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**THE TRANSLATION PROCESS OF BRAZILIAN
PORTUGUESE-ENGLISH FALSE COGNATES**

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Dissertação apresentada ao Programa de Pós-graduação em Estudos da Tradução (POET) da Universidade Federal do Ceará, como requisito parcial à obtenção do título de mestre em Estudos da Tradução. Área de concentração: Tradução: linguagem, cognição e recursos tecnológicos.

Orientadora: Profa. Dra. Pâmela Freitas Pereira Toassi

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ABSTRACT

The present study is part of the project: “*Portuguese-English bilingual lexicon*” by the Bilingual and Multilingual Language Processing Laboratory (PLIBIMULT), at the Federal University of Ceará. This study has as its main objective to examine the effect of false cognates in Brazilian Portuguese-English bilinguals, in a language decision task and a multiple-choice translation task. The general objective was divided into two specific objectives: 1) to analyze whether there is any significant difference in the processing cost between false cognates and control words in Brazilian Portuguese (L1) and in English (L2) in a language decision task and in a translation task; 2) to investigate if there are false cognate repetition priming effects in a translation task. The studies carried out by Otwinowska and Szewczyk (2019), Otwinowska, Forys-Nogala, Kobosko and Szewczyk (2020), Brenders, Van Hell and Dijkstra (2011), Lalor and Kirsner (2001), Poort, Warren and Rodd (2015), Gadelha (2021) and Borém (2023) provided the main theoretical support for the present study. For the language decision task (task 1), 25 English false cognates, 25 Brazilian Portuguese false cognates, 100 English control words and 100 Brazilian Portuguese control words were selected. For the translation task (task 2), 50 English words were selected in total to be translated. Out of these 50 words, 25 were English false cognate words and 25 were English control words. 12 English false cognates that were used in task 1 were repeated in task 2. Reaction time and accuracy data for both tasks were collected using the software PsyToolkit (Stoet, 2010, 2017). All lexical items used in this study were controlled regarding frequency and number of characters. A demographic and linguistic questionnaire and an L2 vocabulary knowledge test were used as additional research instruments in this study. For tasks 1 and 2, accuracy was lower for false cognates compared to control words and reaction time was higher for false cognates compared to control words, highlighting that for false cognates the processing cost was higher, Therefore, H1 was confirmed. Regarding the second specific objective of this research, in task 2, results showed that there were no repetition priming effects for false cognate words in a translation task, therefore H2 was confirmed. The findings for this research may contribute to the discussion regarding lexical access and they may also foment translation studies concerning the cognitive processes underlying translation. Furthermore, this research can contribute to studies on false cognates and how differently this type of word is processed by bilinguals, as well as providing effective strategies for language learners when accessing lexical items in different languages.

Keywords: translation studies; psycholinguistics of bilingualism; lexical access; English as L2; false cognates.

RESUMO

O presente estudo faz parte do projeto: “Léxico bilíngue português-inglês” realizado pelo Laboratório de Processamento da Linguagem de Bilíngues e Multilíngues (PLIBIMULT), da Universidade Federal do Ceará. Este estudo tem como objetivo principal examinar o efeito de falsos cognatos em bilíngues português brasileiro-inglês, em uma tarefa de decisão linguística e em uma tarefa de tradução de múltipla escolha. O objetivo geral foi dividido em dois objetivos específicos: 1) analisar se existe diferença significativa no custo de processamento entre falsos cognatos e palavras de controle em português brasileiro (L1) e em inglês (L2) em uma tarefa de decisão linguística e em uma tarefa de tradução; 2) investigar se há efeitos de *priming* de repetição de falsos cognatos em uma tarefa de tradução. Os estudos realizados por Otwinowska e Szewczyk (2019), Otwinowska, Forys-Nogala, Kobosko e Szewczyk (2020), Brenders, Van Hell e Dijkstra (2011), Lalor and Kirsner (2001); Poort, Warren and Rodd (2015), Gadelha (2021) and Borém (2023) forneceram o principal suporte teórico para o presente estudo. Para a tarefa de decisão linguística (tarefa 1), foram selecionados 25 falsos cognatos em inglês, 25 falsos cognatos em português brasileiro, 100 palavras de controle em inglês e 100 palavras de controle em português brasileiro. Para a tarefa de tradução (tarefa 2), foram selecionadas 50 palavras em inglês no total para serem traduzidas. Destas 50 palavras, 25 eram palavras falsas cognatas em inglês e 25 eram palavras de controle em inglês. 12 falsos cognatos em inglês usados na tarefa 1 também foram repetidos na tarefa 2. Os dados de tempo de reação e acurácia para ambas as tarefas foram coletados por meio do software PsyToolkit (Stoet, 2010, 2017). Todos os itens lexicais utilizados neste estudo foram controlados quanto à frequência e número de caracteres. Um questionário demográfico e linguístico e um teste de conhecimento de vocabulário em L2 foram utilizados como instrumentos adicionais de pesquisa neste estudo. Para as tarefas 1 e 2, a acurácia foi menor para falsos cognatos em comparação com palavras de controle e o tempo de reação foi maior para falsos cognatos em comparação com palavras de controle, destacando que para falsos cognatos o custo de processamento foi maior, portanto, a H1 foi confirmada. Em relação ao segundo objetivo específico desta pesquisa, na tarefa 2, os resultados mostraram que não houve efeitos de *priming* de repetição para palavras falso-cognatas na tarefa de tradução, portanto a H2 foi confirmada. Os resultados desta pesquisa podem contribuir para a discussão sobre o acesso lexical e também podem fomentar estudos de tradução sobre os processos cognitivos subjacentes à tradução. Além disso, esta pesquisa pode contribuir para estudos sobre falsos cognatos e quão diferentemente esse tipo de palavra é

processado por bilíngues, bem como também pode fornecer estratégias eficazes para alunos de línguas ao acessar itens lexicais em diferentes idiomas.

Palavras-chave: estudos da tradução; psicolinguística do bilinguismo; acesso lexical; inglês como L2; falsos cognatos.

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LIST OF ABBREVIATIONS

BIA	Bilingual Interactive Activation
BIA+	Bilingual Interactive Activation Plus
BP	Brazilian Portuguese
CW	Control Words
ECW	English Control Words
EFC	English False Cognates
FC	False Cognates
FLT	Foreign Language Teaching
H1	Hypothesis 1
H2	Hypothesis 2
IA	Interactive Activation Model
L1	Native or First Language
L2	Non-Native or Second Language
NCW	Noun Control Words
NEW FC	New False Cognate
NFC	Noun False Cognates
OLD FC	Old False Cognate
PCW	Portuguese Control Words
PFC	Portuguese False Cognates
PLIBIMULT	Bilingual and Multilingual Language Processing Laboratory
RHM	Revised Hierarchical Model
RT	Reaction Time
SL	Source Language
TCLE	Termo de Consentimento Livre e Esclarecido
TL	Target Language
VCW	Verb Control Words
VFC	Verb False Cognates

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1 INTRODUCTION

Language processes are more complex for bilinguals than for monolinguals due to the constant need to select the appropriate language for a given context. The bilingual mind is a dynamic and interactive system, where two languages coexist and compete for activation. This linguistic coactivation generates a constant process of inhibition and selection, requiring greater cognitive control to avoid interference between languages (Cowles, 2011; Fernández; Cairns, 2011). Furthermore, bilinguals need to deal with the flexibility of their mental representations, adapting them to the demands of each communicative context, which contributes to greater complexity in language processing.

A number of studies have collected evidence in recent years, indicating that word recognition in one language may be influenced by word recognition in another language. The language non-selective access hypothesis supports that words from both languages of the bilingual are activated when a word is recognized (Dijkstra, *et al.*, 1998). Evidence also would point to the activation of both languages in the bilingual mind, regardless of the target language involved in the context (Barcelos; Fontes, 2022). The next paragraphs present two studies that shed light and provide evidence that languages interact during lexical processing by bilinguals.

Dijkstra *et al.* (1998) applied a lexical decision task with 24 bilingual students of Dutch (L1) and English (L2). The results for experiment 2 of their study showed that accuracy for false cognates was lower compared to controls. This suggests that because false cognates and homographs share form between the two languages, but are semantically different, participants had greater effort in recognizing these words. Thus, considering that both linguistic systems are active during the task, this difference in meaning causes confusion in the bilingual, which can lead to longer reaction time to recognize a word. In this case, the results corroborate the non-selective lexical access view. In Otwinowska and Szewczyk (2019), in a study that explored factors that determined knowledge of L2 words with orthographic neighbors in L1, with cognates and false cognates, 150 Polish learners of English were asked to translate 105 English non-cognate words, cognates and false cognates into Polish. The results showed that cognates were learned better, whereas false cognates were known worse, compared to non-cognates. Additionally, the authors concluded that cross-linguistic similarity affects L2 word learnability.

Toassi (2016) states that lexical access is the mental search for a word or its corresponding meaning. This search can be fast, automatic, and efficient, but some variables

may interfere with the speed, the automation and in the effectiveness of this process in the bilingual mind. For instance, when accessing a word that shares the same form, but does not share the same meaning in different languages, we must investigate how differently lexical items in both languages are activated. This is the case of interlingual homographs (words represented by the same spelling across languages but with different meanings or pronunciations in each language). For example, the linguistic pair Brazilian Portuguese-English, as “data” which in Brazilian Portuguese refers to a certain day and in English means “information collected” and false cognates, also known as false friends, such as “college” in English, which refers to a higher educational institution and “*colégio*”, which means “school” in Portuguese. Note that for the false cognate examples, the words have similar form, but they are not identical. It is important to state that some authors consider false cognates as interlingual homographs, such as Lemhöfer and Dijkstra (2004). In line with the definition of interlingual homographs by Lemhöfer and Dijkstra (2004), are Dijkstra, Grainger and Heuven, (1999), as the authors explained that word forms may be shared in different languages, which is the case of interlingual homographs. According to the authors, these words that share the same orthographic form in different languages and are also called false friends, because they look similar but have different meanings.

In the present study, interlingual homographs are understood as words with identical spelling and different meanings or pronunciations, whereas false cognates are words that may have similar but not necessarily identical form and have different meanings (De Groot *et al.*, 2000). Additionally, it is important to note that there are false cognate homographs (identical orthography and different meanings), but this type of word was considered to be confusing in this study, especially in the language decision task (task 1), where participants only saw an isolated word, without a specific context, in the center of a computer screen and had to choose which language that word belonged to. So, we chose not to use false cognate homographs in our research. Thus, the false cognate words used in this study are similar in form, but not identical.

This research aimed to investigate the processing of the linguistic pair Brazilian Portuguese-English false cognates (words with similar or very close form across languages, but differing in meaning). According to the non-selective lexical processing view, bilinguals activate both languages, even when in a monolingual task demand (Dijkstra *et al.*, 1998). Regarding the type of target word used in our study (false cognates) and the types of tasks applied, Duarte and Blank (2019) also provide theoretical support to our research, considering that during linguistic processing, languages are active in parallel, which can make their

processing possibly more costly in bilingual minds, once great cognitive effort is made to access a target word. It can occur because words of the two languages compete to be selected. In other words, a bilingual individual accesses more than one suitable candidate when seeing the item.

To work with false cognates, bilinguals need to show lexical and semantic knowledge to identify a word and decide which language the word belongs to. In other words, the bilingual must recognize the lexical item form and its meaning (Marecka *et al.*, 2021).

The present study, which was developed under the guidance of professor Pâmela Freitas Pereira Toassi, is part of the project: “*Portuguese-English bilingual lexicon*” by the Bilingual and Multilingual Language Processing Laboratory (PLIBIMULT) research group, at the Federal University of Ceará, has as its main objective to examine the effect of false cognates in Brazilian Portuguese-English bilinguals, in a language decision task and a multiple choice translation task.

This research is justified in the sense that, as part of the study group mentioned in the previous paragraph, that has already been developing research in language processing and lexical access, the present study can continue contributing and providing relevant data and analysis to this academic context. Furthermore, the area of lexical processing research is challenging, given that certain conditions concerning types of words may appear to be instigating for researchers, especially in translation studies, which is where the present research is situated. Words such as false cognates and interlingual homographs are widely researched objects in the Psycholinguistics of bilingualism area of study. Therefore, the lexical processing aspects involved in this context appear to be an important object of investigation for the present research, especially to investigate the cognitive processes involved in the translation process. Additionally, Interlingual homographs are words that share form but have different meanings across languages. Therefore, the study of Brazilian Portuguese-English false cognates present in this research can be pertinent and can add to the discussion in this area.

Some researchers are part of the project “*Portuguese-English bilingual lexicon*” by the Bilingual and Multilingual Language Processing Laboratory (PLIBIMULT) research group, at the Federal University of Ceará, such as Gadelha (2021), Miranda (2021), Batista (2022), Freitas (2023), Coutinho (2023), Silva (2023) and Borém (2023). The present study aimed to continue Batista (2022) investigation about the effect of English-Portuguese false cognates on bilingual lexical access. A more in-depth discussion on Batista's work is provided in subsection 2.7 and chapter 6.

In addition to the introduction, chapter 2 presents the theoretical references, and chapter 3, the methodology. Chapter 2 is further divided into the sections on Translation and

translation studies (2.1), translation types (2.2), Translation and the psycholinguistics of bilingualism (2.3), Language interaction in bilingual minds (2.4), Bilingual lexical access and bilingual lexical models (2.5). Section 2.5 is subdivided into three subsections: Revised Hierarchical Model (2.5.1), Bilingual Interactive Activation (2.5.2) and Multilink (2.5.3). In chapter 3, the methodology of the study is discussed. Furthermore, the objectives of our investigation, research questions and hypotheses are presented, the participants who took part in the study are described, information on the study design and the data collection procedures and analysis are detailed. The results are presented in chapter 4, followed by the discussion, presented in chapter 5 and the conclusions are presented in chapter 6. Next, I will present the literature review that supports the present study.

2 LITERATURE REVIEW

The main theoretical references that support our research will be presented in this chapter. Translation Studies, the Psycholinguistics of bilingualism, the interaction of languages in bilingual minds, bilingual lexical access, cognate and false cognate effects and repetition priming in bilingual translation will be addressed.

2.1 Translation and Translation Studies

To Alves (1996), human dedication to communication between different languages and cultures has been object of research by several authors over decades. The author also states that the translation process is a complex cognitive activity that is characterized by a specific cognitive rhythm and it also requires multiple skills. Alves (1996) adds that, in translation studies, there is a varied production of studies and works that address translation activity as an area which aims to investigate the transmutation of the source text into the target text, as well as the translation process.

Conceptualizing translation is not a simple task, due to the complexity of the activity, the multiplicity of modalities, the means in which it can occur and the various purposes that you can achieve. Zipser and Polchlopek (2011) state that the term translation can be attributed to different meanings, depending on the theoretical line that approaches it as an object of study and reflection. Paz (2009) states from the Linguistics perspective, that translation and the act of translating is a characteristic of the human being, as well as language production. Furthermore, Paz (2009) considers that learning to speak is directly linked to learning the act of translating. As the author states, when a child asks his mother the meaning of a word, what he or she really expects is the translation of the unknown term into his or her language. Translation within a language is, in this sense, not essentially distinct from translation between two languages, and the history of all peoples repeats childhood experience (Paz, 2009).

It is through translation that communication between different linguistic communities is possible and, consequently, the diffusion of new scientific, technical and literary information takes place. The word translating derives from the verb *traducere* in Latin, which originally comes from *transladare*. *Traducere* means to lead or pass from one side to another, according to Zipser and Polchlopek (2011). Traditionally, translating is defined as the act of transporting, transferring and it presumes an inherent meaning to the source text, which will be transported to the target text (Diniz, 1999).

For Jakobson (2000), translation is an omnipresent human activity. For the author, comprehending the meaning of a word depends on linguistic knowledge and a verbal code, and he also considers that the meaning of a linguistic sign is nothing more than its translation by another which can replace it.

Zipser and Polchlopek (2011) also understand translation as a creation process, in which content is either transferred or replaced between two natural languages: the source language (SL) and the target language (TL). Still according to the authors, translation can also be seen as an attempt of recreating, and this occurs, because translation cannot be intended to replace the original text. In other words, rewriting attempts can always be made. Additionally, the authors characterized Translation studies, in this perspective, as a set of interrelated problems and questions, centered on the act of translating and the products of translation. To add to this issue, Frota (1999) understands translation as an act of rewriting, that is, a text that transforms into a foreign text, which can generate different functions for the target text in a new cultural environment, due to linguistic and cultural differences.

Travaglia (2013) conceives translation as retextualization, resulting from a dynamic process, generator of meanings, a two-way phenomenon, and interaction. For the author, learners are encouraged to retextualize, that is, to compose new texts according to the communicative intention in the new language/culture. The author proposes a reflection on translation as the transposition of a text from one language to another, considering the differences of each linguistic context. Regarding this issue, translation, as textual production, considers that all linguistic and extralinguistic factors of textuality are articulated, in both the source and target language contexts. Thus, Travaglia (2013) considers the translation act in a textual perspective.

Translation as an autonomous academic discipline emerged in the 1970s as an area of study, based on practical experiences. It is a relatively recent discipline. Batalha and Pontes Júnior (2007) explain that the 1980s and the 1990s were fundamental for the growth and strengthening of translation as an autonomous academic discipline.

As a consolidated academic field, Translation studies began approximately four decades ago with James Holmes, who provided the delimitation and the nomenclature for the academic discipline. Regarding what is explained by Holmes (1972), translation, as an object of study, is conceived as a complex unit, capable of different ramifications and approaches. The author adds that one of the important issues in the discipline of translation studies occurs in the field of translation processes and the translated text. Holmes (1972) proposes a descriptive translation theory in which, among the main aspects involved in the process of translating, we

can cite *translator training*, in which teaching methods, testing techniques and curriculum planning are important issues; *translation aids*, which according to the author are many and various, such as (1) lexicographical and terminological aids and (2) grammars; *translating policy*, in which a scholar should render to others in defending the role of translators, translating and translation in the society; and finally *translation criticism*, where translation interpretation and evaluation could reduce the intuitive element of the translation act to a more acceptable level.

The relevance of translation in academic studies can be focused on two aspects: the development of Translation Studies as a discipline; and the study of language processing, highlighting the role of cognition (Rothe-Neves, 2002).

Toassi (2023) discusses how frequent and recurrent the need for reading is today, as well as its need for acquiring information and as a means of opening doors for knowledge. Considering this, according to Toassi (2023), during the translation process, the reading of the source text is essential. It is from this perspective that the author explains, through the analysis of a set of studies, issues related to the cognitive process of reading for translation. In her analysis, the author, through the review of empirical studies, aimed to answer whether there is a difference between reading for comprehension and reading for translation. Throughout the study review process, it was explained that, based on the evidence reported, reading for translation involves additional efforts compared to reading for comprehension, due to the coactivation of languages between reading the source text and the production of the target text. The present research focused on the second aspect mentioned in the beginning of this paragraph (the study of language processing, highlighting the role of cognition) as we deal with translation as a cognitive activity.

Britto (2012) states that translation was studied within the scope of Linguistics, mainly regarding technical translation. Literature translation was a separate branch of the comparative literature discipline. It was an American scholar based in the Netherlands, James Holmes, the pioneer to establish translation studies as an autonomous area. Holmes proposed to stop discussing equivalence between the original text and the translated text, to start discussing correspondence, a more modest and realistic term. He also drew attention to the fact that translation is not an operation performed on sentences, linguistic structures, but indeed performed on texts, which involve much more than simple grammatical aspects.

Chanut (2012), explains that, in the context of translation, correspondence is a concept used in contrastive analysis to describe sentences and structures that correspond in the source language and the target language, while the concept of equivalence refers to the degree of

equivalence to which a word, a phrase, or even a text from the source culture can be considered in the receiving language and culture.

Pym (2017) emphasizes that equivalence is a necessary creation to establish intercultural communication, thus, his work primarily involves the cultural dimension as a central axis in his approach. He also explains that equivalence does not establish that languages are all the same, he points out that the values may be the same. The author also explains that what we can say in a given language can have the same function when translated into another language, therefore, the relation between the source text and its translation will be equivalent, in other words, of equal value.

In Campos (1986), concepts about textual equivalence and formal correspondence are presented. According to the author, textual equivalence occurs when the translated text transmits to the reader similar information to that which the original text transmitted to its first reader in his or her mother language, while in formal correspondence, the form of the original text must be followed by the translator as faithfully as possible. Additionally, a good translation must meet both content and the original form, thus understanding that textual equivalence is a matter of content, and formal correspondence, as the name suggests, is a matter of form.

The following subsection provides a discussion on various translation types, as we understand this topic to be theoretically supportive for the present study.

2.2 Translation types

Lavault (1985) presents two types of translation: professional translation and pedagogical translation. The difference between professional translation and pedagogical translation lies in the purpose and target audience. In fact, in making this distinction, the term “pedagogical translation” was used for the first time by this author. In other words, professional translation has commercial purposes and is intended for a client, while “pedagogical translation” designates the translation used by the learner to practice the language, limited to classroom use.

Lavault’s (1985) classifications are also used by Alegre (2000), which includes the information that professional translation requires a professional with linguistic knowledge of his/her mother tongue and his/her non-mother tongue. Alegre (2000) presents the differences between professional and pedagogical translation as follows:

a) Professional translation emphasizes translation as a product; work is normally solo; the selection of texts is made based on professional criteria; the text is translated in full; the translator rarely receives the author's reactions; translation takes place from the L2 to L1; translation is interpretative; and translation activity is systematic.

b) Pedagogical translation emphasizes translation as a process; work is normally carried out in groups; the selection of texts is made based on didactic criteria, such as linguistic or cultural criteria; the text can be translated in parts; translations are discussed in groups; translation can occur in different directions: from L2 to the L1, from L1 to L1, and from L2 to L1 and then back to L2.

We highlight the dichotomy of the two types of translation: professional translation focuses on the final product, while pedagogical translation emphasizes the translation process. In other words, pedagogical translation makes room for the exploration and expansion of learner's linguistic and cultural knowledge, instead of focusing on the finished text.

Klaudy (2003) understands professional translation as real translation. Real translation aims to transmit information from a given text to a target audience, while pedagogical translation aims to improve a learner's knowledge of a non-native language. This understanding reinforces the ideas presented by Lavault (1985).

In line with what has been discussed by Klaudy (2003), Lavault (1985) and Alegre (2000), is Alves (1996), who states that translation can be understood as an object of study from two perspectives: as a product and as a process. Under the first aspect, the translation is analyzed as translated text. From the second perspective, we seek to understand translation as a process, that is, as a translation act constructed by work steps from which this text results.

As a product, translation addresses the side of the translated text and an eventual comparison with other translated texts. As a process, translation is organized between two different languages and involves switching to a language other than the original from a source text to a translated text. In other words, as detailed by Alves (1996), while the study of translation as a product has as its object of study the target text or a final product, the study of translation as a process focuses on the analysis of the mental processing stages. In this way, Alves (1996) differentiates translation, that is associated with the product, from translating, that is associated to the process.

In regards to translation in foreign language teaching and learning, within the classroom context, it is conceived as any type of interaction between teachers and learners in which the mother tongue is used, so there is the use of different languages in this context. This interaction, currently justifiable at initial levels of learning, presents itself commonly to

facilitate the progress of the class, avoiding long explanations. Therefore, we understand that translation is an important pedagogical tool that should be used in the classroom.

For Lucindo (2006), translation can be used in foreign language teaching (FLT) in a positive way, so that the function of this activity can be reconsidered and seen as a helping tool for the FLT teachers. There are two types of translation that always occur in a classroom context: (1) internalized translation; (2) explanatory translation. Internalized translation is made by every foreign language learner to understand statements, especially at initial levels. This type of translation is justified by the reference that learners have in their mother, and it from the knowledge of their mother tongue that they build or destroy, in the translation movement, in the foreign language. Although it is believed that this type of translation may not be effective in terms of learning, it does occur and cannot suffer the influence of teachers (Lucindo, 2006).

The explanatory translation, according to Lucindo (2006), is made by the teacher, in the context of foreign language teaching and learning, with the objective of assisting students. This type of translation should be used carefully, only in difficult cases when the student cannot understand, in the foreign language, the instruction of some exercise or vocabulary. However, regarding false cognates, cases of teaching words of a designative nature, in cases of ambiguity and to raise awareness that there are not always equivalents in languages, this type of translation is justified (Lucindo, 2006).

Adding to the context of translation in teaching and learning, Pegenaute (1996) explains that translation provides a range of teaching possibilities, it also helps improve foreign and mother language, it provides reading improvement (as it requires students to read carefully) and it also helps build knowledge.

In this subsection I discussed relevant types of translation that are part of the scope that provides theoretical support for the present study. Concepts such as that of Lucindo (2006), for example, provide an important theoretical basis, since the types of translation presented by the author also concern the translation of false cognates (words that are being researched in the present study). Lavault (1985) and Alegre (2000) also provide important content for this research, as they bring concepts about pedagogical translation and professional translation, which are fundamental for the basis of the present research. Alves (1996)'s concepts about translation as a product and translation as a process presented in this subsection show important content for the present research, especially regarding translation as a process, which involves the role of cognition and language processing, which is directly linked to the objectives of the present study.

Comprehending different types of translation is fundamental, especially for the current research, which deals with bilingual lexical access, focusing on cognitive processes during the act of translating. The following subsection presents translation in the context of the psycholinguistics of bilingualism.

2.3 Translation and the psycholinguistics of bilingualism

For the last decades, linguistic studies have investigated the interaction between language and cognition. Regarding translation as a process, psycholinguistics is used to investigate the phenomena involved during this process. In general, these studies are experimental and use psycholinguistic tasks that involve translation, such as recognition or translation production. Additionally, other types of tasks that do not involve translation, such as lexical decision and picture naming tasks are also used in this type of research.

Currently, Psycholinguistics is defined as the science of language that studies the psychological processes involved in the acquisition and use of language. It is an area of varied research, in which the researcher can choose among different possibilities, such as the production of statements, the interpretation of statements, memorization, plurilingualism, language pathologies and language acquisition. Additionally, it is relevant to say that language refers to the human capacity to communicate and express thoughts, feelings, and ideas through a system of symbols, signs, and rules. This capacity is fundamental to social interaction, transmission of knowledge, and construction of culture.

Aiming to understand language comprehensively, exploring different aspects of its comprehension and production, linguists, psycholinguists and neuroscientists carry out research in different dimensions. Teixeira (2016) specifies the role of each of these researchers. Linguists investigate the consistency of linguistic knowledge in the human mind, formulating abstract theories about what linguistic knowledge is in the human faculty of language and how they work. Psycholinguists are empirical scientists who use experimental methods and techniques to research how the acquisition of a natural language occurs and how linguistic knowledge is used by children and adults during this process. Language neuroscientists study the mechanisms that originate human language, what the physical and physiological foundations of linguistic knowledge are, and what happens in the human brain during language production.

The Psycholinguistics of bilingualism focuses mainly on mapping the linguistic representations present on the bilingual mind. Furthermore, it highlights the cognitive and linguistic consequences of the presence of more than one language in the human mind

(Guimarães, 2020). In this regard, studies in the field of Psycholinguistics have investigated how language processing occurs in bilingual and multilingual individuals. Multilingual lexical access studies have collected evidence that recognition of a word in a language can be affected by knowledge of words from other languages. With that said, the present study had bilingual participants with Portuguese as L1 and English as L2.

Dijkstra and Van Heuven (2002) developed a model to represent this process, BIA+ (Bilingual Interactive Activation Plus) which assumes two basic premises: the model considers that L1 and L2 words are represented in an integrated lexicon and that word recognition occurs in a non-selective perspective of language, in which both languages are currently active, making it costly for the bilingual to select a target word, once words are competing.

The linguistic processing and language acquisition as its main thematic issues (Guimarães, 2020) is part of the Psycholinguistics of bilingualism and it can investigate the cognitive processes underlying language production and comprehension activities, both regarding the study of adult processing, regarding language acquisition and cases of linguistic loss and disability (Rodrigues, 2009). Psycholinguistics is marked by the use of experimental methods, with the elaboration of hypotheses that aim to establish causal relationships between research variables. When carrying out these experiments, testing materials must be handled judiciously to control the testing material and conduct experimental tasks, through the possibility of isolating only the factors that are intended to be investigated.

Gass, Behney and Plonsky (2013) explain that the studies on L2 acquisition, more specifically, have gained independence as a field of knowledge only from the second half of the twentieth century. Due to varied possibilities, studies on L2 acquisition can be related to several fields, including linguistics, psychology, sociology, sociolinguistics and psycholinguistics. In the present study, the relation with psycholinguistics is justified because we aim to examine the effect of Brazilian Portuguese-English false cognates in bilinguals, through two different types of task: (1) language decision task; (2) translation task, who have Brazilian Portuguese as their L1 and English as their L2.

To understand how language translation processing occurs, it is necessary to observe the cognitive aspects of this activity. House (2016) associates the growing interest in what goes on in the translator's mind during the translation act, in the last thirty years, with modern technology. Among the various neuropsychological techniques, House (2016) cites continuous improvement methods for empirical investigation of particular aspects of the translator's performance, such as: eye tracking, mouse or keyboard movements and screen recording. The mentioned author explains that this new cognitive-linguistic orientation emerges

from a critical assessment of the validity and reliability of introspective thought-aloud studies, as well as behavioral studies.

Alves (1996) states that translation has been an object of study for several years. The author argues that translation is a complex activity and that it can be seen from different points of view. What is affirmed by Alves (1996), can also be evidenced by different studies. These varied points of view aim to understand the transformation of the source text into the target text.

For Lörcher (2005), individuals who use more than one language tend to frequently translate, even in an unconscious way. Maier (2008) highlights the fact that translation has specific characteristics for understanding and for producing language. As a process in which a message must be transmuted from one language to another, translation becomes impossible to be carried out by a monolingual. As bilingualism is an essential part of translation activity, there is a relation between translation studies and the theories of bilingualism. As a multidisciplinary area, bilingualism has gained prominence in recent decades within the field of translation studies.

It is in this sub-area of Psycholinguistics that the translation processes can be investigated as a process, since language, cognition, and translation are involved. Furthermore, during the translation process there can be comparisons and competition about the lexicon and the syntax of the two related languages. In other words, the bilingual activates orthographic, phonological, grammatical, and semantic information to access and use the languages in their mind. The Psycholinguistics of Bilingualism investigates how people learn and use the languages they master, as well as the linguistic and cognitive processes involved in this phenomenon, according to Godfroid and Hopp (2023). Psycholinguists study the mechanisms and the cognitive processes involved in comprehension, production, acquisition and in the use of language and they share the belief that unraveling the architecture and mental processes of speakers is fundamental to understanding how L2 processing occurs. One of the most important issues researched in the area of Psycholinguistics is the possible interaction between languages in the mind of a bilingual individual. In the next section I will present two different linguistic perspectives on language interaction in the bilingual mind: The language non-selective view, favoring the interaction of languages in the bilingual mind and the language selective view that supports different processes for each language in the bilingual/multilingual mind.

2.4 Language interaction in bilingual minds

In Psycholinguistics, there are some relevant questions about bilingualism. One of the main debates about the interaction of languages in the bilingual mind occurs about the selective or non-selective activation of the two languages.

Regarding lexical access, it is understood as the activation of systems and subsystems that refer to language processing. In line with the non-selective language activation view, the relation across languages in the brain involves complex processing, which can result in competition for cognitive resources (Lameira; Torresi and Carthery-Goulart, 2020). As mentioned previously, based on the idea that language processing occurs in parallel with the activation of both languages of the bilingual, an increased cognitive effort will be necessary to access a target word.

Concerning the language selective view, it suggests that linguistic input in one language only activates the target language, as a result, this view would imply separate lexicons for two languages (Dijkstra; Van Heuven, 2002). (Fernández; Cairns, 2011) corroborate with this view, predicting that a lexical entry exclusively affects the corresponding lexical entry in the intended language. Therefore, from this view, bilingual lexical access would occur through processes similar to monolingual lexical access during selection lexical.

The language non-selective view argues that linguistic input in one language can induce co-activation of both languages, consequently, a language non-selective view suggests that the bilingual lexicon is integrated (Dijkstra; Van Heuven, 2002). Regarding a translation task, for example, when we obtain differences in reaction time and in percentage of accuracy between interlingual homographs and control words, we have the indication that the non-target language is involved in the process, providing support in favor of the non-selective lexical access view. However, when responses between homographs and control words show no difference concerning reaction time and accuracy, possibly, the non-target language may not be activated, supporting the selective view of lexical access.

Regarding visual word recognition, there is ample evidence that shows bilingual lexical access is language non-selective when the type of word to be recognized is an interlingual homograph (Dijkstra; Grainger; Van Heuven, 1999).

Schwartz and Kroll (2006) additionally discuss the cognitive nature of second language (L2) lexical processing in sentence context, examining word recognition performance for language-ambiguous words such as interlingual homographs in bilinguals, questioning how users of two languages differentiate cross-linguistic homographs, for example. For this

distinction, the authors draw attention to the role of context in lexical access, as well as the degree of language comprehension. The authors examined in their study whether bilinguals reading in their non-native language could show evidence of cross-language lexical activation in sentence context and whether this parallel activation would be modulated by the relative constraint of the sentence context. They also examined the role of second language proficiency and how it would modulate effects of cross-language activation by two Spanish-English bilingual groups. Their overall results showed that the mere presence of a sentence context and language cues could provide, were not sufficient to constrain non-selectivity, as cross-language activation effects persisted in low-constraint sentences. Contrary to that, the non-selectivity effects decreased only when sentences had important semantic information.

Thus, the non-selective language activation view argues that the systems of the two lexicons of bilinguals are activated. In this hypothesis, L2 processing is not completely independent, being affected at different levels by the L1. That is to say, lexical access for bilinguals would be a complex process, because the selection of a given concept could activate two lexical entries, at least, as pointed out by Schwartz and Kroll (2006).

Considering what has been explained previously in this subsection, Schwartz and Kroll (2006) state that the reasoning behind research which examines language interaction in bilinguals, is that if bilinguals activate a single language during lexical processing, words that share properties in two languages would have no effects. Additionally, in case parallel activation of both languages is confirmed, control words would be processed differently compared to words that share lexical characteristics. This differentiated processing would be verified in the performance by accuracy and reaction time data.

Research which investigates the interaction between the bilingual's two languages commonly use words that share lexical characteristics in the two languages as stimuli, such as interlingual homographs, cognates or false cognates. As mentioned in the introduction chapter of the present study, interlingual homographs are understood as words with identical spelling and different meanings or pronunciations (for example, the linguistic Brazilian Portuguese-English pair "grade" which in Portuguese means a series of spaced parallel vertical bars and in English, it means a mark indicating the quality of a student's work), whereas false cognates are words that may have similar but not necessarily identical form and have different meanings (De Groot *et al.*, 2000).

Schwartz and Kroll (2006) consider that most studies point to consistent evidence of non-selective language activation and parallel processing, such as De Groot *et al.*, (2000), whose study examined the inhibitory effect of cross-linguistic homographs in a translation task.

72 Dutch (L1)-English (L2) bilinguals participated in their study. The results showed that reaction time was longer for homographs compared to controls, reinforcing the non-selective lexical access view.

In line with the previous study presented, Dijkstra *et al.* (1999) examined bilinguals of Dutch and English in a language decision task, in which participants had to press a button if the word presented was in the English language. The results demonstrated longer reaction times for recognizing false cognates compared to the reaction time of Dutch control words, suggesting an activation of the non-target language (Dutch) that caused interference in recognizing the English word, thus, providing support for the non-selective lexical access view.

As in the studies described above, the objective of the present study was to examine how language is processed by bilinguals in language decision task and in a translation task, with false cognates and control words as linguistic stimuli.

In the following subsection, we give introductory focus to bilingual lexical access, as well as lexical access models, and afterwards, we focus directly on lexical access models.

2.5 Bilingual lexical access and bilingual lexical access models

Lexical processing can be a significant linguistic aspect to be investigated in translation studies (Freitas, 2023). This may occur because lexical access may involve several aspects, such as the level of proficiency in non-native languages, the speaker's period of time in contact with the language, and even whether L2 learning took place formally, informally or simultaneously. These aspects can interfere with the results of different studies, according to their research issue.

It is important to state that lexical access goes beyond the mere spelling recognition of lexical items in one or more languages. In addition to involving semantic and phonological aspects, Duarte and Blank (2019) point out that great cognitive control is necessary to access a target word, considering that language processing takes place in parallel. For example, Francis (2005) states that a lexical item is used in a general way. When presented in a generalized way, various types of knowledge about a word can be accessed, such as phonological, morphological, syntactic and semantic variations. Relative to that, in tasks of lexical or language decision, stimuli that share form and semantic content can have a facilitating effect, such as cognate words. However, in tasks whose stimuli share orthographic similarity content but differ in meaning, there may be interference effects, such as interlingual homographs or false cognates.

Regarding the possible influence and the organization that the bilingual lexicon may suffer during language processing, Toassi and Mota (2014) state that orthographic, phonological, or semantic similarities between the two languages are important factors that must be considered in terms of bilingual lexical access. The authors also explain that the overlap of these linguistic features from cognates or interlingual homographs can be a source of influence on the organization and processing of the lexicon of bilinguals.

Lexical processing constitutes an interesting area of investigation within translation studies. This field presents significant challenges, as different factors can impact lexical retrieval. Among the factors that may influence bilingual language processing, we can cite, for example, the way bilinguals interact with languages throughout their lives. As investigated in the present study, proficiency in the target language, the time of interaction and experience with a non-native language, the learning environment of another language, the age at which an individual began studying a foreign language, exposure to linguistic environments and experience in specific communicative contexts such as translation are issues which may impact lexical processing.

In order to better understand lexical access, some lexical access models have emerged over the years. These models present a representation of how bilinguals usually use their linguistic knowledge relative to accessing and organizing their L2. In the following subsection, I present, in chronological order, lexical access models that have an important role in studying and investigating lexical access in language research.

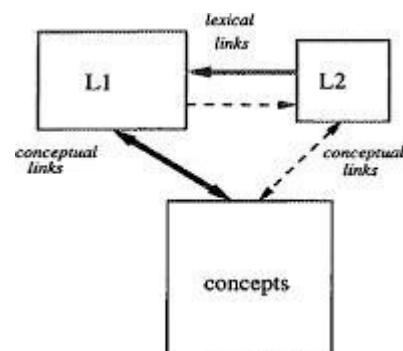
2.5.1 Revised Hierarchical Model

Kroll and Stewart (1994) developed the most influential and discussed model in the psycholinguistics of bilingualism to represent the organization of the bilingual lexicon, The Revised Hierarchical Model (RHM). In this model, the conceptual representation occurs through the L1 lexicon in the initial stages of acquisition of L2, making the L2 lexicon dependent on the L1 lexicon.

Basnight-Brown (2014) adds that The RHM was initially developed as a model of word production in bilinguals, with less emphasis on word recognition. A significant strength of this model is its incorporation of the learning processes that underlie second language acquisition. This aspect of the RHM has been extensively discussed by Kroll *et al.* (2010).

Hierarchical models propose a hierarchy between languages, with L1 being more expressive than L2. These models propose two levels of representation of words: a lexical and a conceptual one. Words from two languages are stored in different lexicons but have a single concept storage for both languages (Marini; Fabbro, 2007). Thus, the Revised Hierarchical Model proposes that bilingual individuals have distinct lexicons for each language they master but share a single conceptual system. Equivalent translations in L1 and L2 are stored separately in the respective lexicons, however, they refer to the same underlying concept. Lexical acquisition in L2 initially occurs through connections with L1. However, as L2 proficiency increases, direct connections between concepts and L2 strengthen, as shown in figure 1. Translation asymmetry is a characteristic that influenced this model, as observed that translation by bilinguals were faster and more accurately from L2 to L1 rather than in the L1 to L2 direction. As Marini and Fabbro (2007, p.12) explain, “In order to account for the translation asymmetry effect, the connections between the two languages (L1 and L2) and the concept-system are supposed to be asymmetrical and to reflect the modalities of L2 acquisition.” The authors also explained that L2 to L1 translation primarily relies on direct access to the L1 lexicon. In contrast, L1 to L2 translation involves a more complex process. It is hypothesized that when translating from L1 to L2, the system not only retrieves the appropriate L2 translation but also activates the concept of the L1 word, thus building a semantic route in addition to the lexical retrieval process. Furthermore, translation from L1 to L2 appears to be challenging for less proficient bilinguals, since the link between L2 and the conceptual store is considered weak. Figure 1 below depicts the RHM.

Figure 1- Revised Hierarchical Model



Source: Kroll and Stewart (1994)

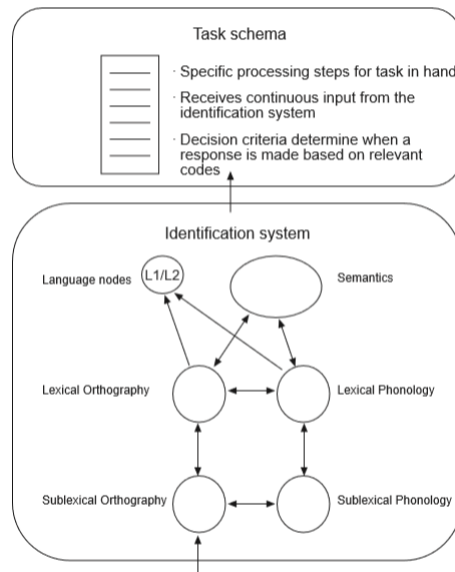
According to the RHM, the mental lexicon for L1 is larger than that of the L2. The reason for this difference is that bilingual individuals generally acquire a larger vocabulary in their native language because of greater exposure to the language. This concept is visually represented in Figure 1. This model presented in figure 1 proposes that bilinguals have two separate mental lexicons, one for their first language and another for their second language. Despite this division, these lexicons are linked through a shared conceptual system. Consequently, L1 and L2 words are connected not only directly to each other but also indirectly through the shared concepts they represent. Continuing the discussion on bilingual lexical access models, in the next section I discuss the Bilingual Interactive Activation Model.

2.5.2 Bilingual Interactive Activation (BIA+)

According to Basnight-Brown (2014), initial investigations into bilingual language processing suggest that when bilinguals use one of their two languages, the other one is not activated. However, recent research, as discussed in the previous paragraphs of this subsection, has shown that both languages of bilinguals are activated during lexical processing. Brenders *et al.*, (2010), additionally state that this phenomenon happens not only with proficient bilingual adults, but also to children who are still in the early stages of acquiring their L2.

In the Bilingual Interactive Activation model and its enhancements, when a word is mentally activated in one language, its corresponding translation in the other language is also activated. In figure 2, we present the BIA+ model proposed by Dijkstra and Heuven (2002).

Figure 2 - Bilingual Interactive Activation (BIA+)



Source: The Bilingual Interaction Activation (BIA+) Model (Dijkstra; van Heuven, 2002)

One of the main assumptions of the BIA+ model is the sense of bilingual word recognition being a non-selective process (i.e., both languages are active during processing). (Dijkstra; Heuven, 1998, 2002). This model was primarily designed to account for bilingual word recognition, focusing on the orthographic representation of words. The model considers that languages are represented in the bilingual brain, in an integrated lexicon and languages are activated during the moment of use of a target language by the speaker. Additionally, word recognition in bilingual individuals occurs within a non-selective linguistic context, implying that both languages are active even when a specific target language is being processed. As stated by Basnight-Brown (2014), the BIA+ model consists of four distinct layers of nodes: letter features, letters, words, and language (L1 or L2), as shown in Figure 2. Consequently, the presentation of a word starts the activation of corresponding letter features, followed by the activation of letters that match these features. Afterwards, the activated letters activate words that share orthographic features within both the L1 and L2 lexicons.

The non-selectivity assumption of the Bilingual Interactive Activation (BIA+) model is supported by empirical evidence Basnight-Brown, (2014). However, it is important to acknowledge that the BIA+ model was initially developed regarding lexical access during word recognition, different from RHM, which focuses on translation. Next, I present the Multilink Model, by Dijkstra *et al.* (2018).

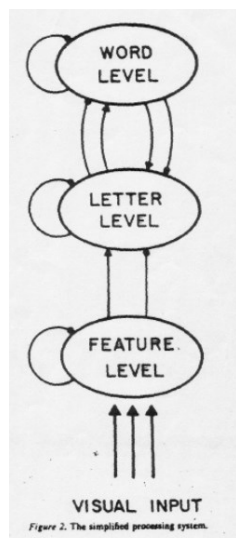
2.5.3 Multilink

First, in this subsection, I present the Interactive Activation Model (IA), by McClelland and Rumelhart (1981). It is a bilingual variant of a model which came from research on visual word recognition on the monolingual domain, which according to Rekké (2010), has influenced the Multilink model and the BIA.

As a model of visual word recognition, IA is one of the most influential models (Rekké, 2010). The author complements, stating that the IA is a localist-connectionist model, and that it conceives symbolic units to represent 'objects in the world.' These representations are local (one unit per object), meaning that each 'object' is represented by a single unit within the model. Moreover, these units are linked, building a network where connections between units can be either excitatory (strengthening activation) or inhibitory (weakening activation). Basically, the IA model consists of multiple levels of symbolic representations which are connected in a network of nodes. As Rekké (2010, p. 8) explains, “the nodes in the bottom level in this network correspond to the visual features of letters, e.g., a vertical line. The nodes in the level above correspond to the letters themselves, e.g., ‘B’ . The nodes in the top layer correspond to the full orthographic (written form) representations of words, e.g., ‘BIKE’”. As described in this subsection, in the field of word recognition, the Interactive Activation Model can account for many effects, however the model is not capable of working with multiple languages and does not incorporate semantic or phonological representation of words.

A visual representation of the IA structure can be seen in figure 3:

Figure 3 - Interactive Activation Model (IA)



Source: (Rekké, 2010).

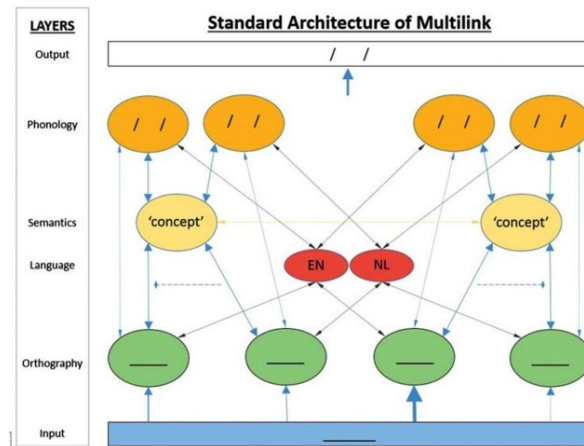
By observing figure 3, at its initial phase, when visual input is presented, feature letter nodes representing visual features of the input are activated. Then, these features spread activation to letters (when they occur) or inhibit letters (when they do not occur). Continuing the processes, as described by Rekké (2010), these letters spread activation or inhibition to words, following the same procedure at the letter level. From the words there is top-down feedback of activation in direction to the letter level, so the words activate the letters that appear in that word and inhibit those who do not appear. Finally, after completing this process, a word can be recognized.

Multilink, developed by Dijkstra *et al.* (2018) is pointed out as a non-selective lexical access model, which aims to cover the processes of recognition, retrieval and production of lexical items. This model incorporates elements of the Revised Hierarchical Model and the BIA. The Multilink model allows the investigation of word processing in bilingual minds as it occurs, with high and low levels of proficiency of L2. Recognizing that translation requires various cognitive skills, which encompasses recognition, retrieval, and production processes, the Multilink model is designed to account for these cognitive operations.

According to Basnight-Brown (2014), the Multilink model proposes that lexical access is non-selective, that is, both languages are activated during processing. At the same time, it distinguishes between phonological, orthographic and semantic representations, similarly to the BIA model. However, it also incorporates elements of RHM, such as the different lexicons sizes for each language and variations in the connections between form and meaning in L1 and L2.

As explained in this subsection, the Multilink model is an important way of demonstrating bilingual word processing, based on connectionist principles and the role of inhibitory processes during lexical access. However, it is important to note that the model has limitations, as it is conceived by computer programmers. The computational model by Dijkstra *et al.* (2018) can be seen in figure 4.

Figure 4 - Multilink



Source: Dijkstra, Wahl, Buytenhuijs, Van Halem, Al-jibouri, Korte and Rekké (2018)

In the Multilink model, presented in figure 3 the two languages shown are in the center of the model, English (EN) and Dutch (NL). The information input is at the base of the model, which is the beginning of the language processing. The orthography is right above the information input, and it is followed by the languages of the bilingual. After this initial phase, semantics is activated. Together with half of the information input, semantics activation is followed by phonological activation. Afterwards, there is the information output. The requested task will indicate how information will be produced phonologically, which may be in the same input language or in a different language, as in the case of translation tasks. It should be noted that, although there is a path to be followed between the input and output of information, all stages of language processing are linked (as can be seen through the arrows). These interconnections can be stronger or weaker and most are bidirectional, indicating that the process can be restarted or resumed during processing time.

According to what has been discussed in this subsection, it is possible to observe that lexical access models have received improvements overtime, as the models emerged, and experts noticed gaps. Thus, to improve the Revised Hierarchical Model, which focuses on translation but does not include completely similar words and cross-linguistic homographs, Bilingual Interactive Activation (BIA) and its improvements emerged. These models explain that when a word is mentally activated in one language, its corresponding translation in the other language is also activated. The Multilink model, which is a non-selective lexical access model and seeks to cover processes of recognition, retrieval and production of lexical items, but incorporates elements of the Revised Hierarchical Model and the BIA. It can also allow the investigation of word processing in bilingual minds as it occurs. Given that this model is still

at an early stage, Basnight-Brown (2014) states that it is important that the model continues to be empirically tested in future simulations and under different conditions, highlighting how this can resolve processing challenges concerning lexical ambiguity and multiple translations across languages.

Thus, going on with the discussion on language processing, in the next subsection, cognates and lexical access are addressed. Since the present study deals specifically with interlingual homographs, in this case specifically false cognates, I consider the cognate effect discussion important for the present research, as it lies within language processing in a cognitive perspective.

2.6 The cognate effect

Throughout history, languages have evolved, and some languages have undergone modifications. These changes made languages more or less distant. When two languages share similarities, learning one of them as a non-native language may become easier, as Bijsterveld (2010) explains. Among these similarities, cognates can stand out. In psycholinguistic studies, the cognate effect has been extensively investigated. Considering this, we understand that the processing of cognates and false cognates is an important object of study for psycholinguistics. Poort and Rodd (2017) consider that cognates are words that exist in an identical or near identical form in more than one language and carry the same meaning. For example, like “chocolate” in Portuguese and English.

According to Nagy (1993), cognates are words that share some similarity between two or more compared languages. These similarities may vary in several aspects: sound system (phonetics), grammar (morphology and syntax), vocabulary (lexicon), meaning system (semantics), writing system (orthography) and the norms of use of language found in learners (pragmatics).

For example, considering the pair of languages in our study, Brazilian Portuguese and English, there are a considerable number of cognates. Regarding the types of cognates, Dijkstra, Miwa, Brummelhuis and Sappelli (2010) mention three different categories: identical, very similar and non-identical cognates. For example: “chocolate” (in L1) and “chocolate” (in L2) are identical cognates in spelling and differ only in pronunciation; “accidental” (in L1) and “acidental” (in L2), are very similar between each other, being orthographic neighbors, differing in just one letter and, consequently, also in pronunciation; “consideração” (in L1) and “consideration” (in L2), are not identical, differing in the suffix and pronunciation.

Due to the similarity and consequent possible facilitation effect, cognates are commonly applied in language processing studies. This possible cognate facilitation effect presupposes interlingual coactivation and supports the hypothesis of language non-selective in bilingual minds, which would cause lower linguistic cost.

Three examples of studies which examined the cognate effect are Schwartz and Kroll (2006), Brenders, van Hell and Dijkstra (2011), and Antón and Duñabeitia (2020). Additionally, Using the BIA+ model, Dijkstra and Heuven (2002) explain that when a bilingual has contact with a cognate, similar orthographic representations are activated in both languages, achieving a common semantic representation, which makes recognition of the cognate word faster, in comparison with non-cognate words.

Spanish as L1 and English as L2 were the languages involved in the study by Schwartz and Kroll (2006), which used Picture naming tasks to investigate the cognate effect. Their study examined the cognitive nature of second language (L2) lexical processing in sentence context. Initially, 23 participants took part in experiment 1, but only 21 had results analyzed because of errors and performance lower than what was necessary for the research, so these 2 participants were excluded. Bilinguals' L2 word recognition performance for language-ambiguous words, such as cognates (e.g., piano) and homographs (e.g., pan) were examined in the study, in two sentence context experiments. Highly proficient Spanish–English bilinguals living in a bilingual community took part in Experiment 1 and intermediate proficiency Spanish–English bilinguals living in a monolingual community participated in Experiment 2. The results indicated a significant cognate effect in low-constraint sentences, pointing to an integrated activation of the two languages. The cognate facilitation effect was not identified when rare sentences (high-constraint sentences) were used.

Brenders, van Hell and Dijkstra (2011), investigated how Dutch children, from primary and secondary schools learned English as a second language (L2) in the classroom environment. In their study, learners from different levels of L2 proficiency recognized words under different task conditions. Lexical decisions tasks on cognate and false cognate words, considering the linguistic pair English and Dutch were applied. In experiment 1, participants were seated in front of a computer screen and they were instructed in their L1 to read the letter string on the screen and then they were trained through 25 trials to make lexical decisions on cognate and controls. Speed and accuracy were emphasized. Experiment 2's procedure was the same as in Experiment 1, except that cognates and control words were translated into Dutch. Dutch-like pseudowords were constructed by changing one letter of a new set of Dutch words following rules of Dutch word formation. Participants had to perform a Dutch lexical decision

task. For experiment 3, the same procedure as in Experiment 1 was applied, but in this task, participants had eight blocks of 24 trials containing cognates, false cognates, and control words. Results showed that cognates in experiment 1 were processed faster than corresponding control words by all participant groups in an English lexical decision task, but not in a Dutch lexical decision task (Experiment 2). In experiment 3, an English lexical decision task mixing cognates and false friends, the results led to consistently longer reaction times for both item types relative to control words, thus indicating that the participants had candidates for both languages active during processing, thus highlighting the language non-selective access view.

Cognate effects were researched by Antón e Duñabeitia (2020). In this study, they decided to use a fictitious language as L2. Two tasks were performed: a word and image matching task and a translation recognition task. In their study, participants had to learn the names of concrete concepts in a fictional language followed by a picture-word association paradigm. Half of the concepts (list A) had two possible translations in the fictional language (i.e., both words were synonyms): one was a cognate in participants' L1 while the other one was not. The other half of the concepts (list B) had only one possible translation in the new language, a non-cognate word. The results showed that cognate words translation was a lot more remembered than non-cognate words and non-cognate synonym words.

Among the studies carried out in Brazil, we highlight those carried out by our research group, PLIBIMULT. In the next subsections, I will present the studies of Toassi and Pereira (2019), Toassi, Mota and Teixeira (2020), Batista (2022) and Borém (2023).

Using a translation task, Toassi and Pereira (2019) carried out an experiment with ten (10) monolingual individuals who had Portuguese as their L1 and an average age of forty-four (44). In the study, forty (40) non-identical English cognates were used. The task consisted of the translation of 40 non-identical cognate words from English to Portuguese, and participants were instructed to write the word in Portuguese that better expressed the English word that was presented. These monolinguals had never had contact with English as an L2, but even so, more than half of the words were correctly translated. Participants were able to recognize more than half of the words presented. Thus, it is assumed that cognate words were easily understood in this translation task with native speakers of Brazilian Portuguese, who had not have previous contact with the English language.

In Toassi, Mota and Teixeira (2020), the study was developed with the use of three (03) languages: Portuguese as L1, German as L2 and English as L3. They used the eye tracking technique and the participants performed a reading task with sixty (60) sentences, which contained triple cognates (in L1, L2 and L3), double cognates (In L1 and L3; and in L2 and

L3). Participants sat at a viewing distance of 50 to 60 cm of the computer screen and their eye movements were recorded. The viewing was binocular, but only the eye movements from the right eye were recorded. The presentation of the experimental stimuli was divided into two blocks. The results demonstrated that there was an effect of the triple cognates for the L3G (trilingual group). However, the study failed to find evidence supporting the cognate facilitation effect with the double cognates between Brazilian Portuguese and English and between German and English. Furthermore, the results showed that triple cognates were processed faster, denoting a stronger facilitative effect in the English sentences comprehension.

The study by Borém (2023) applied two tasks: a language decision task and a translation task with bilinguals with Portuguese as their L1 and English as their L2. His study had the objective to investigate the cognitive processes in word recognition and lexical access in a language decision task and it also aimed to examine repetition priming effect in a translation task with cognate words. According to the author, regarding all experiments, the cognitive processes involved in the task of language decision and translation of cognate words revealed a high degree of activity in English (L2) compared to Brazilian Portuguese (L1). In his study information regarding reaction time and accuracy was collected using the PsyToolkit software (Stoet, 2010, 2017). The stimuli of this study consisted of 208 words in total: 26 cognate words written in Brazilian Portuguese 26 cognate words written in English 26 control words in Brazilian Portuguese and another 26 control words in English There were also 52 distracting words and another 52 confounding words. The research aimed to examine if the processing cost of cognate words was higher when compared to the cost of processing non-cognate words and if there were repetition priming effects of cognate words in the translation process. The results of the language decision task showed that English control words were processed faster and more accurately than the words in the other conditions. According to the author, control words in English had higher accuracy and shorter response times than the words in the other conditions because the participants' English was highly activated. Through the analysis of the translation task, results demonstrated repetition priming effects for cognate words. Additionally, the study suggested that low proficiency in English can affect reaction time and accuracy, and that the repetition priming effect may be lower as proficiency increases.

In the next subsection, I will discuss false cognates, also commonly called false friends, which are the focus on the present study.

2.7 False cognates

False cognates are described by Brenders, Van Hell and Dijkstra (2011) as words with high orthographic similarity, but with different meanings. These words can also be called false friends. As an example, we may cite: “parentes” (in Portuguese L1) and “parents” (in English L2), which are orthographically similar, but in L2 the lexical item (parents) means “father and mother”.

A definition for interlingual homographs can be found in Dijkstra, Grainger and Van Heuven, as they explain:

Word forms may also be shared by words of different languages. For instance, in the case of *interlingual homographs*, words in different languages share the same orthographic form. The English word ANGEL, for example, is spelled just like a Dutch word meaning “sting”. Such words are also called *false friends*, for they look similar but have very different meanings. In addition to their form, words of different languages may share (some of) their meaning(s), i.e., they may be translation equivalents. Those interlingual homographs that not only share their orthographic form but their semantics as well are termed *cognates*. (Dijkstra; Grainger; Van Heuven, 1999, p.497)

Cognates (words with similar orthography and the same meaning) have been widely studied in the field of psycholinguistics, in addition, interlingual homographs (words with the same orthography but with different meanings – also known as false cognates) have also been investigated, to check whether they are processed differently, compared to control words, generally regarding accuracy and reaction time.

In terms of bilingual lexical access, cognate words, as well as interlingual homographs, or false cognates constitute a rich source for investigation. Due to their orthographic and semantic similarity, they have an integrated representation in both languages in the bilingual lexicon (Dijkstra; Van Heuven, 2002). Additionally, it is stated that there is evidence favoring the non-selective lexical access view in a stronger way, when orthographic neighbors, such as the ones mentioned above, are involved in these types of research (Dijkstra, 2005). However, as Dijkstra *et al.* (1999) explain in their study (experiment 2), Dutch-English adult bilinguals processed false cognates as fast as their matched control words when cognate words were included in the stimuli list. Their study, in sum, showed that the slower reaction time for results to false friends relative to matched controls in these studies supports the view of language-nonselective access in adult bilinguals. Nevertheless, facilitation or inhibition effects for false cognates appear to be affected by whether or not cognates are included in the stimulus list.

We understand that among the studies which investigate lexical access, as the ones mentioned in this subsection, the issue of non-selective lexical access and selective lexical access is subject to controversy, depending, for example, on the list of stimuli used in the study.

As the present study aimed to investigate, in a psycholinguistic perspective, the process of Brazilian Portuguese-English false cognates, through a language decision task and a translation task, the research presented by authors in the following paragraphs also constitute important theoretical bases for the present research.

In Dijkstra, Van Jaarsveld and Ten Brike (1998), 3 experiments were carried out with bilingual students with Dutch as their L1 and English as their L2. These experiments demonstrated that interlingual homographs may be recognized faster, slower, or as fast as monolingual control words, depending on task requirements and language intermixing. Regarding the experiment tasks, Dutch bilingual students had to perform an English lexical decision task including English/Dutch homographs, cognates, and English control words. Reaction time for interlingual homographs were unaffected by the frequency of the Dutch reading and were not different from monolingual controls but cognates were recognized faster than controls. In experiment 2, participants performed an English lexical decision task on homographs again, but, apart from non-words, Dutch words were included. Strong inhibition effects were obtained, depending on the relative frequency difference of the 2 readings of the homograph. In experiment 3, these turned into frequency-dependent facilitation effects, where participants were applied a general lexical decision task. As a conclusion for the study, it is suggested that bilingual word recognition models can only explain these results if they explain how lexical processing is affected by task demands and stimulus list composition.

As discussed in its entirety in subsection 2.6 from the present study, Dijkstra, Van Hell and Brenders (2011) investigated how Dutch children, from primary and secondary schools learned English as a second language (L2) in the classroom environment. In their study, learners from different levels of L2 proficiency recognized words under different task conditions. Lexical decisions tasks on cognate and false cognate words, considering the linguistic pair English and Dutch were applied. In experiment 3, an English lexical decision which mixed cognates and false cognates was applied. Results led to consistently longer reaction times for both item types relative to control words, thus indicating that the participants both languages were active during lexical processing, thus supporting the language non-selective access view.

The language selection or non-selection in bilingual minds was also investigated by Otwinowska and Szewczyk (2019). For this, they used cognates and false cognates in their research. Factors that determine the knowledge of L2 words with orthographic neighbors in L1

(cognates and false cognates) were examined in their study. One hundred and fifty (150) participants in the research had Polish as their L1 and English as their L2 and completed a translation task. In the experiment, participants had to assess the confidence of each translation. Polish participants had to translate 105 English non-cognate words, cognates, and false cognates into Polish, and to assess the confidence of each translation. According to the authors, confidence ratings can be used to apply a novel analytic procedure which disentangles knowing cognates and false cognates from strategic guessing. Additionally, the learnability of L2 cognates and false cognates formally similar to L1 equivalents were tested, compared to the learnability to controls and non-cognate words. In their study, Otwinowska and Szewczyk (2019, p.976) explained that “when learners encounter word A and word B equally frequently in their lifetime, and at the time of testing, 80% of them know word A, but only 20% know word B, we can say that word A is easier to learn (more learnable) than word B”. The results showed that both cognates and false cognates differed from control words in relation to their processing. Comparing cognate and non-cognate lexical items, cognates had a significantly higher chance of being translated correctly, while non-cognate items had a significantly lower chance of being translated correctly. According to the results, it is suggested that cognates may in fact be easier to process, while false cognates are the most difficult to process. Interestingly, the effect of the false cognate disadvantage in this study was of similar strength to the effect of cognate advantage. It was concluded that the knowledge of cognates and false cognates was not affected by the frequency of their formal equivalent in L1, and how cross linguistic similarity affects L2 word learnability.

In the longitudinal research by Otwinowska, Forys-Nogala, Kobosko and Szewczyk (2020), participants also had Polish as their L1 and English as their L2. Two classroom experiments were conducted, with the selection of 30 Polish-English cognates, 30 false cognates and 30 non-cognates with similar frequency. These items were incorporated into typical exercises from English language teaching textbooks, that is, the participants learned the words with their teacher in school classes. A pre-test and a post-test were carried out, furthermore, participants were divided into two groups: the control group and the experimental group. The analysis revealed that, in both the pre-test and the post-test, participants knew the cognates better than the non-cognates. However, knowledge of false cognates did not differ from knowledge of control words. This means that the facilitation effect was evidenced in this research, but the disadvantage of false cognates was not revealed.

Batista (2022) studied the effects of Brazilian Portuguese-English false cognates on bilingual access through a language decision task, where participants saw a word in the center

of a computer screen and had to choose what language that word belonged to: English or Portuguese. In her study, it was registered accuracy percentage and reaction time data formed from an experiment containing 120 words (30 words being false cognates and 60 being control words – two control words for each false cognate), including Brazilian Portuguese-English false cognates and control words, divided in two lists of 90 words, applied to 11 participants. Her study was carried out using Psytoolkit (Stoet, 2010, 2017). The stimuli used in the research consists of four condition groups: false cognates in English; control words in English; false cognates in Portuguese; and control in Portuguese. The analyses showed that Portuguese false cognates were processed with higher accuracy and reaction time compared to English false cognates and control words. Her study contributes to the issue of false cognate effect, especially with the linguistic pair analyzed (Brazilian Portuguese-English) on bilingual lexical access. Batista (2022)'s findings are in line with the present study and were used as a guide and a pilot.

The different findings, from the studies previously mentioned for false cognates studies indicate the necessity of more research in order to verify the hypothesis of selectivity with this type of stimulus. This need lies in the studies' results which show evidence that point to non-selective lexical access and also results that indicate selective lexical access. With that said, we understand that further research is important on this issue.

Thus, the objective of the present study is to examine the translation process of Brazilian Portuguese-English false cognates. The sample of participants is constituted by Brazilian Portuguese bilingual speakers with L1 as their first language and English as L2. A specific level of proficiency is not established for each of the languages, therefore, considering a bilingual, an individual who is able to communicate in two different languages, mastering the use of languages differently when in diverse contexts, according to Grosjean and Li (2013).

2.8 Repetition priming in bilingual translation

A number of studies on bilingual translation and language processing indicate that the priming effect can influence the translator's lexicon, affecting linguistic aspects, such as lexical and semantic of the bilingual in both languages, such as Lalor and Kirsner (2001), Poort, Warren and Rodd (2015), Gadelha (2021) and Borém (2023).

According to Carl and Schaeffer (2019), priming is an effect that does not depend on the individual's will, therefore it is an unconscious issue that depends on our memory of previous events. Priming describes a cognitive process which occurs when a stimulus is repeated (prime), generating facilitation or interference on how we process and respond to a

subsequent stimulus. It can help identify cognitive facilitation which happens through linguistic overlap between previous and current processing.

It is relevant to state that prototypical priming experiments involve two steps. The first step is the presentation of a given stimulus to the participant in the experiment. The second stage consists of presenting another stimulus, with the purpose of verifying whether the presentation of the first effect causes the activation of the recognition of the second stimulus, making the process faster. It is suggested that this paradigm occurs unconsciously.

The priming effect in linguistic tasks can be understood regarding the speed and accuracy of linguistic processing of the target language, caused by prior exposure to a meaning or linguistic form with which the target structure has some kind of relationship, such as lexical, semantic, phonological or structural, as affirmed by Bock (1986). As defined by the mentioned author, priming is a phenomenon that influences language processing through previous contact with a similar meaning or linguistic form (prime).

Levelt and Kelter (1982) developed a study that investigated repetition priming effects in Dutch, observing the use of prepositions, through questions and answers made to merchants by telephone. When the question asked was (a) "At what time does your store close?", merchants were more likely to answer (a) "At 6 o'clock." Differently, when the question asked was (b) "What time does your store close?", the answer given was (b) "6 o'clock". Therefore, it was possible to observe that when asking a question using a preposition, there was tendency for the same preposition to appear in many of the answers given.

Francis and Goldmann (2011) used the conceptual repetition priming methodology to evaluate whether translation equivalents of abstract nouns shared conceptual representations. The authors also compared the degree of conceptual overlap for concrete and abstract nouns. 72 bilinguals (Spanish-English) participated in their study making concrete-abstract decisions on English and Spanish nouns. Regarding the stimuli used in the study, 120 concrete and 120 abstract nouns were used. They eliminated words that were unlikely to be familiar in both languages, words that would be ambiguous in translation, identical cognates, and interlingual homographs. Letter lengths, English word frequencies, Spanish word frequencies and orthographic overlap were balanced across the types of word. Participants performed the task individually for 30 minutes, the stimulus words appeared on the screen, with counterbalanced language order, in which they would press the button corresponding to one of the three options, "concrete", "abstract" or "don't know the word". The mean reaction time for each participant and each experimental condition was obtained. To sum up, the study concluded supporting the idea that translation equivalents access a common conceptual representation. As the authors

affirm, between-language transfer was as strong for abstract nouns as for concrete nouns, that suggests that both concrete and abstract nouns shared conceptual representations across languages, and that the degree of overlap in conceptual representations of translation equivalents does not differ for concrete and abstract words. Finally, it is suggested that both word comprehension and semantic decision processes happen faster when semantic classification is repeated. It is demonstrated through Francis and Goldmann (2011)'s study that there are robust repetition priming effects between languages in abstract and concrete language decision experiments.

Miranda (2021) investigated how bilinguals with English as a foreign language usually translate noun phrases with possession effect between nouns. The objectives of her study were: (1) investigate which syntactic construction bilinguals use in translations of sentences with noun phrases that present a relationship of possession between nouns; (2) examine whether bilinguals are able to reproduce the noun phrase not prepositioned in the target translation with noun phrase with possession relation between nouns in the sense $L1 \rightarrow L2$ and (3) analyze whether there is a significant difference in syntactic choices and response time in the different phases of the study. She conducted an experiment that included a pre-test, two translation tasks and a post-test, with 20 high school students from public schools in the State of Ceará, who were studying English as L2. Miranda (2021) used the syntactic priming paradigm as a pedagogical strategy and the researched structure was the noun phrase with relation of possession between nouns. The experiment was constituted with the following steps: (1) pre-test; (2) translation task in the $L1 \rightarrow L2$ direction; (3) translation task in the $L2 \rightarrow L1$ direction; and (4) post-test. The pre-test presented 10 multiple-choice items and aimed to verify students' prior knowledge regarding the syntactic construction of sentences with noun phrases with a possession relationship between nouns. Also, it served as parameter to check whether syntactic constructions changed in translation tasks that were carried out in the following stages of the research, enabling the analysis of the effects of syntactic priming. Her findings indicated that there was implicit learning of syntactic structure and that participants were able to use the same syntactic structure of the prime translations more often in the production of their translations, thus indicating a repetition priming effect.

Gadelha and Toassi (2021) examined cognitive processes involved in translation, at the word level, through the technique of repetition priming and the recognition and lexical access from interlingual homographic words. One of the objectives of the study was to examine whether there were repetition priming effects of cross-linguistic homographs and non-homographs in the translation process in relation to the control condition. 23 teachers (the

participants) performed two experiments. Experiment 2, which is specifically relevant for the present study, because we investigated repetition priming effects in a translation task with false cognates, was a translation task. Regarding experiment 2, there was a training session containing 10 multiple-choice translation questions. Participants had to use the A, G and L keys on the keyboard to indicate which of the three options presented on the screen was the correct translation of an English word. The target word (English word) appeared in the center of the screen, to be translated, and there were three possible translation response options. The experiment followed the same procedure as the training session, having reaction time and accuracy analyzed, in order to compare differences between conditions (homographs and non-homograph words). The presented results were partially confirmed, since there was no repetition priming effect for the interlingual homographs. However, there was a repetition priming effect, for the “old” control words (non-homographs).

Borém (2023) also investigated the effects of repetition priming in a translation task. The experiment examined if there were repetition priming effects of cognate words in a translation task (experiment 2). In the study, English cognate words were classified as old cognate words (also used in experiment 1) and 26 items were new cognate words. Having “old” and “new” cognate compared concerning reaction time and accuracy between the two conditions possible. The words for this experiment were written in English. The task consisted of providing the correct translations for fifty-two English cognates. For each of these words, participants were presented with three possible response options in Brazilian Portuguese to choose from, as fast and accurately as they could. His results showed that repetition priming effects for cognate words were evident, since the old cognate words condition led to significantly shorter RTs compared to the new cognate words condition, suggesting that previous exposure to cognate words can facilitate the translation process.

After discussing the theoretical references that support the present study, I present the methodology of this work in chapter 3.

3 METHODOLOGY

In this study, the main objective is to examine the effect of false cognates in two tasks with Portuguese-English bilingual participants. To achieve the general objective of this work, this research, with a Psycholinguistics perspective, was developed through a language decision task and a translation task, which is detailed in this chapter. We will then return to the general objective and specific objectives of our research, which were presented in the introduction section, as well as the research questions and hypotheses of this study. Furthermore, we describe and present the participants, the study design and how data collection will be carried out. We will also detail the materials used, which will help us outline the participants' profiles and control the variables of this study, as well as the procedures adopted to analyze the data collected.

3.1 Objectives

This study presents a general objective and two specific objectives, as described in the subsections that follow:

3.1.1 General objective

The general objective of this study is to examine the effect of Brazilian Portuguese-English false cognates regarding lexical processing, in two tasks (a language decision task and a translation task), with bilinguals, who have Portuguese as their L1 and English as their L2 (the target language of the study).

3.1.2 Specific objectives

The general objective of this study is subdivided into two specific objectives, which are:

(1) to analyze whether there is any significant difference in the processing cost between false cognates and control words in Brazilian Portuguese (L1) and in English (L2) in a language decision task and in a translation task.

(2) to investigate if there are false cognate repetition priming effects in a translation task.

3.2 Research questions and hypotheses

Research question 1: How is the processing cost between false cognates and control words in Portuguese (L1) and in English (L2) in a language decision task and in a translation task.

Hypothesis 1: The processing cost is greater for false cognates compared to control words in Portuguese (L1) and in English (L2) in a language decision task and in a translation task.

Research question 2: Are there false cognate repetition priming effects in a translation task?

Hypothesis 2: There are no false cognate repetition priming effects in a translation task.

The first hypothesis is based on two research studies: Otwinowska and Szewczyk (2019) and Otwinowska, Forys-Nogala, Kobosko and Szewczyk (2020). The results of both studies indicate more errors and more difficulty in learning false cognates than in control words. The study by Brenders, Van Hell and Dijkstra (2011) was also taken into consideration. In their study, the authors identified that processing cost was consistently greater for false cognates than for control words

For the second hypothesis, Lalor and Kirsner (2001), Poort, Warren and Rodd (2015), Gadelha (2021) identified that repetition priming effects for interlingual homographs were not observed, thus indicating that the present study's second specific objective is in line with their research.

3.3 Participants

The language decision task and the translation task were applied to twenty (20) bilingual Brazilians who have Portuguese as their native language (L1), and English as their non-native language (L2). They were informed that the study was going to be carried out online and that it was necessary that they use a laptop or desktop computer, as tasks cannot be completed using a mobile phone. Since the participants agreed to take part in the research, they were given a link to access the Psytoolkit software (Stoet, 2010, 2017). All participants work in different professional areas and had their level of English proficiency verified through a vocabulary test. The detailed profile of the participants can be seen in subsection 4.2 of this study.

3.4 Design of the study and data collection

For this study, the browser PsyToolKit (Stoet, 2010; 2017) version 2021.09.0 – 351 was used, so that the two tasks of the research were applied, including the demographic and linguistic questionnaire. This software will provide us with information on reaction time and accuracy of the participants while they perform the required tasks for experiment 1 (the language decision task) and experiment 2 (the translation task). This software, available for carrying out research and collecting data, can be used with no charge at <https://www.psytoolkit.org/>.

In terms of psycholinguistics research, PsyToolKit (Stoet, 2010, 2017) is a widely used and methodologically validated software as a means for collecting data for studies which have the necessity to analyze accuracy and reaction time. We highlight here, that Kim, Gabriel and Gygax (2019), carried out studies in which they observed comparisons between PsyToolKit (Stoet, 2010; 2017) and E-prime 3.0, and the conclusion was that PsyToolkit (Stoet, 2010; 2017) is a viable method for conducting psycholinguistic experiments that use complex tasks concerning reaction time as well as effects for choices. Our research group, PLIBIMULT, at Federal University of Ceará, has been constantly using Psytoolkit for its psycholinguistic research successfully, as a means of collecting data. Some of the psycholinguistic research developed at PLIBIMULT with this software are Gadelha (2021), Miranda (2021), Batista (2022), Freitas (2023), Coutinho (2023), Silva (2023) and Borém (2023).

The language decision task and the translation task that are part of this study are available at <https://www.psytoolkit.org/c/3.4.6/survey?s=cUhzC>.

3.5 Documents, instruments and materials

We present below the instruments and materials which were used in this study in detail.

3.5.1 Informed consent

Upon accepting to participate in this research, the participant were instructed to read and fill in a consent form called “Termo de Consentimento Livre e Esclarecido (TCLE)” in their mother tongue, Brazilian Portuguese, in which information, such as the objective of the study and the procedures (composed by five 5 parts) were available. It is important to explain that each participant was accompanied during the research individually via video call, and when needed for additional support, in person. The participants were asked to read the “Termo de Consentimento Livre e Esclarecido” attentively, followed by further clarification by the researcher, to solve any possible doubt. All participants accepted to take part in the study by clicking “aceito” and filled in with his/her personal information. The “Termo de Consentimento Livre e Esclarecido (TCLE)” can be found in appendix A. Importantly to say, this research was put into effect after the project was approved by the Ethics Review Board in research with human beings from the Federal University of Ceará (CAAE: 82656024.2.0000.5054).

3.5.2 Demographic and linguistic questionnaire

For our study, we decided to use factual and behavioral questions to elaborate the questionnaires. It is of our understanding, that this approach concerning the creation of the questionnaires, helped us control important variables, for instance age, sex and time of experience with the L2. As Dörnyei e Taguchi (2009) state, questionnaires are probably the most employed data collection devices in statistical work and it is also brought by the authors that questionnaires may generate three types of data: (1) factual, such as age, sex and level of education; (2) behavioral, such as L1 and L2 use and study habits; (3) attitudinal issues, including ethnic or cultural affiliation.

In the perspective of psycholinguistic studies, an important methodological challenge refers to the selection of participants and the use of tools that are able to assist their profiling (Silva; Souza; Valadares, 2022). To observe detailed information on participants' profiles, subsection 4.2 in the present study can be accessed. One of the factors that can interfere in language processing is the control of variables. Considering this, according to Grosjean (1998), questionnaires must be used in the selection of participants in linguistic research, given the importance of collecting and organizing relevant information. It is worth mentioning that the questionnaire was administered in the speaker's native language (Brazilian Portuguese). The

demographic and linguistic questionnaire that were used in this research is described on table 1.

Table 1 - Demographic and linguistic questionnaire (written in L1)

<ol style="list-style-type: none"> 1. Escreva seu nome completo 2. Escreva seu código com duas letras e dois números 3. Qual sua idade? 4. Qual seu sexo biológico? 5. Em que cidade e estado você nasceu? 6. Qual sua nacionalidade? 7. Qual das mãos você utiliza para escrever? 8. Qual seu grau de escolaridade? 9. Qual a sua profissão? 10. Qual é sua área de formação? 11. Como você aprendeu inglês? 12. Com que idade você começou a estudar inglês? 13. Além do inglês, você tem conhecimento de outros idiomas? 14. Que tipo de máquina você está utilizando para a realização desta pesquisa? 15. Qual sistema operacional você está usando para esta pesquisa? 16. Qual navegador de internet você está utilizando para esta pesquisa? 17. Como é o teclado que você está utilizando para esta pesquisa? 18. Qual seu nível de leitura em inglês? 19. Qual seu nível de escrita em inglês? 20. Qual seu nível de compreensão auditiva em inglês? 21. Qual seu nível de produção oral em inglês?
--

Source: own authorship

The research questionnaire consisted of nineteen questions relative to a demographic and linguistic nature, including technological information requested from each participant. It was answered on Psytoolkit website (Stoet, 2010; 2017) shortly after the participant accepted the consent form.

The demographic information deals with participant identification, with a code containing two numbers and two letters. In addition, each participant must fill in the following information: age, gender, place of birth, nationality, profession, and whether they write using their right hand, left hand or are able to write with both hands.

3.5.3 Receptive vocabulary test

In order to accurately and reliably estimate the proficiency of the participants in our research, I used a receptive vocabulary test which can be accessed at <https://itt-leipzig.de/wortschatztests>. The test hosted on this platform belongs to the Test Research and Development Institute at the University of Leipzig in Germany, which is a reference for psychometric tests and assessments, having developed a wide range of reliable and validated tests, such as the cognitive abilities test and the interpersonal and job-related skills tests. In accordance with what we propose for the vocabulary receptive test, Souza (2019) states that the classification of proficiency is not sufficiently reliable when it is conducted only by the information of the total time spent studying a second language (L2) or by the systematic exposure to the L2, such as the time spent living in a community in which the L2 is dominant. In terms of self-assessment of proficiency level, the author argues that this is a questionable issue, as well as the act of reporting self-satisfaction in the L2 learning process. In the same study, for example, the correlation between self-assessment and proficiency measured by an objective instrument, did not achieve the desirable results. Therefore, we agree with the study presented by Souza (2019), as it provides theoretical support for the proficiency data collection instrument for our research.

The vocabulary test is based on a free platform which can access lexical knowledge in fifteen different languages, in two distinct formats: the productive test and the receptive test. The test consists of five subtests, which register the levels of language knowledge. The productive test has 90 cloze items, distributed across 5 levels, which consists in writing (typing) keywords to fill out the sentences. The receptive test has 150 items, distributed across 5 levels, which consists of the selection of words that are the definition or synonym for the terms presented. In the receptive format, the participant has access to a considerable number of words,

because for each item there are 6 options to choose from. In both formats, the vocabulary test lasts a maximum of 30 minutes.

The test may indicate a participant's level of proficiency in written language, according to the Common European Framework (Council of Europe, 2001). When a participant concludes the two first levels of the vocabulary test successfully, which explores the two thousand (2,000) most common words in English, the corresponding level of proficiency achieved is the A2. The third level of the test uses the three Thousand (3,000) most common words in the language and a successful result in this stage corresponds to level B1. To be considered proficient at level B2, the participant must be successful at levels 4 and 5 of the test, which assesses the knowledge of the five thousand (5,000) most common words in English. In order to be considered approved in all levels, the participant must have at least 80% of correct answers in each stage of the test.

In the next section, the experiments of this research will be presented.

3.6 The experiments

In this section, the two experiments of this study are described. Two types of tasks were applied: a decision task and a translation task. As already mentioned, both tasks were conducted through the software PsyToolkit (Stoet; 2010, 2017).

3.6.1 The experiments stimuli

Considering all the lexical items that were used in the two experiments applied in this study, we used three hundred (300) words in total, 250 items for experiment 1 and 50 items for experiment 2. For the language decision task (task 1), 25 English false cognates, 25 Brazilian Portuguese false cognates, 100 English control words and 100 Brazilian Portuguese control words were selected. For the translation task (task 2), 50 English words to be translated were selected in total. Out of these 50 words, 25 were English false cognate words and 25 were English control words. 12 English false cognates that were used in task 1 were repeated in task 2 in order to examine repetition priming effects. Additionally, among the response options for the translation task (task 2), there are 25 Brazilian Portuguese false cognates. It is worth highlighting that translation direction applied in task 2 happened from L2 to L1, only. Having that explained, one hundred (100) false cognates were used in total, considering both languages

(Portuguese L1 and English L2) for this research. Regarding control words, we decided to select the items using two criteria: proximity in frequency to false cognates and similarity in word length (the numbers of letters in the words).

To control the Frequency of lexical items for both tasks, two linguistic databases were used: one in Portuguese (L1) and another in English (L2). To organize the selection of the lexical items in Portuguese (L1), LexPorBr was used. The database can be accessed at <http://www.lexicodoportugues.com/> (Estivalet, 2019) and it has more than two hundred thousand (200,000) words, with information such as meaning, semantic category and frequency. To select the lexical items in English (L2), SubtlexUS was used. This database has an extensive *corpus* that takes into consideration American English, with more than fifty-one million (51,000,000) items and it is based on film and TV series subtitles. SubtlexUS can be accessed at <http://www.lexique.org/> (Meta, 2023).

Frequency of words in L1 and L2 was taken into account for the elaboration of stimuli lists for the two experiments. This procedure was designed to achieve two objectives: (1) avoid items with low frequency in both languages of the study and (2) use items which have similar values related to frequency. We decided to use the Zipf frequency Scale because it is the best unit for comparing *corpora* from different languages (Van Heuven and colleagues, 2014). In Zipf frequency Scale, the frequency of words varies from 1 to 7, in which words that have frequencies between one (1) and two (2) are rarer words, between three (3) and four (4) are words that appear with a certain frequency in the language and the words that have frequencies between five (5), six (6) or seven (7) are items with high frequency. In this study, we decided to specifically use words with the value of frequency ranging from two (02) to seven (7). Very rare words were avoided.

Thus, all lexical items that were used in our study varied in length from three (03) to thirteen (13) letters, with the variation of letters in L1 ranging from four (04) to thirteen (13) and the variation of letters in L2 ranging from three (03) to ten (10).

With that said, the stimuli lists for both experiments, containing information on frequency will be presented in subsections 3.5.1.2 and 3.5.2.2. The lists are composed by verbs and nouns in both languages (Brazilian Portuguese and English), which are in the infinitive and base form respectively. The nouns used in both experiments were written in the singular, both for L1 and L2.

3.6.2 Experiment 1 - Language decision task

In a language decision task such as the one presented in this study, one of its main objectives is to measure how quickly and accurately participants process words. In the case of the present study, Brazilian Portuguese (BP) and English are the two languages involved in this task. In this type of task, participants are asked to classify stimuli (Portuguese false cognates, English false cognates, and Portuguese- English control words for the present study) as belonging to a specific language. Additionally, a variety of topics can be investigated through this type of experiment, such as language comprehension, language acquisition and language processing. In various psycholinguistic experiments, lexical decision tasks are also used to measure the reaction time participants spend to decide whether strings of letters are real words or nonwords. This type of task has been used in thousands of studies, investigating semantic memory and lexical access in general (Lucas, 2000). For our research, we decided to use a language decision task. In experiments of this nature, the dependent variables used are reaction time and accuracy. We will use these variables to investigate the false cognate effects on language processing between Brazilian Portuguese (L1) and English (L2).

Specifically for the language decision's first task of the present experiment, the objective is to identify which language the lexical item can be related to by the bilingual. This type of task can contribute to the discussion about the selective or non-selective activation of languages in the bilingual mind.

The first dependent variable of this study will be reaction time to each one of the stimuli, that is, the time taken by the participant to identify or not the language to which each word belongs to. Errors will be taken out of the analysis. The second dependent variable in this experiment will be the convergence of judgements made by the participants, which is accuracy.

The design of experiment 1 and the stimuli used are shown in the next subsections.

3.6.2.1 Experiment 1 design - language decision task

Experiment 1 is a language decision task, in which the participant should indicate which language the lexical item belongs to: whether it is part of their native language, Brazilian Portuguese (L1), or it is part of their non-native language, English (L2). To do this, participants should press the "A" key for L1 (native language) or the "L" key for L2 (non-native language). Each lexical item was shown in the center of the screen for up to three thousand (3,000) milliseconds or until the participant made their decision. Arial font, size 40, was used for the

stimuli. The screen background was black, and the font color was white. Then, when the participant pressed the selected key for his/her option of choice, the next word appeared on screen, and so on.

Through the experiment link, participants had access to the informed consent and the research questionnaire. After having read the consent form and having filled the questionnaire, participants were directed to the task on Psytoolkit (Stoet, 2010, 2017). They saw a greeting message containing the instructions to be followed during the entire experiment, as shown in figure 5:

Figure 5 - Greeting message for the data collection process

BEM-VINDO(A)!

Você vai realizar dois experimentos.
O primeiro experimento será uma **tarefa de decisão linguística**
e o segundo experimento será **uma tarefa de tradução.**

Quando estiver preparado, clique na **barra de espaço** para ler
as orientações.

Source: own authorship

Figure 5 welcomed the participants and informed them that they had two tasks to be done: first, a language decision task and then a translation task. Participants had to press the space bar when they were ready to read the following instructions.

After that, participants read a welcome message for task 1, specifically, as shown in figure 6:

Figure 6 - Welcome message – task 1

Bem-vindo(a) à **tarefa de decisão linguística**

Nesta tarefa você verá uma palavra no centro da tela e deverá indicar o mais rápido possível qual a primeira língua que esta palavra lhe traz à mente: o **português** ou o **inglês**.

A tarefa está dividida entre o **treinamento e mais 3 blocos**:

Treinamento: contendo 8 palavras.
Bloco 1: primeira parte da **tarefa de decisão linguística**, contendo 85 palavras.
Bloco 2: segunda parte da **tarefa de decisão linguística**, contendo 83 palavras.
Bloco 2: segunda parte da **tarefa de decisão linguística**, contendo 82 palavras.

Quando você estiver pronto(a) para ler as instruções do **TREINAMENTO**, pressione a barra de espaço.

Source: own authorship

Figure 6 gave the instruction in Brazilian Portuguese informing that participants had to indicate as quickly as possible which language the word in the center of the screen belongs to, Brazilian Portuguese or English. It also provided information on how the task was divided. It started with the training session containing eight (8) words, and then, there are three more blocks: Block 1, the first part of the task containing eighty- five (85), block 2, the second part of the task containing one eighty-three (83) words, and block three the last part of the task containing eighty-two (82) words. When participants felt they were ready to start the task, they clicked the keyboard “space bar”. This task was used for the collection and analysis of data for experiment 1.

Before starting task 1, participants were given a training session, as shown in figure 7:

Figure 7 - Training session – task 1

TREINAMENTO

Você verá uma palavra no centro da tela e deverá tomar uma decisão o mais rápido possível sobre qual a língua que vem primeiro à sua mente ao ver a palavra na tela.

Se for o **PORTUGUÊS**, pressione a tecla “A”.
 Se for o **INGLÊS**, pressione a tecla “L”.

Você terá até 3 segundos para responder cada item.
 Pressione a **barra de espaço** quando se sentir preparado para começar o treinamento.

Source: own authorship

Figure 7, as seen, brought information on the training session. When participants pressed the space bar, he or she saw a word in the center of the screen, as shown in figure 8 and had to press the "A" key if he or she decided that the word shown belonged to the Portuguese language (L1) or had to press the "L" key, if he or she decided that the word belonged to the English language (L2). The amount of time each participant had to press key "A" or key "L" and make their decision for each item shown in the center of the screen was up to three (3) seconds. If no key was pressed, the word disappeared from the screen and the next word would appear. The procedure of choosing the "A" key, which is located on the left side of the computer keyboard, and the "L" key, which is located on the right side of the computer keyboard is appropriate since it is important to avoid having the computer keys close to one another, thus avoiding the induction of typing errors or confusion when judging the answer the participant considered correct.

Figure 8 - Item example - task 1



Source: own authorship

Figure 8 showed a word in the center of the screen. Participants had to press the "A" key if they decided that that word belonged to Portuguese (L1) or had to press the "L" key if they decided the word belonged to English (L2).

Figure 9 - End of training session – task 1

MUITO BEM!

Você finalizou o **treinamento**.

Quando se sentir preparado,
clique na **barra de espaço** para ler as instruções da
tarefa de decisão linguística.

Source: own authorship

After the training session, participants read a message informing them that they had finished the training session and that they should press the space bar when they felt ready to start the language decision task – task 1, as shown in figure 9.

Figure 10 - Instructions for task 1 – block 1

Bloco 1: TAREFA DE DECISÃO LINGUÍSTICA

Você verá uma palavra no centro da tela e deverá tomar uma
decisão o mais rápido possível sobre qual a língua que vem
primeiro à sua mente ao ver a palavra na tela.

* Se for o **PORTUGUÊS**, pressione a tecla "A".
* Se for o **INGLÊS**, pressione a tecla "L".

Você terá até 3 segundos para responder.
Pressione a **barra de espaço** quando se sentir preparado para
começar a tarefa.

Source: own authorship

Figure 10 provided instructions for the language decision task-block 1. The information given for this task was similar to what participants were instructed for the training session, as follows: when participants pressed the space bar, he or she saw a word in the center of the screen, as shown in figure 8 and should press the "A" key if he or she decided that the

word shown belonged to the Portuguese language (L1) or should press the "L" key, if he or she decided that the word belonged to the English language (L2). The amount of time each participant had to press key "A" or key "L" and make their decision for each item shown in the center of the screen was up to three seconds. If no key was pressed, the word would disappear from the screen and the next word would appear.

One of the reasons for the language decision task to be divided into three parts, is the number of items involved in the task. Since the time required for the participant to answer two hundred and fifty (250) items might be extensive, and above all to avoid participant fatigue, we believe that dividing this task into three blocks could allow for a brief rest period between the task blocks.

It is important to note that all three blocks of experiment 1 followed the same procedure as shown in figure 10 (instructions for task 1-block 1). When participants finished doing the three blocks of the language decision task, they were directed to the next screen, which is an end of task message, as seen in figure 11.

Figure 11 - End of task 1

MUITO BEM!

Você finalizou a tarefa de decisão linguística.

Pressione a **barra de espaço** quando estiver pronto(a)
para começar a próxima etapa: a **tarefa de tradução**.

Source: own authorship

Figure 11 shows a congratulating message, informing that the participant finished the complete language decision task, the first task of the data collection. To proceed to the translation task, the second task of the experiment, participants should press the space bar when they felt ready to start. Before presenting the translation task, I will present in the next subsection the stimuli list that was used in experiment 1 of the present study.

3.6.2.2 Experiment 1 stimuli - language decision task

In this subsection, I present the stimuli list for experiment 1, for this first experiment, which was a language decision task, two hundred and fifty (250) words were used, in total. Out of these words, fifty (50) words were false cognates, distributed as follows: twenty-five (25) words were false cognates in Portuguese and twenty-five (25) words were false cognates in English. Additionally, two hundred (200) control words were used, out of which one hundred (100) control words were in Portuguese and one hundred (100) were control words in English.

Next, I present in table 2 the English false cognates that are part of the stimuli list of experiment 1 with their respective frequency:

Table 2 - English false cognates used in experiment 1 with their respective frequencies and Brazilian Portuguese false cognate pairs

FALSE COGNATES IN ENGLISH	FREQUENCY	FALSE COGNATES IN PORTUGUESE
attend	4,14	atender
intend	4,36	entender
notice	4,77	notícia
pretend	4,60	pretender
pull	5,16	pular
push	4,84	puxar
reclaim	3,14	reclamar
concern	4,41	concertar
shoot	5,21	chutar
enroll	2,83	enrolar
resume	3,75	resumir
relative	3,89	relativo
anthem	3,27	antena
army	4,93	arma
balcony	3,86	balcão
college	4,92	colégio
commodity	3,22	comodidade
degree	4,17	degrau
fabric	3,68	fábrica
lecture	4,02	leitura
library	4,36	livraria
deception	3,49	decepção

recipient	3,06	recipiente
estate	4,32	estado
remark	3,64	remarcar

Source: own authorship

Table 2 presented the English false cognates that appear in the language decision task. It is important to note that the presentation of the items was randomized, in order to avoid order effects.

Additionally, I present the Brazilian Portuguese false cognate words that were used in task 1, with their respective frequencies, as shown in table 3:

Table 3 - Brazilian Portuguese false cognates used in experiment 1 with their respective frequencies and English false cognate pairs

FALSE COGNATES IN PORTUGUESE	FREQUENCY	FALSE COGNATES IN ENGLISH
realizar	4,82	realize
sortear	3,31	sort
assumir	4,67	assume
tossir	2,55	toss
traduzir	3,86	traduce
divertir	3,86	divert
designar	3,82	design
remarcar	2,97	remark
tornar	4,76	turn
assinar	4,32	assign
chutar	3,84	shoot
pular	3,72	pull
comprometer	4,12	compromisse
lanche	3,49	lunch
novela	4,78	novel
parente	3,79	parente
prejuízo	2,71	prejudice
relativo	4,10	relative
batom	3,42	baton
polícia	5,45	policy
cartão	4,80	carton
fingir	3,44	finger
injúria	3,60	injury
braço	4,54	brace

casualidade	2,71	casualty
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Source: own authorship

In table 4, the Brazilian Portuguese and English control words that were used in the present study (experiment 1) and their respective frequencies are presented.

Table 4 - Brazilian Portuguese and English control words and their respective frequencies (experiment 1)

CONTROL WORDS IN ENGLISH	FREQUENCY	CONTROL WORDS IN PORTUGUESE	FREQUENCY
settle	4,62	começar	4,90
read	5,38	aumentar	5,01
handle	5,03	trabalhar	5,03
bless	4,54	gostar	4,03
soak	3,53	jogar	5,12
blow	4,98	conseguir	4,94
switch	4,44	escolher	4,02
answer	5,24	encostar	3,35
catch	5,13	conversar	4,47
buy	5,28	provar	4,51
picture	5,14	chegar	5,24
slip	4,41	cantar	4,28
follow	5,09	costurar	3,43
listen	5,73	carregar	3,91
sketch	3,69	aprender	4,47
write	5,10	brilhar	3,53
erase	3,79	guardar	4,01
dinner	5,30	livro	5,46
reader	3,73	sorvete	3,82
plumber	3,65	mito	4,31
ward	4,15	macaco	3,68
cousin	4,68	jogo	5,66
warehouse	3,99	dinheiro	5,53
glasses	4,51	rancor	3,51
background	4,24	porteiro	3,03
garden	4,42	moeda	5,24
knee	4,16	trabalhador	4,54
tissue	4,03	aumento	5,46
money	5,80	viveiro	3,35
meaning	4,57	maioria	5,43
window	4,93	nada	5,52
cloth	3,78	metade	4,95

fellow	4,76	trabalho	5,67
wallet	4,35	comprar	5,02
believe	5,79	escutar	3,19
become	5,06	vender	4,83
ring	4,96	brindar	3,04
choose	4,98	conviver	4,03
spread	4,49	entregar	4,42
smile	4,76	pensar	4,83
forget	5,44	voar	3,80
joke	4,86	parar	4,74
teach	4,86	possuir	4,03
call	5,93	pagar	5,13
giggle	3,23	morrer	4,55
begin	4,75	chorar	3,99
bite	4,61	nadar	3,58
awake	4,42	caminhar	3,96
build	4,68	perdoar	3,40
deal	5,41	sentar	3,79
dig	4,66	torta	3,47
health	4,60	atacante	5,11
landscape	3,39	tarefa	4,70
kids	5,47	parede	4,34
lawsuit	3,78	teclado	3,85
measure	4,02	jogador	5,34
lawn	4,09	vendaval	3,56
father	5,74	primo	4,02
carrot	3,58	guerra	5,24
mother	5,68	conversa	4,76
hair	5,18	igreja	4,81
writer	4,37	gravata	3,84
eraser	3,00	costura	3,74
lettuce	3,53	credor	4,21
friend	5,62	bolsa	4,82
mouth	5,01	bairro	4,91
strawberry	3,74	terra	5,16
drink	5,39	mostrar	4,95
drive	5,18	beijar	3,67
fly	4,92	ensinar	4,12
forgive	4,88	avisar	3,83
give	6,06	mudar	4,94
hear	5,74	levantar	4,27
achieve	3,86	aparecer	4,48
clean	5,08	surgir	4,17

cook	4,65	tocar	5,58
crash	4,45	falar	5,17
enjoy	4,91	andar	4,78
fix	4,93	ficar	5,33
jump	4,84	vencer	4,90
miss	5,66	beber	4,09
rain	4,68	arrancar	3,78
start	5,53	voltar	5,03
view	4,58	alegria	4,57
potato	4,05	casa	5,66
people	6,04	sapato	3,76
clothes	5,00	malandro	3,26
powder	4,20	garfo	3,21
fashion	4,27	martelo	3,55
power	5,17	girassol	3,19
apple	4,37	frango	4,21
speech	4,57	lenço	3,67
foreigner	3,47	brinde	3,49
chicken	4,79	ousadia	3,82
nose	4,84	vestido	3,99
teacher	4,74	propósito	4,48
screen	4,36	lata	3,97
birthday	4,98	cachorro	4,11
beard	4,10	cotovelo	3,01
church	4,84	mulher	5,43

Source: own authorship

3.6.3 Experiment 2 – translation task

For the second experiment, a translation task was applied. Our objective was to analyze the translation processing of false cognates. This type of task can contribute to the discussion about the processing of false cognates in the bilingual mind, within the area of Psycholinguistics of Bilingualism.

The first dependent variable was reaction time (RT) for each one of the stimuli, that is, the reaction time to identify the translation from L2 to L1 of each word. The second dependent variable of this experiment was accuracy, which was verified through the selection of items.

The experiment 2 design and the stimuli used are as shown in the next section.

3.6.3.1 Experiment 2 design - translation task

In experiment 2, which is a translation task, participants indicated the translation of the lexical item presented in the center of the computer screen. To do this, participants pressed the “A”, “G” or “L” keys according to their option of choice. Each lexical item was shown in the center of the computer screen for up to ten thousand (10.000) milliseconds or until the participant makes their selection. Participants had access to fifty (50) words in English that should be translated into Portuguese, through the selection of one of the three (3) response options.

For the translation task, firstly, participants read a welcome message as shown in figure 12:

Figure 12 - Welcome message – task 2

Bem-vindo(a) à tarefa de tradução

Nesta tarefa você deve **escolher a tradução** para a palavra que aparece no centro da tela o mais rápido possível.

Você verá **3 opções de tradução**, devendo assinalar apenas uma, que julgar ser a resposta correta.

A tarefa está dividida entre o **treinamento e tarefa de tradução**:

Treinamento: contendo 8 palavras.
Tarefa de tradução: contendo 50 itens.

Quando você estiver pronto(a) para ler as instruções do **TREINAMENTO**, pressione a barra de espaço.

Source: own authorship

In figure 12, there were the general instructions for task 2. For this task, participants had to choose the translation for the word that appears in the upper side of the screen (see figure 14), which is part of a total of fifty (50) English words, false cognates and control words, which are the stimuli for this task. Right below the word to be translated, there were three options of choice, lined horizontally, that corresponded to the following commands: “A” for the first word, “G” for the word that appears in the center, and “L” for the last word (see figure 14). As done in the language decision task, a training session with eight (8) words was provided before the

actual task, so participants could get familiarized with the procedures. In this task, the stimuli were presented for ten thousand (10,000) milliseconds before moving on to the next word. The participants answered 50 trials. The whole task took about 10 minutes to be done. The key the participant pressed in the computer keyboard was recorded by Psytoolkit software (Stoet, 2010, 2017) and converted into numerical values of 1, 2 or 3 so that the accuracy of the answers could be analyzed later.

Figure 13 shows the instructions for the training session, as it follows:

Figure 13 - Training session – task 2

TREINAMENTO

Você verá uma palavra no centro da tela e deverá
escolher a tradução correta para ela o mais rápido
possível.

Pressione a tecla “**A**”, “**G**” ou “**L**”, de acordo com a
tradução que julgar correta.

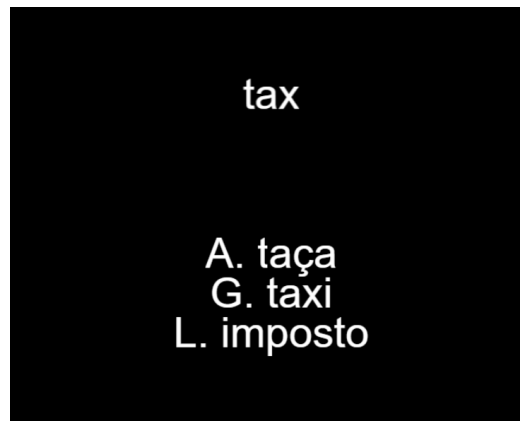
Você terá até 10 segundos para responder cada item.
Pressione a **barra de espaço** quando se sentir preparado
para começar o treinamento.

Source: own authorship

The instructions for the training session were discussed in detail in the description of figure 13, but additionally, it is relevant to say that if no key was pressed during the trials, the word would disappear from the screen after ten thousand (10,000) milliseconds and the next word would appear, so that the participant could continue their task.

Figure 14 shows a screenshot of the training session for task 2 as an example.

Figure 14 - Item example – task 2



Source: own authorship

After the training session, participants read a congratulating message, confirming that he or she had finished training and that they could press the space bar when they felt ready to start task 2, as shown in figure 15:

Figure 15 - End of training session – task 2

MUITO BEM!

Você finalizou o **treinamento**.

Quando se sentir preparado,
clique na **barra de espaço** para ler as instruções da **tarefa de tradução**.

Source: own authorship

After finishing the training session, participants pressed the space bar when they felt they were ready to read the instructions, to start answering the translation task, as shown in figure 16.

Figure 16 - Instructions for task 2

TAREFA DE TRADUÇÃO

Você verá uma palavra no centro da tela e deverá **escolher a tradução** correta para ela o mais rápido possível.

Pressione a tecla "**A**", "**G**" ou "**L**", de acordo com a tradução que julgar correta.

Você terá até 10 segundos para responder cada item.
Pressione a **barra de espaço** quando se sentir preparado para começar a **tarefa de tradução**.

Source: own authorship

Figure 16 brought the instructions for the translation task. The instructions given were the same as for the training session, as shown in figure 13.

After finishing task 2, the participant read a thanking message, informing them that they had completed the entire experiment, as shown in figure 17.

Figure 17 - End of task 2

MUITO BEM!

Você finalizou todo o experimento.

OBRIGADO POR SUA PARTICIPAÇÃO!

Source: own authorship

3.6.3.2 Experiment 2 stimuli - translation task

In our second experiment, a translation task was applied, with three (3) response options, so that participants could choose which translation they consider appropriate for the

word that appeared first in the upper part of the computer screen. Participants were asked to translate fifty (50) words in total, from which twenty-five (25) words were English false cognates and twenty-five (25) were English control words. I controlled the grammatical class for all the items. Thus, there are twenty-five (25) nouns and twenty-five (25) verbs. Among false cognate words, there are thirteen (13) nouns and twelve (12) verbs. Considering control words, there are twelve (12) nouns and thirteen (13) verbs. 12 false cognates from experiment 1 were repeated in experiment 2, in order to have repetition priming effects analyzed.

Table 5 presents all the false cognates that had to be translated by the participants and the translation options in Brazilian Portuguese.

Table 5 - List of false cognates and response options (experiment 2)

FALSE COGNATES IN ENGLISH	OPTION "A"	OPTION "G"	OPTION "L"
accent	acento (Portuguese false cognate)	jogador (control word)	sotaque (correct translation)
army	jogo (control word)	exército (correct translation)	arma (Portuguese false cognate)
attend	atender (Portuguese false cognate)	viajar (control word)	participar (correct translation)
assume	assumir (Portuguese false cognate)	começar (control word)	presumir (correct translation)
balcony	varanda (correct translation)	balcão (Portuguese false cognate)	rancor (control word)
collar	ombro (control word)	colarinho (correct translation)	colar (Portuguese false cognate)
commodity	comodidade (Portuguese false cognate)	pagamento (control word)	mercadoria (correct translation)
curse	praguejar (correct translation)	cursar (Portuguese false cognate)	congelar (control word)
exit	aumento (control word)	saída (correct translation)	êxito (Portuguese false cognate)
fabric	berço (control word)	tecido (correct translation)	fábrica (Portuguese false cognate)
grip	teto (control word)	firmeza (correct translation)	gripe (Portuguese false cognate)
intend	entender (Portuguese false cognate)	trabalhar (control word)	pretender (correct translation)
lecture	palestra (correct translation)	leitura (Portuguese false cognate)	sorvete (control word)
legend	lenda (correct translation)	legenda (Portuguese false cognate)	leite (control word)
estate	estatuto (control word)	propriedade (correct translation)	estado (Portuguese false cognate)

tax	taxi (Portuguese false cognate)	taça (control word)	imposto (correct translation)
notice	perceber (correct translation)	noticiar (Portuguese false cognate)	falar (control word)
office	parede (control word)	escritório (correct translation)	ofício (Portuguese false cognate)
pretend	fingir (correct translation)	pretender (Portuguese false cognate)	conseguir (control word)
push	gritar (control word)	empurrar (correct translation)	puxar (Portuguese false cognate)
reclaim	reclamar (Portuguese false cognate)	brigar (control word)	recuperar (correct translation)
record	gravar (correct translation)	recordar (Portuguese false cognate)	escolher (control word)
resume	costurar (control word)	retomar (correct translation)	resumir (Portuguese false cognate)
retire	guardar (control word)	aposentar (correct translation)	retirar (Portuguese false cognate)
support	suportar (Portuguese false cognate)	conversar (control word)	apoiar (correct translation)

Source: own authorship

For each one of the false cognates listed on table 5 that were translated by the participants of our research, there were three (03) response options. For all the items, the options were provided as responses, considering the following possibilities: the correct answer, an orthographically similar item, and a distractor item. All the items were presented randomly by Psytoolkit (Stoet, 2010, 2017). The response options were randomized to avoid order effects. The parts of speech for response options were controlled. Thus, if the item to be translated was a noun, all the response options were nouns. For verbs, the same pattern was used.

As mentioned previously in this section, twenty-five (25) control words were added for experiment 2. In order to elaborate the translation options for these items, the number of letters and frequency were also controlled, as mentioned in subsection 3.5.1. Table 6 shows these control words.

Table 6 - Control words for experiment 2

CONTROL WORDS IN ENGLISH	OPTION "A"	OPTION "G"	OPTION "L"
become	colocar (distractor)	começar (distractor)	tornar (correct translation)

believe	amar (distractor)	acreditar (correct translation)	costurar (distractor)
carrot	terra (control word)	cenoura (correct translation)	caixa (control word)
child	vestuário (control word)	criança (correct translation)	maioria (control word)
draw	subir (distractor)	ligar (distractor)	desenhar (correct translation)
dress	jogador (distractor)	vestido (correct translation)	lençol (distractor)
eraser	borracha (correct translation)	zelador (distractor)	loja (distractor)
fall	cair (correct translation)	cozinhar (distractor)	sentir (distractor)
find	perder (distractor)	brigar (distractor)	encontrar (correct translation)
friend	amigo (correct translation)	empresário (distractor)	gravata (distractor)
know	viver (control word)	dizer (control word)	conhecer (correct translation)
lawn	quintal (distractor)	grama (correct translation)	moeda (distractor)
lend	emprestar (correct translation)	levar (control word)	quebrar (control word)
lettuce	martelo (distractor)	alface (correct translation)	girassol (distractor)
listen	chamar (control word)	ouvir (correct translation)	vender (control word)
mouth	braço (distractor)	boca (correct translation)	baleia (distractor)
need	aprender (distractor)	voltar (distractor)	precisar (correct translation)
open	obedecer (distractor)	abrir (correct translation)	ficar (distractor)
sing	voar (distractor)	nadar (distractor)	cantar (correct translation)
sketch	esboço (correct translation)	intriga (distractor)	tela (distractor)
strawberry	morango (correct translation)	sobrinho (distractor)	unha (distractor)
tell	contar (correct translation)	olhar (distractor)	escutar (distractor)
uncle	tio (correct translation)	mito (control word)	casa (control word)
view	pista (distractor)	vista (correct translation)	nuvem (distractor)
write	deixar (control word)	pegar (control word)	escrever (correct translation)

Source: own authorship

3.7 Data analysis

This study was experimentally manipulated. For this type of study, researchers need to control the conditions that prevail in the investigation (Marconi; Lakatos, 2017). This means that the value of one or more variables is manipulated, and the effects of this manipulation are analyzed. As experimental research, Del Ré (2020) states that quantitative data presupposes a stable reality and is usually linked to objective and controlled tasks. Furthermore, this type of study is focused on results to verify and confirm or refute, an applied method.

All these considerations justify the option of treating the data in this study in a quantitative way, through statistical analysis of the answers given by participants. Therefore, this research has as dependent variables accuracy and reaction time. In detail, to investigate false cognate facilitation or interference, accuracy and reaction time were analyzed across two tasks: a language decision task (task 1) and a translation task (task 2). To achieve this, the mean, standard deviation, median, minimum value, and maximum value were calculated using RStudio software. To this end, the mean, standard deviation, median, minimum value and maximum value were calculated using RStudio software. Next, I used the Generalized Linear Mixed Model in RStudio software to analyze accuracy. To analyze response time the Linear Mixed Model was used in RStudio. Through these two models, it was possible to analyze the impact of mixed and random effects on our dependent variables. In the present study, the fixed effect is the exposure to false cognates and the random effects are participants and items. Our decision to work with the Linear Mixed Model to analyze the results related to the false cognate effects is justified because this model is applicable to categorical variables. Thus, as the false cognate effect is a binominal independent variable, the use of the Generalized Mixed Model is the most appropriate. For the analysis of the results that refer to reaction time, I worked with the Mixed Linear Model. The results obtained from the application of the two tasks are analyzed in the next chapter.

4 RESULTS

In the sections of this chapter, the results of analysis of data collected in the PsyToolkit (Stoet, 2010, 2017) are presented. Statistical analysis was carried out through the RStudio (*R Core Development Team*, 2011). Regression models were used for inferential statistical analysis, the Generalized Mixed Model and the Linear Mixed Model. The choice of the model was due to the type of dependent variable. Binomial variables such as accuracy are analyzed with the Generalized Mixed Model. On the other hand, continuous variables, such as reaction time (RT), are analyzed with the Linear Mixed Model.

To reiterate, the general objective of this research was to examine the effect of Brazilian Portuguese – English false cognates in two tasks (a language decision task and a translation task), with bilinguals, who have Brazilian Portuguese as their L1 and English as their L2. Additionally, as already mentioned, the specific objectives of this study were: 1) to analyze whether there is any significant difference in the processing cost between false cognates and control words in a language decision task and in a translation task; (2) to investigate if there are false cognate repetition priming effects in a translation task.

The results of the demographic and linguistic questionnaire and the vocabulary test helped us profile the participants in this research and can be found in section 4.1. The results of the two experiments are presented in the following sections: in section 4.2, the results of task 1 (language decision) are presented; and in section 4.3, the results of task 2 are found (translation task). Finally, in chapter 5, we present the discussion of the obtained results and in chapter 6 the conclusions are found.

4.1 Participants' profile

In this section, we present the results obtained through data analysis from the demographic and linguistic questionnaire and the vocabulary test. These two instruments were used aiming to profile the participants in a more detailed way.

4.1.1 Demographic and linguistic questionnaire

The demographic and linguistic questionnaire contained 18 questions, and was answered on the PsyToolkit (Stoet, 2010, 2017) software. Participants' answers are presented in

the following. The questionnaire's first question was: "how old are you?" Information regarding participants' age is provided in Table 10:

Table 7 - Participants' age

MEASURES	AGE
Mean (Standard deviation)	39.85 (10.2)
Minimum	18
Maximum	56

Source: own authorship

P = 20

P = number of participants

Table 7 shows that participants' mean age was 39.85, with a standard deviation of 10.02. The youngest participant to take part in the research was 18 years old and the oldest was 56 years old.

The second question was: "what is your biological sex?" Table 8 shows the collected responses for question 2:

Table 8 - Participants' gender

GENDER	PARTICIPANTS
FEMALE	9 (45%)
MALE	11 (55%)

Source: own authorship

P = 20

P = number of participants

Out of the 20 participants, 9 (45%) were female and 11 (55%) were male. Thus, the majority of participants were male.

The third question was: "what is your nationality?" All 20 research participants were Brazilian.

The fourth question was: "which hand do you use to write?" Table 9 shows the collected responses for question 4:

Table 9 - Hand used to write

HAND USED TO WRITE	PARTICIPANTS
Right	17 (85%)
Left	3 (15%)

Source: own authorship
P = 20
P = number of participants

Table 9 shows that out of the 20 participants, 17 responded that they use their right hand to write and 3 responded that they use their left hand to write. This means that 85% of participants were right-handed and 15 were left-handed.

The fifth question was: “what is your level of education?” Table 10 shows the collected responses for question 5:

Table 10 - Participants’ level of education

LEVEL OF EDUCATION	PARTICIPANTS
High School	02 (10%)
Graduation	02 (10%)
Specialization	08 (40%)
Master’s degree	05 (25%)
Doctorate	03 (15%)

Source: own authorship
P = 20
P = number of participants

Out of the 20 participants, 2 (10%) completed high school education, 8 (40%) are specialists, 5 (25%) have a master’s degree, and 3 (15%) have a doctorate.

The sixth question was: what is your profession?” Table 11 shows the collected responses for question 6:

Table 11 - Participants' profession

PROFESSION	PARTICIPANTS
English teacher	5 (25%)
Other professions	15 (75%)

Source: own authorship

P = 20

P = number of participants

By observing table 11, of the 20 participants, 5 (25%) were English teachers and 15 (80%) have other professions.

The seventh question was: “what is your job?” From the 20 participants, 5 (25%) were English teachers, 4 (20%) were Spanish teachers, 2 (10%) were History teachers (one working in High school and the other working in Higher education), 1 (5%) worked in primary school, 1 (5%) was a school secretary, 1 (5%) was an administrative assistant, 1 (5%) was a Geography teacher, 1 (5%) was an undergraduate of Physical Education , 1 (5%) was a professor working in the health area, 1 (5%) was an economist, 1 (5%) was an information technology analyst and 1 (5%) was an agricultural engineer.

The eighth was: “how did you learn English?” Table 12 shows the collected responses for question 8:

Table 12 - Context of learning English

CONTEXT OF ENGLISH LEARNING	PARTICIPANTS
Immersion	1 (5%)
With friends	4 (20%)
At home	4 (20%)
At school	8 (40%)
English course	15 (75%)
At work	6 (30%)

Self-learning	9 (45%)
---------------	------------

Source: own authorship
P = 20
P = number of participants

In question 8, participants had the possibility to indicate more than one answer. Out of the 20 participants, 1 (5%) indicated that he/she learned English through immersion, 4 (20%) indicated that they learned English with friends, 4 (20%) indicated that they learned English at home, 8 (40%) indicated that they learned English at school, 15 (75%) indicated that they learned English at an English course, 6 (30%) indicated that they learned English at work and 9 (45%) responded they learned English on their own.

The ninth question was: “at what age did you started studying English?” Table 13 shows the collected responses for question 9:

Table 13 - Starting age of studying English

MEASURES	AGE
Mean (Standard deviation)	14.10 (6.74)
Minimum	5
Maximum	38

Source: own authorship
P = 20
P = number of participants

Table 13 shows that, on average, participants started studying English at the age of 14, with a standard deviation of 6.74. The earliest a participant started studying English was at the age of 5 and the latest at the age of 38.

The tenth question was: “do you know any other language besides English?” Table 14 shows the collected responses for question 10:

Table 14 - Knowledge of languages other than English

OTHER LANGUAGES	PARTICIPANTS
No knowledge of another language	9 (45%)
Spanish	7 (35%)
German	2 (10%)

French	1 (5%)
<i>Libras</i>	1 (5%)

Source: own authorship
P = 20
P = number of participants

In this question of the demographic and linguistic questionnaire, participants had the possibility to provide more than one answer. Out of the 20 participants, 9 (45%) stated that they did not know any language other than English, 7 (35%) had knowledge of Spanish, 2 (10%) had knowledge of German, 1 (5%) had knowledge of French and 1 (5%) has knowledge of *Libras*.

The eleventh question was: “what type of machine are you using to participate in this research?” Table 15 shows the collected responses for question 11:

Table 15 - Type of machine used in the research

TYPE OF MACHINE	PARTICIPANTS
Laptop	12 (60%)
Desktop	8 (40%)

Source: own authorship
P = 20
P = number of participants

Table 15 shows that out of the 20 participants, 12 (60%) used a laptop and 8 (40%) used a desktop.

The twelfth question was: “which operating system are you using for this research?” Table 16 shows the collected responses for question 12:

Table 16 - Operating system used in the research

OPERATING SYSTEM	PARTICIPANTS
Windows 10	11 (55%)
Windows 11	9 (45%)

Source: own authorship

P = 20

P = number of participants

Table 16 shows that out of the 20 participants, 11 (55%) used the Windows 10 operating system and 9 (45%) used the Windows 11 operating system. There were no responses that indicated the use of other systems.

The thirteenth question was: “which browser are you using for this research?” Table 17 shows the collected responses for question 13:

Table 17 - Browser used in the research

BROWSER	PARTICIPANTS
Chrome	19 (95%)
Firefox	1 (5%)

Source: own authorship

P = 20

P = number of participants

Table 17 shows that of the 20 participants, 19 (95%) used the Chrome browser and 1 (5%) used the Firefox browser. There were no responses that indicated the use of other browsers.

The fourteenth question was: “what is the keyboard you are using for this research like?” Table 18 shows the collected responses for question 14:

Table 18 - Keyboard used in the research

KEYBOARD	PARTICIPANTS
Integrated into the laptop	8 (40%)
Connected via USB	10 (50%)
Wireless	2 (10%)

Source: own authorship

P = 20

P = number of participants

Table 18 shows that out of the 20 participants, 8 (40%) used the keyboard integrated into the laptop, 10 (50%) used the keyboard connected to the computer via USB and 2 (10%) used a wireless keyboard.

The fifteenth question was: “what is your reading level in English?” Table 19 shows the collected responses for question 15:

Table 19 - English reading level

ENGLISH READING LEVEL	PARTICIPANTS
Poor	2 (10%)
Fair	5 (25%)
Functional	6 (30%)
Good	2 (10%)
Very good	2 (10%)
Excellent	3 (15%)

Source: own authorship
P = 20
P = number of participants

Table 19 shows that out of the 20 participants, 2 (10%) self-evaluated their reading level in English as poor, 5 (25%) as fair, 6 (30%) as functional, 2 (10 %) as good reading, 2 (10%) as very good and 3 (15%) as excellent. There were no responses that indicated a very poor reading level.

The sixteenth question was: “what is your level of writing in English?” Table 20 shows the collected responses for question 23:

Table 20 - English writing level

ENGLISH WRITING LEVEL	PARTICIPANTS
Very poor	1 (5%)

Poor	5 (25%)
Fair	5 (25%)
Functional	2 (10%)
Good	2 (10%)
Very good	3 (15%)
Excellent	2 (10%)

Source: own authorship
P = 20
P = number of participants

Table 20 shows that out of the 20 participants, 1 (5%) has a very poor level of writing in English, 5 (25%) have a poor level of writing, 5 (25%) have a fair level of writing, 2 (10%) have a functional writing level, 2 (10%) have a good writing level, 3 (15%) have a very good writing level and 2 (10%) have an excellent writing level.

The seventeenth question was: “what is your level of listening comprehension in English?” Table 21 shows the collected responses for question 17:

Table 21 - English listening comprehension level

ENGLISH LISTENING COMPREHENSION LEVEL	PARTICIPANTS
Very poor	1 (5%)
Poor	3 (15%)
Fair	4 (20%)
Functional	4 (20%)
Good	4 (20%)
Very good	2 (10%)
Excellent	2 (10%)

Source: own authorship
P = 20
P = number of participants

Table 21 shows that out of the 20 participants, 1 (5%) has a very poor level of listening comprehension in English, 3 (15%) have a poor level of listening comprehension, 4 (20%) have a fair level of listening comprehension, 4 (20%) have a functional listening comprehension level, 4 (20%) have a good listening comprehension level, 2 (10%) have a very good listening comprehension level and 2 (10%) have an excellent level of listening comprehension.

The eighteenth question was: “what is your level of oral production in English?” Table 22 shows the collected responses for question 18:

Table 22 - Level of oral production in English

LEVEL OF ORAL PRODUCTION IN ENGLISH	PARTICIPANTS
Very poor	1 (5%)
Poor	6 (30%)
Fair	4 (20%)
Functional	2 (10%)
Good	1 (5%)
Very good	4 (20%)
Excellent	2 (10%)

Source: own authorship

P = 20

P = number of participants

Table 22 shows that out of the 20 participants, 1 (5%) has a very poor level of oral production in English, 6 (30%) have a poor level of oral production, 4 (20%) have a fair level of oral production, 2 (10%) have a functional level of oral production, 1 (5%) have a good level of oral production, 4 (20%) have a very good level of oral production and 2 (10%) have an excellent level of oral production.

It is relevant to note that I decided to apply the receptive vocabulary test in the present study, because participants were requested to use their reading comprehension ability only, in order to answer the two tasks of this research (a language decision task and a translation task). There was no need to produce oral or written English in this vocabulary test. For

additional information on this test, subsection 3.4.3 can be read. Next, I present the results regarding the vocabulary test.

4.1.2 Vocabulary test

An English vocabulary knowledge test was applied, which contained 150 items. The results from the vocabulary test are shown in table 23:

Table 23 - Participants' proficiency

MEASURES	PROFICIENCY (%)
Mean (Standard deviation)	56.25 (24.33)
Median	53
Minimum	21
Maximum	99

Source: own authorship

P = 20

P = number of participants

Table 23 shows that the participants' mean proficiency was 56.25%, with a standard deviation of 24.33% and the median was 53%. The lowest proficiency among participants was 21% and the highest proficiency was 99%.

The next section presents the first experiment, a language decision task.

4.2 Experiment 1 – language decision task

As presented in the subsection 3.5.1.1, experiment 1 is a language decision task, in which participants indicated which language the lexical item belonged to: whether it was part of their native language, Brazilian Portuguese (L1), or it was part of their non-native language, English (L2). For this first experiment, two hundred and fifty (250) words were used in total. Out of these words, fifty (50) words were false cognates. Twenty-five (25) words were in Portuguese and twenty-five (25) English words. Additionally, two hundred (200) control words were used in the experiment, out of which one hundred (100) control words were in Portuguese (PCW) and one hundred (100) were control words in English (ECW). The stimuli list for this experiment was constituted in a balanced way, by using only verbs and nouns. This task was divided into three blocks, divided as follows: block 1 (85 items: 67 controls and 18 false

cognates), block 2 (83 items: 67 controls and 16 false cognates) and block 3 (82 items: 66 controls and 16 false cognates). Experiment 1 aims at answering the first research question: do false cognates demand greater processing cost than control words in a language decision task? To this end, hypothesis 1 (H1) was raised: the processing cost is greater for false cognates compared to control words in Brazilian Portuguese (L1) and in English (L2) in a language decision task. The studies from Otwinowska and Szewczyk (2019) and Otwinowska, Forys-Nogala, Kobosko and Szewczyk (2020) indicate more errors in false cognates than in control words. Furthermore, Brenders, Van Hell and Dijkstra (2011) identified that processing cost was consistently greater for false cognates relative to control words.

Next, I present the descriptive statistics analysis of the first dependent variable of this experiment.

4.2.1 Analysis – descriptive statistics

To compile data from the 20 participants in this research, I used the free software Psytoolkit (Stoet, 2010, 2017). After obtaining this data, the software showed a text file with the data of each participant, containing information about accuracy, reaction time and stimuli used in this research. The data were exported and organized into a spreadsheet in Excel format and were later processed by RStudio software, showing tables and graphs, with the organized data that are part of this analysis. Next, I present the descriptive and inferential statistics analyzes of experiment 1 – Language decision task.

4.2.1.1 Analysis – variable: accuracy

In this subsection, I present the data analysis and results from the first experiment, the language decision task, which I previously described in detail in the methodology chapter. Status can be accuracy, non-accuracy and not responded. Table 24 shows the general status results from experiment 1:

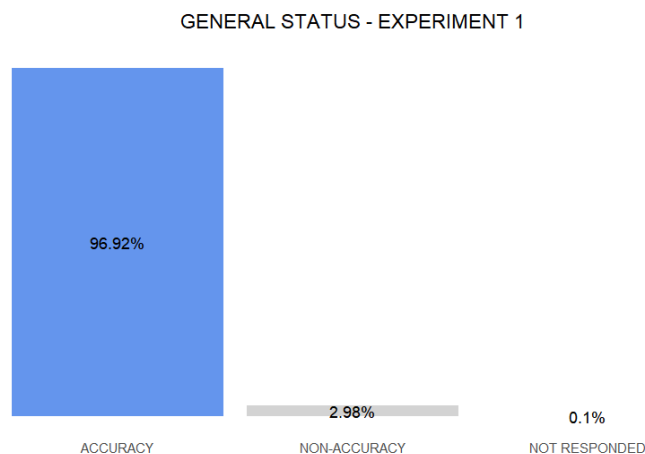
Table 24 - General status – experiment 1

STATUS	ACCURACY	NON-ACCURACY	NOT RESPONDED	TOTAL
Items	4846 (96.92%)	149 (2.98%)	5 (0.10%)	5000 (100%)

Source: own authorship

The 20 participants who took part in experiment 1 had access to 250 trials each one. As seen in table 27, 5000 lines (from Psytoolkit) were generated, one for each trial. The “Status” reference showed in RStudio software (1 – correct answers, 2 – incorrect answers and 3 – unanswered items), it was possible to know the number of correct answers, (represented by ACCURACY), errors (represented by NON-ACCURACY), and trials that exceeded the 3-second time limit for a possible answer (represented by NOT RESPONDED). Considering the total of 5000 lines, 4846 (96.92%) were correct, 149 (2.98%) were errors and 5 (0.10%) had to be removed from the analysis because participants did not respond within the time limit established for the task – 3000ms, which resulted in 4995 trials to be analyzed. Graph 1 provides the data concerning the general status of experiment 1:

Graph 1 - General status – experiment 1



Source: own authorship

Graph 1 shows that accuracy of experiment 1 was greater than non-accuracy, corroborating the percentage rates shown in table 27, which indicate 96.92% accuracy and 2.98% non-accuracy. Only 0.1% of items were not responded.

Considering only the responded items, table 25 presents accuracy and non-accuracy:

Table 25 - Status of responded items – experiment 1

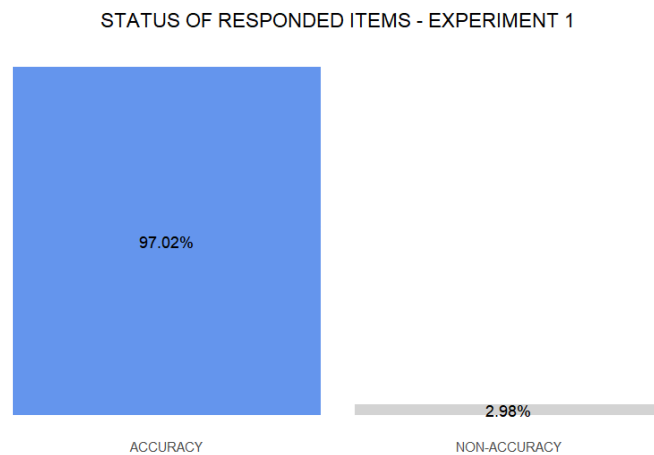
STATUS	ACCURACY	NON-ACCURACY	TOTAL
Items	4846 (97.02%)	149 (2.98%)	4995 (100%)

Source: own authorship

Considering only the responded items, after removing items that were responded after the time limit of 3000ms, the items responded correctly (represented by ACCURACY) were 4846 (97.02%), the items responded incorrectly (represented by NON-ACCURACY) were 149 (2.98%). The total number of items after the exclusion of the items that were not responded within the time limit was 4995 (100%). It is apparent that accuracy achieved a higher percentage considering the responded items.

Next, I present graph 2, which provides the data regarding the status of responded items of experiment 1:

Graph 2 - Status of responded items – experiment 1



Source: own authorship

Graph 2 shows that accuracy of experiment 1, concerning only responded items, was greater than non-accuracy, corroborating the percentages shown in table 25, which indicate 97.02% accuracy and 2.98% non-accuracy. Accuracy was also analyzed by condition, considering the experiment had false cognates and control words, as seen in table 26:

Table 26 - Status versus condition – experiment 1

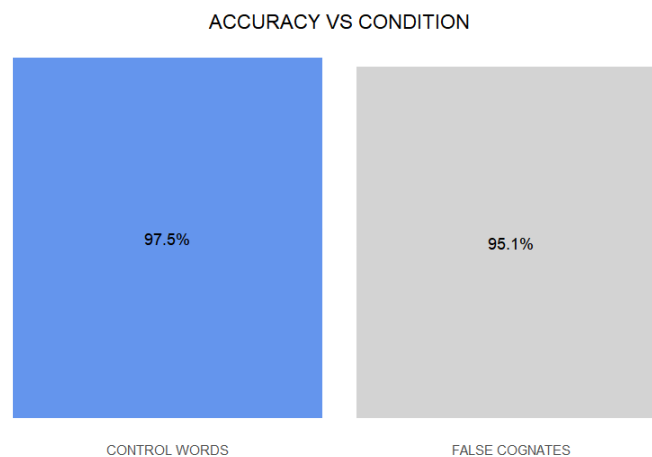
CONDITION	ACCURACY	NON-ACCURACY	TOTAL
False cognates	950 (95.10%)	49 (4.9%)	999 (100%)
Control words	3896 (97.50%)	100 (2.5%)	3996 (100%)

Source: own authorship

Table 26 shows that from the total responded items of 4995 (100%), 999 (20%) were false cognates and 3996 (80%) were control words. Out of the total of 999 false cognates (100%), 950 (95.10%) were responded correctly (represented by ACCURACY) and 49 (4.9%) were responded incorrectly (represented by NON- ACCURACY). Observing the control word condition, it is verified that from the total of 3996 items, 3986 (97.50%) were responded correctly (represented by ACCURACY) and 100 (2.5%) were responded incorrectly (represented by NON-ACCURACY). When observing table 29 carefully, the number of correct answers is higher than the number of errors considering the two conditions presented, thus indicating that accuracy data also showed that there were no major differences between the conditions.

Next, I present graph 3, which depicts the data of experiment 1 dealing specifically with accuracy versus condition:

Graph 3 - Accuracy versus condition – experiment 1



Source: own authorship

Observing the data in graph 3, we found that the percentage of correct answers was greater in both conditions, when compared to errors. Therefore, there is a possibility that there will be no effect of type of word about the analyzed variable. This data corroborates the percentages shown in table 26, which indicate 97.5% accuracy for control words and 95.1% accuracy for false cognates.

Next, I present table 27, which shows the results regarding status versus language (English vs Portuguese) of the responded items.

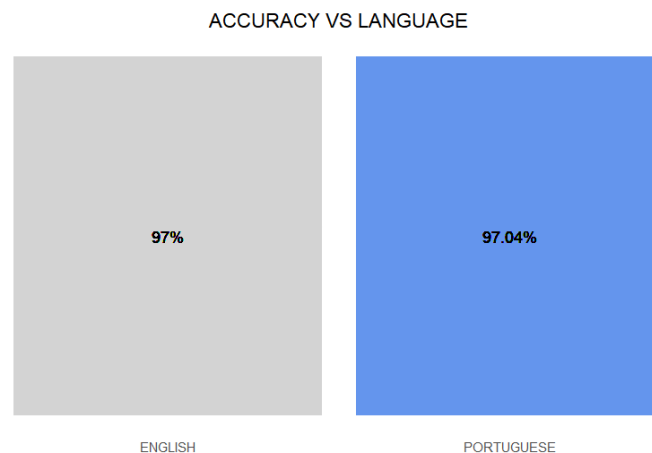
Table 27 - Status versus language – experiment 1

LANGUAGE	ACCURACY	NON-ACCURACY	TOTAL
English	2423 (97%)	75 (3%)	2498 (100%)
Portuguese	2423 (97.04%)	74 (2.96%)	2497 (100%)

Source: own authorship

Considering the total items presented in table 27, after removing items that were responded after the time limit of 3000ms, 2423 (97%) English items were answered correctly (ACCURACY) and 75 (3%) English items were answered incorrectly (NON-ACCURACY). Regarding Portuguese language, 2423 (97.04%) items were answered correctly (ACCURACY) and 74 (2.96%) items were responded incorrectly (NON-ACCURACY). We can observe that there were no major differences regarding accuracy for both languages. Next, I present graph 4, which presents the data of experiment 1 dealing specifically with accuracy versus language:

Graph 4 - Accuracy versus language – experiment 1



Source: own authorship

Observing the data in graph 4, it is possible to see that the percentage of correct answers was similar and greater in both languages, when compared to errors (as seen in table 27). Thus, there is a possibility that there will be no effect of type of language about the analyzed variable. This data corroborates the percentages shown in table 27, which indicate 97% accuracy for English language and 97.04% accuracy for Portuguese language.

Next, in table 28, I present the data comparing accuracy for the following four predetermined conditions: English false cognates (EFC), Brazilian Portuguese false cognates (PFC), English control words (ECW) and Brazilian Portuguese control words (PCW).

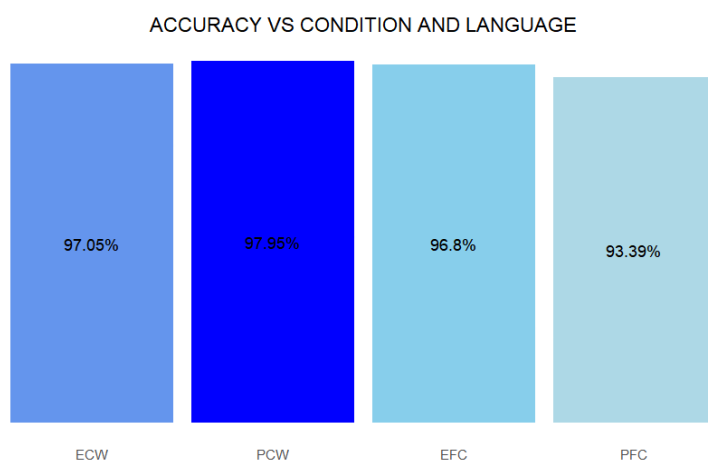
Table 28 - Status versus condition and language – experiment 1

CONDITION	ACCURACY	NON-ACCURACY	TOTAL
English false cognates	484 (96.80%)	16 (3.20%)	500 (100%)
Portuguese false cognates	466 (93.39%)	33 (6.61%)	499 (100%)
English control words	1.939 (97.05%)	59 (2.95%)	1.998 (100%)
Portuguese control words	1.957 (97.95%)	41 (2.05%)	1.998 (100%)

Source: own authorship

When examining table 28, it is observed that the number of correct answers (represented by ACCURACY) is higher than the number of errors (NON-ACCURACY). Additionally, the data reveals that out of the four predetermined conditions, accuracy had the highest percentage in the control group for Portuguese (PCW), followed by the control group for English (ECW). The proportion also provides information that accuracy was greater for control words, the PCW and ECW conditions, in comparison to false cognate words (EFC and PFC conditions). Graph 5, which presents accuracy versus language and condition, provides objective information of the results for this dependent variable.

Graph 5 - Accuracy versus condition and language – experiment 1



Source: own authorship

Observing graph 5, it is possible to state that there are no major differences regarding accuracy for the four different conditions. The control group for Portuguese (PCW) had the highest accuracy percentage (97.95%), followed by the control group for English

(ECW) with the percentage of 97.05%. The English false cognate group (EFC) had a lower accuracy percentage (96.8%) compared to the control groups. The Portuguese false cognate group (PFC) obtained the lowest accuracy percentage (93.39%) compared to the other remaining three conditions, with the highest percentage of errors within the four groups (6.61%).

4.2.1.2 Analysis – variable: reaction time

Continuing the analysis of the items from experiment 1, in this subsection I carried out the analysis of the dependent variable reaction time (RT), which was our second response variable. It was considered only correct answers. Therefore, I present the data analysis and results from the first experiment, the language decision task, which I previously described in detail in the methodology chapter in this research. Next, I present table 29, which shows the data of experiment 1 dealing with the general reaction time (RT), considering the total responded items of 4995.1

Table 29 - General reaction time (in ms) – experiment 1

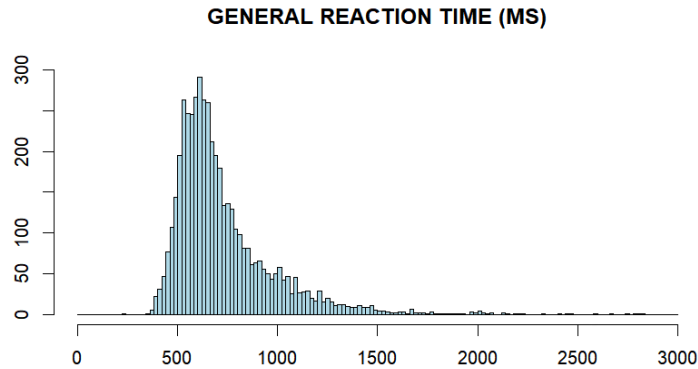
ITEMS	MEAN (SD)	MEDIAN	MINUMUM	MAXIMUM
	736 (274)	658	235	2831

Source: own authorship

Observing table 29, we can see that the mean RT was 736ms (274), the median was also 658ms, followed by the minimum of 235ms and the maximum of 2831ms.

A histogram is an important tool for visualizing data, identifying patterns, trends and outliers in a clear and concise way. To this end, it is possible to observe the distribution of reaction time in graph 6.

Graph 6 - Histogram of reaction time – experiment 1



Source: own authorship

According to graph 6, most responses were within the range between 500ms and 1000ms and few responses occurred after 1500ms. This distribution shows that this variation of data concentrates most participants' responses within a delimited range, however this type of data is expected regarding reaction time. Additionally, the information provided also shows that there was a balance between the participants and the items, as only a few responses occurred outside the group's mean responses. It is important to observe that this distribution considers all data regarding reaction time, so, the distribution by experimental condition will further be discussed, as well as the analysis considering the languages involved in this research.

Additional analysis was also carried out regarding two distinct conditions: False cognates and Control words. Table 30 presents the analysis considering reaction time for these two conditions.

Table 30 - Reaction time versus condition – experiment 1

CONDITION	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
False cognates	775 (291)	695	395	2809
Control words	726 (268)	649	235	2831

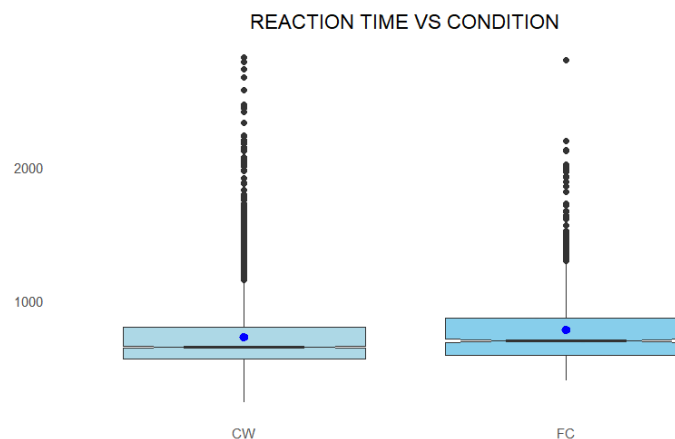
Source: own authorship

Observing table 30, it is apparent that there were probably no major differences regarding reaction time variation in the two conditions. Additionally, we can see that the RT mean for false cognate condition was 775ms (274), the median was also 695ms, followed by the minimum of 395ms and the maximum of 2809ms. Regarding the control word condition,

the mean was 726 (268), the median was also 649ms, followed by the minimum of 235ms and the maximum of 2831ms. It is important to note that despite the similar mean and median in both conditions, there are slightly visible differences in the results of minimum and maximum standard measures. Next, to complement our analysis, I compared the descriptive statistics data on table 30 with a boxplot (Graph 7).

A boxplot is a graphical resource generally used in scientific research to summarize and analyze quantitative data. It presents measures of non-parametric central tendency (median), dispersion (quartiles), distribution shape or sample symmetry (minimum and maximum point values), atypical values (outliers) and extremes. Neto *et al.* (2017) explained that a boxplot is an improved graphical resource that performs exploratory and inferential data analysis and can also improve the interpretation of data, detect outliers and compare sample groups. Through Graph 7 it is possible to visualize the distribution of data regarding reaction time per condition, control words (CW) and false cognates (FC), considering both languages.

Graph 7 - Boxplot - Reaction time versus condition – experiment 1



Source: own authorship

According to Graph 7, it is apparent that there may not be significant reaction time variation between the two conditions. Interestingly, when examining the median, which is represented by a line in the center of the boxplot, it appears that there is no significant difference between conditions, as the line is almost in the same place for both conditions. Observing graph 7, we can also identify patterns or trends, such as outliers, which are easily identified in the boxplot. Considering this, outliers appeared in greater number when the items were control words. It was expected that the false cognate condition would have a higher processing cost, due to the co-activation of the two languages (English – Portuguese) involved in the experiment,

however, what is observed is a similarity between the boxplots for each condition, therefore, it is important to confirm this similarity by previously observing the descriptive statistics data in table 30.

I also carried out additional analysis comparing reaction time for the two languages involved in this research: English (L1) and Portuguese (L2). Table 31 presents the descriptive statistics considering reaction time for these two languages.

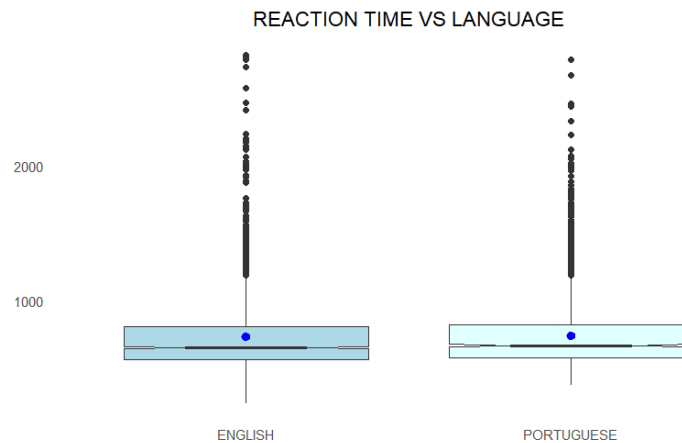
Table 31 - Reaction time versus language – experiment 1

LANGUAGE	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
English	733 (286)	649	235	2831
Portuguese	738 (261)	666	371	2798

Source: own authorship

When comparing the results of the reaction time analysis between the false cognates and control words conditions to the results obtained through the analysis of the reaction time between languages, it is possible to see that the same pattern, as reaction time versus condition (table 30) was obtained. Considering this, it is clear by analyzing the data in table 31, that the mean for reaction time on both conditions remained very similar, followed by the median for both conditions, whose results were the same as the mean. However, when observing the data from the minimum and maximum measurements, we noticed that there was a slight difference between the two conditions. For the condition “English”, the minimum of 235ms and the maximum of 2831ms. For the condition “Portuguese”, the minimum of 371ms and the maximum of 2798ms. Through Graph 8, it is possible to visualize the distribution of data regarding reaction time versus language.

Graph 8 - Boxplot - Reaction time versus language – experiment 1



Source: own authorship

According to graph 8, we can also observe that there seems to be no reaction time variation between the English and Portuguese conditions. The English condition group had a small reaction time difference (733ms) compared to the Portuguese group condition (738ms). The data regarding the median, minimum and maximum are very similar, thus denoting the possibility that there may be no effect of the analyzed variable considering the type of language. The outliers, the dots that are shown above the boxes and that represent the attempts of participants whose answers were distant from the mean of all participants, are also similar in both conditions presented.

Continuing the reaction time analysis of experiment 1, table 32 shows the analysis that was carried out with more specific information regarding the reaction time according to all the four predetermined conditions and languages analyzed in the experiment.

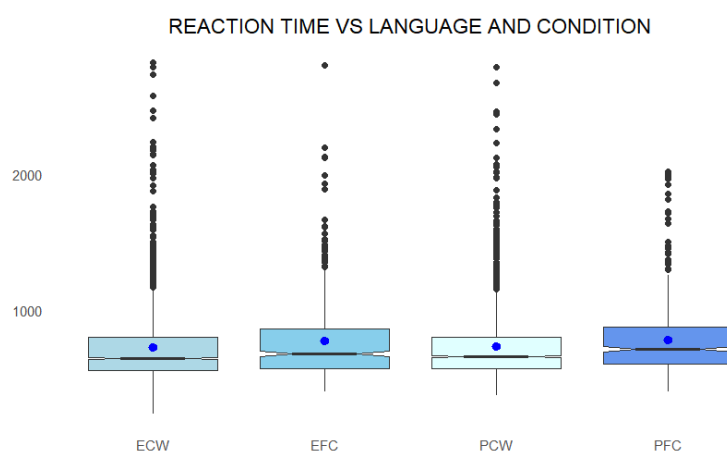
Table 32 - Reaction time (RT) versus condition and language – experiment 1

CONDITION AND LANGUAGE	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
False cognate English	771 (306)	674	396	2809
False cognate Portuguese	781 (275)	709	395	2023
Control word English	724 (280)	643	235	2831
Control word portuguese	728 (257)	657	371	2798

Source: own authorship

Based on the results presented in table 32, which shows the data generated by RStudio software, it is possible to highlight that the control word English condition (ECW) had the lowest reaction time mean compared to the other conditions; that is, 724ms, compared to the mean RT of the control word Portuguese (PCW) – 728ms, followed by the false cognate English condition – 771ms and the false cognate Portuguese condition – 781ms. Thus, it can be observed that the false cognate conditions (EFC and PFC) were processed a little slower than the control conditions, generating a slight difference regarding reaction time, and even though the reaction time between the two conditions (controls and false cognates) is very short. To complement our analysis, I compared table 32 with a boxplot (Graph 9).

Graph 9 - Boxplot - Reaction time versus language and condition – experiment 1



Source: own authorship

By observing graph 9, it is apparent, when examining the line in the center of the boxes (the median), that the difference concerning the variable reaction time for the four conditions, is not expressive, as the line is almost in the same place for all the four different conditions. The same for the representation of the blue dot, that represents the participants' mean, which is very similar in the four conditions. Therefore, we understand that we cannot see a large difference regarding all the four conditions when comparing reaction time among them. Visually, the condition which had the lowest number of outliers was the false cognate Portuguese group (PFC), which means that in this condition, there were less responses out of the participants' mean.

In the next subsection, I will continue the presentation of the results through inferential statistics in order to check if the difference in conditions of the data is significant or not.

4.2.2 Inferential statistics

In order to answer the first and second questions of this research, after a descriptive analysis of the accuracy results of experiment 1, I verified whether the status differences between the control words and false cognates were significantly different or not. To do this, I performed statistical analysis using a Generalized Linear Mixed Model, with item conditions as a fixed effect and participants and items as random effects. We used the following formula: `glmer(STATUS ~ CONDITION + LANGUAGE + (1 | PARTICIPANT) + (1 | ITEM), data = d1, family = binomial)` and the results are presented in table 33:

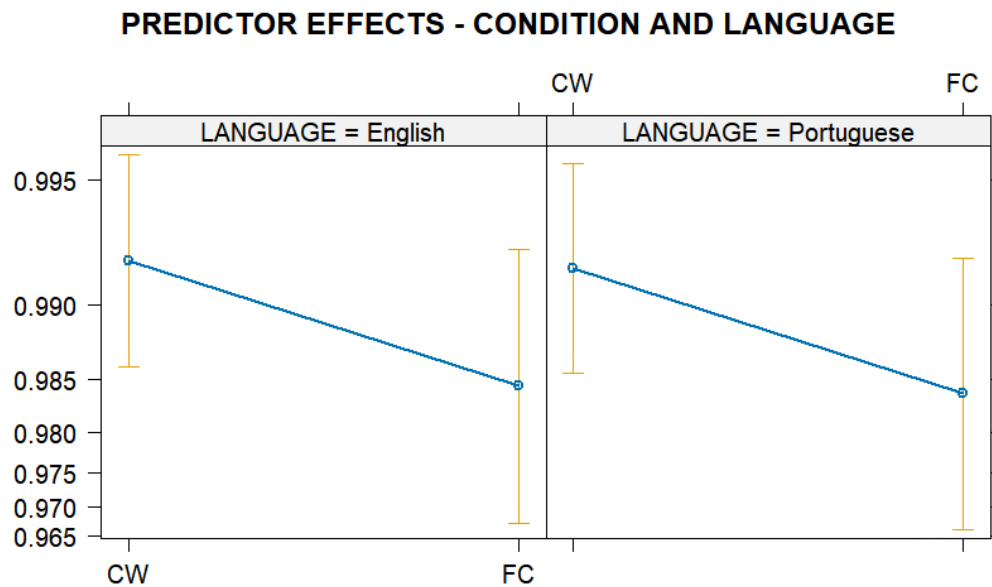
Table 33 - Status – experiment 1

<i>Predictors</i>	STATUS		
	<i>Odds Ratios</i>	<i>CI</i>	<i>p</i>
(Intercept)	127.08	70.65 – 228.59	<0.001
CONDITION [FC]	0.50	0.25 – 1.00	0.049
LANGUAGE [Portuguese]	0.96	0.53 – 1.73	0.885
Random Effects			
σ^2	3.29		
τ_{00} ITEM	2.37		
τ_{00} PARTICIPANT	0.20		
ICC	0.44		
N PARTICIPANT	20		
N ITEM	250		
Observations	4995		
Marginal R^2 / Conditional R^2	0.013 / 0.445		

Source: own authorship

To do the analysis in table 33, the false control words in English were the intercept, whose accuracy prediction was 4.84 (log-odds), varying between 4.26 and 5.43 within the 95% confidence interval. Thus, table 33 shows that there is a significant difference between the accuracy of control words and false cognates ($p < 0.05$), showing greater accuracy for control words. The language didn't interfere with results in a significant way. Random effects show a variance of 2.37 per item and 0.20 per participant. Graph 10 shows the predicted status effects:

Graph 10 - Predicted status effects per item condition – experiment 1



Source: own authorship

Graph 10 shows that the accuracy prediction was higher for control words, which was above 99%, both in English and in Portuguese. On the other hand, the lowest accuracy prediction was for false cognates, with values of approximately 98%, both in English and in Portuguese.

We also checked whether the reaction time differences between control words and false cognates were significantly different, in both languages. We performed statistical analysis using a Linear Mixed Model, with conditions as fixed effects and participants and items as random effects. We use the following formula: $\text{lmer}(\text{TEMPO} \sim \text{CONDITION} + \text{LANGUAGE} + (1 | \text{PARTICIPANT}) + (1 | \text{ITEM}), \text{data} = \text{d1})$ and the results are presented in table 34:

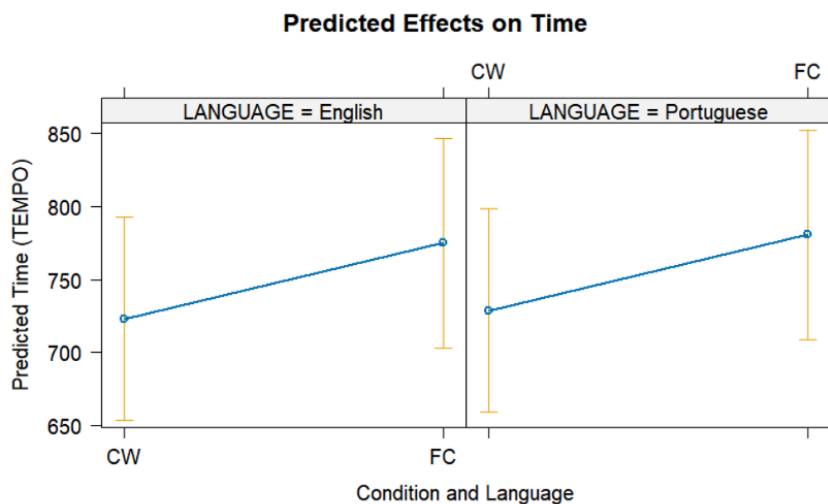
Table 34 - Reaction time – experiment 1

TEMPO			
<i>Predictors</i>	<i>Estimates</i>	<i>CI</i>	<i>p</i>
(Intercept)	723.08	653.46 – 792.70	<0.001
CONDITION [FC]	51.88	29.17 – 74.60	<0.001
LANGUAGE [Portuguese]	5.57	-12.51 – 23.66	0.546
Random Effects			
σ^2	48926.74		
τ_{00} ITEM	2776.24		
τ_{00} PARTICIPANT	24262.47		
ICC	0.36		
$N_{PARTICIPANT}$	20		
N_{ITEM}	250		
Observations	4846		
Marginal R^2 / Conditional R^2	0.006 / 0.360		

Source: own authorship

As seen in table 34, the control words in English were the intercept, whose predicted reaction time was 723.08 ms, varying between 653.46 ms and 792.70 ms, within the 95% confidence interval. Thus, table 34 shows that there is a significant difference between the reaction time of control words and false cognates ($p < 0.05$). The language didn't interfere in a significant way. The random effects show a variance of 2776.24 ms per item and 24262.47 ms per participant. Graph 11 shows the predicted reaction time effects:

Graph 11 - Predicted reaction time effects – experiment 1



Source: own authorship

Graph 11 shows that the highest reaction time prediction occurred for the false cognate condition, with a record above 750 milliseconds, in both languages. The lowest reaction time prediction happened for the control word condition, with a record above 700 milliseconds, in both languages. Additionally, we observe the model prediction for the change in reaction time relative to the condition of the type of word, false cognates or control words, indicating that there was significant effect of word type on the predictor variable Reaction Time.

4.3 Experiment 2 – translation task

As I presented in subsection 3.5.1.2, experiment 2 is a translation task, in which participants should indicate the translation of the lexical item presented in the center of the computer screen. To do this, participants should press the “A”, “G” or “L” keys according to their option of choice. For this second experiment, participants were asked to translate fifty (50) words in total, from L1 to L2. From the total of 50 items, twenty-five (25) words were false cognates and twenty-five (25) were control words. We controlled the grammatical class for all the items. Thus, there were twenty-five (25) nouns and twenty-five (25) verbs. Among false cognate words, there were thirteen (13) nouns and twelve (12) verbs. Considering control words, there were twelve (12) nouns and thirteen (13) verbs. Two questions guided experiment 2. The first question was: how is the processing cost for false cognates and controls in a translation task? To this end, hypothesis 1 (H1) was raised: the processing cost of false cognates is greater than the processing cost of control words in a translation task. The studies from Otwinowska and Szewczyk (2019) and Otwinowska, Forys-Nogala, Kobosko and Szewczyk (2020) indicate more errors in false cognates than in control words. Additionally, Brenders, Van Hell and Dijkstra (2011) identified that processing cost was consistently greater for false cognates than for control words. According to Otwinowska and Szewczyk (2019), in their study, they conclude that false cognates were known worse compared to control words. Thus, the authors stated that false cognates had a significantly smaller chance of being correctly translated. Additionally, supporting the second hypothesis of the present study, Brenders, Van Hell and Dijkstra (2011) identified that processing cost was consistently greater for false cognates than for control words.

For the second research question: are there false cognate repetition priming effects in a translation task? For this question, a second hypothesis was raised (H2): there are not false

cognate repetition priming effects in a translation task. Gadelha and Toassi (2021) concluded that there was no repetition priming effect for interlingual homographs in their study, but there was a repetition priming effect only, for the “old” non-homographs control words. Gadelha and Toassi (2021)’s study also provides a theoretical basis for the present study, since it sheds light on interlingual homographs processing, using repetition priming paradigm.

Next, I present the descriptive statistics analysis of the first dependent variable of this experiment: Accuracy.

4.3.1 Descriptive statistics

To compile data from the 20 participants in this research, I used the free software Psytoolkit (Stoet, 2010, 2017). After obtaining this data, the software showed a text file with the data of each participant, containing information about accuracy, reaction time and stimuli used in this research. The data were exported and organized into a spreadsheet in Excel format and were later processed by the RStudio software the same way as happened in experiment 1. Next, I present the descriptive and inferential statistics analyzes of experiment 2 – Translation task.

4.3.1.1 Analysis – variable: accuracy

In this subsection, I present the data analysis and results from the second experiment, a translation task, which I previously described in detail in the methodology chapter. Table 35 shows the general status results from experiment 2:

Table 35 - General status – experiment 2

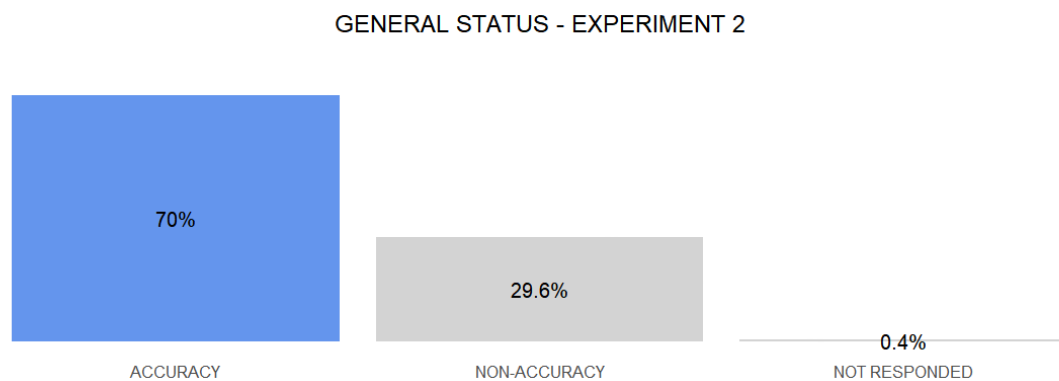
STATUS	ACCURACY	NON-ACCURACY	NOT RESPONDED	TOTAL
Items	700 (70%)	296 (29.60 %)	4 (0.40%)	1000 (100%)

Source: own authorship

The 20 participants who took part in experiment 2 had access to 50 trials each one. As seen in table 35, 1000 lines were generated, one for each trial. Through the “Status” reference obtained through RStudio software (1 – correct answers, 2 – incorrect answers and 3 – unanswered items), it was possible to know the number of correct answers, (represented by ACCURACY), errors (represented by NON-ACCURACY), and trials that exceeded the 10-

second time limit for a possible answer (represented by NOT RESPONDED). Considering the total of 1000 lines, 700 (70%) were answered correctly, 296 (29.60%) were answered incorrectly and 4 (0.40%) had to be removed from the analysis because participants did not respond within the time limit established for the task – 10000ms, which resulted in 996 lines to be analyzed. Graph 12 provides the data concerning the general status of experiment 2:

Graph 12 - General status – experiment 2



Source: own authorship

Graph 12 shows that accuracy of experiment 2 was greater than non-accuracy, corroborating the percentages shown in table 35, which indicate 70% accuracy and 29.6% non-accuracy. Only 0.4% of items were not responded.

Considering only the responded items, table 36 presents accuracy and non-accuracy:

Table 36 - Status of responded items – experiment 2

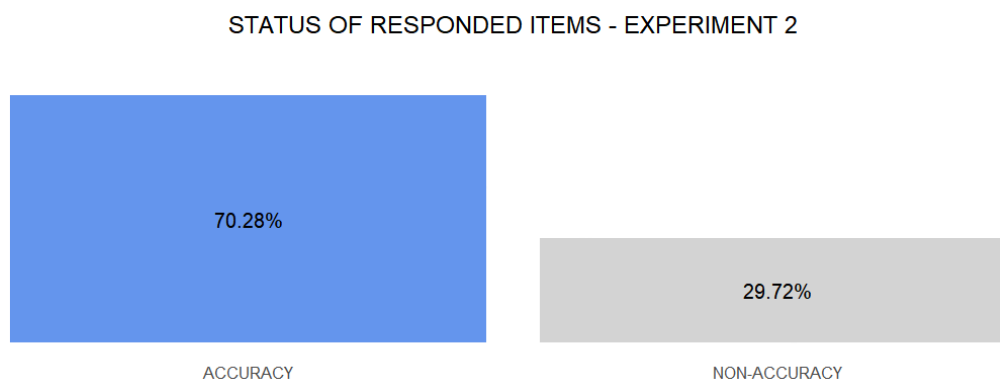
STATUS	ACCURACY	NON-ACCURACY	TOTAL
Items	700 (70.28%)	296 (29.72%)	996 (100%)

Source: own authorship

Considering only the responded items, after removing items that were responded after the time limit of 10000ms, the items responded correctly (represented by ACCURACY) were 700 (70.28%), the items responded incorrectly (represented by NON-ACCURACY) were 296 (29.72%). The total number of items after the exclusion of the items that were not responded within the time limit (10000ms) was 996 (100%). It is apparent that accuracy achieved a higher percentage in responses.

Next, I present graph 13, which provides the data regarding the status of responded items of experiment 2:

Graph 13 - Status of responded items – experiment 2



Source: own authorship

Graph 13 shows that accuracy of experiment 2, concerning only responded items, was greater than non-accuracy, corroborating the percentage rates shown in table 36, which indicate 70.28% accuracy and 29.72% non-accuracy. Accuracy was also analyzed by condition, considering the experiment had false cognates and control words, as seen in table 37:

Table 37 - Status of responded items versus condition – experiment 2

CONDITION	ACCURACY	NON-ACCURACY	TOTAL
False cognates	270 (54.11%)	229 (45.89%)	499 (100%)
Control words	430 (86.52%)	67 (13.48%)	497 (100%)

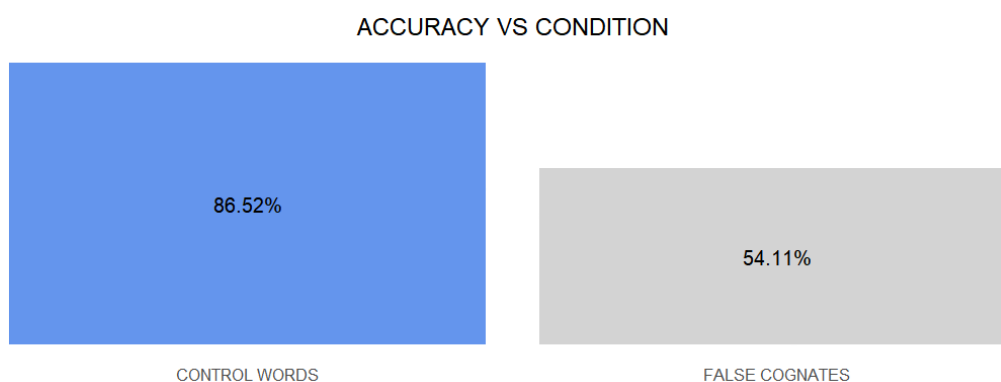
Source: own authorship

Table 37 shows that from the total responded items of 996 (100%), 499 were false cognates and 497 were control words. Out of the total of 499 false cognates (100%), 270 (54.11%) were responded correctly (represented by ACCURACY) and 229 (45.89%) were responded incorrectly (represented by NON- ACCURACY). Observing the control word condition, it is verified that from the total of 497 items, 430 (86.52%) were responded correctly (represented by ACCURACY) and 67 (13.48%) were responded incorrectly (represented by NON-ACCURACY). When observing table 37 carefully, the number of correct answers is higher than the number of errors considering the two conditions presented, however it is indicated that accuracy data also showed that there were important differences between the two

conditions when comparing to incorrect answers. The percentage of errors in both conditions appears to be significant. Further, I ran an inferential statistics analysis, that can be checked in subsection 4.3.2, to verify if these results were significant or not.

Next, I present graph 14, which depicts the data of experiment 2 dealing specifically with accuracy versus condition:

Graph 14 - Accuracy versus condition – experiment 2



Source: own authorship

Observing the data in graph 14, we found that the percentage of correct answers was greater in both conditions. However, the percentage of correct answers for the false cognate group also indicates a significant number of errors, higher than the percentage of errors for the control word group. By looking at graph 13, we can predict a high error percentage for both conditions. Therefore, an inferential statistical analysis must be applied to verify the trends presented in the descriptive statistics, as well as to evaluate the effect that may appear from the type of word. This data corroborates the percentage rates shown in table 37, which indicate 86.52% accuracy for control words and 54.11% accuracy for false cognates.

As I controlled the parts of speech of the stimuli in this experiment, only verbs and nouns were used in this research, in a balanced way, as mentioned in subsection 3.5.1.2 of the present study. Although the parts of speech (verbs and nouns) of the stimuli were not in my research questions, I understand the analysis as relevant, since the items selected for this experiment are specifically verbs and nouns. Additionally, I present the descriptive statistics analysis considering these two specific conditions. Next, I present table 38, which shows the results regarding status versus parts of speech (verb vs noun) of the responded items.

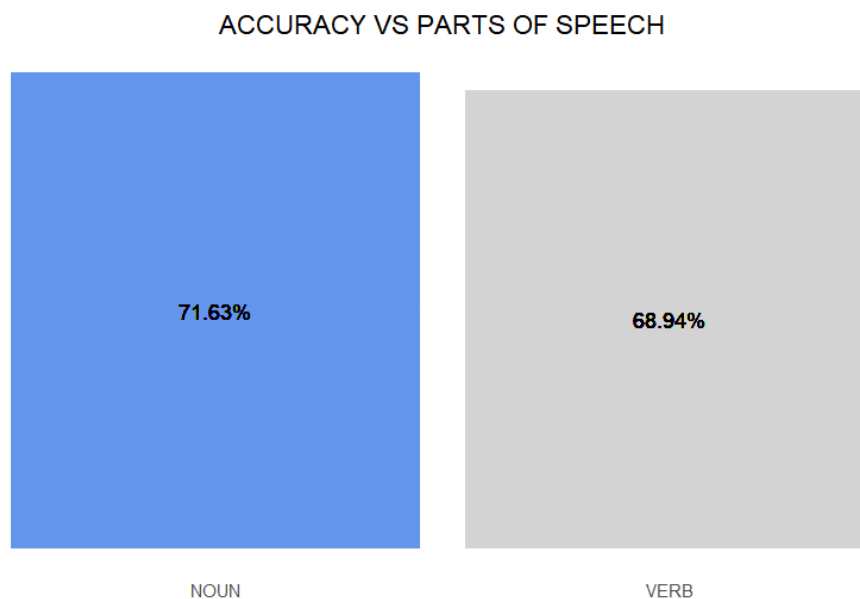
Table 38 - Status versus parts of speech – experiment 2

PARTS OF SPEECH	ACCURACY	NON-ACCURACY	TOTAL
Verb	344 (68.94%)	155 (31.06%)	499 (100%)
Noun	356 (71.63%)	141 (28.37%)	497 (100%)

Source: own authorship

Considering the total items presented in table 38, after removing items that were responded after the time limit of 10000ms, 344 items from the condition group “verb” were answered correctly (ACCURACY) and 155 items from the condition group “verb” were answered incorrectly (NON-ACCURACY). Regarding the condition group “noun”, 356 items were answered correctly (ACCURACY), and 141 items were responded incorrectly (NON-ACCURACY). We can observe by looking at the proportion in table 38, that the highest accuracy percentage was found in the condition group “noun” (71.63%), followed by the accuracy percentage of 68.94% in the condition group “verb”. The total number of items analyzed for the “verb” group was 499 (100%) and the total number of items analyzed for the “noun” group was 497 (100%). To complement our analysis, graph 15 illustrates the descriptive analysis presented in table 38.

Graph 15 - Accuracy versus parts of speech – experiment 2



Source: own authorship

Observing the data in graph 15, we found that the percentage of correct answers was greater in both conditions. However, the percentage of items responded incorrectly may show that there are differences in the results. An inferential statistical analysis must be applied to verify the trends presented in the descriptive statistics, to see if the differences in accuracy between conditions were significant. The data presented in graph 15 corroborates the percentage rates shown in table 38, which indicate 71.63% accuracy for the “noun” group and 68.94% accuracy for the “verb” group.

Next, in table 39, I present the data comparing accuracy for the following four predetermined conditions: Verb false cognates (VFC), Noun false cognates (NFC), Verb control words (VCW) and Noun control words (NCW).

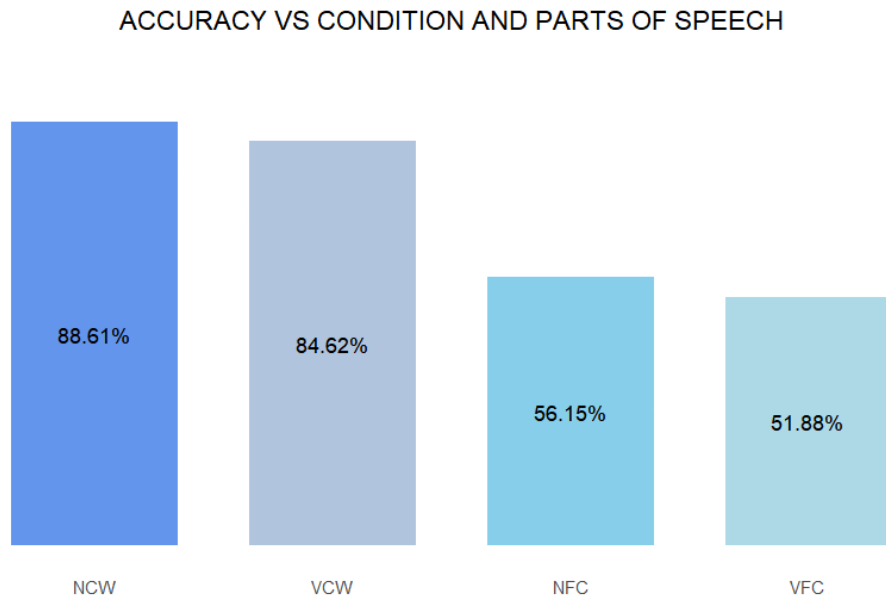
Table 39 - Status versus condition and parts of speech – experiment 2

CONDITION AND GRAMMAR CLASS	ACCURACY	NON-ACCURACY	TOTAL
False cognate Verb	124 (51.88%)	115 (48.12%)	239 (100%)
False cognate Noun	146 (56.15%)	114 (43.85%)	260 (100%)
Control word Verb	220 (84.62%)	40 (15.38%)	260 (100%)
Control word Noun	210 (88.61%)	27 (11.39%)	237 (100%)

Source: own authorship

Based on the results presented in table 39, it is possible to highlight that the Noun control words condition (NCW) had the highest accuracy percentage of 88.61% compared to the other conditions. The Verb control words condition (VCW) had an accuracy percentage of 84.62%, followed by the Noun false cognates condition (NFC), with an accuracy percentage of 56.15% and finally the Verb false cognates condition (VFC) with an accuracy percentage of 51.88%. Thus, it can be observed that the false cognate conditions (VFC and NFC) had lower accuracy percentages compared to the control words groups. To complement our analysis, I compared table 39 with graph 16.

Graph 16 - Accuracy versus condition and parts of speech – experiment 2



Source: own authorship

By observing graph 16, we can see that the control groups achieved higher accuracy results, 88.61% for the Noun control group and 84.62% for the Verb control group. It is also observed that the results for the False cognates groups had lower accuracy percentages, as seen: 56.15% for the Noun false cognate group and 51.88% for the Verb false cognate group. The false cognate group lower accuracy results are expected, once parallel activation of both languages seems to take place during the process of experiment 2, making it more difficult for participants to answer the task when candidates of both languages are competing, more specifically when the target word is a false cognate, which has orthographic similarity but does not share meaning, as it may bring difficulties in processing for participants. Furthermore, it is relevant to observe that for both conditions (controls and false cognates) the part of speech “noun” was processed with higher accuracy.

Continuing the descriptive statistics analysis in experiment 2, I describe how data regarding accuracy was analyzed for two conditions that are also part of this study: New false cognate words (NEW FC), words not used in Experiment 1, and Old false cognate words (OLD FC), which were used in Experiment 1. The analysis concerning these two conditions had the objective to verify if false cognate repetition priming effects occurred. Thus, a second question for this research was raised: Are there false cognate repetition priming effects in a translation task? Table 40 presents the descriptive statistics considering accuracy for these two conditions.

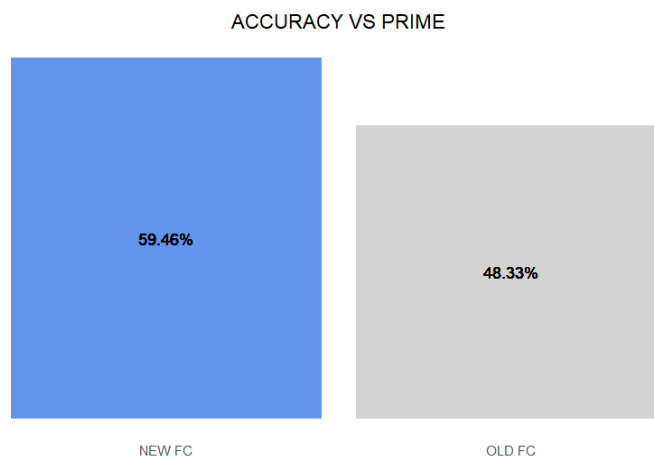
Table 40 - Accuracy versus old/new false cognate conditions – experiment 2

CONDITION	ACCURACY	NON-ACCURACY	TOTAL
Old false cognate words	116 (48.33%)	124 (51.67%)	240 (100%)
New false cognate words	154 (59.46%)	105 (40.54%)	259 (100%)

Source: own authorship

According to the results presented in table 40, it is possible to highlight that the Old false cognate condition (OLD FC) had an accuracy percentage of 48.33% compared to the New false cognate condition (NEW FC), which was 59.46%. Thus, it can be observed that the Old false cognate condition had a lower accuracy percentage compared to the New false cognate condition. To complement our analysis, I compared table 40 with graph 17.

Graph 17 - Accuracy versus old/new false cognate conditions – experiment 2



Source: own authorship

According to graph 17, we can observe that the New false cognate condition obtained a higher accuracy percentage (59.46%), while the Old false cognate condition had an accuracy percentage of 48.33, thus denoting the possibility that there may be no false cognate repetition priming effects in accuracy. To check if the difference in accuracy between the conditions is significant or not, inferential statistics in subsection 4.3.2 will be provided.

4.3.1.2 Analysis – variable: reaction time

Continuing the analysis of the items from experiment 2 (translation task), in this subsection I carried out the analysis of the dependent variable reaction time (RT), which was

our second response variable. Only correct answers were considered. Therefore, I present the data analysis and results from the second experiment, the translation task, which I previously described in detail in the methodology chapter. Next, I present table 41, which shows the data of experiment 2 dealing with the general reaction time (RT), considering the total responded items of 996 trials.

Table 41 - General reaction time – experiment 2

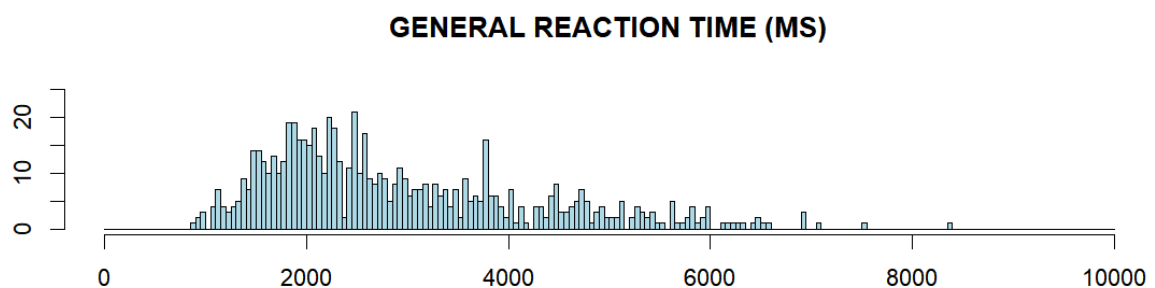
ITEMS	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
	2901 (1317)	2537	897	8355

Source: own authorship

Observing table 41, we can see that the mean RT was 2901ms (1317), the median was 2537ms, followed by the minimum of 897ms and the maximum of 8355ms.

Histograms provide a visual representation of data distribution, allowing us to identify patterns, trends, and anomalies. These kinds of graphs help us understand the shape, center, and spread of data, making it easier to draw insights and make concise decisions. Additionally, histograms are useful for comparing different datasets and identifying potential outliers. To this end, it is possible to observe the distribution of reaction time in graph 18.

Graph 18 - Histogram of reaction time – experiment 2



Source: own authorship

According to graph 18, most responses were within the range between 1000ms and 6000ms and few responses occurred after 6000ms. This distribution shows that this variation of data concentrates most participants' responses within a delimited range, however this type of data is expected regarding reaction time. Additionally, the information provided also shows

that there was a balance between the participants and the items, as only a few responses occurred outside the group's mean responses. There were more trials within the time limit than in Experiment 1. It is worth mentioning that the histogram did not separate RT by conditions, so, it is important to observe that this distribution considers all data regarding reaction time, so, the distribution per experimental condition will further be discussed, as well as the analysis considering the parts of speech involved in this research, which are verbs and nouns.

Additional analysis considering reaction time was also carried out regarding two distinct conditions: False cognates and Control words. Table 42 presents the analysis considering the variable reaction time for these two conditions.

Table 42 - Reaction time versus condition – experiment 2

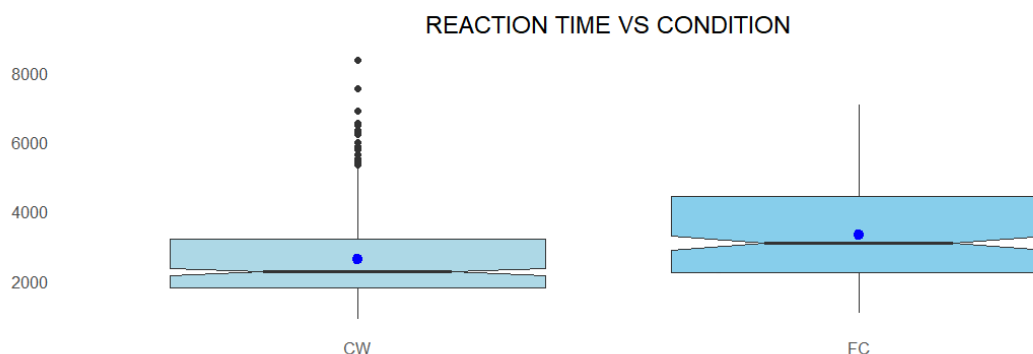
CONDITION	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
False cognates	3331 (1336)	3080	1064	7072
Control words	2631 (1231)	2259	897	8355

Source: own authorship

Observing table 42, it is apparent that the false cognate condition demanded more time by participants to answer the trials, compared to the control word condition. Additionally, we can see that the mean RT for false cognate condition was 3331ms (1336), the median was 3080ms, followed by the minimum of 1064ms and the maximum of 7072ms. Regarding the control word condition, the mean was 2631ms (268), the median was 2259ms, followed by the minimum of 897ms and the maximum of 8355ms. It is apparent that there are important differences concerning reaction time measures in both conditions. Additionally, it is important to note that there are also important differences in the results of minimum and maximum standard measures for both conditions. Next, to complement our analysis, I compared the descriptive statistics data on table 42 with a boxplot (Graph 19).

As explained previously in subsection 4.2.1.2, a boxplot offers a clear overview of data distribution, making it an important tool for comparing groups in experimental research. It highlights central tendency, spread, and potential outliers, aiding in data interpretation and providing concise visual information for analysis. Through Graph 19 it is possible to visualize the distribution of data regarding reaction time per condition, control words (CW) and false cognates (FC).

Graph 19 - Reaction time versus condition – experiment 2



Source: own authorship

According to Graph 19, it is apparent that for the false cognate condition, reaction time was higher, happening between 4000ms and 6000ms, while the control condition had a response interval between the 2000ms and 4000ms. By looking at the mean and the median values, we can additionally observe that the false cognate condition took longer to have trials for experiment 2 answered, suggesting that this type of condition may influence reaction time, supporting the non-selective view, when candidates for both languages compete. Observing graph 19, we can also identify patterns or trends, such as outliers, which are easily identified in the boxplot. Considering this, outliers appeared in greater number when the items were control words. It was expected that the false cognate condition would have a higher processing cost, due to the co-activation of the two languages (English-Portuguese) involved in the experiment, as we can see by observing graph 18. Table 42 shows the numerical data in order to contribute with descriptive statistics analysis.

I also carried out additional analysis comparing reaction time for the parts of speech involved in this research: verbs and nouns. Table 43 presents the descriptive statistics considering reaction time for these two conditions.

Table 43 - Reaction time vs parts of speech – experiment 2

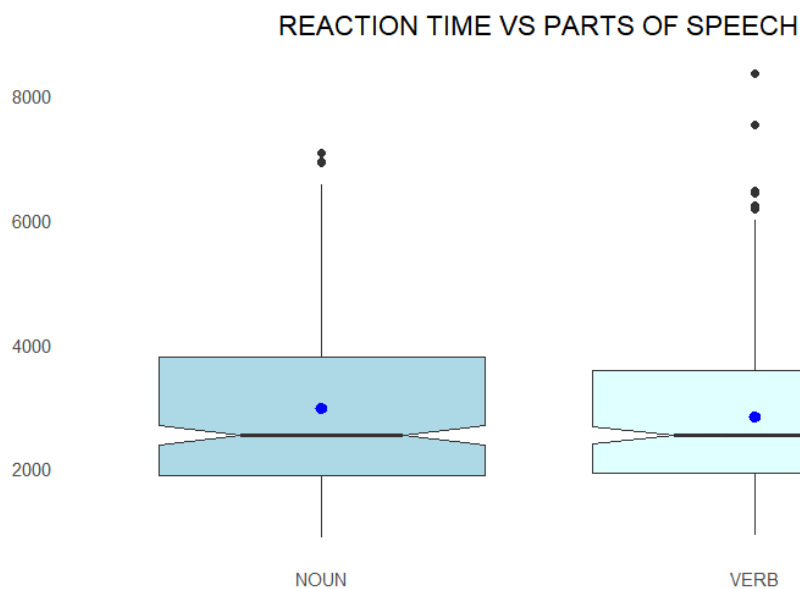
PARTS OF SPEECH	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
Verb	2838 (1248)	2535	921	8355
Noun	2962 (1378)	2537	897	7072

Source: own authorship

Observing table 43, it is apparent that there were no major differences regarding reaction time variation in the two conditions. Additionally, we can see that the RT for “verb” was 2838ms (1248), the median was 2535ms, followed by the minimum of 921ms and the maximum of 8355ms. Regarding “noun” class, the mean was 2962ms (1378), the median was 2537ms, followed by the minimum of 897ms and the maximum of 7072ms. Comparing the results between the two types of items, it is observed that there are no major differences regarding reaction time measures.

Next, to complement our analysis, I compared the descriptive statistics data on table 43 with a boxplot (Graph 20).

Graph 20 - Reaction time versus parts of speech – experiment 2



Source: own authorship

According to graph 20, we can also observe that there seems to be no reaction time variation between the parts of speech conditions, however, the “noun” condition obtained a slightly higher reaction time mean compared to the "verb" condition. Both conditions obtained a reaction time mean between 2000ms and 3000ms. The data regarding the median, minimum and maximum are very similar, thus denoting the possibility that there may be no effect of the analyzed variable considering the type of the parts of speech. The outliers, the dots that are shown above the boxes and that represent the attempts of participants whose answers were distant from the mean of all participants, are in greater number for the “verb” condition.

Continuing the descriptive statistics on reaction time analysis of experiment 2, table 44 shows the analysis that was carried out with more specific information regarding the reaction time according to four predetermined conditions: False cognate verb (VFC), False cognate noun (NFC), Control word verb (VCW) and Control word noun (NCW).

Table 44 - Reaction time versus condition and parts of speech – experiment 2

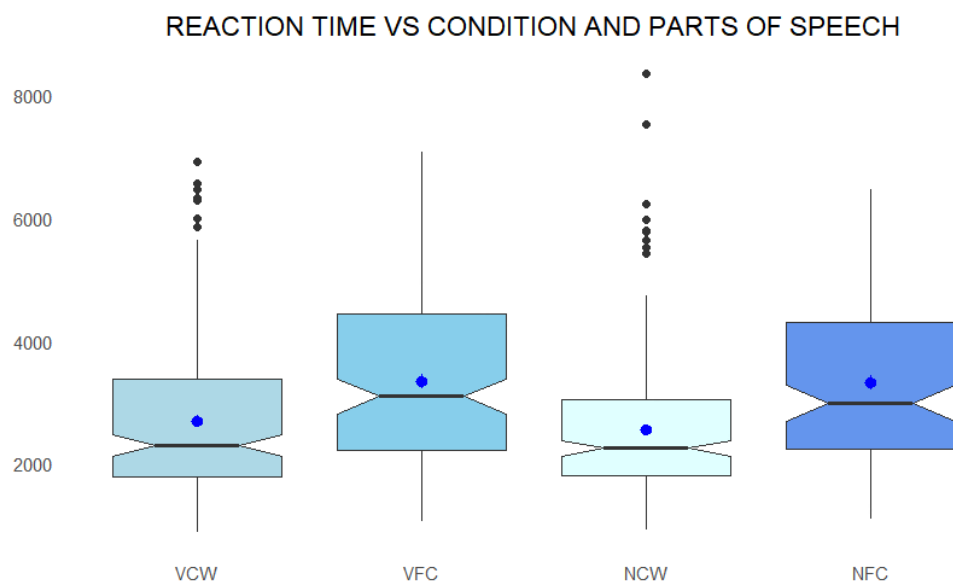
CONDITION AND PARTS OF SPEECH	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
False cognate Verb	3323 (1269)	2988	1111	6457
False cognate Noun	3338 (1395)	3100	1064	7072
Control word Verb	2565 (1152)	2258	921	8355
Control word Noun	2700 (1307)	2298	897	6909

Source: own authorship

Based on the results presented in table 44, which presents the data generated by RStudio software, it is possible to highlight that the control word Verb (VCW) condition (VCW) had the lowest reaction time mean compared to the other conditions; that is, 2565ms, compared to the RT of the control word Noun (NCW) – 2700ms, followed by the false cognate verb condition (VFC) – 3323ms and the false cognate Noun (NFC) – 3338ms. Thus, it can be observed that the false cognate word types (VFC and NFC) were processed slower than the control conditions, generating differences regarding reaction time. In Dijkstra, Van Jaarsveld and Ten Brike (1998), a lexical decision task was carried out with bilingual students with Dutch as their L1 and English as their L2. In experiment 2 of their study, reaction time for false cognates was processed slower than control items, which may suggest the need for greater effort for their recognition. Therefore, for their research, regarding experiment 2, the results would support the hypothesis of non-selective lexical access.

To complement our analysis, I compared table 44 with a boxplot (Graph 21).

Graph 21 - Reaction time versus condition and parts of speech – experiment 2



Source: own authorship

By observing graph 21, it is apparent that the false cognate conditions (VFC and NFC) obtained a higher processing cost. It is possible that this result was achieved because of competition between the two conditions (controls and false cognates). This competition increases the time needed to select the correct item, resulting in slower processing. Examining the line in the center of the boxes (the median), the difference concerning the variable reaction time for the false cognate conditions is not expressive, as the line is almost in the same position or these two conditions. The same for the representation of the blue dot, that represents the participants' mean, which is very similar in the VFC and NFC conditions. However, it is important to note, that when comparing false cognate conditions to control conditions, the reaction time for controls was shorter, which may indicate co-activation of both languages during this translation task – experiment 2. Visually, the condition which had the lowest number of outliers was the control word Verb (VCW), which means that in this condition, there were less responses out of the participants' mean.

Continuing the descriptive statistics analysis in experiment 2, I describe how data regarding reaction time was analyzed for two conditions that are also part of this study: New false cognate words (NEW FC), words not used in Experiment 1, and Old false cognate words (OLD FC), which were used in Experiment 1. The analysis concerning these two conditions had the objective to verify if false cognate repetition priming effects occurred. Thus, a second question for this research was raised: are there false cognate repetition priming effects in a

translation task? Table 45 presents the descriptive statistics considering reaction time for these two conditions.

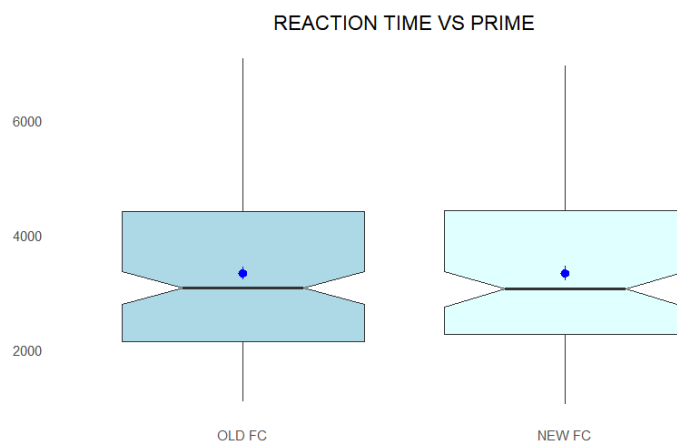
Table 45 - Reaction time versus old/new false cognate conditions – experiment 2

CONDITION	MEAN (SD)	MEDIAN	MINIMUM	MAXIMUM
Old false cognates	3334 (1309)	3058	1064	6943
New false cognates	3330 (1361)	3080	1111	7072

Source: own authorship

Observing table 45, it is apparent that there were no major differences regarding reaction time variation in the two conditions. Additionally, we can see that the RT mean for the Old false cognate condition (OLD FC) was 3334ms (1309), the median was 3058ms, followed by the minimum of 1064ms and the maximum of 6943ms. Regarding the New false cognate condition (NEW FC), the mean was 3330ms (1361), the median was 3080ms, followed by the minimum of 1111ms and the maximum of 7072ms. Comparing the results between the two types of items, it is observed that there are no major differences regarding reaction time measures. I compared the descriptive statistics data on table 45 with a boxplot (Graph 22).

Graph 22 - Reaction time versus old/new false cognate conditions – experiment 2



Source: own authorship

According to graph 22, we can also observe that there seems to be no reaction time variation between the two conditions. Both conditions obtained a mean reaction time between 3000ms and 4000ms. The data regarding the median, minimum and maximum are very similar, thus denoting the possibility that there may be no false cognate repetition priming effects. To check if the difference in reaction time between the conditions is significant or not, inferential statistics in the next subsection will be provided.

4.3.2 Inferential statistics

In this subsection, with the aim of verifying the trends presented by the descriptive statistics analysis previously done for experiment 2, regarding accuracy, and with the objective to answer the first and second questions of this research, I verified whether the status differences between control words and false cognates are significantly different. To this end, I performed statistical analysis using a Generalized Linear Mixed Model, with item conditions as a fixed effect and participants and items as random effects. We use the following formula: `glmer(STATUS ~ CONDITION + PRIME + (1 | PARTICIPANT) + (1 | ITEM), data = d1, family = binomial)` and the results are presented in table 46:

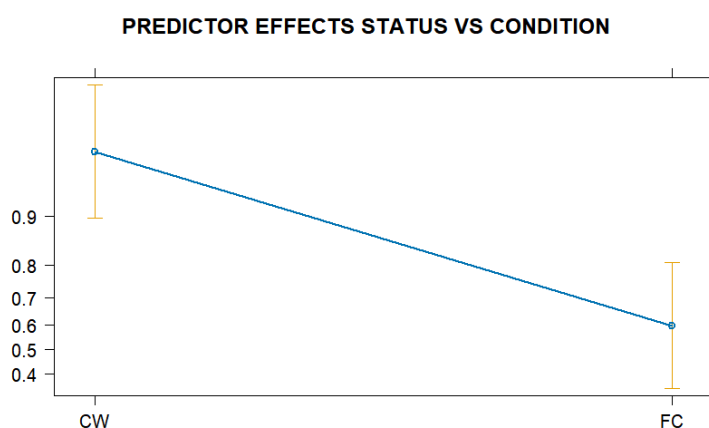
Table 46 - Status (glmer) – experiment 2

<i>Predictors</i>	STATUS		
	<i>Odds Ratios</i>	<i>CI</i>	<i>p</i>
(Intercept)	25.75	8.65 – 76.60	<0.001
CONDITION [FC]	0.09	0.03 – 0.27	<0.001
PRIME [OLD]	0.43	0.12 – 1.56	0.198
Random Effects			
σ^2	3.29		
τ_{00} ITEM	2.31		
τ_{00} PARTICIPANT	3.32		
ICC	0.63		
N PARTICIPANT	20		
N ITEM	50		
Observations	996		
Marginal R ² / Conditional R ²	0.193 / 0.702		

Source: own authorship

For this analysis, table 46 depicts, considering all the items which were responded (996), the new control words considered as an intercept, whose accuracy prediction was 3.25 (log-odds), ranging from 2.16 to 4.34 (log-odds), within the 95% confidence interval. Thus, table 46 shows that there is a significant difference between the accuracy of control words and false cognate words ($p < 0.05$), showing greater accuracy for control words. The prime effect didn't show difference in a significant way. The random effects show a variance of 2.31 per item and 3.32 per participant. By observing graph 23, we can visualize the status predicted effects:

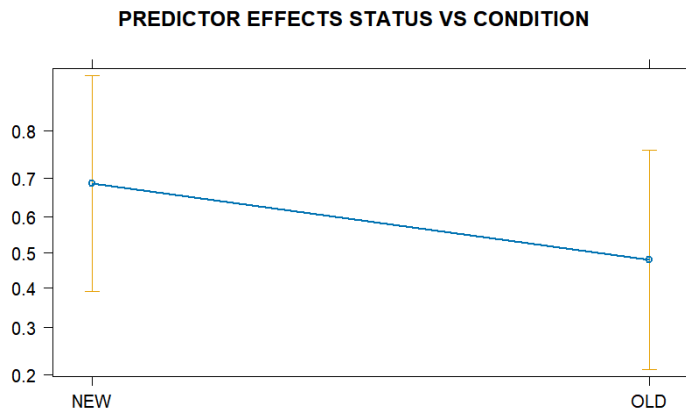
Graph 23 - Status predictor effects– experiment 2



Source: own authorship

When observing graph 23, we can see that the accuracy prediction was higher for the control word condition, which was above 99%. On the other hand, the lowest accuracy prediction occurred for the false cognate condition, with values below 70%. The visual status representation in graph 23, between controls and false cognates shows that the results obtained are significant. Next, in graph 24, we can visualize the status for the two conditions presented in table 46.

Graph 24 - Status versus repetition priming condition – experiment 2



Source: own authorship

Graph 24 shows that accuracy was higher for New cognate words, (words that appeared exclusively in task 2), with results below 70%. On the other hand, the lowest accuracy rate was registered for words that had already appeared in task 1 (Old false cognate words) and were repeated in task 2, with values just above 50%. Results showed that there was no significant difference between accuracy of the Old false cognate words (which appeared in task 1) and the New false cognate words (words that appeared only in task 2).

Regarding reaction time differences and values between conditions, I also analyzed whether control words and false cognate words have significant results or not. I ran a statistical analysis using a Linear Mixed Model, with item conditions as fixed effects and participants and items as random effects. We use the following formula: $\text{lmer}(\text{TEMPO} \sim \text{CONDITION} + \text{PRIME} + (1 | \text{PARTICIPANT}) + (1 | \text{ITEM}), \text{data} = \text{d2})$. The results obtained through this analysis can be observed in table 47:

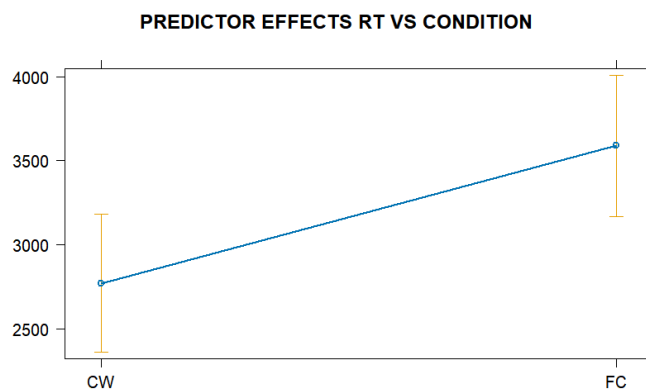
Table 47 - Reaction time (lmer) – experiment 2

<i>Predictors</i>	TEMPO		
	<i>Estimates</i>	<i>CI</i>	<i>p</i>
(Intercept)	2770.96	2359.60 – 3182.33	<0.001
CONDITION [FC]	838.87	340.44 – 1337.30	0.001
PRIME [OLD]	-44.64	-640.24 – 550.95	0.883
Random Effects			
σ^2	810168.74		
τ_{00} ITEM	481283.75		
τ_{00} PARTICIPANT	452851.70		
ICC	0.54		
N PARTICIPANT	20		
N ITEM	50		
Observations	700		
Marginal R ² / Conditional R ²	0.084 / 0.574		

Source: own authorship

By looking at table 47, new control words were taken as the intercept, with a value of 2770 ms for reaction time, ranging from 2359 ms to 3182 ms, within a 95% confidence interval. Thus, table 47 additionally shows that there is a significant difference regarding reaction time for control words and false cognates ($p < 0.05$), but there isn't significant difference to the prime. The random effects show a variance of 481283 ms per item and 452851 ms per participant. By observing graph 25, we can visualize the reaction time predicted effects per item condition:

Graph 25 - Reaction time versus condition – experiment 2

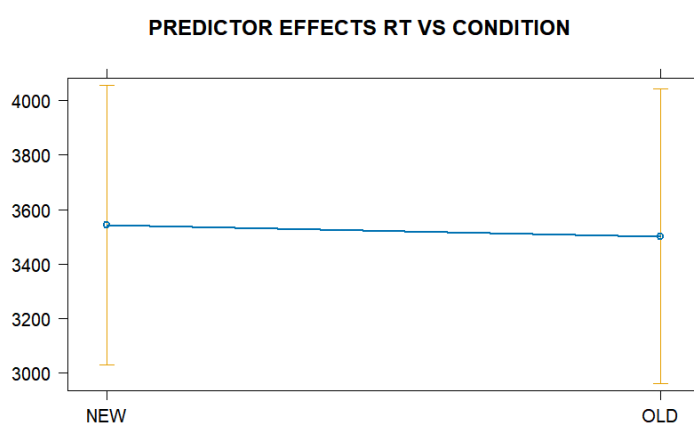


Source: own authorship

Graph 25 shows that the highest reaction time measure occurred for the false cognate condition, with a record above 3500 milliseconds. The lowest reaction time measure was registered for the control word condition, with a record above 2500 milliseconds. Based on the information in table 47 and with the support of visual detail in graph 25, It is apparent that the difference was significant when analyzing the two conditions with the predictor variable reaction time ($p < 0.05$).

Additionally, in graph 26, the reaction time and its predicted effects for the two conditions are presented.

Graph 26 - Reaction time versus repetition priming condition – experiment 2



Source: own authorship

Graph 26 makes it possible to visualize that the reaction time prediction was slightly higher for New false cognate words, with a record below 3600 milliseconds. The lowest reaction time prediction occurred for the Old false cognate words condition, but as it can be observed through the graph, it was a very close register to the RT prediction for the New false cognate word condition. Therefore, supporting H2 for this study, I can confirm that there was no significant effect in terms of repetition priming effects regarding reaction time for the Old false cognate words and New false cognate words.

5 DISCUSSION

In this chapter, I present the results discussion obtained through a language decision task and a translation task which were the two experiments applied in this research. I also present a comparison of the results obtained between the two experiments. I reiterate that the main objective of this research was to analyze the processing of false cognates in bilinguals with Brazilian Portuguese as L1 and English as L2. The two specific objectives were: (1) to analyze the processing cost of false cognates compared to control words in Brazilian Portuguese (L1) and English (L2); and (2) examine whether there is repetition priming effect of false cognates in a translation task. These two experiments make up the set of data collected to carry out the complete analysis of this research.

Returning to the hypotheses of this research, we have hypothesis 1, which considers that accuracy is greater for control words as compared to false cognates both in the language decision and translation tasks. This hypothesis, among other cited studies in the present research, is supported by Otwinowska and Szewczyk (2019) and Otwinowska whose research explored factors that determined knowledge of L2 words with orthographic neighbors in L1, with cognates and false cognates. The results showed that cognates were learned better, whereas false cognates were known worse, compared to non-cognates, this suggests a lower accuracy regarding false cognates compared to non-cognate words. Thus, the authors concluded that cross-linguistic similarity affects L2 word learnability. Therefore, it is a theoretical support for the present study. Another study that serves as a theoretical basis for this research is that of Forys-Nogala, Kobosko and Szewczyk (2020) in which they selected 30 Polish-English cognates, 30 false cognates, and 30 non-cognates matched with L2 frequency and concreteness and placed them in exercises typical of English language teaching textbooks. They concluded that the awareness-raising manipulation (a procedure regarding manipulation of orthographic cross linguistic similarity in the classroom with students), had no additional effect on their acquisition of cognates and false cognates. Brenders, Van Hell and Dijkstra (2011) are also important references for the present study. In their research, the authors identified that processing cost was consistently greater for false cognates than for control words. By looking at Experiment 3 in their study (an English lexical decision task that mixed cognates and false friends), it concluded that these items were processed with longer reaction times for both word types relative to controls and it was also stated that children in early stages of learning an L2 already activated lexical candidates in both of their languages (considering it language-nonspecific access).

The present study, whose results showed that false cognates were processed slower compared to control words, is in line with Brenders, Van Hell and Dijkstra (2011).

Hypothesis 2 of the present study assumes that there are no false cognate repetition priming effects in a translation task. Lalor and Kirsner (2001), Poort, Warren and Rodd (2015), Gadelha and Toassi (2021) provide theoretical support for current research. These studies shed light on repetition priming effects for interlingual homographs, affirming that this type of effect was not observed through the analyses of their experiments. Thus, indicating that the present study's second specific objective is in line with their research. Returning to Gadelha and Toassi (2021), they investigated cognitive processes involved in translation, at the word level, using repetition priming, recognition and lexical access from interlingual homographic words. According to their results, they confirmed that there were significant effects of interlingual homographs and interlingual non-homographs in a language decision task, reflected in a higher processing cost. It was also concluded by the authors there was no repetition priming effect for interlingual homographs, but there was a repetition priming effect only, for the "old" non-homographs control words. Gadelha and Toassi (2021)'s study also provides a theoretical basis for the present study, since it sheds light on interlingual homographs processing, using repetition priming paradigm.

As already described in subsection 4.1 of the present study, 20 participants took part in the research. Among the participants, the youngest was 18 years old and the oldest was 56 years old. The mean age was 39.85 (SD 10.2) years old. 11 men and 9 women participated in the study. The educational level of the participants ranged from high school (10%) to PhD (15%).

Out of the 20 participants, only 5 (25%) were English teachers, which is something that may have influenced the results of accuracy and reaction time in both tasks carried out in the present study, once the target language was English (L2). This data regarding English language teachers was observed only in the demographic and linguistic questionnaire, as well as data regarding proficiency of the participants. Therefore, I collected important information about the participants, but I emphasize that this data was not part of the analysis of results as predictive variables.

Information on the participants' L2 learning context showed that 75% of them studied English on language courses, while 45% reported that they were self-taught.

The results from the demographic and linguistic questionnaire pointed out that 9 (45%) of the participants had no knowledge of other languages than English.

Participants' proficiency was not predicted in the hypotheses of this research. The vocabulary test applied in this study, as seen in detail in the results, subsection 3.4.3 of this research, showed that the mean proficiency was 56.25%, with a minimum record of 21%. This interval can be explained by the fact that there was no restriction on the level of proficiency for participants to take part in the study, but rather the interest of the researcher to obtain a population that had already started their studies in English, regardless of their level of proficiency, once it was not restricted to level in the present study.

Next, we describe the results obtained regarding accuracy and response time in the two experiments using descriptive and inferential statistics. To this end, we detail an experiment in each section.

In the two following subsections, 5.1 and 5.2, I discuss the results achieved with both experiments, which consisted of a language decision task and a translation task. Accuracy and reaction time are discussed in this subsection. It is worth reiterating that the data obtained was generated in the software PsyToolKit (Stoet, 2010, 2017) and read in RStudio software. To this end, I detail each experiment in each section.

5.1 Experiment 1 – language decision task

In the language decision task, the general results showed an accuracy of 97.02% and an average reaction time of 736 milliseconds per item.

As one of our objectives was to investigate the processing cost of false cognates and control words, we analyzed the lexical items considering the condition and the language. The data showed that the language cost of the two conditions and the two languages was very close. Regarding accuracy, a percentage of 96.80% was obtained for false cognates in English; 93.39% accuracy for false cognates in Portuguese; 97.05% accuracy for control words in English; and 97.95% accuracy for control words in Portuguese.

In terms of reaction time, the results were similar for the four conditions. An average of 771 milliseconds was registered for false cognates in English; 781 milliseconds for false cognates in Portuguese; 724 milliseconds for English control words; and 728 milliseconds for control words for Portuguese.

The data showed that accuracy was greater for control words in Portuguese, with an accuracy percentage of 97.95%, whereas reaction time was shorter for control words in English, averaging 724 milliseconds.

Inferential analysis, using logistic regression, showed a significant difference ($p < 0.05$) between control words and false cognates for both accuracy and reaction time, indicating a lower processing cost for control words. Language was not significantly different for item processing.

From what I observed through the results obtained in this task, it is possible that false cognate words were processed slower and with less accuracy because participants had both languages activated during the processing of the words involved in the task. As false cognates share orthographic form but differ in meaning, this suggests that both languages were raising candidates and competing between languages, therefore causing a slower processing time and less accuracy for this type of word.

These results confirm our first hypothesis, which says that accuracy is greater for controls as compared to false cognates in a translation task. The studies from Otwinowska and Szewczyk (2019) Their results indicate that both cognates and false cognates differed from control words in relation to their processing. According to the results, it is suggested that cognates may in fact be easier to process, while false cognates are the most difficult to process. Brenders, Van Hell and Dijkstra (2011) also confirm in their study that processing cost was consistently greater for false cognates than for control words.

5.2 Experiment 2 – translation task

Regarding the translation task, the general results showed an accuracy of 70.28% and an average reaction time of 2.901 milliseconds per item.

We also analyzed the lexical items, but this time considering the condition and parts of speech of the items. The data showed that the linguistic cost of the two conditions and the two parts of speech (verbs and nouns) was different. Regarding accuracy, we had 51.88% accuracy for false cognates that are verbs; 56.15% accuracy for false cognates that are nouns; a percentage of 84.62% accuracy for control words that are verbs; and 88.61% accuracy for control words that are nouns.

Regarding reaction time, the results were similar for the four possibilities. An average of 3.323 milliseconds were spent on false cognates that are verbs; 3.398 milliseconds for false cognates that are nouns; 2.565 milliseconds for control words that are verbs; and 2.700 milliseconds for control words that are nouns.

The data obtained showed that accuracy was greater for control words that are nouns, with a percentage of 88.61% accuracy. Reaction time was shorter for control words that are verbs, with an average of 2,565 milliseconds.

Inferential analysis, using logistic regression, showed a significant difference ($p < 0.05$) between control words and false cognates for both accuracy and reaction time, indicating a lower processing cost for control words. The parts of speech and repetition priming were not significantly different for the processing of the items.

These results confirm the first hypothesis of this research, which states that control words are easier to process compared to the investigated items (false cognates). The findings also confirm the second hypothesis of the present study, showing that there were no repetition priming effects for false cognate words in the translation task.

Returning to Brenders, Van Hell and Dijkstra (2011), their research suggested that processing cost was consistently greater for false cognates than for control words. According to experiment 3 of the study 3 (an English lexical decision task that mixed cognates and false friends), it was concluded that false cognates were processed with longer reaction times compared to controls and cognates.

Regarding the results obtained through experiments 1 and 2, in summary, both demonstrated significant activation in the L2 compared to the L1. Our findings indicate that the presentation of false cognate words in English or Brazilian Portuguese influenced participants' reaction times and accuracy percentages in a language decision task and in a translation task.

As already mentioned in Subsection 2.5 on Bilingual lexical access and bilingual lexical access models, psycholinguistic research suggests that the lexicon is activated through the recognition and comprehension of words stored in the bilingual mind. This process involves the bilingual's mental assimilation of these words, influenced by their native language. It is relevant to note that the BIA+ (Bilingual Interactive Activation Plus) and Multilink are significant cognitive models in terms of bilingual lexical access. Both experiments in this study involved the recognition of spelling and semantics concerning false cognates and control words. The findings for the present study demonstrated an inhibitory effect for false cognate words in both experiments, the language decision task and the translation task, as the processing cost for this type of word, regarding accuracy and reaction time, was higher.

The results of the present study are in line with what is assumed by the BIA+ activation model, when lexical and semantic processing by bilinguals is influenced by spelling similarities in word recognition. The Multilink model, developed by Dijkstra *et al.* (2018) enables simulation of word processing, including psycholinguistic tasks, such as language

decision tasks and translation tasks, such as the types of tasks applied in the present study. The design of the two experiments in this research (task 1 and task 2), reflect characteristics of the Multilink model (Dijkstra *et al.*, 2018).

6 CONCLUSIONS

In this chapter, I present the conclusions of this study, showing the main findings and possible contributions to the area of Psycholinguistics of Bilingualism. I also present possible limitations and suggestions for future studies.

Two experiments were applied in this study to analyze the processing of false cognates with 20 bilingual participants, with Brazilian Portuguese as L1 and English as L2. The bilingual participants had an average age of 39.85 years and an average L2 proficiency of 56.25%, according to the vocabulary test results.

The first experiment was a language decision task with 250 experimental items. Bilinguals should click on key A or key L on the computer keyboard, according to the language to which the word being seen belonged. For this task, bilinguals had up to 3.000 milliseconds for each item. In this experiment, the predictor variables were word conditions (false cognates or control words) and language (Portuguese or English). Our response variables were accuracy and response time.

Results of experiment 1 showed that the control words led to a significantly lower cognitive cost, in terms of greater accuracy and shorter reaction time, compared to false cognates. The languages presented results that were not significantly different. The results of the language decision task showed that the reaction time was higher for false cognates, as suggested in the present study that the fact that this type of word would have similar orthographic representation but different meanings, causing conflict between languages during the task (language non-selective view). Through accuracy analysis, it was evident that false cognates were processed with more errors compared to control words. This data confirms the hypothesis for the results of Experiment 1.

The second experiment was a translation task with 50 items to be translated by participants. Bilinguals should click on the A, G or L key, depending on the response option for the translation of the target word which appeared on the center of the computer screen. To make the judgment, participants had up to 10.000 milliseconds. The predictor variables were word conditions (false cognates or control words) and parts of speech (nouns or verbs). The response variables were accuracy and response time.

It is important to note that there are relevant implications concerning reaction time for the results of Experiment 2, as the translation task in which the participant had to answer each question using three keyboard commands, which were: “A”, referring to the first option exposed on the screen, “G” referring to the second option exposed on the screen and “L”

referring to the third option exposed on the screen. For this reason, I extended the time limit to 10 seconds as this task required motor coordination to handle the commands on the computer keyboard properly, and that task itself posed as a challenging activity. With that said, all participants concluded task two, and only 4 trials were removed because they were answered after the time limit established for the task.

Results of experiment 2 demonstrated that control words led to a significantly lower cognitive cost, in terms of greater accuracy and shorter reaction time, compared to false cognates. The parts of speech and repetition priming effect were not significantly different.

Previous studies by the group (PLIBIMULT) investigated lexical items from different conditions, such as Gadelha (2021), Borém (2023) and Batista (2022). The results of the present study, which investigated false cognates, as well as in Batista (2022), reinforced that the processing cost of false cognates is greater than that of control words. Furthermore, based on the study by Batista (2022), the present study showed progress in some points: I used more items than that of Batista's, I also used new lexical items as stimuli and reached a greater number of bilingual participants. All studies carried out by our research group converge, identifying that control words are processed faster than words in other conditions: cognate items (Borém, 2023), false cognates (Batista, 2022) and interlingual homographs (Gadelha, 2021). These findings corroborate the language non-selective view in the bilingual mind.

The results found confirm several other studies that state that the cost of processing false cognates is greater than that of other types of words that are not in this condition. The present study's findings on repetition priming effects align with those reported by Lalor and Kirsner (2001), Poort, Warren and Rodd (2015), Gadelha and Toassi (2021), who provided theoretical support for current research. As mentioned before in the present study, false cognates (also considered as an interlingual homograph) constituted our issue of study. The results of the current study indicated that the present study's second specific objective, which is to verify whether there was repetition priming effect in a translation task, is in line with their research. Warren and Rodd (2015) 's results show that a single encounter with a cognate or interlingual homograph in one language can affect its subsequent processing in another language after, and that this priming effect is influenced by the relationship between the languages' meanings. Returning to Gadelha and Toassi (2021), they investigated cognitive processes involved in translation, at the word level, using repetition priming, recognition and lexical access from interlingual homographic words. According to their results, they confirmed that there were significant effects of interlingual homographs and interlingual non-homographs in a language decision task, reflected in a higher processing cost. It was also concluded by the authors there

was no repetition priming effect for interlingual homographs, but there was a repetition priming effect only, for the “old” non-homographs control words. Gadelha and Toassi (2021)’s research also provide a theoretical basis for the present study, since it sheds light on interlingual homographs processing, using repetition priming paradigm.

Therefore, I believe that this research can contribute with studies in the area of Psycholinguistics of Bilingualism, as it reinforces the idea of non-selectivity of languages in the bilingual mind. Furthermore, it is evidenced that the cost of processing false cognates is greater due to the spelling similarity, but difference in meaning, causing co-activation of both languages during word processing. Within Translation Studies, false cognates can be a challenge for those who translate, leading to longer reaction times and possible lower accuracy, requiring greater concentration and effort in the translation act.

With this perspective, the present study can contribute to the understanding of the organization process of the mental lexicon of bilinguals, once false cognates have lexical representations in the bilingual's two languages, and these representations may be activated even when the task is only L2-oriented (translation task-Experiment 2). The representations of the two languages in the bilingual mind can influence a greater processing cost for false cognates than for control words.

As limitations for the current research, I believe that a higher number of false cognate items could be used, as well as the number of participants. It is also possible to expand the research for false cognates by including these items in sentences, not just words, in isolation. I also believe that word frequency is an important factor in lexical access analyses, when comparing different word types to controls. Future studies can perform more in-depth statistical analysis to verify this issue. It can also be included in future analyses the relationship between the level of proficiency and the processing of false cognates. Additionally, these types of words can also be researched in different experimental tasks, such as eye tracking, self-monitored reading, and acceptability judgment tasks.

To sum up, the present study can contribute to improve translation studies methodologies, with a focus on psycholinguistics, mainly regarding the importance of bilingualism in a globalized world. Furthermore, the present study can also contribute in terms of English teaching practice improvement focusing the cognitive processes involved in translation.

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APPENDIX A – TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO (TCLE)**TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO (TCLE)**

Você está sendo convidado pelo aluno Mário Pacheco Miranda Filho, mestrando no Programa de Estudos da Tradução – POET da Universidade Federal do Ceará, como participante da pesquisa intitulada “A TRADUÇÃO DE ITENS LEXICAIS PORTUGUÊS-INGLÊS”. Leia atentamente as informações abaixo, para que todos os procedimentos desta pesquisa sejam esclarecidos.

Caro (a) Senhor (a)

Gostaria de convidá-lo a participar do estudo do PLIBIMULT que busca investigar os processos cognitivos envolvidos na aprendizagem de línguas estrangeiras. Os estudos nessa área visam não só compreender os processos envolvidos na aprendizagem de uma ou mais línguas estrangeiras, mas também desenvolver meios de aperfeiçoar o processo de ensino/aprendizagem dessas línguas. Peço que você leia este termo de consentimento e tire todas as dúvidas que possam surgir (através do email - XXXXXXXXXXXXXXXX) antes de concordar em participar do estudo.

Objetivo do estudo

O objetivo geral deste estudo é examinar a tradução de itens lexicais português-inglês em duas tarefas (uma de decisão linguística e outra de tradução), com bilíngues, que tem o português como língua nativa e o inglês com segunda língua.

Procedimentos

Se você concordar em participar deste estudo, você será solicitado a realizar duas (2) tarefas, as quais estão divididas em 3 blocos experimentais e a responder um questionário, e realizar um teste de conhecimento de vocabulário, todos no formato *online*, na sequência do presente formulário. Você poderá realizar as atividades desta pesquisa em qualquer lugar, desde que tenha acesso a um computador e internet. Não é possível realizar esta pesquisa através de tablet ou celular. A pesquisa se desdobrará em 6 etapas, especificadas abaixo:

1ª etapa: Leitura do TCLE:

Se você concordar em participar deste estudo, deverá clicar na opção “Aceito” ao final deste formulário e depois pressionar “*enter*”, então você será encaminhado para uma segunda página. (Se ao final da leitura desse TCLE ainda tiver dúvidas sobre a pesquisa, esclareça-as primeiramente com o pesquisador principal por email – XXXXXXXXXXXXXXXXXX).

2ª etapa: Questionário (tempo total estimado: 5 minutos)

Esta etapa consistirá no preenchimento de um questionário que contém 13 questões de múltipla escolha e/ou de resposta curta para investigar o seu histórico de aprendizagem das línguas materna e estrangeira.

3ª etapa: Identificação:

Você será solicitado a criar um código para identificá-lo em toda a pesquisa, para garantir a preservação da sua identidade. O código deverá conter duas letras e dois números, exemplo: LC22. Você será requisitado a informar este mesmo código durante todas as etapas da pesquisa. Caso você deseje receber os resultados da pesquisa, deverá também informar este código por email (XXXXXXXXXXXXXXXX).

4ª etapa: Tarefas de decisão linguística e de tradução (tempo total estimado: 40 minutos)

Esta etapa consiste nas seguintes duas (2) tarefas, divididas em 3 blocos.

Tarefa de decisão linguística: você verá uma palavra no centro da tela e deverá indicar o mais rápido possível qual a primeira língua que essa palavra lhe traz à mente: o português ou o inglês. Se a escolha for o português, pressione a tecla “A”, se for inglês pressione a tecla “L”. A tarefa está dividida entre treinamento e mais dois (2) blocos. No total serão 8 palavras para o treinamento e 250 palavras para a tarefa, 125 em cada bloco.

Tarefa de tradução: você verá uma palavra no centro da tela e deverá escolher a tradução correta para ela o mais rápido possível, pressionando as teclas “A”, “G” ou “L”, de acordo com a tradução que julgar correta. No total serão 8 palavras para o treinamento e 50 palavras para a tarefa, que acontecerá em apenas 1 bloco.

Antes de iniciar as tarefas haverá instruções específicas na tela do computador e uma sessão de treinamento para você se familiarizar com os procedimentos de cada tarefa.

5ª etapa: Teste de vocabulário em língua estrangeira (tempo total estimado: até 30 minutos)

Ao finalizar a tarefa anterior e pressionar “espaço” você será direcionado a um teste de vocabulário em língua estrangeira. Neste teste, você deve completar 150 palavras de acordo com as definições apresentadas. O resultado do teste é disponibilizado imediatamente após o seu término. Você deverá salvar este resultado em pdf ou como um *print* da tela, e enviar para o e-mail XXXXXXXXXXXXXXXX informando o seu código de identificação.

Estima-se que o tempo total da pesquisa será em torno de 2h. Você poderá fazer intervalos para descansar entre uma etapa e outra. Você também poderá interromper a sua participação no estudo a qualquer momento. A sua participação nas tarefas desse estudo será voluntária e contribuirá para uma melhor compreensão sobre a aprendizagem de vocabulário de bilíngues. Durante a pesquisa, você terá a oportunidade de praticar uma língua estrangeira e terá uma avaliação do seu nível de conhecimento desta língua.

Riscos

Toda investigação com a participação de seres humanos, ainda que seja realizada em documentos, é passível de riscos. No caso específico desse estudo, trata-se de um risco mínimo, que poderá ser o cansaço proveniente da realização de 2 tarefas e o preenchimento de um questionário e um teste de vocabulário em formato eletrônico. No entanto, você é livre para

interromper o experimento, a qualquer momento, sem que haja nenhum prejuízo a você. Além disso, você poderá fazer intervalos para descansar ao finalizar cada etapa da pesquisa. Cabe destacar que, por se tratar de uma pesquisa online, os pesquisadores não têm como assegurar total confidencialidade dos dados, em virtude da natureza do recurso tecnológico.

Benefícios

Um benefício direto da pesquisa será a avaliação do seu nível de vocabulário em língua estrangeira. Você poderá obter os resultados das tarefas realizadas, entrando em contato por email (XXXXXXXXXXXXXXXX), informando seu código de identificação (aquele criado por você mesmo, contendo duas letras e dois números – releia 2ª etapa acima).

Direitos dos participantes

Você é livre para decidir se deseja participar ou não desse estudo. Como a participação é voluntária, você pode desistir a qualquer momento sem nenhum prejuízo para você. A qualquer momento você poderá recusar a continuar participando da pesquisa e poderá retirar o seu consentimento, sem que isso lhe traga qualquer prejuízo.

Compensação financeira

Não existirão despesas pessoais ou compensações financeiras relacionadas à participação no estudo. Qualquer despesa adicional será absorvida pelo orçamento da pesquisa.

Utilização dos dados:

Os dados coletados nesse estudo serão acessados apenas pelos responsáveis pela pesquisa e a divulgação das mencionadas informações só será feita entre os profissionais estudiosos do assunto. Mesmo após os resultados se tornarem públicos, a sua identidade será totalmente preservada. Não haverá nenhuma informação que leve a sua identificação. A qualquer momento você poderá ter acesso a informações referentes à pesquisa, pelo telefone da instituição e endereço de e-mail do grupo de pesquisa (plibimult@ufc.br). Uma cópia deste documento será enviada para o seu email. Recomenda-se que você guarde esta cópia.

Endereço dos responsáveis pela pesquisa:

Nomes: Mário Pacheco Miranda Filho

Instituição: Universidade Federal do Ceará - UFC

Endereço: XXXXXXXXXXXXXXXX

Telefones para contato: XXXXXXXXXXXXXXXX

E-mail para contato: XXXXXXXXXXXXXXXX

ATENÇÃO: Se você tiver alguma consideração ou dúvida, sobre a sua participação na pesquisa, entre em contato com o Comitê de Ética em Pesquisa da UFC/PROPESQ – Rua Coronel Nunes de Melo, 1000 - Rodolfo Teófilo, fone: 3366-8346/44. (Horário: 08:00-12:00 horas de segunda a sexta-feira).

O CEP/UFC/PROPESQ é a instância da Universidade Federal do Ceará responsável pela avaliação e acompanhamento dos aspectos éticos de todas as pesquisas envolvendo seres humanos.

O abaixo assinado ____ (preencher nome) _____, (preencher idade) __ anos, declara que é de livre e espontânea vontade que está como participante da pesquisa “A TRADUÇÃO DE ITENS LEXICAIS PORTUGUÊS-INGLÊS”.

Data: ____ / ____ / ____

Mário Pacheco Miranda Filho (pesquisador principal)

() Eu declaro que li cuidadosamente este Termo de Consentimento Livre e Esclarecido e **ACEITO** participar da pesquisa.

(pressione “*enter*” se desejar iniciar a pesquisa)