (Laplace Approximation) in R- package. Figure 11 displays the probability of passive answers per quartile in each condition.

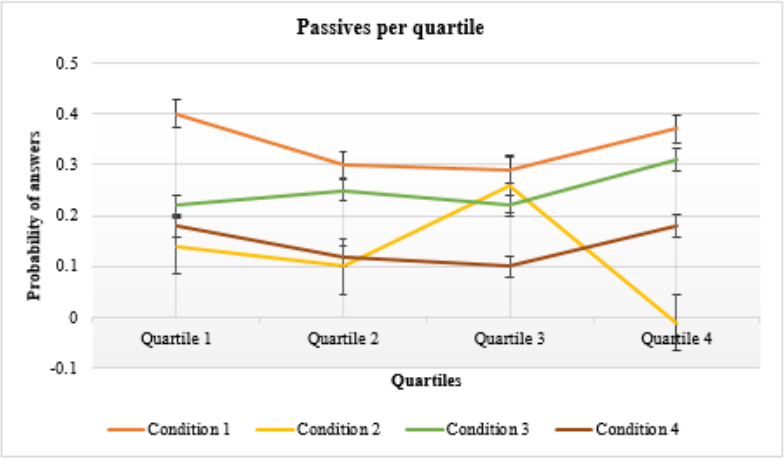


Figure 11. Response tendency results: the proportion of passive sentences per quartile in each condition.

As can be seen on Figure 11, condition 1 had a high proportion of passive responses starting in the first quartile of the experiment. Thus, the assumption that there were cumulative syntactic priming effects throughout the experiment that affected condition 1 does not hold. Furthermore, this analysis showed an intriguing result considering condition 2, because from quartile 2 to quartile 3 of the experiment, the number of passive responses increased significantly, which did not occur in the other conditions. Table 8 shows the p-value of each condition per quartile.

Table 8
Summary of linear mixed model: p- value per quartile.

Predictor	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Condition 1	p<0.053.	p>0.436	p>0.859	Intercept
Condition 2	p<0.063.	p< 0.015 *	p< 0.016 *	Intercept
Condition 3	p>0.859	p> 0.234	p>0.821	Intercept
Condition 4	p>0.58	p>0.13	p>025	Intercept

As displayed in Table 8, when considering the quartiles of the experiment, condition 2 had significant results in the 3 first quartiles. Condition 1 had significant results in the first quartile. Since these

results raised another question regarding an effect of order of stimulus in the experiment, another analysis was run considering order of items as a factor.

In context 3, an analysis was carried out considering only the conditions and including the order of items as a factor, to further investigate if this factor could influence the results. Again, linear-mixed models were employed to compare the conditions with order as a factor. The results of the analysis of fixed effects in the mixed model including order as a factor are summarized in Table 9.

Table 9
Summary of fixed effects in the mixed model including order as a factor.

Predictor	Estimate	SE	*dt*	*t- value*	*Pr(>|t|)*
Condition 1	0.111	0.172	39.274	0.647	> 0.521
Condition 2	-0.238	0.088	112.347	-2.703	< 0.007 ***
Condition 3	-0.171	0.170	40.573	-1.007	> 0.319
Condition 4	-0.407	0.099	88.191	-4.089	< 0.001***

This analysis demonstrated that order was statically significant only for condition 2 ($p < 0.007$) and condition 4 ($p < 0.001$). Therefore, in order to understand the result of condition 2 the same model was run including items (verbs) as fixed effects. In this analysis, order was considered as intercept. Table 10 summarizes results including only the verbs that reached statistical significance (*draw, feed, and follow)* [6].

Table 10
Summary of fixed effects in the mixed logit model including items as a factor.

Predictor	Estimate	SE	*Z-value*	*P-value*
Intercept	-1.49	3.33	-4.47	<0.001
Verb *to draw*	-2.60	1.06	-2.44	<0.01
Verb *to feed*	1.034	4.23	2.44	<0.01
Verb *to follow*	8.488	3.98	2.12	<0.03

[6] The table including all verbs of the study is attached on Appendix D.

The Results displayed on Table 10 show that order was significant ($p<0.001$). As previously demonstrated in Tables 08 and 09 that the condition 2 was affected by order biases. Therefore, it was necessary to examine, in the experimental design, the conditions in which the verbs (*draw, feed* and *follow*) with significant results were found in targets. It was noticed that these 3 verbs significantly motivated responses in the passive voice. Surprisingly, the verbs *feed* and *follow* were allocated in condition 1 in the first quartile. Besides that, the verbs *draw* and *follow* were placed in condition 2 in the third quartile (for the complete list of verbs and conditions, see Appendix D) These findings may demonstrate that these verbs are more frequently used in passive instances in comparison with the other verbs of the experiment. These findings might be the reason for the high number of passives in condition 2 (third quartile) and might partially explain the high number of passives in condition 1 in the first quartile. It is important to state that even though items were counterbalanced and randomized, the experimental design did not control for showing all items in all experimental conditions. In addition, in fact, some items could be naturally more common in the passive voice, which might be the case of the items mentioned above.

All findings of this study are further discussed within the theoretical framework in the next section.

4.4 GENERAL DISCUSSION

In this study, I investigated syntactic priming effects during sentence production in English as L2. In this section, I further discuss the results previously reported by readdressing the research questions and hypotheses that were pursued in the present study. In addition, I contrast the findings of this study with the theoretical framework

Research Question 1: Are there syntactic priming effects during the oral production of sentences in English as L2? If so, which syntactic structure may benefit from syntactic priming: the active voice or the passive voice structure?

Hypothesis 1: There are syntactic priming effects on the oral production of sentences in English as L2 and the passive voice structure may benefit from syntactic priming effects.

Hypothesis 1 was supported by the results of the present study. The comparison of the results of the syntactic priming task with the

baseline results shows that there was a greater production of passive voice sentences in the experimental conditions. Likewise, the effects of syntactic priming in oral sentence production in L2 were mainly found in Conditions 3 and 4, which were both related to the passive voice. These findings are in line with Segaert et al. (2011), who claimed for a larger effect of syntactic priming in less frequent structures (i.e. the passive voice).

Research Question 2: If syntactic priming effects are found during the production of sentences, are these effects related to verb repetition?

Hypothesis 2: Syntactic priming effects during the production of sentences in the passive voice in English as L2 are related to verb repetition.

The results of the syntactic priming experiment support hypothesis 2. There was a statistically significant syntactic priming effect in condition 3, in which the verb was repeated between prime and target. By that it is possible to state that syntactic priming effects are more robust when there is a repetition of syntactic structure and verb. The results of condition 3 are in line with previous studies in L1 (e.g., Branigan et al., 2000; Cleland & Pickering, 2006) that claim that syntactic priming effects benefit from lexical repetition between prime and target. These results also support Segaert et al. (2011) findings for syntactic priming effects on responses tendencies when the head of the structure (i.e. the verb) is repeated. Concerning the L2, these findings are in line with Hartsuiker et al. (2004) who demonstrated that syntactic priming is more likely to occur when two languages have the same translation equivalents, as predicted by the shared syntax account.

Research Question 3: Is syntactic processing independent of lexical repetition?

Hypothesis 3: Syntactic processing is independent of lexical repetition.

Hypothesis 3 was also supported by the results of the present study. In condition 4, the syntactic structure was shared between prime and target without verb repetition between prime and target. The results of the syntactic priming task show that, in condition 4, the magnitude of syntactic priming may appear even when it is not helped by lexical repetition between prime and target, that is, without the influence of lexical access. These results are in line with Segaert et al. (2011).

Concerning condition 1, as stated previously, the experimental results found were unexpected. However, a few assumptions can be made by looking closely at the results and thinking about the theories

related to syntactic priming effects in bilinguals. Overall, the results of this condition demonstrate that there is not syntactic priming effects for actives when there is lexical repetition. However, these results can be interpreted in different ways.

First, as stated by the literature, the active voice is a very frequent structure in the language and, according to Pickering and Branigan (1999), skilled language speakers, as is the case of the population of this study, "might be less susceptible to syntactic priming effects, since they have more computational resources available" (Pickering & Branigan, 1999, p.141). Most participants in the study reported using their second language frequently for a sort of different activities. Therefore, for the participants, the representation of the active voice in English as L2 may be well integrated in their syntactic knowledge in a way that prevents them from being affected by syntactic priming effects within this syntactic construction and the verb repetition, which may be the case in condition 1.

Second, the results in condition 1 can also be interpreted considering the experimental design of the study, in which half of the experimental items were in the passive voice, which increased significantly the exposure to a structure that can be assumed being less frequent in English as L2. Thus, the participants of the present study, advanced speakers of the English as L2, might have benefited from the exposure to the passive and implicitly learned throughout the experimental session. According to Ferreira and Bock (2006), implicit learning reflects "the incidental tuning or adjustment of the tendencies of a processing as a function of experience" (Ferreira & Bock, 2006, p.3), which might be the case for the results in this condition.

Moreover, the results of condition 1 also allow inferences concerning the inverse-preference theory (Ferreira & Bock, 2006) related to syntactic priming effects. This theory states that structures that are in general less preferred (i.e. passive voice) demonstrate more syntactic priming effects, whereas the general more preferred structure (i.e. active voice) evokes less syntactic priming effects. According to Ferreira and Bock (2006) when something is already known (i.e. active voice) it does not reflect learning. On the other hand, when something is poorly known it may unable a greater learning, which maybe the case in condition 1.

The results of condition 1 may also reflect individual differences because some participants demonstrated a natural tendency to produce more passive voice sentences than others in the baseline part of the task,

in which there was not stimuli manipulation. According to Jackson (2018), the magnitude of syntactic priming may vary across individuals, meaning that not all L2 speakers are primed under the same conditions. This variation may also be related to individual differences in other cognitive resources, such as attention or working memory capacity.

Summarizing, the results of this research show that syntactic priming effects within L2, during oral sentence production, were more likely to occur in the less frequent structure (i.e. passive voice), which is in line with Segaert et al. (2011) results in L1. Moreover, it is possible to state that syntactic priming occurred when prime and target shared the same syntactic structure and verb, which may be in line with the residual activation theory (Pickering & Branigan, 1998), since syntactic priming effects were boosted when the head of the construction was repeated (i.e. verb). However, syntactic priming was also demonstrated without verb repetition in the less frequent structure, which may suggest that the magnitude of priming may occur even when there is no verb repetition, which corroborates with McDounough and Mackey (2008) findings showing that syntactic priming was stronger when participants produced the target structure with new lexical items.

The next chapter presents the final remarks of this study, summarizing the findings, pointing out limitations of the study and offering further suggestions for future research as well as pedagogical implications for English L2 classroom.

CHAPTER V
FINAL REMARKS

The main objective of the present study was to investigate whether there were syntactic priming effects during sentence production within the L2. The specific objective of the study was to investigate if these effects were related to lexical access. To do so, an experiment was conducted to investigate whether there were syntactic priming effects in the oral production of sentences in the active and passive voice in English as L2. The experiment was carried out with 31 adult native speakers of BP, late-bilinguals of English. The experiment also aimed at verifying the influence of lexical repetition on the effects of syntactic priming.

This chapter presents the main findings of the present study and it is divided into three sections. Section 5.1 presents the main conclusions of this study, section 5.2 discusses limitations of the study and explores suggestions for further research and last, and section 5.3 proposes pedagogical implications for the English as L2 classroom set, taking the results of this study into consideration.

5.1 CONCLUSIONS

This section comprises the main findings of the present study, as follows:

1.The present results show that there are syntactic priming effects in English as L2. In addition, based on the findings, it is possible to state that syntactic priming effects during oral production in L2 are stronger in less frequent syntactic structures in the language, such as the passive voice, than in the active voice.

2. When comparing target sentences preceded by active primes with target sentences preceded by passive primes, it was found that there was a lexical boost effect for target passives only. Active primes with target verb repetition boosted the production of passives and not actives.

3.Although the results showed that a syntactic priming effect was more likely to occur when there was both verb and structure repetition, syntactic priming effects occurred even when there was structure repetition only, without the help of lexical repetition.

4. It is not possible to state that the syntactic priming effects found in this study are cumulative/residual because not all verbs were shown in all conditions.

Taken together, these results can be interpreted as evidence for the inverse-preference theory in a nonnative language (Ferreira & Bock, 2006). Considering that, in this study, syntactic priming effects enhanced the production of the less frequent structure (i.e. passive voice) in the L2.

In light of the findings of the present study, it is possible to state that the investigation concerning syntactic priming effects in L2 speakers is worth and may help in the understanding of syntactic processing and the stages of acquisition of syntax by L2 learners.

In the next section, I present the limitations of this study and suggestions for further research.

5.2 LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR FURTHER RESEARCH

The present study might contribute to the area of second language syntactic processing as well as to the area of Second Language Acquisition in general. Although there are some recent studies on syntactic priming in L2 in Brazil (Felicio, 2018; Santos, 2017), these studies are related to language comprehension. Therefore, there is still a lack of studies on syntactic priming in L2 production by BP speakers of English. In this sense, the present study aimed at adding data to the area of syntactic processing during oral production. Although during the process of this research the best was done to avoid experimental errors and to control for the maximum number of variables, various limitations were noticed in the end of the research process that should be avoided in future research.

First, as pointed out by the results, some verbs influenced the results. Therefore, controlling for the presentation of all verbs in all conditions in the targets could improve the design of the experiment. A second variable that should have been better controlled concerns participants' proficiency. Although an online test of proficiency was applied, together with a self-assessment questionnaire about L2 skills and only participants with advanced score (C1 or C2 according to the CEFR) were selected for this research, previous studies (e.g. Hartsuiker & Bernolet, 2017) demonstrated that proficiency may interact with

syntactic priming effects. Besides that, considering the contradictory results in condition 1 of this study, a better control of proficiency could perhaps shed light on the results for condition 1.

Although the theoretical framework supports the results of the present research, more investigation in the topic still needs to be made. For instance, the present study had half of the items of the experiment in the passive voice. However, it would be interesting to investigate if syntactic priming effects are boosted when the exposure to the passive voice is higher. This would be an interesting research topic within syntactic priming in L2 in order to test if syntactic priming can reflect a form of learning in L2.

The results of the present study demonstrated that the magnitude of syntactic priming might appear even when it is not helped by verb repetition between prime and target, that is, without the influence of lexical repetition. Therefore, the level of lexical dependency should be investigated in further studies to shed light on this aspect.

In a future study, it would be interesting to have a similar experimental design of this study, with groups of learners in different stages of language learning. This would allow investigating whether syntactic priming effects can help students to learn syntactic structures, thus improving research on Hartsuiker and Benolet's (2018) developmental model of L2, which claims for a development of abstract representations over time and states that the cumulative exposure to target structures in L2 modulates the strength of syntactic priming in L2.

Finally, this research showed that individual differences might play a role in syntactic priming effects. Further research should investigate which cognitive resources are related to the syntactic priming effects, for instance: does working memory capacity somehow interfere in the results? Are participants with more attentional resources susceptible to syntactic priming effects? These questions are worth to be explored.

In the next section, I outline some pedagogical implications of the present study to the English L2 classroom.

5.3 PEDAGOGICAL IMPLICATIONS TO ENGLISH L2 CLASSROOM

This section provides some insights and pedagogical implications of this study to the English L2 classroom.

The findings of this study suggest that nonnative speakers of English tend to reuse a syntactic structure they have just used, mainly when this structure is less frequent in the language. Therefore, the first pedagogical implication of this study is that the exposure to infrequent structures and the repetition of these structures may benefit learners to acquire less frequent structures in the target language. Thus, syntactic priming may be helpful in the acquisition of syntactic features, which could be applied in classroom setting as a task to teach grammar.

The second pedagogical implication of this study is that syntactic priming may be a fruitful method to improve students' fluency, since previous studies (e.g. McDonough, 2006; Kim & McDonough, 2008; McDonough et al., 2015) have shown that syntactic priming facilitates the acquisition of abstract representation and strengthens the representations learners already have.

Finally, the present study has shown that skilled speakers tend to switch from a well-acquired structure to a less known structure when the lexical items are repeated, which also consists in a kind of learning. Teachers may be aware of this tendency in order to improve their approach to the teaching of syntax.

Given the complexity of syntax processing and acquisition, this area deserves more research in the syntactic priming paradigm as well as a careful pedagogical approach.

REFERENCES

Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language*, 59. 390-412.

Bernolet, S. & Hartsuiker, R. J. (2010). Does verb bias modulate syntactic priming? *Cognition*, 114 (3), 455-461.

Bernolet, S. & Hartsuiker, R. J. (2018). Syntactic representations in late learners of a second language: A learning trajectory. In D. Miller, F.Bayram, J. Rothman, & L. Serratrice (Eds.), *Bilingual Cognition and Language the state of the science across its subfields.* (pp.205-225) John Benjamins publishing company.

Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2013). From language-specific to shared syntactic representations: The influence of second language proficiency on syntactic sharing in bilinguals. Cognition, 127, 287-306.

Bernolet, S.,Hartsuiker, R.J., and Pickering M.J. (2007). Shared syntactic representations in bilinguals: Evidence for the role of word-order repetition. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 33: 931-49.

Biria, R., & Golestan, A. A. (2013). Stuck in the Gap: EAP Needs Assessment… / 13 Syntactic Priming Effects on EFL Learners' Production and Retention of Indirect Questions. *Research in English Language Pedagogy , 1*(1), 13–23.

Bock, J. K., & Loebell, H. (1990). Framing sentences. *Cognition*, 35, 1-39.

Bock, J.K., Loebell, H., & Morey, R. (1992). From conceptual roles to structural relations: Bridging the syntactic cleft. *Psychological Review*, 99(1), 150-171.

Bock, K. (1986). Syntactic persistence in language production. *Cognitive Psychology*, 18, 355–387.

Bock, K., & Griffin, Z. M. (2000). The persistence of structural priming: Transient activation or implicit learning? *Journal of Experimental Psychology-General*, 129, 177-192.

Branigan, H. P. (2007). Syntactic Priming. *Language and Linguistics Compass*, 1, 1–16.

Branigan, H. P., & Pickering, M. J. (2016). An experimental approach to linguistic representation. Behavioral and Brain Sciences, 1–73. https://doi.org/10.1017/S0140525X16002028

Branigan, H. P., Pickering, M. J., & Cleland, A. A. (1999). Syntactic priming in written production: Evidence for rapid decay. *Psychonomic Bulletin and Review*, 6(4), 635-640.

Branigan, H. P., Pickering, M. J., & McLean, J. F. (2005). Priming prepositional-phrase attachment during comprehension. Journal of Experimental Psychology. Learning, Memory, and Cognition, 31(3), 468–481. https://doi.org/10.1037/0278-7393.31.3.468

Branigan, H. P., Pickering, M. J., Stewart, A. J., & McLean, J. F. (2000). Syntactic priming in spoken production: Linguistic and temporal interference. *Memory and Cognition*, 28, 1297-1302.

Branigan, H.P, Pickering, M. J., Liversedge, S. P., Stewart, A. J., & Urbach, T. P. (1995). Syntactic priming: Investigating the mental representation of language. *Journal of Psycholinguistic Research*, 24, 489-506.

Chen, B., Jia, Y., Wang, Z., Dunlap, S & Shin, J. (2013). Is word-order similarity necessary for cross-linguistic structural priming? *Second Language Research*, 29, 375- 389.

Cleland, A. & Pickering, M. (2003). The use of lexical and syntactic information in language production: Evidence from the priming

of noun-phrase structure. *Journal of Memory and Language*, 49, 214-230.

Cleland, A. & Pickering, M. (2006). Do writing and speaking employ the same syntactic representations? Journal of Memory and Language, 54(2), 185-198.

Corley, M., & Scheepers, C. (2002). Syntactic priming in English sentence production: Categorical and latency evidence from an Internet-based study. *Psychonomic Bulletin and Review*, *9*(1), 126–131. https://doi.org/10.3758/BF03196267

De Bot, K. (1992). A bilingual model: Levelt's "speaking model" adapted. *Applied Linguistics*, 13(1), 1-24.

De Bot, K. (1996). The Psycholinguistics of the output Hypothesis. *Language Learning*, 46:3, 529-555.

De Jesus, D. (2018). *Efeitos de priming sintático em português brasileiro : um estudo eletrofisiológico.* PhD dissertation, Programa de Pós-Graduação em Linguística, UFSC, Florianópolis.

Desmet, T. & Declercq, M. (2006). Cross-linguistic priming of syntactic hierarchical configuration information. *Journal of Memory and Language*, 54(4), 610-632.

Felicio, A. R. (2018). *Cross-linguistic syntactic priming effects in sentence comprehension: a study with Brazilian Portuguese-English bilinguals.* MA Thesis, Programa de Pós-Graduação em Inglês e Literatura Correspondente, UFSC, Florianópolis.

Ferreira, F. (1994). Choice of passive voice is affected by verb type and animacy. *Journal of Memory and Language*, *33*, 715–736.

Ferreira, V. S., & Bock, K. (2006). The functions of structural priming. *Language and Cognitive Processes*, *21*(7–8), 1011–1029. https://doi.org/10.1080/01690960600824609

Filgueras, M., Park, H., & Pandža, N. (2013). The effects of proficiency and working memory capacity on L2 syntactic priming. *Conference: American Association for Applied Linguistic*. DOI: 10.13140/2.1.1864.6408

Fine, A. B., & Jaeger, T. F. (2016). The role of verb repetition in cumulative structural priming in comprehension. *Journal of Experimental Psychology: Learning Memory and Cognition*, *42*(9), 1362–1376. https://doi.org/10.1037/xlm0000236

Grosjean, F. (1998). Studying bilinguals : Methodological and conceptual issues. *Bilingualism: Language and Cognition*, *1*, 131–149.

Hartsuiker, R. J., & Bernolet, S. (2017). The development of shared syntax in second language learning. *Bilingualism*, *20*(2), 219–234. https://doi.org/10.1017/S1366728915000164

Hartsuiker, R. J., & Kolk, H. H. J. (1998). Syntactic Persistence in Dutch. *Language and Speech*. https://doi.org/10.1177/002383099804100202

Hartsuiker, R. J., & Pickering, M. J. (2008). Language integration in bilingual sentence production. Acta Psychologica, 128(3), 479–489. https://doi.org/10.1016/j.actpsy.2007.08.005

Hartsuiker, R. J., Beerts, S., Loncke, M., Desmet, T., & Bernolet, S. (2016). Cross-linguistic structural priming in multilinguals: Further evidence for shared syntax. Journal of Memory and Language, 90, 14–30. https://doi.org/10.1016/j.jml.2016.03.003

Hartsuiker, R. J., Pickering, M. J., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in spanish-english bilinguals. *Psychological Science*. https://doi.org/10.1111/j.0956-7976.2004.00693.x

Jackson, C. N. (2018). Second language structural priming: A critical review and directions for future research. *Second Language Research*, 34(4), 539-552.

Jaeger, T. F. (2008). Categorical data analysis: Away from ANOVAs (transformation or not) and towards logit mixed models. *Journal of Memory and Language*, 59, 434-446.

Jaeger, T. F., & Snider, N. (2007). Implicit learning and syntactic persistence : Surprisal and Cumulativity. *Proceedings of the 30th Annual Meeting of the Cognitive Science Society (CogSci08)*, (January), 1061–1066.

Kidd, E., Tennant, E., & Nitschke, S. (2015). Shared abstract representation of linguistic structure in bilingual sentence comprehension. *Psychonomic Bulletin & Review*, 22(4), 1062–1067. https://doi.org/10.3758/s13423-014-0775-2

Kim, Y., & McDonough, K. (2008). Learners' Production of Passives during Syntactic Priming Activities. *Applied Linguistics*, *29*(1), 149–154. https://doi.org/10.1093/applin/amn004

Kootstra, G. & Doedens, W. (2016). How multiple sources of experience influence bilingual syntactic choice: Immediate and cumulative cross-language effects of structural priming, verb bias, and language dominance*. *Bilingualism: Language and Cognition*, 19(4), 710-732.

Kramer, R. (2017). O efeito de priming sintático na leitura de sentenças na voz passiva por bons e maus leitores dos 5 e 6 anos de ensino fundamental. PhD dissertation, Pontifícia Católica do Rio Grande do Sul, Porto Alegre.

Kuerten, A. B. (2017). *Investigating Syntactic Priming During Sentence Comprehension in Developmental Dyslexia: Evidence for Behavioral and Neuronal Effects*. PhD dissertation, Programa de Pós-Graduação em Inglês e Literatura Correspondente, UFSC, Florianópolis.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation*. MIT Press. Cambridge, MA.

Levelt, W. J. M., & Kelter, S. (1982). Surface form and memory in question answering. Cognitive Psychology, 14(1), 78–106. https://doi.org/10.1016/0010-0285 (82)90005-6

Levelt, W. J. M., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. *Behavioral and Brain Sciences*, 22, 1-75.

Maclin, A. (1992). *Reference Guide to English: A Handbook of English as a Second Language* (Third edition). Washington, DC, Office of English Language programs.

McDonough, K. (2006). Interaction and syntactic priming: English L2 speakers' production of dative construction. *Studies in Second Language Acquisition*, 28, 179-207.

McDonough, K., Trofimovich, P., & Neumann, H. (2015). Eliciting production of L2 target structures through priming activities. *The Canadian Modern Language Review*, 71(1), 75-95.

McDounough, K & Mackey, A. (2008). Syntactic priming and ESL question development. *Studies Second Language Acquisition*, 30.31-47.

Menenti, L., Gierhan, S. M. E., Segaert, K. & Hagoort, P. (2011). Shared Language: Overlap and segregation of the neuronal infrastructure for speaking and listening revealed by functional MRI. *Psychological science*, 22(9), 1173-1182.

Mota, M. B. (2010). Interlanguage development and L2 speech production. How do they relate? In L. Scliar-Cabral (Ed.) *Psycholinguistics: scientific and technological challenges*, (pp.220-227). Porto Alegre: EDIPUCRS.

O'Grady, W. and Archibald, J. (2016). *Contemporary Linguistic Analysis an introduction*. *Contemporary Linguistics: An Introdcution* (8th ed.). Toronto: Pearson.

Pickering, M. J., & Branigan, H. P. (1998). The Representation of Verbs: Evidence from Syntactic Priming in Language Production. *Journal of Memory and Language*, *39*(4), 633–651. https://doi.org/10.1006/jmla.1998.2592

Pickering, M., & Branigan, H. (1999). Syntactic priming in language production. *Trends in Cognitive Sciences*, 3(4), 136-141.

Psychology Software Tools, Inc. [E-Prime 2.0]. (2012). Retrieved from http://www.pstnet.com/

R development core team (2005). R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing, http://www.R-project.org.

Salamoura, A & Willians, J. N. (2007). Processing verb argument structure across languages: Evidence for shared representations in the bilingual lexicon. *Applied Psycholinguistics*, 28, 627-660.

Santos, M. P. dos. (2017). *Os efeitos de priming sintático intra e translinguístico no processamento de francês como L2*. MA thesis, Programa de Pós-Graduação em Linguística, UFSC, Florianópolis.

Schoonbaert, S., Hartsuiker, R.J, & Pickering M.J. (2007). The representation of lexical and syntactic information in bilinguals: Evidence from syntactic priming. *Journal of Memory and Language*, *56*, 153-71.

Segaert, K., Menenti, L., Weber, K.; Hagoort, P. (2011). A paradox of Syntactic Priming: Why response tendencies show priming for passives, and response latencies show priming for actives. *Plos One*, 6(10), 2011.

Shin, J.A. & Christianson, K. (2009). Syntactic processing in Korean-English bilingual production: Evidence from cross-linguistic syntactic priming. *Cognition*, 112, 175-80.

Smith, M. & Wheeldon, L. (2001). Syntactic priming in spoken sentence production- an online study. *Cognition*, 78, 123-164.

Tagarelli, K. M., Borges Mota, M. & Rebuschat, P. (2015). Working memory, learning conditions, and the acquisition of L2 syntax. In Z. Wen, M. Borges Mota, & A. McNeill (Eds.), *Working memory in second language acquisition and processing: theory, research and commentary* (pp. 224-247). Bristol: Multilingual Matters.

Teixeira, M.T. (2016). *O efeito de priming sintático no processamento de sentenças ativas e passivas do português brasileiro.* MA Thesis, Programa de Pós-graduação em Letras, PUCRS, Porto Alegre.

Toassi, P.F.P. (2012). *Crosslinguistic influences in the acquisition of English as a third language: an investigation*. MA Thesis, Programa de Pós-Graduação em Linguística, UFSC, Floriánopolis.

Tooley, K. M., & Traxler, M. J. (2010). Syntactic Priming Effects in Comprehension: A Critical Review. Language and Linguistics Compass, 4(10), 925–937. https://doi.org/10.1111/j.1749-818X.2010.00249.x

Traxler, M. J., Tooley, K. M., & Pickering, M. J. (2014). Syntactic priming during sentence comprehension: Evidence for the lexical boost. *Journal of Experimental Psychology: Learning Memory and Cognition*, *40*(4), 905–918. https://doi.org/10.1037/a0036377

Ullman, M.T. (2001). The neural basis of lexicon and grammar in first and second language: the declarative/procedural model. Bilingualism: Language and Cognition, 4, 105–122.

Van Gompel, R. P. G., & Arai, M. (2017). Structural priming in bilinguals. *Bilingualism*, *21*(3), 448–455. https://doi.org/10.1017/S1366728917000542

Weber, K., & Indefrey, P. (2009). Syntactic priming in German-English bilinguals during sentence comprehension. NeuroImage, 46(4), 1164–1172. https://doi.org/10.1016/j.neuroimage.2009.03.040

Wei, H., Boland, J. E., Brennan, J., Yuan, F., Wang, M., & Zhang, C. (2018). Lexicalized structural priming in second language online sentence comprehension. *Second Language Research*, *34*(3), 395–416. https://doi.org/10.1177/0267658317723684

Wisintainer, D.S. dos (2016). *The processing of phrasal verbs by nonnative and native speakers of English: an eye movement study*. MA Thesis, Programa de Pós-Graduação em Inglês e Literatura Correspondente, UFSC, Florianópolis.

APPENDICES

APPENDIX A
Consent Form

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Termo de Consentimento Livre e Esclarecido (TCLE) baseado na resolução 466/2012 de acordo com o CNS (Conselho Nacional de Saúde).

UNIVERSIDADE FEDERAL DE SANTA CATARINA
CENTRO DE COMUNICAÇÃO E EXPRESSÃO
PROGRAMA DE PÓS-GRADUAÇÃO EM LINGUÍSTICA
LABLING – LABORATÓRIO DA LINGUAGEM E PROCESSOS COGNITIVOS

Projeto de Pesquisa: Priming sintático na produção oral de inglês como L2

Caro (a) Senhor (a):

Eu, Francineide Fatima Davies dos Santos, CPF XXXX, RG XXXX, aluna regularmente matriculada no Mestrado em Linguística da Universidade Federal de Santa Catarina, tenho como objetivo desenvolver um estudo sobre os efeitos da repetição de sentenças em falantes bilíngues, como requisito parcial para a obtenção do título de Mestre em Linguística.

Gostaria de convidá-lo(a) a participar do meu estudo, que busca investigar os efeitos da repetição de estruturas durante a produção oral em inglês. Pretendo, com esta pesquisa, contribuir os estudos sobre o papel facilitador da repetição no processamento da linguagem. Peço que você leia atentamente este termo de consentimento e tire todas as dúvidas que possam surgir, antes de concordar em participar do estudo.

Objetivo do estudo: O objetivo geral deste estudo é investigar os efeitos da repetição de sentenças no processamento de bilíngues do para português brasileiro-inglês.

Instrumentos: Se você concordar em participar desse estudo, você será solicitado, primeiramente, a responder dois questionários, a fazer um teste de proficiência em inglês, online, e a realizar tarefas no computador de produção de sentenças em Inglês e de memória de trabalho.

Questionário: O primeiro questionário pede informações básicas sobre você, que serão mantidas em sigilo, servindo apenas de controle para a pesquisadora. Todas estas informações também serão mantidas em sigilo e somente a pesquisadora terá acesso a elas.

Teste de proficiência online: Neste teste será verificado o nível de seu conhecimento gramatical em inglês.

Experimentos: Você também será solicitado(a) a realizar duas tarefas. Na primeira tarefa você vai ouvir e visualizar palavras em Língua Portuguesa no computador e deverá retomá-las em ordem alfabética depois que elas desaparecerem da tela. Na segunda tarefa você receberá informações (imagens e verbos) para a produção de sentenças em inglês na voz passiva ou ativa. Sua produção será gravada para posterior análise de dados. As tarefas terão uma duração total aproximada de 20 a 25 minutos cada uma.

Benefícios: A sua participação no experimento será voluntária e contribuirá para a pesquisa sobre o processamento sintático em inglês como segunda Língua.

Riscos: Em todas as pesquisas, mesmo de forma involuntária, existe a possibilidade de submeter os sujeitos a baixos riscos. A participação na presente pesquisa envolve possíveis riscos inerentes a qualquer situação de avaliação, como nervosismo, constrangimento e cansaço. Visando minimizar estes possíveis riscos, serão feitas sessões de prática antes da aplicação das tarefas no computador, de maneira que você possa se familiarizar com os procedimentos e sanar eventuais dúvidas, sentindo-se mais tranquilo e confiante.

Desconforto: É possível que durante a realização dos experimentos, você sinta certo desconforto, tal como cansaço visual por ter que ler várias sentenças, constrangimento ou alterações de comportamento durante a gravação de áudio ou por ter que memorizar palavras. Tentaremos minimizar o desconforto dividindo as tarefas em pequenos blocos, com intervalos entre eles. Certificaremos-nos de que o ambiente do Laboratório da Linguagem e Processos Cognitivos (LabLing) ofereça condições satisfatórias de conforto, além de

iluminação e temperatura adequadas e do mínimo possível de ruídos externos.

Direito dos participantes: Você é livre para decidir se deseja participar ou não desse estudo. Como a participação é voluntária, você poderá desistir a qualquer momento sem nenhum prejuízo a você. Caso você tenha algum prejuízo material ou imaterial em decorrência desta pesquisa, poderá solicitar indenização, de acordo com a legislação vigente. Ao aceitar participar desta pesquisa, duas vias deste documento serão assinadas por você e pelo pesquisador responsável. Guarde cuidadosamente sua via, pois este documento assegura seus direitos como participante.

Compensação Financeira e Indenização: Não há compensação financeira relacionada à participação neste estudo. Se você tiver algum gasto pela sua participação nessa pesquisa, ele será assumido pelas pesquisadoras e reembolsado para você. Se você sofrer algum dano comprovadamente decorrente desta pesquisa, você será indenizado.

Utilização dos dados: As informações desta pesquisa serão confidenciais e os resultados do estudo serão divulgados apenas em eventos ou publicações científicas, não havendo identificação dos voluntários a não ser entre os responsáveis pelo estudo, sendo assegurado completo sigilo sobre sua participação. Não haverá nenhuma informação que leve à identificação do participante aqui nomeado.

Contatos: Qualquer dúvida sobre esta pesquisa poderá ser esclarecida com Francineide Fatima Davies dos Santos, atráves do email ou telefone XXXX ou com a Professora Dra Mailce Borges Mota pelo telefone XXXX ou e-mail , ou no prédio do CCE / UFSC, Bloco B sala 513.

Comitê de Ética em Pesquisa (CEP): o CEP é formado por pessoas que avaliam se a proposta de pesquisa apresenta riscos ou se pode ser prejudicial aos participantes. O projeto desta pesquisa foi avaliado e aprovado pelo Comitê de Ética em Pesquisa da Universidade Federal de Santa Catarina (CEPSH – UFSC). Caso você tenha alguma dúvida sobre este estudo, entre em contato com o CEPSH – UFSC pelos telefones (48) 3721-6094 ou pelo e-mail: cep.propesq@contato.ufsc.br, ou dirija-se ao seguinte endereço: Prédio Reitoria II, 4ºandar, sala 401, localizado na Rua Desembargador Vitor Lima, nº 222, Trindade, Florianópolis. Telefone para contato: 3721-6094.

TERMO DE ACEITE

Eu, (NOME DO PARTICIPANTE), RG (...) li este documento (ou tive este documento lido para mim por uma pessoa de confiança) e

obtive dos pesquisadores todas as informações que julguei necessárias para me sentir esclarecido e optar por livre e espontânea vontade participar desta pesquisa. O pesquisador responsável, que também assina esse documento, compromete-se a conduzir a pesquisa de acordo com o que preconiza a Resolução 466/12 de 12/06/2012, que trata dos preceitos éticos e da proteção aos participantes da pesquisa.

FLORIANÓPOLIS, _____ de 2018.

_____

(ASSINATURA PESQUISADOR)

_____

(ASSINATURA PARTICIPANTE)

APPENDIX B

Biographical and Language Experience Questionnaire

UNIVERSIDADE FEDERAL DE SANTA CATARINA
CENTRO DE COMUNICAÇÃO E EXPRESSÃO
PROGRAMA DE PÓS-GRADUAÇÃO EM LINGUÍSTICA
LABORATÓRIO DA LINGUAGEM E PROCESSOS COGNITIVOS

Pesquisa: Priming sintático na produção oral de inglês como L2

Orientadora: Profa. Dra. Mailce Borges Mota (PPGI/ PPGLg/CNPq/ UFSC)

Pesquisadora: Francineide Fatima Davies dos Santos (Mestranda PPGLg/ UFSC)

QUESTIONÁRIO DE INFORMAÇÕES GERAIS E LINGUÍSTICAS

A) Informações pessoais

1. Nome do participante: _____
2. Idade: _____ Data de nascimento: _____
Sexo: ( ) M ( ) F
3. Profissão/ Ocupação: _____
4. Nível de escolaridade: ( ) Ensino Médio completo

( ) Ensino Médio incompleto
( ) Superior completo
( ) Superior incompleto
( ) Pós-graduação – Especialização
( ) Pós-graduação – Mestrado
( ) Pós-graduação – Doutorado

B) Informações linguísticas

Preencha ou assinale as informações abaixo:
1. Quantos idiomas você fala?

( )1 ( ) 2 ( ) 3 ( ) 4+
Quais são?_____

2. Quantos idiomas você compreende?

( )1 ( ) 2 ( ) 3 ( ) 4+
Quais são? _____
3. Você se considera fluente em sua segunda língua (L2)? (É considerado fluente aquele que consegue se comunicar na segunda língua sem precisar recorrer à língua materna)

( ) sim ( ) não
4. Com que idade você começou a aprender sua L2? _____

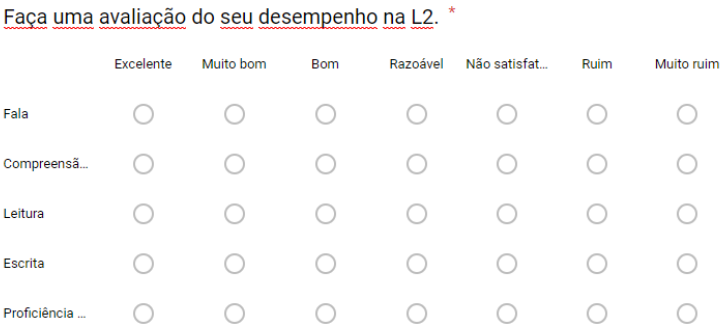
5. Com que idade você percebeu que já tinha o domínio da L2? _____

6. Você se sente à vontade para conversar em L2 com alguém estranho?

( ) sim ( ) não
7. Em que contexto(s) você aprendeu a L2? (Ex.: curso no Brasil, morou no exterior)

_____
_____
_____

8. Faça uma avaliação do seu desempenho na L2.



9. Você já morou num país no qual a sua L2 seja o idioma oficial?

( ) sim ( ) não
Se 'sim', responda as perguntas abaixo:
Onde você morou? _____
Quanto tempo morou lá? _____
Durante o tempo em que você morou no exterior, em que contexto(s) você utilizou a língua inglesa? (Ex.: em casa, na escola) _____

C) Nível de Instrução na L2

Preencha ou assinale as informações abaixo:
Você frequentou aulas de sua L2 num curso de línguas?
( ) sim ( ) não
Se 'sim', por quanto tempo você frequentou as aulas?
_____
Você já teve algum outro tipo de instrução formal em sua L2? (Ex.: professor particular) _____
Você continua tendo aula em sua L2?
( ) sim ( ) não
Se 'sim', qual seu nível? _____

D) Informações pertinentes ao uso da L2

Assinale a alternativa que mais combina com você atualmente:

a) Comunico-me somente em uma das línguas (por exemplo, português);

b) Comunico-me essencialmente em português, e em L2 raramente;

c) Comunico-me essencialmente em português, e em L2 ocasionalmente (Ex.: em sala de aula apenas).

d) Comunico-me tanto em português quanto em L2, com a mesma regularidade nas duas línguas.

E)Informações pertinentes ao contexto e a exposição à L2

Com que frequência você se encontra num ambiente onde o português e a L2 possam ser utilizados alternadamente? Assinale abaixo.

a) O tempo todo;
b) Quase o tempo todo;
c) Em certas ocasiões;
d) Raramente;
e) Nunca.

Quantas horas por dia/semana você tem contato com a L2? (Ex.: assistir TV – 2 horas por dia)

_____

APPENDIX C
List of experimental verbs

Syntactic Priming Production Task
List of the 34 transitive verbs depicted in the experiment

Experimental Transitive verbs
Aid
Assist
Call
Comfort
Drag
Draw
Dress

Dry
Feed
Find
Follow
Greet
Help
Hold
Hug
Interview
Kiss
Lift
Massage
Measure
Pay
Photograph
Pull
Punish
Push
Tease
Scare
Serve
Stop
Threat
Tie
Touch
Transport
Wet

APPENDIX D
List of Experimental Stimuli Presentation

Condition	Verb
Condição 2 (ANWR)	Wet
Condição 4 (PNWR)	Transport
Condição 1 (AWR)	Call
Condição 3 (PWR)	Comfort
Condição 1 (AWR)	Drag

Condição 2 (ANWR)	Touch
Condição 4 (PNWR)	Tie
Condição 1 (AWR)	Feed
Condição 3 (PWR)	Dress
Condição 1 (AWR)	Follow
Condição 3 (PWR)	Stop
Condição 2 (ANWR)	Threaten
Condição 1 (AWR)	Hold
Condição 4 (PNWR)	Tease
Condição 3 (PWR)	Interview
Condição 4 (PNWR)	Stop
Condição 2 (ANWR)	Serve
Condição 4 (PNWR)	Scare
Condição 2 (ANWR)	Push
Condição 3 (PWR)	Measure
Condição 4 (PNWR)	Punish
Condição 2 (ANWR)	Pay
Condição 3 (PWR)	Pull
Condição 1 (AWR)	Punish
Condição 2 (ANWR)	Photograph
Condição 3 (PWR)	Scare
Condição 4 (PNWR)	Measure
Condição 2 (ANWR)	Massage
Condição 1 (AWR)	Tease

Condição 4 (PNWR)	Lift
Condição 1 (AWR)	Tie
Condição 3 (PWR)	Touch
Condição 1 (AWR)	Transport
Condição 4 (PNWR)	Kiss
Condição 2 (ANWR)	Kick
Condição 3 (PWR)	Assist
Condição 1 (AWR)	Greet
Condição 4 (PNWR)	Interview
Condição 3 (PWR)	Drag
Condição 2 (ANWR)	Hug
Condição 4 (PNWR)	Hold
Condição 3 (PWR)	Transport
Condição 1 (AWR)	Find
Condição 4 (PNWR)	Help
Condição 3 (PWR)	Call
Condição 4 (PNWR)	Greet
Condição 3 (PWR)	Help
Condição 2 (ANWR)	Follow
Condição 1 (AWR)	Interview
Condição 2 (ANWR)	Pull
Condição 1 (AWR)	Kiss
Condição 4 (PNWR)	Draw
Condição 3 (PWR)	Massage
Condição 2 (ANWR)	Feed

Condição 4 (PNWR)	Dress
Condição 3 (PWR)	Pay
Condição 2 (ANWR)	Draw
Condição 1 (AWR)	Scare
Condição 4 (PNWR)	Drag
Condição 3 (PWR)	Punish
Condição 2 (ANWR)	Comfort
Condição 1 (AWR)	Stop
Condição 2 (ANWR)	Call
Condição 1 (AWR)	Threaten
Condição 2 (ANWR)	Help
Condição 4 (PNWR)	Assist
Condição 1 (AWR)	Aid
Condição 3 (PWR)	Kiss
Condição 2 (ANWR)	Measure
Condição 4 (PNWR)	Call
Condição 1 (AWR)	Lift
Condição 3 (PWR)	Follow
Condição 2 (ANWR)	Aid
Condição 4 (PNWR)	Photograph
Condição 1 (AWR)	Punish
Condição 3 (PWR)	Tease
Condição 2 (ANWR)	Lift
Condição 4 (PNWR)	Wet

Condição 3 (PWR)	Photograph
Condição 1 (AWR)	Serve

APPENDIX E
Data Analyses

Best fitted model Summary (m2)

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial (logit)
Formula: Resposta ~ Condição + (1 | Participante) + (1 | Item)
Data: DATA

AIC	BIC	logLik	deviance	df.resid
2854.8	2898.7	-1420.4	2840.8	3908

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.9578	-0.4157	-0.2489	-0.1117	10.1211

Random effects:

Groups	Name	Variance	Std.Dev.
Item	(Intercept)	0.1382	0.3717
Participante	(Intercept)	1.7077	1.3068

Number of obs: 3915, groups: Item, 34; Participante, 31

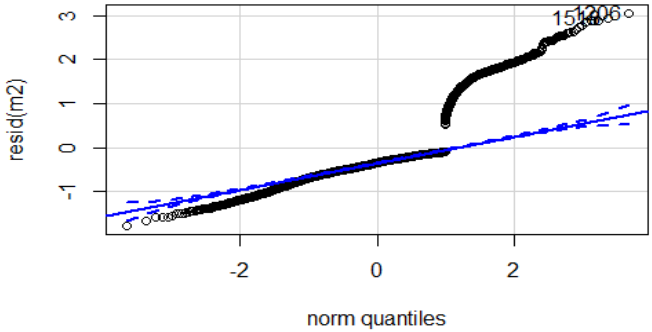
Fixed effects:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-2.8715	0.2678	-10.724	< 2e-16	***
CondiçãoCondição 1 (AWR)	1.8808	0.1439	13.069	< 2e-16	***
CondiçãoCondição 2 (ANWR)	0.2286	0.1666	1.372	0.16997	
CondiçãoCondição 3 (PWR)	1.2246	0.1470	8.328	< 2e-16	***
CondiçãoCondição 4 (PNWR)	0.4597	0.1633	2.816	0.00487	**

```
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) CC1(AW CC2(AN CC3(PW
CndçC1(AWR) -0.270
CndC2(ANWR) -0.203  0.347
CndçC3(PWR) -0.249  0.445  0.359
CndC4(PNWR) -0.215  0.410  0.305  0.403

qqPlot(resid(m2))
[1] 1206 1518
```



ANOVA(m2,m3)

```
Data: DATA
Models:
m3: Resposta ~ Condição + (1 | Participante)
m2: Resposta ~ Condição + (1 | Participante) + (1 | Item)
   Df    AIC    BIC  logLik deviance  Chisq Chi Df Pr(>Chisq)
m3  6 2876.9 2914.5 -1432.5   2864.9
m2  7 2854.8 2898.7 -1420.4   2840.8 24.099      1  9.151e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']

```
Formula: OrdItem ~ Condição * Ordem + (Condição | Participante)
   Data: DATA

REML criterion at convergence: 8463.1

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.5755 -0.3796 -0.1284  0.0947  4.4321

Random effects:
 Groups       Name                    Variance Std.Dev. Corr
 Participante (Intercept)             0.1269   0.3562
              CondiçãoCondição 1 (AWR)  0.5946   0.7711   0.17
              CondiçãoCondição 2 (ANWR) 0.1065   0.3263   -0.55 0.30
              CondiçãoCondição 3 (PWR)  1.0248   1.0123   -0.52 -0.43  0.38
              CondiçãoCondição 4 (PNWR) 0.1693   0.4115   -0.46 0.27  0.99  0.42
 Residual                              0.4605   0.6786
Number of obs: 3915, groups:  Participante, 31

Fixed effects:
                                  Estimate Std. Error       df t value Pr(>|t|)
(Intercept)                       -0.33646    0.06641 29.98367  -5.066 1.94e-05 ***
CondiçãoCondição 1 (AWR)           0.51731    0.14829 35.40953   3.488  0.00132 **
CondiçãoCondição 2 (ANWR)         -0.03633    0.07901 58.63436  -0.460  0.64738
CondiçãoCondição 3 (PWR)           0.34659    0.19259 35.44944   1.800  0.08043 .
CondiçãoCondição 4 (PNWR)          0.14979    0.09776 64.42202   1.532  0.13035
Ordem1                            -0.09909    0.08252 3778.95435  -1.201 0.22990
Ordem2                            -0.13706    0.08215 3778.39539  -1.669 0.09529 .
Ordem3                            -0.05311    0.07925 3778.59989  -0.670 0.50280
```

CondiçãoCondição 1 (AWR):Ordem1 0.21411 0.11077
3778.66465 1.933 0.05333 .
CondiçãoCondição 2 (ANWR):Ordem1 0.20530 0.11077
3778.50488 1.853 0.06390 .
CondiçãoCondição 3 (PWR):Ordem1 -0.02059 0.11617
3778.53508 -0.177 0.85932
CondiçãoCondição 1 (AWR):Ordem2 0.08607 0.11059
3778.38340 0.778 0.43644
CondiçãoCondição 2 (ANWR):Ordem2 0.26830 0.11067
3778.29745 2.424 0.01538 *
CondiçãoCondição 3 (PWR):Ordem2 0.13795 0.11599
3778.26536 1.189 0.23438
CondiçãoCondição 1 (AWR):Ordem3 0.01984 0.11201
3778.43860 0.177 0.85941
CondiçãoCondição 2 (ANWR):Ordem3 0.26682 0.11173
3778.27556 2.388 0.01699 *
CondiçãoCondição 3 (PWR):Ordem3 0.02524 0.11167
3778.34526 0.226 0.82120

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> **m13 = glm(Resposta ~ Item , data = NBSet, family = binomial)**
> summary(m13)

Call:
glm(formula = Resposta ~ Item, family = binomial, data = NBSet)

Deviance Residuals:
Min 1Q Median 3Q Max
-0.9895 -0.7155 -0.5931 -0.4895 2.8674

Coefficients:
Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.494e+00 3.336e-01 -4.478 7.55e-06 ***
ItemAssist 6.681e-02 4.633e-01 0.144 0.8853
ItemCall -1.547e-01 4.134e-01 -0.374 0.7082
ItemComfort -1.547e-01 4.802e-01 -0.322 0.7473

```
ItemDrag        3.953e-01  4.114e-01   0.961   0.3367
ItemDraw       -2.600e+00  1.062e+00  -2.449   0.0143 *
ItemDress       2.618e-01  4.512e-01   0.580   0.5618
ItemFeed        1.034e+00  4.234e-01   2.443   0.0146 *
ItemFind        4.823e-01  5.308e-01   0.909   0.3635
ItemFollow      8.488e-01  3.987e-01   2.129   0.0333 *
ItemGreet      -4.156e-01  5.048e-01  -0.823   0.4103
ItemHelp       -4.156e-01  4.550e-01  -0.914   0.3610
ItemHold        1.877e-01  4.572e-01   0.410   0.6815
ItemHug        -1.547e-01  5.914e-01  -0.262   0.7936
ItemInterview   1.992e-01  4.183e-01   0.476   0.6340
ItemKick       -7.397e-01  6.931e-01  -1.067   0.2859
ItemKiss       -7.729e-02  4.322e-01  -0.179   0.8581
ItemLift       -1.547e-01  4.368e-01  -0.354   0.7232
ItemMassage    -2.601e-01  4.916e-01  -0.529   0.5967
ItemMeasure     2.618e-01  4.157e-01   0.630   0.5289
ItemPay        -3.969e-01  5.052e-01  -0.786   0.4320
ItemPhotograph -2.365e-01  4.420e-01  -0.535   0.5927
ItemPull        6.681e-02  4.633e-01   0.144   0.8853
ItemPunish      2.151e-01  3.983e-01   0.540   0.5893
ItemPush       -1.547e-01  5.914e-01  -0.262   0.7936
ItemScare       3.953e-01  4.114e-01   0.961   0.3367
ItemServe       5.205e-01  4.386e-01   1.187   0.2353
ItemStop        2.758e-01  4.160e-01   0.663   0.5073
ItemTease       3.509e-01  4.138e-01   0.848   0.3965
ItemThreaten    2.618e-01  4.512e-01   0.580   0.5618
ItemTie         8.701e-02  4.637e-01   0.188   0.8512
ItemTouch      -5.675e-01  5.219e-01  -1.087   0.2769
ItemTransport   6.517e-01  4.030e-01   1.617   0.1058
ItemWet        -2.342e-14  4.718e-01   0.000   1.0000
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 2480.8  on 2464  degrees of freedom
Residual deviance: 2405.6  on 2431  degrees of freedom
AIC: 2473.6
Number of Fisher Scoring iterations: 6
```