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Syntactic Priming Effects on the Processing of the Passive Voice by

Brazilian Portuguese Adult Native Speakers:

a Behavioural Study

Florianópolis

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Ficha de identificação da obra

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To my mother, Hilda, for always inspiring me to be great.

To my father, Carlos (*in memoriam*), for always believing in me.

To my son, Yuri, for being my partner, my best friend and the

best child I could possibly ask for. Loving you gave me a future.

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ABSTRACT

Syntactic priming, or structural priming, is a phenomenon in which the exposure to a syntactic structure facilitates the processing of a following structure (Pickering & Branigan, 1999) during language production or comprehension. The present behavioural study investigated syntactic priming effects on the processing of the passive voice by 20 Brazilian Portuguese adult native speakers performing a self-paced reading task. The results indicated that BP adult native speakers show shorter response times when processing a passive structure after having previously processed the same structure with the same main verb. These findings are in line with previous research on syntactic priming effects during comprehension of BP passive sentences conducted with children (Kramer, 2017; Kuerten, 2017) that suggested that syntactic processing during comprehension is, to some extent, lexically mediated.

Keywords: syntactic processing; Brazilian-Portuguese; syntactic priming; comprehension

RESUMO

O *priming* sintático é caracterizado como um fenômeno através do qual a exposição a uma estrutura sintática facilita o processamento da estrutura sintática seguinte (Pickering & Branigan, 1999). O presente estudo investigou o processamento da voz passiva por 20 falantes nativos adultos de PB durante uma tarefa de leitura auto monitorada. Os resultados encontrados indicam que os participantes demonstraram tempos de repostas mais curtos ao processar uma estrutura passiva após terem processado a mesma estrutura com o mesmo verbo principal. Os resultados encontrados estão de acordo com estudos prévios acerca de efeitos de priming sintático na compreensão de sentenças passivas em PB conduzidos com crianças (Kramer, 2017; Kuerten, 2017) que sugerem que o processamento sintático é, em certa medida, lexicalmente mediado.

Palavras-chave: processamento sintático; Português-Brasileiro; priming sintático; compreensão

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Our mental and social lives are invariably mediated by language. Despite the existence of communicative systems in other species, the language faculty is human exclusive and its complexity is intrinsically related to the human brain (Federmeier, Kluender, & Kutas, 2003). Moreover, the diversity found in language studies, both in terms of variety of languages as well as of theoretical perspectives, is directly connected with the high degree of complexity of its object of interest. Thus, language can be investigated from different perspectives regarding structure, semantics, pragmatics, historical context and social use, to mention a few possibilities.

In psycholinguistics, the organization and nature of linguistic knowledge in our cognitive architecture as well as how this knowledge is processed during language production and comprehension are important topics of investigation (Branigan & Pickering, 2017; De Jesus, 2018). In the course of language production and comprehension, speakers have to build and interpret the syntactic structures of sentences. Syntactic processing is, therefore, a core element of language processing. One possible way of investigating such processing is by means of the syntactic priming paradigm.

The experimental paradigm of Priming is a construct originally found in the field of cognitive psychology. First adopted by Kar Lashley (1951) when referring to the pre-activation of lexical units, priming is currently seen as both a phenomenon and a method.

As a phenomenon, priming is, broadly speaking, the effect that the processing of previous stimulus has on the following target (Bermeitinger, 2015).

As a method, priming is largely used in language studies, specifically in psycholinguistic experiments. According to Branigan and Pickering (2017) "if processing one stimulus affects the subsequent processing of another stimulus, then these stimuli share some aspect of their representation" . With that in mind, researchers investigate the possible effects that the processing of a prime has on the processing of a following target. For example, in a seminal study, Bock (1986) investigated if speakers that produced a determined syntactic structure would have a higher probability of reusing such structure afterwards when describing an unrelated image.

Therefore, the present study investigated syntactic priming effects on the processing of the passive voice by Brazilian Portuguese native adult speakers. In order to attain that, a quantitative behavioural experiment measuring syntactic priming effects in one experimental condition was conducted. More specifically, the present study investigated syntactic priming effects during the comprehension of passive sentences in Brazilian Portuguese (BP) as L1.

Significance of the study

The present study's significance is threefold. First, even though syntactic priming has been investigated in different languages such as English, German, Dutch and Mandarin (e.g. Bock, 1986; Pappert & Pechmann, 2013; Segaert, Menenti, Weber, & Hagoort, 2011; Cai, Pickering, & Sturt, 2013), little is still known about its occurrence in Brazilian Portuguese (BP). Second, the literature on syntactic priming effects during comprehension is still scarce when compared to the literature on production (Arai, van

Gompel, & Scheepers, 2007; Ledoux, Traxler, & Swaab, 2007; Thothathiri & Snedeker, 2008; Traxler & Tooley, 2007). Finally, to the best of my knowledge, the present study is the first behavioural study on syntactic priming effects during comprehension conducted with a population of adult native speakers of BP. Therefore, it will provide behavioural data regarding the occurrence of syntactic priming effects during comprehension of BP in an adult population. Such contribution is of keen importance due to the aforementioned scarcity of data from BP.

Review of Literature

The present section will be organized as follows. First, a brief introduction to syntactic priming will be given. Then, I will address the topic of syntactic priming in relation to language representation. Next, I will discuss syntactic priming in language production. Finally, the topic of interest of the present study, syntactic priming in comprehension will be addressed.

Syntactic priming, or structural priming, is a phenomenon in which the previous exposure to a syntactic structure facilitates the processing of a similar subsequent structure (Pickering & Branigan, 1999). According to Chang and colleagues (2000) syntactic priming effects may be a form of implicit learning. Additionally, less frequent syntactic structures are more likely to yield significant priming effects (Jaeger & Snider, 2013). In such sense, the passive voice is one of the structures of interest in syntactic priming studies (e.g. Bock, 1986; Hartsuiker, Pickering, & Veltkamp, 2004; Teixeira, 2016; Kuerten, 2017).

Furthermore, syntactic priming effects can shed light on important issues regarding the nature of the information activated during language production and

comprehension. According to Bock (1986), while phonological and semantic priming effects can be accounted for as the result of the activation of elements in the same representational network, syntactic priming effects cannot be accounted for in the same way due to its complex nature. In her seminal study, Bock (1986) used the priming paradigm for the first time in order to investigate syntactic processing. She aimed at investigating an account for syntactic persistence in language production that argued that such phenomenon was due to the residual activation of syntactic operations responsible for sentence production. In order to do so, she conducted three syntactic priming experiments with 48 members of the University of Pennsylvania as participants. The first experiment aimed at testing the persistence in the production of a sentence type (e.g. passive or active, prepositional or a double-object dative) after previous exposure to a sentence with the same syntactic structure. The second experiment investigated whether or not the syntactic parser incorporates conceptual information while processing a sentence. Finally, the third experiment was a follow up of the second with some design adaptations due to an unexpected pattern in the results. In every experiment, the participants had to repeat a prime sentence and describe a target image. In relation to the first experiment, the results suggested that the probability of a participant use a determined syntactic structure to describe the image was enhanced when such structure had occurred in the prime sentence. Moreover, in the second and third experiments, the priming effects were persistent in all prime variations thus suggesting that syntactic processing is, to some extent, conceptually encapsulated. The findings have both methodological and theoretical implications. First, Bock (1986) argues that future experiments should use the priming paradigm since it enables structural manipulations

without conceptual changes. Second, in relation to the nature of syntactic processing, her findings may indicate that, at least at some level, syntactic processing is isolated from other types of information.

Regarding the possible functions of syntactic priming, Ferreira and Bock (2006) present three positions found in the literature. First, syntactic priming could be related to proficiency enhancement. Second, syntactic priming could be the result of the implicit learning of how aspects of meaning are related to syntactic structures. Finally, syntactic priming could be the result of the alignment between speakers.

What can syntactic priming experiments suggest about language representation?

More than address issues related to language processing, data gathered in syntactic priming experiments also enrich the debate about syntactic representation, that is, the organization and representation of syntactic information to be accessed during language production and comprehension (Pickering & Ferreira, 2008). In line with that, Pickering and Branigan (1999) proposed that due to the shared nature of syntactic information in language production and comprehension, speakers would represent such information only once. Hence, syntactic priming effects would be the result of residual activation thus decreasing the computational load of representing the same information twice.

Still regarding the mental representation of syntax, two important and mutually exclusive positions are depicted in the literature: the lexicalist and the autonomous approaches. On the one hand, according to lexicalist approaches (Tooley, Traxler, & Swaab, 2009) syntactic knowledge is tied to individual lexical items. In such sense, syntactic representation would be the derived from non-syntactic representations that conduct communicative and cognitive functions. On the other hand, for autonomous

approaches (Bock, 1986) syntactic knowledge is independent of other forms of knowledge. Thereby syntactic representation would be organized solely based on syntactic categories.

Additionally, Levelt, Roelofs, and Meyer (1999) propose that language production is implemented in stages of conceptual preparation, lexical selection, morphophonological encoding and syllabification, phonetic encoding and, finally, articulation. In terms of language representation such stages can be related to three strata of nodes in the representational network: the conceptual stratum, the lemma stratum and the word-form stratum (for a detailed account see Level, Roelofs, & Meyer, 1999). Addressing the organization of the lemma stratum, Pickering and Branigan (1998) conducted a series of syntactic priming experiments where syntactic priming effects were found when the main verb was repeated between prime and target (e.g. give – give) as well as when the main verb was inflected (e.g. gave – gives). The authors then argue that such results provide evidence about the organization at the lemma stratum. Thus, according to the authors, the combinatorial information is shared and associated with the verb's lemma and not to a particular inflection of the verb.

Moreover, Branigan and Pickering (2017) argue that cognitive science research should not be restricted to grammaticality judgements tests when investigating syntactic representation. On the contrary, the authors propose that syntactic priming is a superior method of investigation that can enable the online testing of linguistic models as well as aid the design of new ones.

Finally, syntactic priming experiments can shed light on important issues regarding language representation. For example, they can address to issue of whether or

not processes of language comprehension and production rely upon the same representational network. Moreover, they can provide empirical data regarding the organization of such representation network. In the following subsection, I will present some studies on syntactic priming effects during production.

Syntactic priming in language production

Since the aforementioned experiments conducted by Bock (1986) syntactic priming in language production has been more investigated than syntactic priming in comprehension. According to Jaeger and Snider (2013) in language production "syntactic priming refers to the increased probability of re-using recently processed syntactic structures" (p.57). In turn, such increased probability can address the issue of what is the relation between lexical and syntactic knowledge. That is, if syntactic knowledge is independent of lexical knowledge syntactic priming effects will not be sensible to any non-syntactic manipulations in the prime. However, if both types of knowledge were shared, that is, if syntactic knowledge is encapsulated in lexical knowledge, then non-syntactic manipulations in the prime would yield priming effects. In light of this debate, Bock et al. (1992) found both message sensible and purely syntactic priming effects. Moreover, Messenger et al. (2012) reported syntactic priming effects in semantically different sentences, thus suggesting the existence of a purely syntactic representational level.

As stated before, syntactic priming in production has been well researched. Addressing such research, Mahowald, James, Futrell and Gibson (2016) analysed 73 syntactic priming articles published from 1986 to 2013. Their main findings were (a) a lack of modality effect in priming effects; (b) marginally negatives priming effects in

sentence completion tasks; (c) weaker priming effects in cross-linguistic conditions (L1-L2) and (d) a small negative effect when a filler is included between prime and target. Moreover, the authors recommend that, in order to enhance the statistical power of the experiments, 96 subjects and 24 items should be analysed. Nevertheless, when the independent variable is the lexical repetition, the authors suggest that fewer subjects and items are required. Thus, with 16 subjects and 16 items a 92% statistical power would be met.

In relation to the advantages of the syntactic priming paradigm when compared to grammaticality judgments, the population variety to be tested is greater. Thus, the contributions of syntactic priming studies to the understanding of the processes underlying language production are many. Regarding Brazilian Portuguese, Teixeira (2016) investigated syntactic priming effects during production of passive and actives sentences by Brazilian children and adults. As expected, priming effects were only found for passive sentences. Moreover, priming effects were only found in children. The results were interpreted as evidence in favour of the implicit learning account (Chang, Dell, & Bock, 2006) as well as indicative of the probabilistic nature of the language system.

As already said, since the aforementioned seminal study of Bock (1986) many experiments have used the syntactic priming paradigm in order to investigate language production. However, although less frequent, syntactic priming studies in language comprehension are also found in the literature and will be discussed in the following subsection.

Syntactic priming in language comprehension

Even though syntactic priming in comprehension is less addressed than syntactic priming in production, interest in priming during comprehension has increased over the last years. Branigan, Pickering and McLean (2005) investigated syntactic priming effects in the interpretation of ambiguous prepositional phrases in which the ambiguity was created due to the competition between high and low attachments. Their results suggested that participants were more likely to interpret such ambiguous phrases as highly attached if the prime phrase had the same high attachment as well as the same main verb. Such result sheds light on a crucial variable in the studies of syntactic priming effects in language comprehension: the lexical repetition, or lexical boost.

Being the more consistent moderator of syntactic priming effects in the studies analysed by Mahowald et al. (2016), lexical repetition occurs when prime and target sentences share the same main verb. Moreover, in language production lexical repetition effect has been shown to be even more robust than syntactic priming effects (Mahowald et al., 2016). Yet, lexical repetition is not a *sine qua non* of syntactic priming effects in language production since the effects do occur in its absence. In language comprehension, however, such relation of interdependency remains debatable since studies have yielded results in which priming effects only occur in the presence of lexical repetition (e.g. Arai, van Gompel, & Scheepers, 2007) . Notwithstanding such position of interdependency, Thothathiri and Snedeker (2008) found syntactic priming effects independent of lexical repetition in three comprehension experiments where participants should act out double-object or prepositional-object dative sentences while their eye movements were recorded. In the target sentences, a temporary ambiguity was created in the argument structure of

the verb (e.g., Show the horse the book X Show the horn to the dog). After the participants heard the target sentences, the authors measured their gaze to the object placed before them (e.g. a horse and a horn). Finally, the authors found priming effects in every experiment despite the absence of lexical repetition. Moreover, a possible account for the disparity found in relation to the role of lexical repetition, according to Tooley and Traxler (2010), is the different experimental designs. Despite that, the facilitative role of lexical repetition in comprehension is well accepted among researchers. Thus, the implication of such phenomenon to our understanding of language processing and representation should be addressed.

In light of that, the subtle differences between the processes of language production and comprehension should be taken into account (Tooley & Traxler, 2010). For instance, during comprehension the order of constituents restricts the representational possibilities of a sentence. Thus, the role of lexical repetition could be related to this aspect. However, the subtle differences account sheds light on another important issue related to the nature of the priming effects elicited during language comprehension. That is, are they syntactic or semantic?

Addressing such question, Ledoux, Traxler and Swaab (2007) conducted an event related potentials (ERP) experiment with the syntactic priming paradigm. According to the authors, since ERP experiments can differentiate syntactic priming effects from semantic priming effects, they are crucial when investigating such question. Accordingly, their results were able to detect both syntactic and semantic priming effects. Moreover, syntactic priming effects during comprehension were found in the absence of lexical repetition at the verb.

Regarding syntactic priming effects during comprehension of BP sentences a behavioural study was conducted at LabLing under the supervision of professor Mailce Borges Mota. Kuerten (2017) used the syntactic priming paradigm to investigate sentence processing in children with dyslexia. Her behavioural results indicated that syntactic priming effects for passives were greater than for actives as well as long lasting and cumulative. Contrasting with the control group, of non-dyslexics, dyslexics experienced greater priming effects. Also addressing syntactic processing in Brazilian children, Kramer (2017) found a greater syntactic priming effect during the comprehension of passive structures by 5th and 6th grade poor readers than by 6th grade good readers. According to the author, such result indicates that syntactic priming effects become scarcer as language develops.

Finally, syntactic priming effects during comprehension of BP sentences by adult speakers have not yet been investigated in a behavioural study. Also at LabLing and with the supervision of professor Mailce Borges Mota, De Jesus (2018) investigated priming effects by analysing the event-related potentials (ERPs) elicited during comprehension of BP passive sentences. Her results indicated that syntactic priming effects during comprehension of BP sentences might be dependent upon lexical repetition. In order to address such possibility as well as to enrich such debate with behavioural data, the present study was an exploratory investigation regarding the existence of syntactic priming effects during comprehension of BP sentences by adult speakers.

Summing up, syntactic priming effects during production and comprehension have been reported in the literature (e.g. Bock, 1986; Pickering & Branigan, 1998). However, when addressing language comprehension such effects might be lexically

dependent (e.g. Branigan et al., 2005). In the following section, the methodological procedures of the present study will be presented.

Method

As previously stated, the syntactic priming paradigm constitutes an effective method of investigation for studies about language processing and representation. Thus, the present study used the syntactic priming experimental paradigm in order to investigate the processing of passive sentences by BP native speakers. The experimental design was based on De Jesus (2018) and adaptions were made in order to include conditions with lexical repetition of the main verb.

Objectives, research question, hypothesis and rationale

The present study aimed at investigating syntactic priming effects during comprehension by means of a behavioural experiment where syntactic priming effects were measured in one experimental condition (to be explained in the following subsection). More specifically, I investigated the occurrence of syntactic priming effects during the comprehension of passive sentences by Brazilian Portuguese (BP) adult native speakers. The study pursued the following research question:

RQ: Are there priming effects during the comprehension of BP passive sentences in which prime and target sentences share the same main verb and syntactic structure?

The research question raised the following hypothesis:

H1: There will be syntactic priming effects during the comprehension of BP passive sentences in which prime and target sentences share the same main verb and syntactic structure.

The available literature points to a facilitating effect of lexical repetition at the main verb upon syntactic priming effects during comprehension (e.g. Branigan, Pickering & McLean, 2005; Tooley & Traxler, 2010). That is, syntactic priming effects during comprehension are more likely to occur when prime and target sentences share the same main verb. In light of that, participants' reaction times should be faster for the main verb of the target sentence of the experimental condition when compared to the main verb of the control condition. Thus, previous processing of a passive structure should facilitate the processing of a following passive structure when both sentences share the same main verb.

Participants

Twenty-two undergrad students participated in the present study. They were invited through announcements on LabLing's official profiles as well as via private messages. Their ages ranged from 18 to 30 years old (*M*=23, *SD*=2.90). Based on data pre-processing the finale sample consisted of 20 participants (11 female). All participants were native speakers of Brazilian Portuguese.

Instruments

Two instruments for data collection were employed in the present study: an info-biographical questionnaire and a self-paced reading task.

After signing the consent form (Appendix A), participants were invited to answer an online info-biographical questionnaire on Google Forms platform (Appendix B).

First and foremost, the behavioural experiment carried out in the present study is part of a series of priming studies conducted at LabLing with the supervision of Professor

Mailce Borges Mota[1]. Its main objective was to determine whether reading a passive sentence would facilitate the processing of a following sentence with the same syntactic structure by BP native adult speakers. In order to attain that, reaction times were measured in one experimental condition as well as in one control condition.

The self-paced reading task consisted of 240 sentences divided into 120 experimental sentences and 120 filler sentences. The experimental sentences were adapted from the original design of De Jesus (2018) whereas the filler sentences were entirely reproduced from De Jesus (2018). Such adaptation was conducted in order to eliminate highly emotional charged words (e.g. *matar*, *bater*, *abandonar*) as well to include lexical repetition at the main verb. The experimental sentences were divided into pairs of passive-passive sentences as well as active-passive sentences. Since syntactic priming effects during comprehension are more likely to occur when prime and target sentences share the same main verb (e.g. Tooley & Traxler, 2010) the main verb was repeated between prime and target sentences. The active-passive sentences served as a control condition.

The experimental task was divided into 10 blocks consisting of three trials each. Every trial had a prime sentence, a target sentence and two filler sentences. In order to control for participants' attentional dispersion yes or no comprehension questions were included after every block. Such questions were always related to the last sentence of the mini block (a filler sentence). Since more complex and infrequent structures are more likely to yield syntactic priming effects the passive structure was our main interest.

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[1] CNPq fellowship – Process 310729/2016-5

Finally, in order to include lexical repetition at the main verb De Jesus's (2018) sentences were adapted and went through an online grammaticality judgment test with BP native speakers. Sentences were assessed on a 5-point Likert scale, from not acceptable (score value =1) to completely acceptable (score value=5). Sentences with a mean score of at least 3.5 were selected for the pilot study.

The self-paced reading syntactic priming task was programmed in the E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA). The task is categorized as a self-paced reading task due to the fact that participants had control over their reading pace. The sentences appeared word by word in the middle of the computer screen, in a white Arial font of size 20 on a black background in a DELL 23-inch widescreen monitor. Participants were instructed to press the space bar on the keyboard after reading a word so that the next word could appear. Their reaction time measures were automatically recorded. After each sentence, a fixation cross was presented on the screen and participants had to press the space bar so that the first word of the next sentence could appear. An example of the presentation of a sentence is shown below in Figure 1:
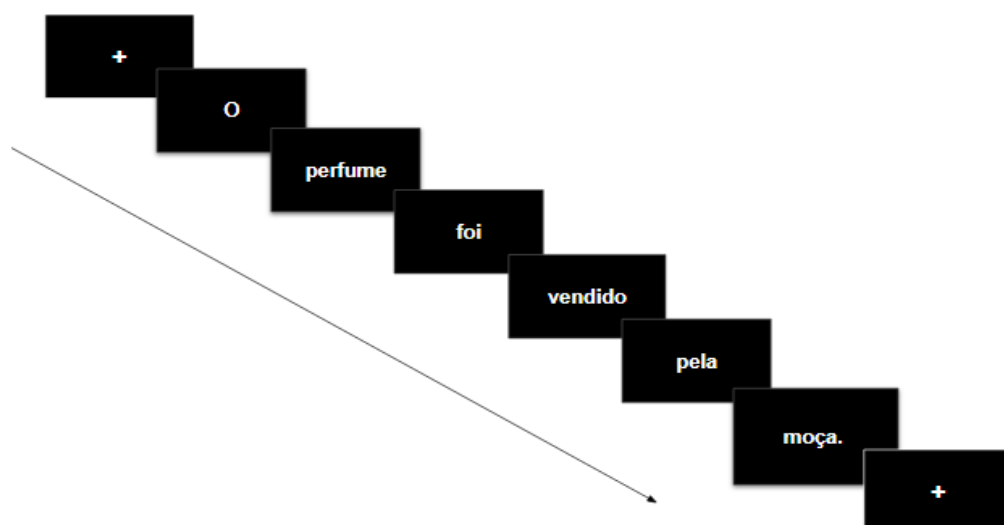
Figure 1. Experimental design of a passive sentence presentation

Procedures

The experimental task reported in the present study was conducted at LabLing-UFSC. More specifically, the behavioural data was collected in LabLing's experimental cabin. After reading and signing a consent form (namely, the TCLE) as well as answering an online info biographic questionnaire, participants entered the experimental cabin accompanied by one researcher. The instructions were read out load by the researcher and participants had the chance of enlightening any remaining doubts. Then, a practice session was conducted so participants could be familiarized with the procedure. After such session, the researcher left the cabin and the proper data collection began. The task lasted approximately 25 minutes. Following LabLing's experimental protocol the sessions of data collection were always conducted by two researchers.

The present study was approved by UFSC's Ethics Review Board[2]. In the following subsection, the pilot study will be addressed.

Pilot study

The pilot study was conducted in the first week of September 2019. Its main objective was to test instruments and procedures. Six PB native speakers (3 females) participated in the pilot study. They signed the consent form and answered the info biographic questionnaire before partaking in the syntactic priming reading task.

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[2] CAAE: 15907519.9.0000.0121

The researchers followed the data collection through a mirrored monitor placed outside of the experimental cabin. Based on our own observations as well as on participants' feedback typos and formatting errors were fixed. No further adaptations on the instruments were necessary. In the following section, I will present and discuss the results of the experimental task.

Results and discussion

The present section will report the results of the behavioural syntactic priming experimental task. First, I will address the pre-processing procedures that the raw data went through before the proper statistical analysis could take place. Then, I will present the results of the behavioural syntactic priming experiment. Finally, I will discuss the results in light of the syntactic priming literature.

Data pre-processing

Two dependent variables were looked into during the data pre-processing procedures. First, participants' accuracy on the comprehension questions was measured (M=17, SD=2). Participants who answered correctly less than 15 out of the 20 questions were considered outliers and their data were discarded. Second, participants' reading times were analysed. First, all impossible values (under 50ms and over 1500ms) were discarded. Then, every value beyond the Mean±3SD range was considered an outlier and removed. After the data pre-processing procedures, the data from 20 participants remained for further analysis.

Analyses of the behavioural data

As shown in Figure 2 the data distribution was not normal (Gaussian). Instead, a

Gamma distribution was found. Due to such feature of the data, a generalized linear model

was considered as most suitable for the analysis (Baayen, Davidson, & Bates, 2008). The

areas of interest were word 4 (past participle) and word 5 (by preposition) of the target

sentences. The methodological decision of including word 5 in the analysis was based on

the possible existence of a spill-over effect. Such effect might be, as argued by Kaiser

(2013), a limitation of self-paced reading tasks due to the possibility that "the impact of

a particular word on processing time does not show up until a word or two later" (p. 141).

Thus, in order to account for such possible effect reaction times for word 5 (by

preposition) were also analysed. In order to answer the proposed research question, a

generalized linear model with Condition and Words' Length as fixed factors and Subjects

as random factors was calculated.
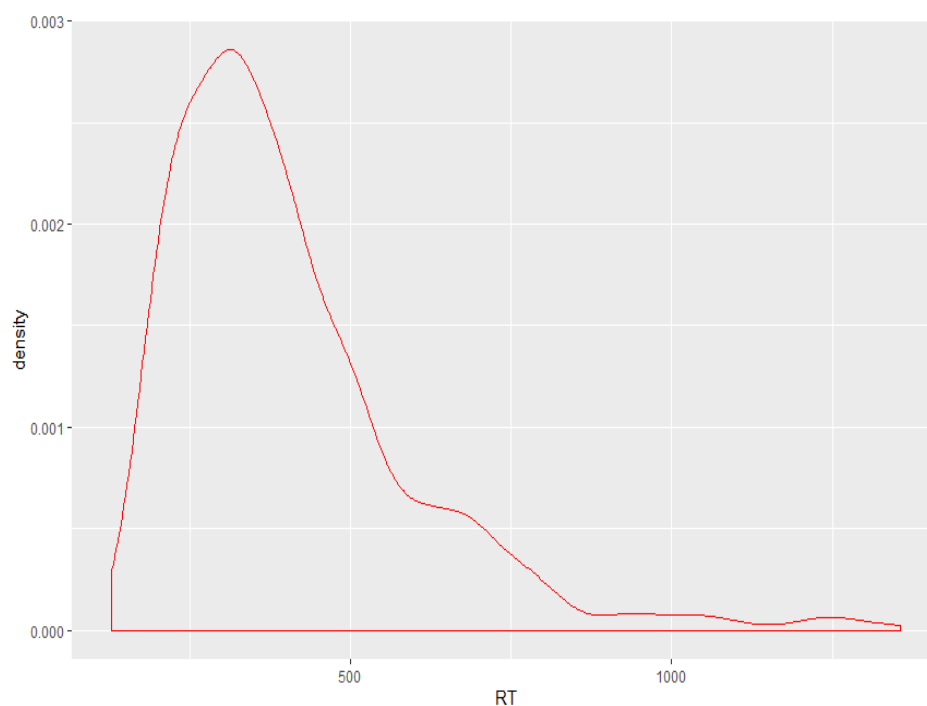
Figure 2. Distribution of the data.

For word 4, the results indicated that previous processing of a passive structure facilitates the following processing of a passive structure ($ß$: -28.568 *SE*: 8.412 *t* (2): -3.396 *p*=.0006). That is, participants' reaction times were approximately 28.568ms faster in the experimental condition (passive-passive) when compared with the control condition (active-passive). Figure 3 reports the mean reading times for word 4 in both experimental and control conditions. On the other hand, word length was not found to have significant impact on RT ($ß$: -1.790 *SE*: 1.555 *t* (2): -1.151 *p*=.2497). Finally, the intercept, which was the active voice in the control condition, was significant ($ß$: 456.787 *SE*: 17.668 *t* (2): 25.854 *p*<2e-16).
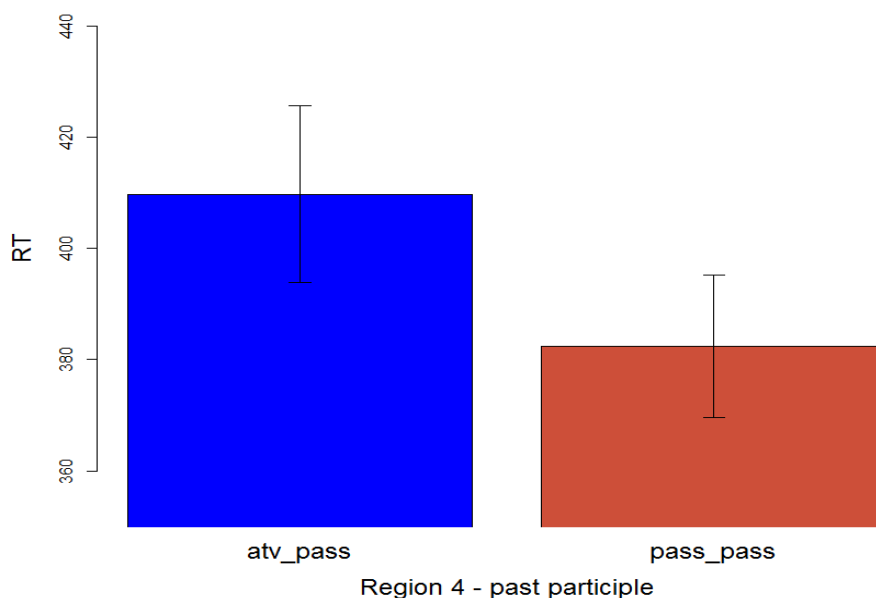
Figure 3. Comparison of reaction times for region 4 in both control and experimental condition

Finally, the priming effect was restricted to word 4 (the main verb). Accordingly, for word 5 (the by-preposition), the results did not show a facilitation effect (*ß*: -10.227 *SE*: 7.745 *t* (2): -1.32 *p*=.18) thus indicating the absence of a spill over effect (Kaiser, 2013). In the next section, an in-depth discussion of the results will be conducted.

Discussion

The main objective of the present study was to investigate the occurrence of syntactic priming effects during the comprehension of passive sentences by BP adult native speakers. Despite the increasing literature on syntactic priming effects in languages such as English, German, Dutch and Mandarin (e.g. Bock, 1986; Pappert & Pechmann, 2013; Segaert, Menenti, Weber, & Hagoort, 2011; Cai, Pickering, & Sturt, 2013) little is known about syntactic priming effects in Brazilian Portuguese. More than that, behavioural studies on syntactic priming effects during comprehension of BP were only conducted with children (Kramer, 2017; Kuerten, 2017). In light of that, the present study was the first behavioural experiment on syntactic priming effects during the comprehension of BP conducted with adults.

The results reported here were able to answer the research question and were in accordance with the proposed hypothesis: BP adult native speakers were found to be susceptible to syntactic priming effects during comprehension. Due to the exploratory nature of the present study, the research design only counted with an experimental condition in which the main verb was repeated between prime and target sentences. The results were in line with the findings of Branigan and colleagues (2005) and Arai and colleagues (2007) in which priming effects were found in the presence of repetition at the

main verb. However, the present study cannot address the possible existence of syntactic priming effects independent of lexical repetition during comprehension.

Moreover, despite dealing with a different population, the results reported here were also in accordance with Kramer (2017) and Kuerten (2017) in the extent that both authors found priming effects during comprehension. However, the effects were greater for less proficient readers (namely, poor readers and dyslexics). Finally, the only previous behavioural syntactic priming study conducted with the same population (BP adult native speakers) dealt with production rather than comprehension. Teixeira (2016), however, did not find syntactic priming effects during production in adults. Contrasting such results with those found here, the occurrence of syntactic priming effects during comprehension may be due to processes intrinsic to language comprehension, as argued by Tooley and colleagues (2009).

Finally, the results were able to contribute to De Jesus's (2018) findings to the extent that syntactic priming effects were found in the presence of lexical repetition at the main verb. In light of that, the absence of syntactic priming effects on the study reported by De Jesus (2018) might be due to the absence of lexical repetition. Furthermore, if that is the case syntactic processing might be, at least to some extent, lexically driven.

Final remarks

Syntactic priming experiments are able to provide empirical data regarding the nature and organization of the language processing system. On that note, the present study contributed to the literature regarding syntactic priming effects during comprehension with data from Brazilian Portuguese adult native speakers. The results indicated that adult speakers of BP are susceptible to syntactic priming effects during comprehension of

passive sentences in which the main verb was repeated. The occurrence of syntactic priming effects during comprehension in a population of adult speakers may suggest that such effects might not be restricted to less proficient speakers of a language. However, the present study can only attest to such possibility in the presence of lexical repetition at the main verb.

Notwithstanding the importance of the results presented here, some considerations should be made. First, due to the time limitations of an undergraduate dissertation, the number of participants (N=20) constitutes a small sample size. Thus, further research should be conducted with a larger sample of individuals. Another limitation of the present study is its inability to address the extent to which syntactic priming effects during comprehension are dependent upon lexical repetition. Accordingly, a different experimental design in which conditions without lexical repetition are included would be suitable to address such issue.

Finally, due to the behavioural nature of the present study, it cannot provide information regarding the nature of the processes underlying the syntactic priming effects. The possibility that the effects found here were actually morphosyntactic in nature cannot be disregarded due to the continuous repetition of the past participle structure in regular verbs.

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Appendix A

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO
Participação em Experimento de *Priming*
Termo de Consentimento Livre e Esclarecido (TCLE) baseado na resolução 510/2016
de acordo com o CNS (Conselho Nacional de Saúde)

UNIVERSIDADE FEDERAL DE SANTA CATARINA
CENTRO DE COMUNICAÇÃO E EXPRESSÃO
DEPARTAMENTO DE LÍNGUAS E LITERATURAS ESTRANGEIRAS – DLLE
LABLING – LABORATÓRIO DA LINGUAGEM E PROCESSOS COGNITIVOS

Projeto de Pesquisa: efeitos da repetição lexical no processamento sintático da voz passiva em português brasileiro: um estudo no paradigma de priming sintático

Caro (a) Participante,
Eu, Natália Pinheiro De Angeli, CPF: XXXXXXXX-XX, RG:XXXXXXXX-X, aluna de graduação do curso de Letras - Inglês da Universidade Federal de Santa Catarina, orientada pela Professora Dra. Mailce Borges Mota, tenho como objetivo desenvolver um estudo sobre o processamento de frases em português brasileiro.
Gostaria de convidá-lo(a) a participar desta pesquisa, que busca investigar como processamos a voz passiva. Os estudos nessa área visam não só compreender o processamento de uma língua, mas também desenvolver meios de aperfeiçoar o ensino e aprendizagem. Peço que você leia este formulário de consentimento e tire todas as dúvidas que possam surgir antes de concordar em participar do estudo.
Os experimentos aplicados serão realizados no Laboratório da Linguagem e Processos Cognitivos (LabLing), no 5º andar, sala 513 do prédio B do Centro de Comunicação e Expressão da Universidade Federal de Santa Catarina. Se você concordar em participar deste estudo, você será solicitado(a) a preencher um questionário biográfico e realizar um experimento de *priming* sintático. Você preencherá o questionário biográfico com alguns dados pessoais (por exemplo, idade, sexo, etc.) O experimento de *priming* é uma tarefa de leitura auto monitora de sentenças. Você lerá as sentenças palavra por palavra em um computador. Seu tempo de resposta será gravado automaticamente. Esta tarefa terá duração de 30 minutos.
Em decorrência da participação nesta pesquisa, você pode estar exposto(a) a eventuais riscos, mesmo que baixos, tais como nervosismo, constrangimento, cansaço ou aborrecimento inerentes a qualquer situação de avaliação, assim como a quebra de sigilo mesmo que de maneira involuntária e não intencional. Para minimizar a possibilidade de desconforto, sessões de prática serão feitas antes da aplicação do experimento para que você possa se familiarizar com os procedimentos. Para diminuir esse desconforto, o experimento será realizado em uma sala com cadeiras confortáveis, iluminação e temperatura adequadas e posicionamento adequado do monitor do computador, de acordo com a sua altura.

De acordo com a legislação brasileira, sua participação é voluntária e não remunerada. Os pesquisadores estarão à disposição para esclarecimentos, antes, durante e depois da pesquisa. Você tem assegurada a liberdade de desistir de participar a qualquer momento do estudo, sem nenhuma penalização. Duas vias deste documento serão rubricadas e assinadas por você e pelo pesquisador responsável. Guarde cuidadosamente a sua via, pois é um documento que traz importantes informações de contato e garante os seus direitos como participante da pesquisa. Caso a sua participação nessa pesquisa lhe traga alguma despesa, você tem direito a ressarcimento. Caso venha sofrer qualquer prejuízo, material ou imaterial, comprovadamente decorrente de sua participação nesta pesquisa, você será indenizado de acordo com a legislação vigente.

Os dados obtidos neste estudo serão mantidos em sigilo e serão armazenados no LabLing por 5 anos, quando então serão descartados. Os dados serão acessados apenas pelos pesquisadores responsáveis. Os resultados desta pesquisa serão divulgados em eventos ou publicações científicas sem qualquer identificação dos participantes. Você pode ter acesso aos resultados da pesquisa a qualquer momento entrando em contato com os pesquisadores.

Os procedimentos metodológicos adotados obedecem aos preceitos éticos implicados em pesquisas envolvendo seres humanos, conforme normatizado pela Resolução do Conselho Nacional de Saúde nº 510 de 07 de abril de 2016, que dispõe sobre as normas aplicáveis a pesquisas em Ciências Humanas e Sociais. As pesquisadoras também aderem a esse documento e comprometem-se a conduzir a pesquisa de acordo com o que preconiza a referida Resolução.

Contatos. Tendo qualquer dúvida sobre a pesquisa, você pode entrar em contato com Natália Pinheiro De Angeli, pelo e-mail nataliapinheirod@gmail.com ou pelo telefone (XX) XXXXX--XXXX, ou com a professora Dra. Mailce Borges Mota através do e-mail mailce.mota@ufsc.br, telefone (XX) XXXX-XXXX, ou no prédio do Centro de Comunicação e Expressão – CCE, bloco B, sala 513, Universidade Federal de Santa Catarina, UFSC.

Comitê de Ética em Pesquisa (CEP). A pesquisa, da qual faz parte esse questionário, foi avaliada e aprovada pelo Comitê de Ética em Pesquisa com Seres Humanos (CEPSH) da UFSC. O CEPSH é um órgão colegiado interdisciplinar, deliberativo, consultivo e educativo, vinculado à Universidade Federal de Santa Catarina, mas independente na tomada de decisões, criado para defender os interesses dos participantes da pesquisa em sua integridade e dignidade e para contribuir no desenvolvimento da pesquisa dentro de padrões éticos. Caso você tenha alguma dúvida ou reclamação quanto à condução ética dessa pesquisa, você pode entrar em contato com o CEPSH – UFSC. Endereço: Prédio da Reitoria II, 4º andar, sala 401, Rua Desembargador Vitor Lima, nº222, Trindade, CEP 88040-400, Florianópolis-SC. Telefone: (48) 3721-6094. E-mail: cep.propesq@contato.ufsc.br.

Termo de consentimento livre e esclarecido

Eu, _____, RG _____, declaro que li e compreendi as informações do **Termo de Consentimento Livre e Esclarecido**. Eu compreendo meus direitos como voluntário(a) da pesquisa, concordo em participar deste estudo e em ceder

meus dados para a pesquisa. Compreendo o objetivo do estudo bem como os procedimentos que serão realizados. Receberei uma via assinada deste formulário de consentimento.
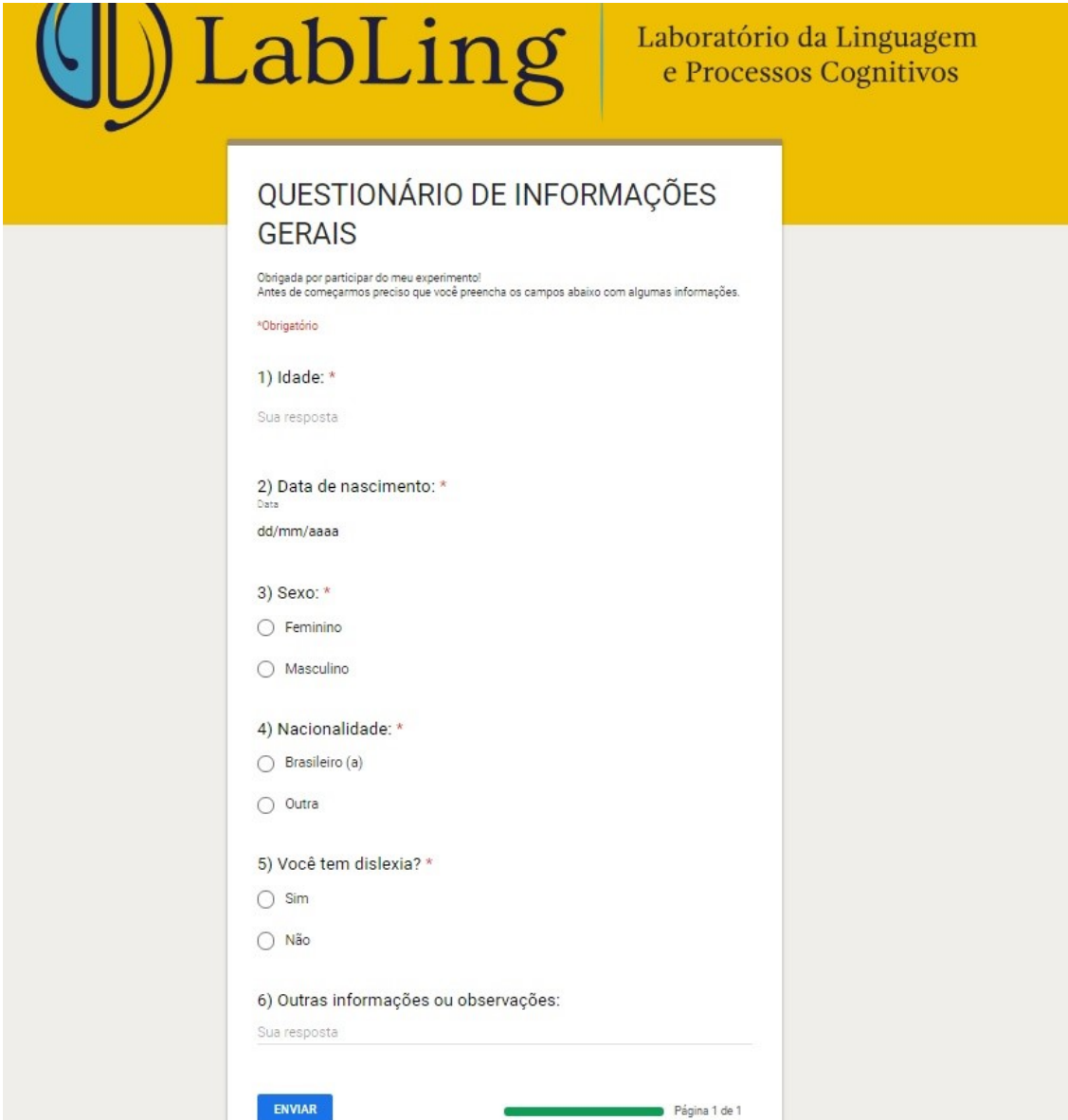
Nome: _____

Assinatura do Participante: _____

Assinatura da Pesquisadora Responsável: _____
Data:____/____/____/

Appendix B