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**Spanish-English Bilinguals' Processing of Two Types of Causative Constructions**

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Dissertação apresentada ao Programa de Pós-Graduação em Estudos Linguísticos da Faculdade de Letras da Universidade Federal de Minas Gerais, como requisito parcial para obtenção do título de Mestre em Linguística Teórica e Descritiva.

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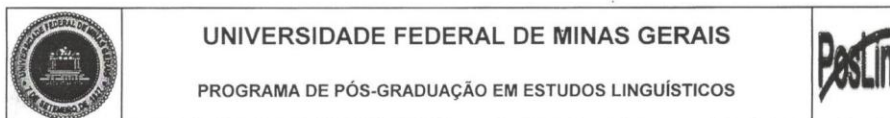
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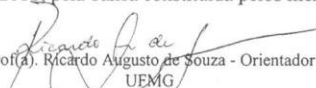
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**Spanish-English Bilinguals' Processing of Two Types of Causative Constructions**

**ALONSO ERICK GOMEZ TRUJILLO**

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Expect the unexpected and be positive about it.  
(Tapia Carlin, 2010)

## Abstract

The main purpose of this research is to compare the processing cost and the acceptability judgment of two syntactic configurations from two types of causative sentences that are licensed in English, and their equivalent syntactic configurations in Spanish, which is a language that only licenses the first: Causative sentences with change of state verbs (COS), and causative sentences with induced movement alternation (IMA). This research departs from the studies of Cook (2004), and his idea of *multi-competence*, and, at the same time, it is based on the investigations of Souza & Oliveira (2011), Souza (2012, 2014) and Fernandez & Souza (2016), in which the same cross-linguistic variation was studied in Brazilian Portuguese-English bilingual samples. 70 people were tested during this research, dividing them into three categories according to their scores in the *Vocabulary Levels Test* (VLT): Monolinguals (MN, n=30), low proficiency bilinguals (LPB, n=30), and high proficiency bilinguals (HPB, n=10). They answered two adaptations of the instruments used in Fernandez and Souza (2006) (one in Spanish and one in English) in which the processing cost and the acceptability judgment were measured through a self-paced reading task and an acceptability judgment task. The results obtained from these experiments suggest a higher cost to process sentences that contained the IMA structures in all the samples from this research, opposite to the results of Fernandez and Souza (2016). In addition, the grades from the judgment task from all samples support such resistance to IMA sentences in the Mexican groups, since they considered them as ungrammatical sentences. These results suggest a higher flexibility in the Brazilian Portuguese-English bilingual samples from Fernandez and Souza (2016) to sentences that contain IMA structures, while Mexican Spanish-English bilinguals do not present such flexibility.

**Keywords:** judgment acceptability task, self-paced reading task, sentence processing, induced movement alternation, change of state verbs, cross linguistic variation.



## Resumo

O objetivo principal desta pesquisa é comparar o custo de processamento e o julgamento de aceitabilidade de duas configurações sintáticas de dois tipos de sentenças causativas que são licenciadas em inglês, e suas configurações sintáticas equivalentes em espanhol, que é uma língua que apenas licencia a primeira dessas: Frases causativas com mudança de verbos de estado (COS) e sentenças causativas com alternância de movimento induzido (IMA). Esta pesquisa parte dos estudos de Cook (2004), e sua ideia de multi-competência, e ao mesmo tempo, é baseada nas investigações de Souza & Oliveira (2011), Souza (2012, 2014) e Fernandez & Souza (2016), em que a mesma variação interlinguística foi estudada em pessoas bilíngues do tipo português brasileiro-inglês. Foram testadas 70 pessoas durante a pesquisa, dividindo-as em três categorias segundo seus resultados na prova *Vocabulary Levels Test* (VLT): monolíngues (MN, n = 30), bilíngues de baixa proficiência (BPL, n = 30) e bilíngues de alta proficiência (HPB, n = 10). Eles responderam duas adaptações dos instrumentos utilizados em Fernandez e Souza (2006) (um em espanhol e o outro em inglês) nos quais o custo de processamento e o julgamento de aceitabilidade foram medidos através de uma tarefa de leitura auto-cadenciada e uma tarefa de julgamento de gramaticalidade. Os resultados obtidos com esses experimentos sugerem um custo maior para processar sentenças que possuem as estruturas do IMA em todas as amostras desta pesquisa, contrariando os resultados de Fernandez e Souza (2016). Além disso, as notas da tarefa de julgamento de gramaticalidade de todas as amostras suportam tal resistência às sentenças do IMA nos grupos mexicanos, uma vez que as consideram como sentenças não-gramaticais. Estes resultados sugerem uma maior flexibilidade nas amostras bilíngues brasileiras do estudo de Fernandez e Souza (2016) para sentenças que contêm estruturas de IMA, enquanto bilíngues mexicanos espanhol-inglês não apresentam tal flexibilidade.

**Palavras chave:** julgamento de gramaticalidade, leitura auto-cadenciada, processamento de sentenças, alternância de movimento induzido, verbos de mudança de estado, variação linguística cruzada.

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## LIST OF ABBREVIATIONS

BHQ	Bilingual History Questionnaire
BUAP	Autonomous University of Puebla
COS	Change of State
HPB	High Proficiency Bilinguals
IMA	Induced Movement Alternation
L1	First Language
L2	Second Language
LPB	Low Proficiency Bilinguals
MN	Monolinguals
N	Noun
n	Number of participants
NP	Noun phrase
P	Preposition
PC	Phrasal Categories
PP	Prepositional Phrase
RT	Reaction time
S	Sentence
UFMG	Federal University of Minas Gerais
V	Verb
VLT	Vocabulary Levels Test
VP	Verb phrase

## Chapter I: Introduction

Language comprehension is such a common activity that it is taken for granted. We seldom, or possibly never, stop to reflect on the fact of how people are able to understand each other. We just do it. Nevertheless, finding out about the underlying structures and processes behind the ability of speaking in humans is, according to Aitchison (1995), the common aim of those who call themselves as psycholinguists.

For psycholinguistic researchers, the ability of bilinguals to perform in either a monolingual or a bilingual context, or to switch languages with little or no effort at all, has raised up new questions that inquire about how both language systems are organized inside the bilinguals' mind. According to Heredia (2008), "this ability of bilinguals to function independently in one language or in both languages simultaneously has lead bilingual researchers to wonder about how bilinguals might represent their two languages in memory".

Language representations in the human mind is a branch of psycholinguistics that could be divided even further, depending on their aim of study. The study of psycholinguistics often uses knowledge, theories and techniques from many different areas of study, such as linguistics, psychology, neurology, the cognitive sciences, and other sciences in order to find the answers to the fundamental questions that are analyzed in psycholinguistic studies. This is the reason why psycholinguistics is considered by many people as an interdisciplinary field (Slobin, 1979). These questions can be categorized into three main areas:

- How do children acquire language? (Language acquisition)
- How do people produce language? (Language production)
- How do people understand language? (Language comprehension)

The current research bases itself into the last category and, at the same time, aims to present empirical data from which the syntactic representations of two languages are studied, trying to get a better understanding of how they relate to each other in the bilingual mind.

According to Steingberg (1996), there have been many researches that have studied two linguistic systems in bilingual populations before, and many of them date from a very long time ago (Goddart 1917; Smith, 1939; Smith & Madorah 1939; Bruck



et al, 1976; Brain & Yu, 1980; in Steingber, 1996). However, according to the same author, the very first studies about bilingualism were carried out with the objective of getting familiar with their social impact and the possible positive or negative impact of bilingualism. Later on, mostly during the 1980s, the focus of the researches about bilingualism changed their scope. Again, Steingberg (1996) says that many researches about the benefits of an early or late acquisition of the language were carried out during this time (De Villiers & De Villiers, 1978; Vihman, 1982; Schmidt, 1990; in Steingberg, 1996). During these researches, the role of awareness when learning a language was studied, specially comparing children to adults.

Nevertheless, the empirical studies from the decades of the 1960s and 1970s about error analyses contributed to show a possible influence of the first language (L1) on the second language (L2). From then on, many of the studies from the following years focused on this subject, and terms such as language interference, proposed by Ulrich Weinreich in 1953, became a trending topic.

The very first studies about the influence of L2 on L1 seem to track back to those of Vivian Cook. Based on the definition proposed by Ulrich Weinreich (Weinreich, 1953: 1; in Cook, 2003) about *language interference*, Cook sets the bases to what he calls “perhaps the first book devoted only to the effects of the second language on the first” (Cook, 2003). This new perspective opened a new path for researches about what at that time was also called of 'reverse' or 'backward' transfer. Besides, this new perspective of 'language interference' helped to back up Cook's previous idea of multi-competence, which was a term that used in order to refer to the knowledge that a bilingual person had about two different linguistic systems.

“The idea of *multi-competence* resulted as the necessity for a term that could describe the knowledge of two different systems in one mind” (Cook, 2004). So far, the term that was used was *interlanguage*, but this term, according to Cook, only referred to the knowledge of L2, without taking into account the previous knowledge that the speaker already had. With this new concept, the first speculations about how both systems were organized in the bilingual mind were proposed. For Cook, it was more likely that both systems shared some characteristics, hypothesizing that “they must form a language super-system at some level rather than [being] completely isolated systems” (Cook, 2004).

Along with the first propositions of how the languages were organized inside a bilingual's mind, some statements also changed the perspective in which the study of bilinguals occurred. For example, most of the researches compared bilinguals L2 users to monolinguals as if being monolingual-like was the main goal; in other words, "whether the very best learners actually have native-like competence" (Long, 1990: 281, in Cook, 2007). This, however, is not the intention of the present study.

More recent researches (Fernandez, 2003; Oliveira & Souza 2011; Souza 2012; Fernandez & Souza 2016) compare the bilinguals and monolinguals' performances; still, their focus is totally different. Psycholinguistic studies nowadays focus on trying to understand the way in which linguistic systems are organized inside the bilinguals' mind, without having into account the idea of a monolingual mind as a target. This idea is reinforced by Fernandez & Souza (2016):

A perennial question in psycholinguistic research in the area of bilingualism asks whether language-specific knowledge is separated or integrated in the bilingual mind. A related question is to what extent such knowledge, be it integrated or separated, underpins performance in one or the other language of the bilingual. (Fernandez & Souza, 2016. p1)

### 1.1 Justification for research and significance of the study.

Based on Cook's previous definition of multicompetence, and the hypothesis that bilinguals are not simply two monolingual systems into one mind, the present study aims to investigate the tolerance that Mexican Spanish- English bilinguals may have compared to Mexican Spanish monolinguals when it comes to syntactic structures that are not licensed in their L1. It is important to mention that the present study departs from the studies by Souza & Oliveira (2011), Souza (2012), Souza (2014) and Fernandez & Souza (2016), in which the cross-linguistic variation of Brazilian Portuguese-English bilinguals was analyzed and, at the same time, the development of tolerance for induced motion constructions in Portuguese was tested.

Cross-linguistic variation is a term that is used in order to describe the differences that exist among languages in terms of their grammatical structures (Fernandez & Souza, 2016). Such differences range from omission of elements (null subjects), word order, or argument structure. Cross-linguistic variation in argument structure may be the reason

behind some learning difficulties when learning a L2, since new arguments may be required in the L2 syntax that were not used in the L1. However, once the bilingual learner achieves a high degree of proficiency in the L2, they might become more tolerant to sentences in L1 in which the arguments of the L2 are used. Such implications fit into the term of multicompetence of Cook, in which not only the influence of L1 on L2 occurs, but also the opposite is possible.

During the study of Fernandez & Souza (2016), the cross-linguistic feature that was studied was the induced-movement alternation phenomenon. The reason behind this is the fact that, in English, the verbs in these constructions require different arguments than in Brazilian Portuguese (or Spanish), having, therefore, a causative reading. However, such constructions are restricted to verbs of manner of motion, which would not “naturally” have a causative reading unless they are used in the induced-movement alternation form. The following sentences illustrate this phenomenon.

- 1) a) The researcher ran the rat in a box.
- b) \*A pesquisadora correu o rato em uma caixa.
- c) \*La investigadora corrió el ratón en una caja.

There are, however, several researches that have studied the so-called synthetic causative sentences in Brazilian Portuguese (Silva, 2009; Da Silva, 2010; Milanio & Vitral, 2015). The results from those researches, especially those from Silva (2009), suggest a similar structure to that of the induced movement alternation structure from English in some causative sentences from Brazilian Portuguese. This would suggest that, even though the induced movement alternation structure is not present in either Brazilian Portuguese or Mexican Spanish, the former would show a higher flexibility to synthetic causative sentences than the latter, making Brazilian Portuguese-English bilinguals more tolerant to such constructions.

This is the reason why, for the purposes of this research, the same cross-linguistics feature is going to be analyzed in the Mexican Spanish-English bilingual sample. The reason behind this decision is the fact that, similar to Brazilian Portuguese, Mexican Spanish does not share the same induced-movement alternation phenomenon that exists in English, and moreover, several verbs constructions that are used in synthetic causative sentences in Brazilian Portuguese are not licensed in Mexican Spanish. Therefore, a similar research with a different study sample would bring new data for analyses.

\* From now on, the symbol \* will be used to denote ungrammatical sentences.

Furthermore, the idea of a previous research replica with a different sample follows the same line that some studies presented in Heredia (2008) followed during their researches about bilingual memory structure, in which some authors replicated studies in order to test their hypothesis.

Bilingual memory has come a long way, but much more work is needed in order to further refine existing models in order to arrive at fuller understanding of how bilinguals organize their languages (Heredia, 2008, p. 62).

The *induced-movement alternation construction*, the *synthetic causative sentences* and the ‘*cross-linguistic variation*’ term will be described in more detail in chapter II.

## 1.2 Objectives of the study, research questions and hypotheses.

As previously mentioned, this paper is based on one main hypothesis: L1 and L2 syntactic systems are actually only one single syntactical system. In order to test such hypothesis, this study intends to replicate those experiments of Fernandez & Souza (2016) in a different population, so it may eventually contribute to enhancing the explanatory power of the theory of multicompetence (meaning that despite of the fact of not having an equivalent syntactic construction, the higher level of proficiency would eventually lead to a higher tolerance to unlicensed constructions in the L1), or on the other hand, disagree with that which was stipulated in Souza’s research (implicating a higher tolerance to induced movement alternations only in the Brazilian Portuguese-English participants). For this reason, the following research questions emerge:

- Do Mexican Spanish monolinguals discriminate the induced-movement alternation phenomenon in their native language the same way the Brazilian Portuguese monolinguals did in the research of Fernandez & Souza (2016)?
- Is the degree of acceptability of the induced-movement alternation phenomenon the same in the Mexican Spanish-English bilinguals than that of the Brazilian Portuguese-English bilinguals when presented in their native languages?
- Taking into consideration the reaction times when analyzing sentences that present the induced-movement alternation structure in their native language, do

the Mexican Spanish-English bilinguals' data provide similar information to that of Fernandez & Souza (2016) that back up the theory of multicompetence and a shared syntactic system?

- Do the differences between Brazilian Portuguese and Mexican Spanish have any relevance when bilinguals of high proficiency of these languages and English have to discriminate sentences in their L1 that present the induced-movement alternation structure?

Such research questions open the possibility for some secondary hypotheses to arise.

- Just like Brazilian Portuguese monolinguals, Mexican Spanish monolinguals will judge sentences that contain the induced-movement alternation in their L1 as ungrammatical sentences.
- It could be expected to have a similar result in the performance of the Mexican Spanish-English bilinguals to that of the Brazilian Portuguese-English bilinguals of high proficiency when reading sentences with the induced-movement alternation in their L1. Such performance would suggest a possible modification in the arguments that a motion verb may require in order to be present in a sentence, due to the high level of exposure of bilinguals to English.

### 1.3 Thesis outline

This thesis is divided into five chapters. The first one contains an introduction to the research topic, describing the objectives and the hypotheses that are expected to be proved with this research. On the second chapter, the definitions, concepts and theories behind the studies of this kind will be discussed in order to guide the reader through the previous knowledge and researches supporting the current research. On the third chapter, a description of the methodology, as well as the variables and instruments used, is provided. On the fourth chapter, the results obtained from the instruments are described and analyzed. And finally, on the fifth chapter, the results and final conclusions based on the previous analyzed data will be given. During this last chapter, implications of the current research, some limitations of the study, and some recommendations for further research are also established.

## Chapter II: Literature review

This chapter is divided into four main parts that provide the necessary background in order to understand the development of this research. In the first part, the definition of bilingualism is discussed in order to delimit its meaning to this research. After this, a brief discussion of how sentences are understood by a person is done. After that, the reasons behind choosing the induced-movement alternation structure are explained and evidenced. Finally, a discussion about an article that describes the influence of second language proficiency and its implications in shared syntactic representations is presented.

### 2.1 Monolingualism and bilingualism

Different to what most people think, according to Grosjean (1985) a bilingual speaker is more than the sum of two monolinguals, in the sense that the bilingual has also developed some unique language behavior. He actually emphasizes this idea discussing some of the most common myths about bilingual people, defending the idea that bilingualism is not a rare phenomenon, that they can acquire a second language not only during childhood, that they do not always have an equal and perfect knowledge about their languages, and that the code switching or borrowing phenomena in bilinguals is not a sign of laziness (Grosjean, 2010). This may be the reason why the definition of bilingualism is still a little controversial.

Some other authors, however, have tried to come into terms that would define and classify bilinguals according to different criteria. In the review of Moradi (2014), he lists the main authors and their classifications for bilinguals. According to him, the most common classifications of bilinguals have to do with their degree of fluency and competence in the languages spoken, their age of second language exposition and acquisition, their context or manner of acquisition, and their possible processing mechanisms or language representations structures. Such classifications are described below.

#### 2.1.1 *Early and late bilinguals*

This is the first classification in Moradi's review. According to him, the turning point between early and late bilinguals is the pre-adolescence phase of life (approximately after the age of 8). Moreover, according to Swain (as cited in Moradi, 2014) early bilinguals manifest bilingualism as a native language, while late bilinguals are regarded

as non-native speakers of L2. They both support this statement arguing that in late bilingualism the bilinguals have already acquired their L1, so they use this experience in order to acquire their L2.

### 2.1.2 *Balanced and dominant bilinguals*

According to Peal and Lambert (as cited in Moradi, 2014), the main distinction between these bilinguals has to do with their relationship with their fluency and degrees of proficiency and mastery in both languages. For the authors, those bilinguals that possess similar degrees of proficiency in both languages are defined as balanced bilinguals. On the contrary, if bilinguals have a higher degree of proficiency in only one of their languages, they fall into the category of dominant or unbalanced bilinguals.

### 2.1.3 *Compound, coordinate and subordinate bilinguals*

In this classification, Moradi brings the concepts of Weinreich (1953, in Moradi, 2014) in which he argues that the difference between these types of bilinguals has to do with how their linguistic codes are organized and stored. From their perspective, compound bilinguals have two sets of linguistic codes, but they are stored in a single meaning unit. On the other hand, coordinate bilinguals, besides having two linguistic codes, they also have two systems of meanings for words, which are connected to each one of their linguistic codes. This could be better appreciated in the following picture.

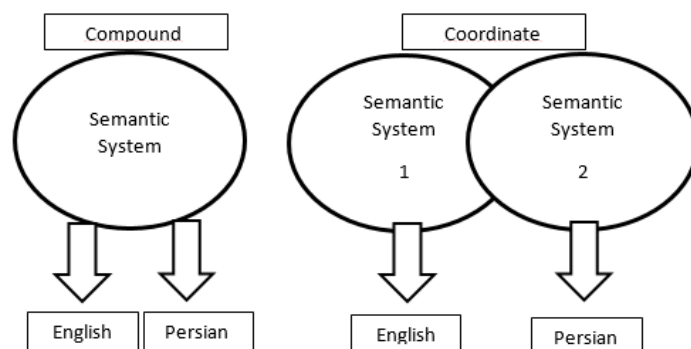


Figure 1. Compound and coordinate bilinguals

Note. Reprinted from *An investigation through Different Types of Bilinguals and Bilingualism* by Hamzeh Moradi (2014)

In addition, the authors define the category of subordinate bilinguals who, in their opinion, have a single meaning unit and two different linguistic codes. However, different

to coordinate bilinguals, subordinate bilinguals can only access to the meaning unit through the use of their L1 linguistic code, implying that there is no direct connection between their L2 and their meaning unit.

Nevertheless, the very last classifications seem to have been questioned by some recent research (Cook, 2003; Bialystok, 2010; Bernolet, Hartsuiker, Pickering, 2013) since these authors propose a different path that would explain the organization of both linguistic codes, invalidating then such classification. Some of the models that would describe bilingual language structure are described below.

## 2.2 Cognitive models in bilingualism and sentence comprehension

David Caplan (1994), in his book “Language: Structure, processing and disorders”, presents a summary of the major concepts and results in the fields of linguistics and psycholinguistics in order to provide with the basis for understanding the studies of language disorders and psycholinguistic literature. He actually dedicates a full chapter of his book to discussing some of the theories used to explain the processes behind sentence comprehension, and describes some of the research carried out in aphasic monolingual patients that struggled with sentence comprehension. Hence, we will look at some of the concepts that were used in his book before describing the phenomenon that will be studied in this research.

### 2.2.1 Syntactic structures and their association with Sentence meaning.

According to Caplan (1994), the structure of a sentence dictates the relationships between the meanings of the words in a sentence, producing in this way a meaning for each statement. In other words, “*syntactic structures* provide the means whereby the meanings of individual words can be combined with one another to add the information conveyed by language”.

However, this relationship is not arbitrary. According to the same author, syntactic structures are hierarchically organized sets of *syntactic categories*. A syntactic category is an individual lexical item with specific characteristics; for instance, *horse* is a noun [N], *read* is a verb [V], and *for* is a preposition [P]. Moreover, these categories combine to create nonlexical nodes (also called phrasal categories), such as noun phrase (NP), verb phrase (VP), prepositional phrase (PP), sentence (S), etc. In order to understand such hierarchy, Caplan gives the following diagram:



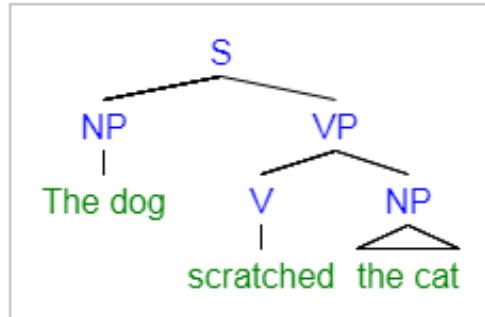


Figure 2. Example of hierarchy of syntactic categories.

Note. Reprinted from *Language: Structure, Processing and Disorders*, chapter 7, pg. 254, by David Caplan.

The previous diagram shows how higher nodes dominate lower nodes. For instance, the noun *dog* is part of the NP *the dog*, which is dominated by the node S. The same diagram explains the *grammatical roles* of each node in the sentence; for example, the first NP *The dog* is considered the subject of the sentence since it is the one immediately dominated by the node S. This, according to Caplan (1994) reflects that the notion of subject is a syntactic notion, defined by the position of words in syntactic structures.

The same diagram works also to represent how the *thematic roles* of the sentence are distributed and, in this case, given by the verb. Again, according to Caplan (1994) part of the meaning of a verb is its “argument structure”, in other words, how it assigns actors, recipients of actions, and other thematic roles. In the previous example, the verb *scratch* assigns the thematic role of agent to its external argument (the first NP: the dog), and the role of theme to its internal argument (the second NP: the cat), making it the object of the sentence.

In the modern study of syntactic structures, the contributions from Chomsky (1955, 1957, 1965, 1985, 1981, in Caplan 1994) marked the beginning of the focus in the relationships between syntactic structures and aspects of meaning, establishing an effort to list the patterns to make well-formed sentences in a language. As a consequence, verbs that at first seemed to behave in two different ways were now explained through the introduction of what Chomsky called co-reference (C-command relations) and “empty categories” (traces [t] and PROs).

C-command relations could be summarized as the description of the relationship of referentially dependent items (such as pronouns and reflexives) to referring NPs. Take the following sentence from Caplan (1994) as an example:

Susan said that Mary's portrait of herself pleased Helen.

Figure 3. Example of c-command relations.

According to Caplan, in figure 3, the reflexive *herself* is referring to Mary, not Susan or Helen. This could be explained since pronouns and reflexives are “co-indexed” with specific NPs. These co-indexed NPs, according to Chomsky (1981, in Caplan 1994), are said to be their antecedents. The following diagram illustrates the notion of c-command.

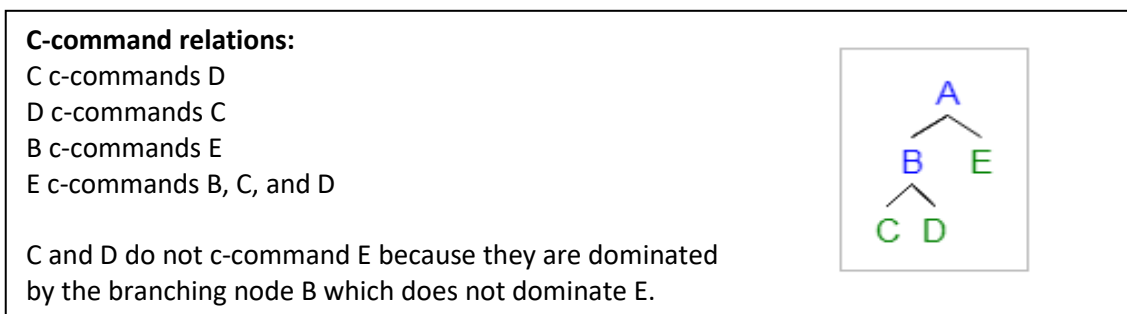


Figure 4. Notion of c-command.

Note. Reprinted from *Language: Structure, Processing and Disorders*, chapter 7, pg. 263, by David Caplan.

On the other hand, the empty categories (traces and PROs) describe phenomena in which there is not phonologically explicit utterance of their referring NP. In essence, they are similar to reflexives and pronouns since they are related to a NP, but the absence of a phonological presence in the sentence makes them fit into a different category. According to Caplan (1994), Chomsky’s theory of PRO and traces differentiates them since PRO does not transmit a thematic role, while trace does. Moreover, PRO may refer to a NP outside the sentence it is in, while trace must always refer to a NP within its sentence.

Based on the information previously described, Caplan (1994) argues that the syntactic structures are a special domain of mental representations, likely to be associated with their own processors. This statement opens the door to a wide field of research in

which the importance of testing syntactic structures is vital and, therefore, we should follow this path.

### 2.2.2 Processes involved in sentence comprehension

According to Caplan (1994), there is a possibility that there are several routes to get to sentence meaning. They could be a) A syntactic route that computes a full syntactic representation for a sentence and uses this representation to assign aspects of meaning, b) a heuristic route that uses a reduced syntactic structure for the same purpose, c) and a lexico-inferential route that infers aspects of sentence meaning from word meanings and knowledge of real world events. He illustrates these possibilities in the following diagram.

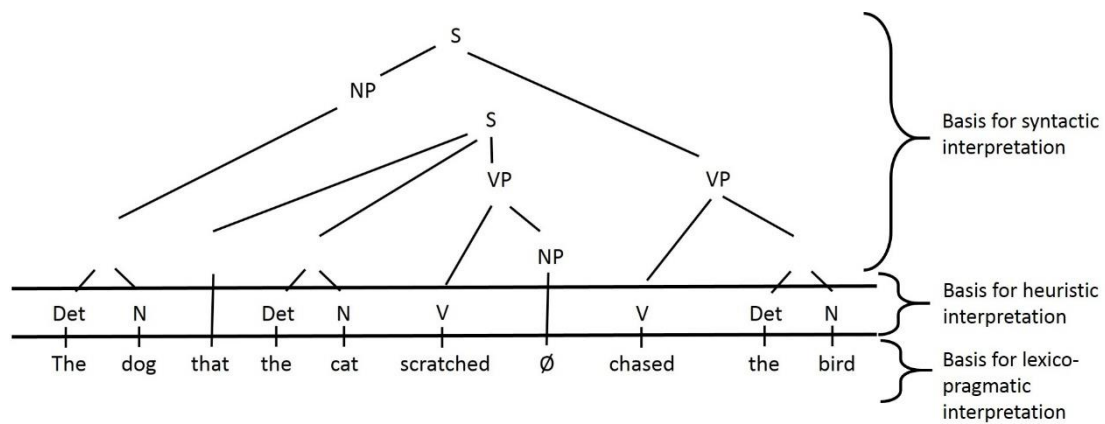


Figure 5. Different bases for sentence comprehension.

Note. Reprinted from *Language: Structure, Processing and Disorders*, chapter 7, pg. 272, by David Caplan.

However, Caplan is more likely to believe in a route that is based on a syntactic basis but that considers the heuristic and lexico-inferential components as well. Caplan calls this syntactic route of understanding “*parser*”, and for him it is a specialized processing mechanism dedicated to the construction of syntactic form. He also establishes that in these parsers, the syntactic structure of a sentence is not recognized as a whole but rather it is built up in a scaffolding way.

Hence, the author stipulates that the creation of a parser that accomplishes an incremental assignment of syntactic structure needs the usage of *pattern-action rules*. A pattern-action rule takes as its input a syntactic category, and creates as its output a syntactic structure.

However, these pattern-action rules are not the only things involved in the functioning of a parser. According to Caplan (1994), Frazier (1987a, in Caplan, 1994) proposes a model that is based on the existence of preferences in interpretation and so-called garden path effects in understanding locally ambiguous syntactic structures. He uses sentences as the following one in order to exemplify how parsers work.

2) The horse raced past the barn fell.

In the previous sentence, there exist an ambiguous syntactic structure leading to a misunderstanding and reanalysis of the sentence. According to Frazier (1987a, in Caplan, 1994), the syntactic preferences of a listener influences the understanding of a sentence, and when these misinterpretations of part of a sentence attain consciousness, they go by the name of “garden path”.

In Caplan’s review of the syntactic processes involved in sentence comprehension, he mentions that there are many researches that evidence that both context and lexical structure affects how constituents are attached to developing syntactic structures, but they do not imply that parsers do not exist. On the contrary, it only evidences that the syntactic processor does not only work based on syntactic input only, but that it is also affected by other types of linguistic information.

### 2.3 The causative sentences in Brazilian Portuguese, Spanish and English.

In this part of the chapter, a review of Silva’s (2009) and Montrul’s (2001) work will be done. Therefore, most of their description of the causative sentences with Chance-of-state verbs and Manner-of-motion verbs will be adopted. Let us then begin with Silva and her description of the synthetic causative sentences in Brazilian Portuguese.

#### 2.3.1 Synthetic causatives and Silva’s proposal

In her research, Silva’s first objective is to describe the causative sentences in Brazilian Portuguese. First of all, she establishes that a causative sentence must be understood as a sentence that refers to the causative relationship between two versions of the same sentence (Crystal, 1988 in Silva, 2009) and that causative sentences are composed of two main parts: the cause and the effect (Comrie, 1981 in Silva, 2009).

Departing from these definitions, she presents the categorization of causative sentences from Bittencourt (2001, in Silva, 2009), who describes that there are three different types of causative sentences: analytical, semi-analytical and synthetic causative sentences.

In analytical causatives, the existence of a causative verb is mandatory (*fazer*) and the predicate of the sentence is considered to be composed of two clauses, which are joined by the causative verb, and that do not share a close linking. They are divided into *subjunctive fitted* and *infinitive fitted*. She illustrates these categories with the following sentences:

- 3) a. Os seguranças fizeram (com) que os caras pintadas *lavassem* o rosto.  
(Subjunctive) (The security guards made the guys with painted faces to wash them off.)  
b. Os seguranças fizeram eles *lavar(em)* o rosto.  
(Infinitive) (The security guards made them wash their faces.)

Similar to the previous category, semi-analytical causative sentences are composed by the same parts. However, the relationship between the cause and the effect is closer. Look at the following sentence as an example:

- 4) O assassinato brutal da minha filha me fez ir a Brasília atrás de justiça.  
(My brutal daughter's murder made me go to Brasilia to seek justice.)

However, the last category of causative sentences in Bittencourt's taxonomy differs in a great way to the previous ones. In synthetic causative sentences, there is only one clause of the predicate in the sentence that codifies both tasks, the causative and the caused phases of the causative process. Besides, this type of causatives also shows a direct causativity, i.e. there is a direct action over the object of the sentence made by the subject of the sentence. However, such action does not limit the participation of the object in the realization of the activity. She exemplifies with the following sentence:

- 5) Graças a Deus estudei todos os meus filhos!  
(*Literally*: Thanks God I studied all my sons; *Meaning*: Thanks God I made all my sons study)

Bittencourt's classification of causative sentences worked as a basis from which Silva proposed her own taxonomy for causative sentences. For Silva (2009), causative sentences could be divided into two categories (having as a main difference the presence or absence of a phonetic form of the causative verb): Analytic and Synthetic causatives.

However, different from Bittencourt's categories, Silva subdivides synthetic causative sentences according to more specific characteristics.

### 2.3.1.1 Synthetic causative sentences with unaccusative verbs.

According to Silva (2009), this type is the most common structure in the Mineiro dialect of Brazilian Portuguese. Unaccusative verbs are characterized by the selection of the feature [affected] over the feature [trigger]. In addition, unaccusative verbs do not assign the accusative case to their argument (hence, the name unaccusative). According to Silva (2009), some examples of this kind of verbs would be *cair* (to fall), *adiantar* (to advance), *chegar* (to arrive), *brilhar* (to shine), *arder* (to burn), *doer* (to hurt), *sair* (to leave), etc. These verbs have an intern argument with the following semantic features [-Trigger, +Affecter, -Control], and they would appear in a sentence as:

- 6) O tempo amadureceu as frutas.  
(The time made the fruits to be ripped.)

However, this kind of causatives could also be found in their synthetic form, without any change in the semantic features of the intern argument (despite its change of position):

- 7) a. O salário adiantou.  
(The salary was early)  
b. O aumento do faturamento este mês adiantou o salário dos funcionários.  
(The increase of invoices this month made the salary of the employees be early)

Finally, Silva proposes a syntactic representation of the causative sentences when they have an unaccusative verb.

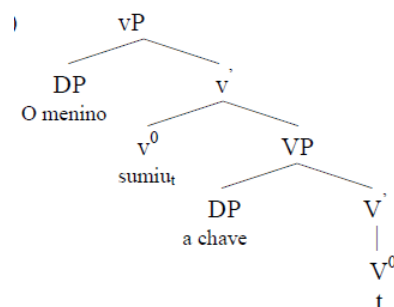


Figure 6. Syntactic tree for unaccusative causative sentences.

Note. Taken from Silva (2009) pg. 87.

### 2.3.1.2 Synthetic causative sentences with unergative verbs.

Opposite to the unaccusative verbs, the unergative verbs take the feature of [trigger] in their internal argument. Besides, according to Chierici (2008), unergative verbs are those that depend on the will of the agent, for example, the verbs *nadar* (to swim), *pular* (to jump), *caminhar* (to walk), *uivar* (to howl), *dançar* (to dance), *viajar* (to travel), *trabalhar* (to work), *mugir* (to moo), *saltar* (to jump, to skip), *pescar* (to fish), *andar* (to walk, to go), etc. In Silva's work, she considers as unergative causative sentences those that take the semantic features of [+Trigger, ±Control, ±Affected]. She provides the following example:

- 8) Eu almocei os meninos e depois levei eles pra escola.  
*(Literally: I had the kids for lunch and then I took them to school; Meaning: I made the kids have lunch and then I took them to the school)*

In this sentence, the internal argument takes the features of [+Trigger, +Affected], and the external argument the features of [+Trigger, -Affected]. Such kind of sentences were also very common in the sample studied by Silva (2009). In addition, she also presents a syntactic representation of the causative sentences when they have a unergative verb.

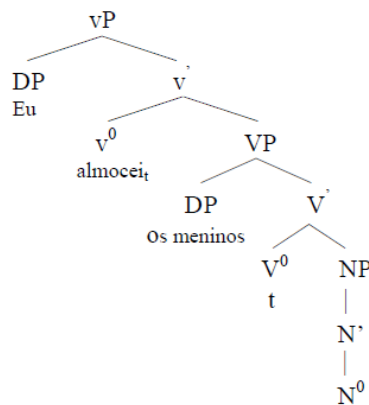


Figure 7. Syntactic tree for unergative causative sentences.

Note. Taken from Silva (2009) pg. 88.

### 2.3.1.3 Synthetic causative sentences with transitive verbs.

During the analysis of this kind of sentences, Silva confessed to be surprised with the existence of causative sentences with transitive verbs since, according to her, these verbs already possess a syntactic position that correspond to either the object or the subject of a sentence. However, she corroborated the existence of these sentences and observed that they could present either an ergative alternation or a transitive one.

Both kinds of sentences are presented below:

- 9) a. O professor acabou a aula mais cedo.  
(The teacher finished the class earlier.)
- b. A aula acabou mais cedo.  
(The class finished earlier.)
- 10) a. Eu consertei o carro por aquele mecânico de nome maluco.  
(Literally: I fixed the car by that crazy named mechanic; meaning: I had the car fixed by that crazy named mechanic.)
- b) O mecânico consertou o carro. / ? O carro consertou.  
(The mechanic fixed the car. / ? The car fixed)

In sentence (9a), it is possible to appreciate how the verb is presented in a synthetic causative sentence, and in (9b) how this same verb presents an ergative alternation with an internal argument with the feature [+affected] (Similar to the sentences in 2.3.1.1). On the other hand, the sentence in (10a) differs from (9a) not only due to the transitive alternation, but also due to the presence of a prepositional phrase that gives a causative reading to the internal argument of this sentence. In other words, the synthetic causative meaning of (10a) is strongly attached to the presence of this prepositional phrase, since this prepositional phrase allows the acquisition of the features [+Trigger, +Affected] in the internal argument. She proposes then the following diagram in order to explain such phenomenon:



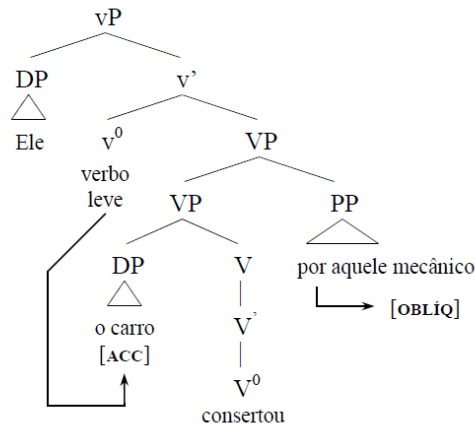


Figure 8. Syntactic tree for unergative causative sentences.

Note. Taken from Silva (2009) pg. 104.

### 2.3.2 Induced movement alternation and change of state verbs in Montrul's proposal.

According to Montrul (2001), most languages present a category of verbs that alternate in transitivity, appearing in two different forms: transitive (causative) and intransitive (inchoative) sentence frames. She exemplifies this difference with the following sentences with a change of state verb:

11) English:

- a. John broke the mirror.
- b. The mirror broke.

12) Spanish:

- a. Juan rompió el espejo.
- b. El espejo se rompió.

The previous sentences are examples of a phenomenon called the causative-inchoative alternation, and it is characterized by the easiness of a transitive verb to undergo an intransitive form. Nevertheless, there is another category of verbs that do not alternate in transitivity since some of them always require a thematic role of an agent. An example of these verbs is shown below:

13) English:

- a. Peter destroyed the evidence.

b. \*The evidence destroyed.

14). Spanish:

a. Pedro destruyó las pruebas.

b. \*Las pruebas se destruyeron.<sup>1</sup>

However, Montrul mentions that, according to the Unaccusative Hypothesis (Burzio, 1986; Perlmutter, 1978, in Montrul, 2001), transitive verbs are divided into two categories: Unaccusatives and unergatives. The main difference between these two kinds of verbs is related to the place in which the sole argument is generated, being in the object position for unaccusative verbs (such as arrive and exist), and in the subject position for the unergative verbs (such as smile and sleep). But even though the inchoative variant of change-of-state verbs ([11b] and [12b]) is considered unaccusative, other variants of unaccusative verbs and unergative verbs do not actually alternate in transitivity; they are, according to Levin & Rappaport Hovav (1995, in Montrul, 2001), ungrammatical in a transitive frame with an extra agent or causer. She provides the following sentences as examples:

15) English:

a. John arrived.

b. \*The pilot arrived John.

16) Spanish:

a. Juan llegó. or Llegó Juan.

b. \*El piloto llegó a Juan.

17) English:

a. John smiled.

b. \*Mary smiled John.

18) Spanish:

a. Juan sonrió.

b. \*María sonrió a Juan.

On the other hand, yet, agentive verbs denoting a manner of motion are, according to Montrul (2001), unergative in the transitive form, and do not typically appear in the transitive sentence frame. Nevertheless, this condition may change if the necessary syntactic conditions are fulfilled; for instance, in languages as Italian, Hebrew or English, the manner-of-motion verbs can adopt an unaccusative meaning when a PP indicates the

<sup>1</sup> This sentence is ungrammatical with an inchoative meaning but not with an impersonal passive reading.

endpoint of the activity described (Kizu, 1997; Levin & Rappaport Hovav, 1995; Rappaport Hovav & Levin, 1998; Ritter & Rosen, 1998; in Montrul, 2001). Take the sentences from Montrul as illustrations:

19) English:

- a. The soldiers marched.
- b. \*The captain marched the soldiers.
- c. The captain marched the soldiers to the tents.

Such modification of arguments is not grammatical in Spanish. According to Montrul (2001), “this unaccusative mismatch (i.e., an unergative verb behaving syntactically like an accusative) is not possible”. For her, verbs of manner of motion cannot transitivize despite the existence of a PP or not.

20) Spanish:

- a. Los soldados marcharon.
- b. \*El capitán marchó a los soldados.
- c.\* El capitán marchó a los soldados hasta el campamento.

In order to support this idea, Montrul (2001) points out that “on the constructional approach, verb meaning and syntactic behavior are not strictly determined by the information contained in the lexical entry of a verb”. In other words, other authors suggest that lexical entry offers part of the basic meaning of a verb, but the interaction of syntax and other aspectual elements also intervene in the other possible meanings that such verb might have in a sentence (Borer, 1994, 1999; Goldberg, 1995; Hoekstra, 1992; Jackendoff, 1996; Kisu, 1997; Ritter & Rosen, 1998; in Montrul, 2001).

The following examples from the research of Kizu (1997, in Montrul, 2001) exemplify how syntactic modification influences the meaning of a verb. For the authors, the unaccusative variant of *march* is a consequence of the addition of a PP that delimits the event.

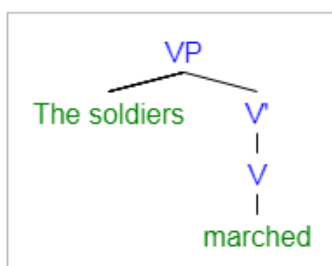
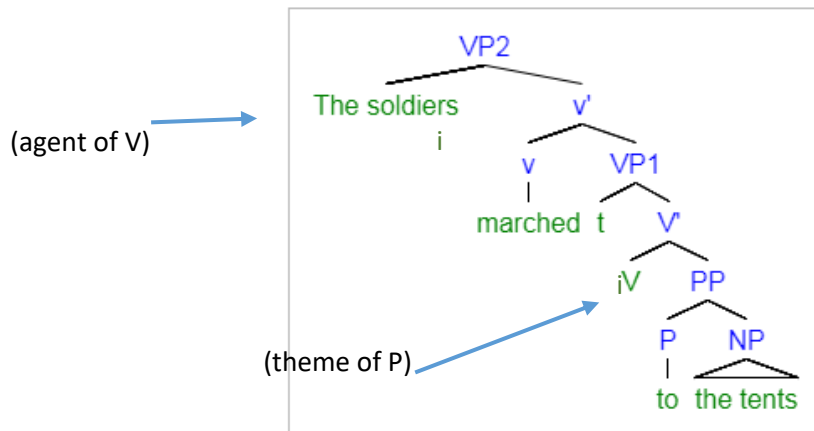


Figure 9. Unergative form of march. (from Kizu, 1997, in Montrul, 2011).

a. intransitive



b. transitive

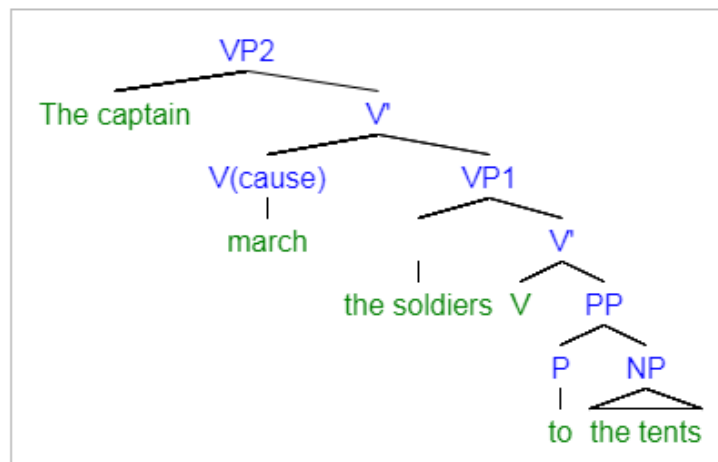


Figure 10. Trees for transitive and intransitive forms of the verb march.

According to Montrul (2001), the tree in figure 7a describes the way in which the verb march becomes an accomplishment due to the presence of the PP that delimits the endpoint of the action, making the NP *The soldiers* to be both the *agent* and the *theme*. In figure 7b, besides adding the PP to the sentence, there is a causer argument in the sentence (*The captain*) causing a movement of the agent *the soldiers* to the specifier of the lower V projection (object position).

Finally, Montrul (2001) concludes her explanation emphasizing the fact that even though agentive verbs of motion can appear in the lexical causative construction under certain circumstances, these verbs have a completely different lexical semantic representation from change of state verbs:

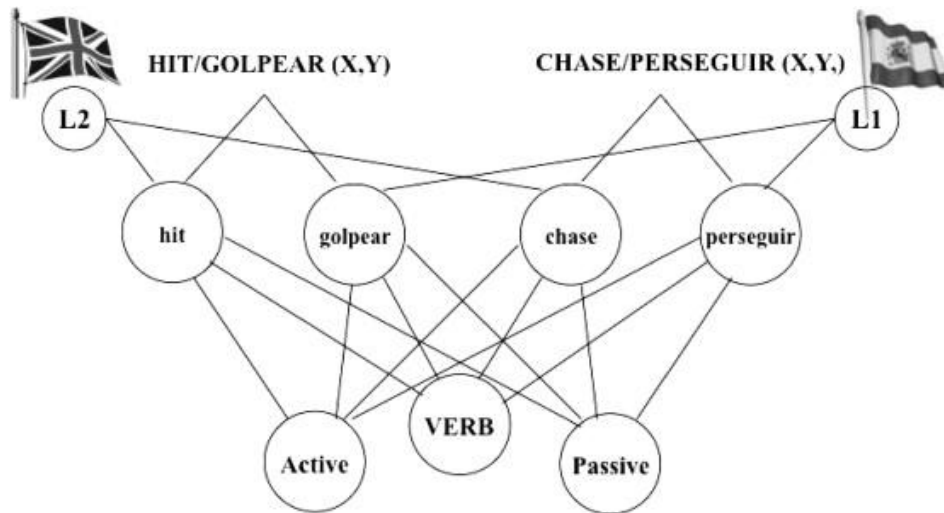
With agentive verbs of directed motion, the causer is usually human or a humanlike being and transmits his or her will to an obedient but independent agent (Cruse, 1972). In contrast, with change-of-state verbs, the causer can be an animate being or a natural force, and the cause is not volitionally independent (i.e. it is a patient or theme). (Montrul, 2001. p. 177)

It is important to mention that for the creation of the sentences to be evaluated in this research, all of these considerations were taken into account. A wider description of the instruments used in this research is done in chapter III.

#### 2.4 Shared syntactic representations in bilinguals.

There is one important factor to take into account when talking about shared syntactic representations: the proximity between the new syntactic structure in L2 and the syntactic structures already existing in L1. In this part of the chapter, syntactic models from Bernolet, Hartsuiker & Pickering (2013) about shared representations in similar structures of L1 and L2 will be presented, and an illustration to the hypothesis of this research will be shown.

In Bernolet, Hartsuiker & Pickering's research (2013), they investigate if syntactic integration depends on proficiency, so they decided to evaluate the priming effects between Dutch (L1) and English (L2) when using genitives, and the within-language priming for English (L2) genitives. In their research, they defend the idea that priming effects are an indicator of shared syntactic representations in L1 and L2, especially if the syntactic structures have an equal counterpart in both languages. They base this hypothesis in their research on Hartsuiker et al.'s model (2004, in Bernolet, Hartsuiker & Pickering, 2013) about lexical-syntactic sentence production in bilinguals, in which syntactic information is shared between languages as much as possible. This model is presented below:

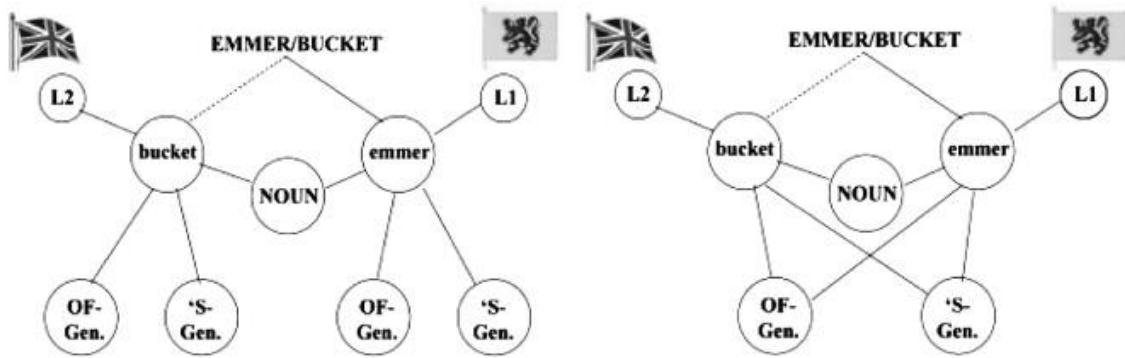


*Note:* Each lemma node (e.g., hit, golpear) is connected to a conceptual node (HIT (X, Y)), a category node (Verb), combinatorial nodes (Active and Passive), and a language node (indicated with British or Spanish flag).

Figure 11. Integrated model of bilingual language representation. From Hartsuiker et al., 2004 in Bernolet, Hartsuiker & Pickering, 2013).

From this diagram, the authors defend the idea that “the activation of a grammatical structure does not determine the languages of an utterance; on the contrary, the language of an utterance is dependent on the choice of lexical items that are inserted into this structure” (Bernolet, Hartsuiker & Pickering, 2013).

As previously mentioned, the authors argue that the proximity between syntactic structures might lead to overgeneralizations in both languages, so they present the following figure in order to exemplify their rationale. However, they do not mention what the possibilities of a syntactic structure in L2 without a counterpart in L1 would be.



*Note:* Figure 2a (left hand side) represents a model in which L2 structures initially receive separate representations; Figure 2b (right hand side) represents a model in which the representations of Dutch (Flemish) and English genitives are shared from the outset.

Figure 12. Hypothetical models for the representation of Dutch (Flemish) and English genitives in Dutch-English late bilinguals in an early stage of acquisition. From Bernolet, Hartsuiker & Pickering (2013).

As already mentioned in chapter I, Cook (2004) agrees with the idea that both systems share some characteristics, but he enhances the idea of multicompetence (or ‘reverse transfer’ of syntactic structures) which, according to him, are caused due to the creation of new combinational nodes that were not existent in a previous L1. The fact of having both systems shared in a bilingual mind would lead to overgeneralizations or, as Fernandez and Souza (2016) say, higher tolerance for constructions not licensed in L1 but licensed in L2, as proved in their research. Since this research departs from the previous ideas, the tolerance of Mexican Spanish-English bilinguals to induced-movement alternation sentences is going to be tested. In the following chapter, the methodology used to measure such tolerance is described.

### **Chapter III: Methodology.**

Psycholinguistics aims to uncover the mental representations and processes through which people produce and understand language, and it uses a wide range of techniques to do this. (Garrod, 2006, p. 251)

There are two main types of techniques in psycholinguistics in order to carry out experiments: Off-line and on-line techniques. According to Garrod (2006), the main difference between them is that off-line techniques measure variables after the processing of the language is done, while on-line techniques measure variables that take part of the language production as the production itself happens. However, according to the same author, it would be wrong to consider both kinds of techniques as two worlds apart; on the contrary, Garrod suggests that in practice, both kinds of techniques complement each other.

For the purposes of this research, an adaptation of the methodology proposed in Fernandez & Souza (2016) was followed. There are two experiments in Fernandez and Souza's research, but due to the characteristics of this research, it was decided to integrate both experiments into a single one. However, the same results of the off-line task and the on-line task can be expected to happen. The experiment, as well as the participants studied in this research are described below.

#### 3.1 Participants.

During this research, 70 people were tested and divided into three different categories: Mexican Spanish monolinguals, Mexican Spanish –English bilinguals of low proficiency, and Mexican Spanish – English bilinguals of high proficiency. For the purposes of this research, all of the participants lived in a context in which the use of their L1 was part of their daily lives and, in the case of the bilingual groups, the study of their L2 started during their early years as teenagers (from 9 to 10 years on), as mentioned before in the previous definition of late bilingualism.

All of the participants that were studied during this research were gathered from the regional campus of Tehuacan of the Autonomous University of Puebla, located in Tehuacan City, Puebla, Mexico. Since different levels of English Proficiency were



needed, the samples analyzed were taken from the ten different Bachelor Degree programs offered in the campus.

Before collecting any kind of data from the students, permission to carry out this research was asked to the principal of the BUAP Tehuacan Campus, PhD. Mariana Vaquero Martínez, and, in collaboration with the coordinators of each Bachelor Degree program, students were asked to collaborate as participants of this research. A copy of such document can be found in the appendix 1.

### 3.2 Instruments

Among the instruments that were used in this research, there were 3 items: a questionnaire, an English test and a psycholinguistic experiment designed in two versions, one in Spanish and the second one in English. Such instruments are described in detail below.

#### 3.2.1 Questionnaire

For the first instrument, a simpler adaptation of the first part of the Bilingual History Questionnaire (BHQ) of Fernandez, 2003 (Fernandez, 2003 in Silva, 2016) was created, and data about background information such as age, L1, and age to exposure to L2 were collected. The reason behind applying this questionnaire before anything else was to have a control over the type of students that were to answer the psycholinguistic experiments, and to make sure that they fit the necessary characteristics for this research, since Tehuacan city is known to have a high percentage of people that have another language different from Spanish (Nahuatl, Ngigua, or Mixteco) as their L1. A copy of this questionnaire can be found in the appendix 2.

#### 3.2.2 Vocabulary Levels Test

A computer-based version of the Vocabulary Levels Test (VLT) adapted from Nation (1990) was used in order to measure participant's proficiency in L2. The reason behind choosing this test to measure participants' proficiency comes from the idea of Grosjean (1998, 2008, both in Souza, Duarte & Berg, 2008) of the necessity of an explicit and accurate distinction of the categories that are involved in bilingual research.

According to different researches carried out in the laboratory of psycholinguistics of the Federal University of Minas Gerais (UFMG) (Souza, Duarte & Berg, 2008; Silva, 2016), the VLT test is a good option to perform such categorization of people's performance in L2 since 1) it is a quick and practical test, easy to apply and to evaluate and 2) due to the flexibility and adaptability of the test methodology, which makes it a welcoming test to explore different research contexts, and potentially, to other languages besides Japanese and Portuguese.

This test was used in order to measure English proficiency in Japanese native speakers (Beglar & Hunt, 1999, in Souza, Duarte & Berg, 2008), but it was validated in Silva (2016) in order to be used as a diagnostic tool to measure English proficiency in Portuguese-English bilinguals. Even though the test itself has not been validated to Spanish-English bilinguals, this is not the first time that such test is used with a population of Spanish native speakers, since Schmitt, Schmitt & Clapham (2001, in Souza, Duarte & Berg, 2008) used this test in order to validate it along with other varieties of the same test. For this reason, it will be used for this research considering the linguistic proximity of Portuguese and Spanish.

A full description of the VLT test is provided in Souza, Duarte & Berg, (2008). According to them, this test is comprised of five different levels; each one of them with six sets of questions, comprised by six lexemes and three possible definitions for only three of the six lexemes. Hence, what the participants must do is to match those three definitions to the three corresponding lexemes in each set.

The evaluation of this test is quite simple compared to other tests. There are 18 correct answers per level, and for a participant to be considered into the corresponding level he must get at least 12 of the 18 possible points. This, according to Souza, Duarte & Berg (2008) ensures that the participant possesses the semantic knowledge of at least two third parts of the vocabulary tested in that level. At the same time, the fact of the VLT test being a test based on vocabulary matches the idea of Alderson (2005), who argues that language ability is largely related to vocabulary size; meaning that one's performance in a language can be measured considering the extent of the vocabulary.

It is important to mention that, even when one of the levels of the VLT test might be a little easier to Spanish Native speakers due to the content of vocabulary from Latin origin, the fact of it lasting only 10 minutes reduces significantly any kind of advantage

that Spanish native speakers might have over this level, as mentioned in Souza, Duarte & Berg (2008). An example of the VLT used for this research can be found in appendix 3.

### 3.2.3 Experiment

The experiment that was used in order to analyze the tolerance to ungrammatical sentences was a hybrid of both, online and offline experiments. However, such hybrid follows the same path that was considered in Fernandez and Souza (2016). A brief introduction to both experiments is presented below.

#### 3.2.3.1 The Acceptability Judgment task

Acceptability judgment tasks are commonly used as offline tools in psycholinguistic researches. For example, the first experiment used in Fernandez and Souza (2016) is based on the *magnitude estimation paradigm* (Bard, Robertson, & Sorace, 1996; Sorace, 2010; both of them in Fernandez & Souza 2016). In this kind of judgement task, the correctness of the sentences is rated based on the evaluation of a first sentence. When the first sentence is presented, the participants are asked to give that sentence a number and from there, to rate the following sentences to come. For instance, if the second sentence is half as good as the first one, the participants should rate this new sentence with a value equivalent to the half of the value of the first sentence; on the contrary, if the second sentence is twice as good as the first one, the value given to this sentence should be twice as much as well.

The purpose of the first experiment in Fernandez and Souza (2016) was to explore bilingual's knowledge of the induced-movement alternation structure, and this is the reason why the authors proposed to use that acceptability judgement task. However, there are other judgement tasks: those that could be answered by using a binary choice (either "correct" or "incorrect"), and those that are answered through a rating scale (also known as Likert scale). According to Fernandez & Souza (2016), both of them evaluate the perception of the participant about how well formed a stimulus is, and even though there is the possibility of using metalinguistic knowledge in order to evaluate or rate the stimuli, these techniques are highly accepted as tools to explore aspects of grammatical knowledge. This is the first argument that was taken into account in order to modify the experiment for this research, and to use the Likert scale instead.

### 3.2.3.2 The self-paced reading task

The second argument considered into the design of the experiment for this research relates to the second experiment in Fernandez & Souza (2016). The purpose of the second experiment is to examine the reaction to the induced-movement alternation structure when presented to the bilingual groups in their L1. In other words, as commented by Fernandez & Souza (2016), it intended to explore the difficulty or ease to process sentences that contain the induced-movement alternation structure in their L1, which would reflect a different grammatical status of this construction in both languages.

This experiment aimed to find the answers to two interrogatives proposed in Fernandez & Souza (2016):

- a) Would the different states of linguistic knowledge possessed by speakers of English and speakers of Brazilian Portuguese impinge on their linguistic performance in relation to the induced-movement alternation with verbs of manner of motion?
- b) Would the participants' bilingualism result in differences in on-line processing of induced-movement alternation sentences?

For this reason, Souza proposed to use a *self-paced reading task* in order to find the answers to the previous questions, and to verify the hypothesis of a possible departure from the L1 syntactic restrictions in the case of the high proficiency bilingual group.

Self-paced readings tasks, according to Garrod (2006), are tasks in which “the reader determines the rate at which written material is presented and the experimenter records the rate of presentation”. Garrod identifies three types of self-paced reading tasks according to the type of written material presented, which could be sentences, phrases, or words. For the purposes of this research, the type of task chosen was the one that involves words' rate which, according to Garrod (2006), is “a technique that has been used to study syntactic analysis, discourse comprehension processes and in particular resolution of anaphors”.

### 3.2.3.3 Modifications to Fernandez and Souza's experiments

In the original version of the self-paced reading experiment in Fernandez & Souza (2016), after presenting all the elements that composed the sentence to be evaluated, a comprehension question would appear in order to control the understanding of the sentence. This is the characteristic that opened the path to a modification in the experiment used in this research.

In the experiment for this research, both experiments from Fernandez & Souza (2016) were combined into a single one. First, the self-paced reading comprehension task was presented as in Fernandez & Souza (2016), but instead of a comprehension question, the acceptability judgment task was shown. This modification to the original experiments did not affect the purpose of any of the experiments, since an understanding of the sentence is necessary in order to give it a grade. An example of how the test looked like is shown in appendix 4.

At the same time, for the experiment that is used in this research, two lists of sentences were created: one in Spanish, and the second one in English. From a total of 56 sentences for each list, eight sentences contained the induced-movement alternation structure and were labeled as Induced Movement Alternation Sentences (IMA sentences), since, according to our hypothesis, the reaction times (RT) from the direct object after a verb of induced-movement alternation would provide insights of the processes to understand them. Eight more sentences from these lists were labeled as Change of State sentences (COS sentences), and they were totally grammatical correct sentences that contained a change-of-state verb with a direct object. On the other hand, eight more sentences were labeled as Control sentences 1 (CS1), and they were basically sentences that were completely ungrammatical in both languages. The rest of the sentences were labeled as distractors, and 16 sentences of them were completely correct sentences, while the last 16 sentences were items that contained at least one ungrammatical element. The lists with the sentences used for this research can be found in the appendixes 5 and 6.

This experiment was created using the program PsychoPy2 that, according to Pierce (2009), is a trustworthy tool for carrying out experiments with visual and auditory stimuli, as it also enables a wide range of design possibilities. Moreover, according to the same author, it takes advantage of the high-level functions and libraries available in Python, making it an ideal language in which such software develops. However, as Pierce

(2009) also arguments, it presents the disadvantage that both programs must be installed in the computer in order to run the experiments creating in this platform, but all of the necessary software is available on internet, and they are open-source licensed programs.

PsychoPy2 allowed us to gather information about the participant's reaction times (RT), since every single time the participant pressed the space bar to move from one chunk to another, the program recorded and reported the time he took to move between chunks. The time obtained from participants responses were measured in seconds and milliseconds, allowing us to perform a more detailed analyses about their performance. In the same way, this program allowed us to record the answers that participants gave to each sentence, storing the grade that students choose of a scale from 1 to 5, considering that sentences marked with number 1 would be sentences that were not allowed in the language evaluated, and 5 to those sentences that did not present any syntactic mistakes in their construction and that would fit into the rules of the same language.

### 3.3 Data gathering procedures

As previously mentioned, several students were invited to participate as part of this research in the BUAP Tehuacan Campus. Each student attended to two sessions in total, with a week difference between them. Each session lasted about 50 minutes and had from five to ten students. The sessions took place in the laboratory of "Business Simulations" which is part of the infrastructure of the Bachelor degree in Administration program.

Before answering the experiments, instructions about how to answer the experiment were given with the help of a screen monitor, and one of the trial sentences was reviewed together as a group. After that, students were asked to perform the rest of the sentences by themselves. As soon as they finished answering the experiments, they continued with the questionnaire or the VLT test.

During the sessions, students were not allowed to use their cellphones or any other kind of device that would work as an advantage or distractor in the test, and they were told that they were answering the experiments as a new tool to test their proficiency.

Once students finished answering both sessions, the data obtained was stored and classified according to the results of their VLT scores. Their results were divided into the categories of Monolinguals, Low-proficiency bilinguals and High-proficiency Bilinguals.

After categorizing the results, a Kolmogorov-Smirnov test was applied to the groups in order to know if the data was normally distributed, and after that a Mann-Whitney test was applied to the RT of the NP that was acting as the object for both, the induced-alternation verbs and the change-of-state verbs. All of these analyses were carried out using the Statistical Package for the Social Sciences program (IBM SPSS Statistics 21). The results obtained from these analyses can be found in the following chapter.

## **Chapter IV: Presentation and analyses of results.**

In this chapter, the results of all the instruments used during this research are presented and discussed. First, the result from the questionnaire and the VLT test are presented since this information was used in order to select the people that participated in the rest of the instruments. Second, the results obtained in the Spanish version of the test (answered by monolinguals, low proficiency bilinguals, and high proficiency bilinguals) are analyzed, and the meaning behind those data is discussed. Third, the results from the English version of the test (answered by only the bilingual groups) are analyzed and discussed. Finally, some comparisons between the groups are done in order to complement the information from this research.

### 4.1 Questionnaire and VLT test.

There were a total of 148 candidates to participate as subjects for this research; however, only 70 of them were considered to fit the criteria needed to perform the rest of the experiments. The first delimitation in the number of participants occurred based on the answers to the first questionnaire and two main factors, their native language and the fact of being late bilinguals. It was decided this way since some of the initial candidates mentioned to have either Mazateco, Inigua or Nahuatl as their first language, and some others lived in an English-Spanish bilingual context since very young age.

It is important to mention that the 70 subjects used for this research were divided into three main categories depending on their VLT test too. The group considered as monolinguals (from now on referred as MN, n=30) scored at maximum level 1 of the VLT test, low proficiency bilinguals (from now on referred as LPB, n=30) scored either level 2 or 3, and finally the high proficiency bilinguals (from now on referred as HPB, n=10) scored either level 4 or 5<sup>2</sup>.

Once the classification of the subjects was done, the analyses of their data started.

### 4.2 Results of the experiment in Spanish

The Spanish experiment was applied to the three groups described in order to measure their tolerance to the induced-movement alternation construction in their L1. As mentioned in chapter II, this construction is not allowed in Spanish, but English. Once the participants answered the experiment, a Kolmogorov-Smirnov test was applied to the reading times (RT, also called reaction times and measured in milliseconds) of the

<sup>2</sup> This decision was made based on the fact of the lack of enough participants that would score a level 5. This is a different factor from the research of Fernandez & Souza (2016), from which this research departs. 48



participants in the NP that corresponded to the object place of the change of state verbs (COS) and the induced-movement alternation verbs (IMA). Since the results of this test showed some of the groups with a normal distribution and some other with an abnormal distribution, a Student's t test or a Mann-Whitney test was applied to the data in order to see if there existed any significant statistical difference. However, different to the research of Fernandez and Souza (2016), no indicators of a significant difference were found in the NPs, even when the test was applied to all of the groups. The results of the test are summarized in the following chart.

Table 1. Results of the Student's t test in the NP corresponding to the direct object of the sentences in all groups.

Comparison tests for NP as Direct object in all the samples								
Group	Phrasal Categories	Mean	SD	Median	Min	Max	U/t	p*
Monolinguals	NP (OD) for induced-movement alternation	1.260	0.419	1.179	0.708	2.299	1.061 (df=58)	0.806 <sup>2</sup>
	NP (OD) for Change-of-State verbs	1.151	0.370	1.077	0.633	2.020		
Bilinguals Low Spanish	NP (OD) for induced-movement alternation	1.104	0.317	1.048	0.602	1.712	409.000	0.544 <sup>1</sup>
	NP (OD) for Change-of-State verbs	1.113	0.479	1.010	0.604	2.818		
Bilinguals High Spanish	NP (OD) for induced-movement alternation	1.022	0.636	0.902	0.671	1.511	0.608 (df=18)	0.891 <sup>2</sup>
	NP (OD) for Change-of-State verbs	0.929	0.345	0.791	0.545	1.537		
Bilinguals Low English	NP (OD) for induced-movement alternation	1.687	0.620	1.636	0.822	3.597	409.000	0.544 <sup>1</sup>
	NP (OD) for Change-of-State verbs	2.071	0.847	1.778	1.015	4.136		
Bilinguals High English	NP (OD) for induced-movement alternation	1.068	0.369	0.938	0.722	1.750	60.000	0.481 <sup>1</sup>
	NP (OD) for Change-of-State verbs	1.484	0.990	0.974	0.793	3.958		

Note. \*p=significant value <0.05; <sup>1</sup> = Test Mann-Whitney (U); <sup>2</sup> = Student's t-test (t), df= degrees of freedom; SD=Standard Deviation

Since no significant results were found in this first analysis, a different path from Fernandez & Souza (2016) was taken. First, the four RTs of the two types of sentences were collected and analyzed with a Kolmogorov-Smirnov test in order to test their normality. After that, either a Student's t test or a Mann-Whitney test was applied to each one of the phrasal categories (PC) in order to find any kind of significant statistical difference between them. The results of the analyses applied to the monolingual sample indicate that the category that presents a significant statistical difference is the prepositional phrase, and not the NP of direct object as in Fernandez and Souza (2016).

Table 2. Comparative tests in the monolingual sample (Spanish experiment).

Comparison tests for Phrasal Categories in the Monolingual Sample (N=30)							
Phrasal Categories	Mean	SD	Median	Min	Max	U/t	p*
NP for induced-movement alternation	0.740	0.674	0.556	0.084	3.602	403.00	0.487 <sup>1</sup>
NP for Change-of-State verbs	0.649	0.538	0.532	0.079	2.256		
VP for induced-movement alternation	1.461	0.815	1.197	0.705	4.431	394.00	0.408 <sup>1</sup>
VP for Change-of-State verbs	1.293	0.595	1.142	0.548	3.144		
NP (OD) for induced-movement alternation	1.260	0.419	1.179	0.708	2.299	1.061 (df=58)	0.806 <sup>2</sup>
NP (OD) for Change-of-State verbs	1.151	0.370	1.077	0.633	2.020		
PP for induced-movement alternation	1.325	0.317	1.345	0.774	2.139	309.00	<b>0.037<sup>1*</sup></b>
PP for Change-of-State verbs	1.158	0.342	1.037	0.664	1.983		

Note. \*p=significant value <0.05; <sup>1</sup>= Test Mann-Whitney (U); <sup>2</sup>= Student's t-test (t), df= degrees of freedom; SD=Standard Deviation

Since a significant statistical difference was found in the PP of the monolingual sample (p=0.037), the same procedures were applied to the LPB and HPB. The results of these analyses are summarized in the following tables.

Table 3. Comparative tests in the low proficiency bilingual sample (Spanish experiment).

Comparison tests for Phrasal Categories in the Low proficiency Spanish test Sample (N=30)							
Phrasal Categories	Mean	SD	Median	Min	Max	U/t	p
NP for induced-movement alternation	0.786	0.614	0.577	0.088	3.365	418.00	0.636 <sup>1</sup>
NP for Change-of-State verbs	0.672	0.366	0.552	0.147	1.791		
VP for induced-movement alternation	1.313	0.489	1.283	0.741	2.582	298.00	<b>0.025<sup>1*</sup></b>
VP for Change-of-State verbs	1.080	0.478	0.966	0.631	2.741		
NP (OD) for induced-movement alternation	1.104	0.317	1.048	0.602	1.712	409.000	0.544 <sup>1</sup>
NP (OD) for Change-of-State verbs	1.113	0.479	1.010	0.604	2.818		
PP for induced-movement alternation	1.311	0.396	1.324	0.660	2.227	3.235 (df=58)	<b>0.045<sup>2*</sup></b>
PP for Change-of-State verbs	1.032	2.256	0.971	0.639	1.610		

Note. \*p=significant value <0.05; <sup>1</sup>= Test Mann-Whitney (U); <sup>2</sup>= Student's t-test (t), df= degrees of freedom; SD=Standard Deviation

Table 4. Comparative tests for the high proficiency bilingual sample (Spanish experiment)

Comparison tests for Phrasal Categories in the High proficiency Spanish test sample Sample (N=10)							
Phrasal Categories	Mean	SD	Median	Min	Max	U/t	p
NP for induced-movement alternation	0.593	0.336	0.514	0.140	1.255	-0.527 (df=18)	0.443 <sup>2</sup>
NP for Change-of-State verbs	0.702	0.560	0.558	0.196	2.148		
VP for induced-movement alternation	1.133	0.431	1.172	0.487	1.824	0.646 (df=18)	0.284 <sup>2</sup>
VP for Change-of-State verbs	1.023	0.320	0.995	0.656	1.693		
NP (OD) for induced-movement alternation	1.022	0.636	0.902	0.671	1.511	0.608 (df=18)	0.891 <sup>2</sup>
NP (OD) for Change-of-State verbs	0.929	0.345	0.791	0.545	1.537		
PP for induced-movement alternation	1.394	0.893	1.032	0.772	3.620	22.00	<b>0.035<sup>1*</sup></b>
PP for Change-of-State verbs	0.859	0.292	0.688	0.589	1.390		

Note. \*p=significant value <0.05; <sup>1</sup>= Test Mann-Whitney (U); <sup>2</sup>= Student's t-test (t), df= degrees of freedom; SD=Standard Deviation

Let us analyze then the implications of the tables previously presented. In table 4, we can find significant statistic difference in the PP of the LPB (p=0.045), which could

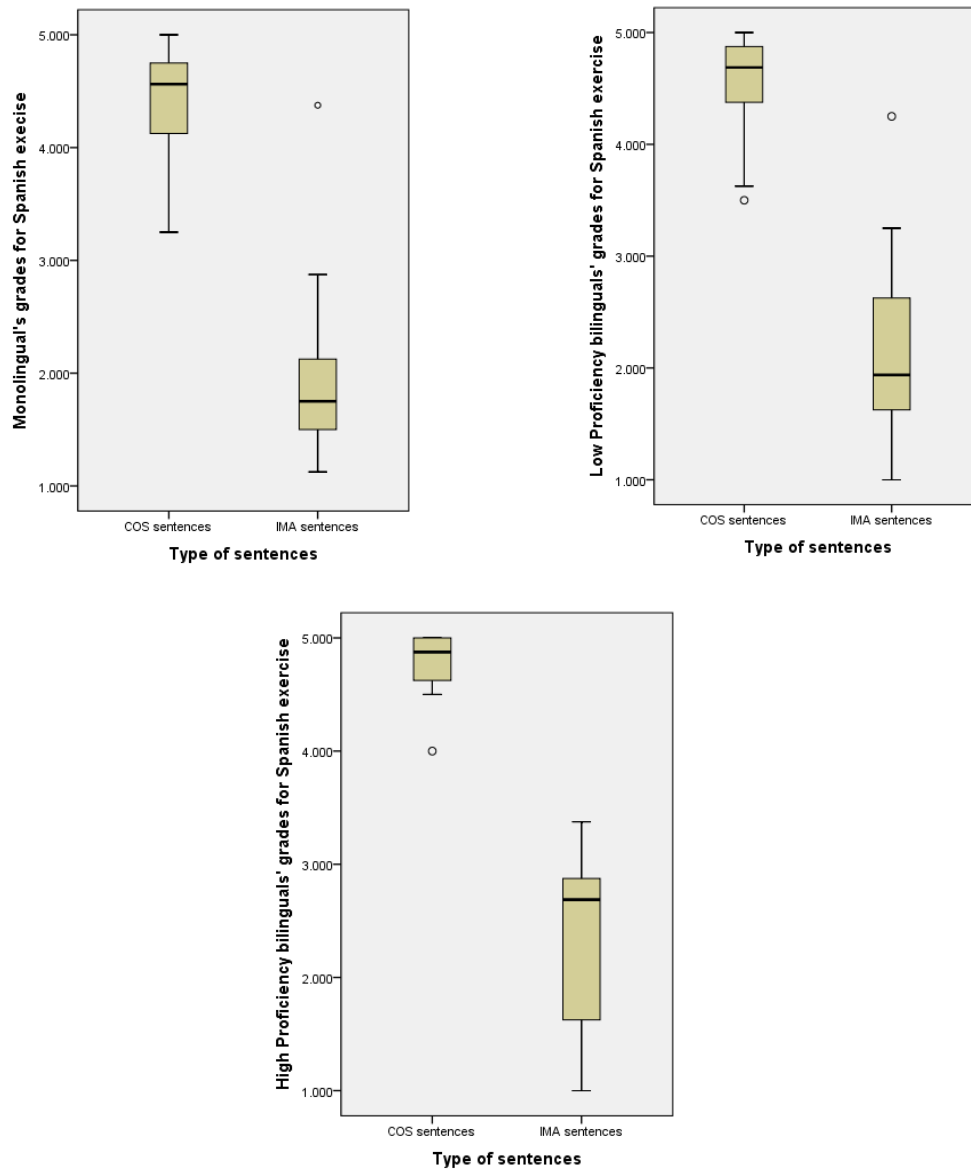
indicate a resistance to the processing of IMA verbs since this construction does not exist in their L1. In the same way, such resistance is also perceived in the HPB sample ( $p=0.035$ ), indicating that the absence of a IMA structure is still causing a higher cost in processing it (measured in the RT the samples took to read the PP of the sentences).

Such cost in the process of IMA sentences by the HPB is opposed to the results obtained in Fernandez and Souza (2016), in which the HPB (Brazilian Portuguese-English) presented no significant statistic difference when processing the IMA verbs, even when this type of sentences is not licensed either in their L1 (Portuguese).

On the other hand, there is a phenomenon in the LPB that also calls our attention. In the comparative analysis of the RT of the VPs, the results indicate a higher cost of processing of the verbs from the sentences evaluated ( $p=0.025$ ). Unlike the other samples (MN and HPB), the LPB are the only ones to present such cost in processing in the VPs. We could believe that such extra cost in processing the VPs in IMA constructions is created due to the acquisition of new combinational nodes into their L2 syntactic representation (In this case, the possibility for IMA verbs to have a causative reading). However, such assumption is just speculative.

A second set of analyses were performed in the results of the Spanish experiment, but this time the grades given to the sentences after reading them were analyzed. Following the same line of analysis than in the previous set of results, tests for normality and comparing the grades from the COS and IMA sentences were carried out. The following graphs show the results of this second analysis.

Figure 13. Comparison of the grades given to the COS and IMA sentences in all samples (Spanish experiment).



From what can be observed, all three groups discriminate COS and IMA sentences the same way, showing a higher tendency to grade COS sentences as correct sentences in their L1, and IMA sentences as incorrect or unacceptable sentences in their L1. There is, however, a higher tolerance to IMA sentences in the bilingual groups. Let us now present the results obtained in the experiment in English.

### 4.3 Results of the experiment in English

For this part of the research, only the results of two groups were considered: the LPB and the HPB. It was decided not to apply the English version of the test to the monolinguals under the assumption that the lack of proximity to the L2 would not have resulted in the creation of any new combinational nodes different from their L1.

Following the same line of analysis than in the previous experiment, tests of normality and comparison were applied to the data obtained from the bilingual samples and the results are presented below:

Table 5. Comparative tests for the low proficiency bilingual sample (English experiment).

Comparison tests for Phrasal Categories in the Low proficiency English test Sample (N=30)							
Phrasal Categories	Mean	SD	Median	Min	Max	U/t	p
NP for induced-movement alternation	0.404	0.200	0.373	0.083	0.764	418.00	0.636 <sup>1</sup>
NP for Change-of-State verbs	0.573	0.321	0.537	0.135	1.637		
VP for induced-movement alternation	1.715	0.694	1.493	0.753	3.239	1.524	<b>0.023<sup>2*</sup></b> (df=58)
VP for Change-of-State verbs	1.476	0.507	1.422	0.670	2.886		
NP (OD) for induced-movement alternation	1.687	0.620	1.636	0.822	3.597	409.000	0.544 <sup>1</sup>
NP (OD) for Change-of-State verbs	2.071	0.847	1.778	1.015	4.136		
PP for induced-movement alternation	1.949	0.784	1.943	0.952	3.591	1.809	<b>0.033<sup>2*</sup></b> (df=58)
PP for Change-of-State verbs	1.637	0.524	1.493	0.911	2.992		

Note. \*p=significant value <0.05; <sup>1</sup>= Test Mann-Whitney (U); <sup>2</sup>= Student's t-test (t), df= degrees of freedom; SD=Standard Deviation

Table 6. Comparative tests for the high proficiency bilingual sample (English Experiment).

Comparison tests for Phrasal Categories in the High proficiency English test sample(N=10)							
Phrasal Categories	Mean	SD	Median	Min	Max	U/t	p
NP for induced-movement alternation	0.467	0.290	0.397	0.166	1.147	60.00	0.481 <sup>1</sup>
NP for Change-of-State verbs	0.594	0.422	0.453	0.117	1.573		
VP for induced-movement alternation	1.525	0.973	1.231	0.456	3.897	0.662	0.093 <sup>2</sup> (df=18)
VP for Change-of-State verbs	1.305	0.387	1.260	0.922	2.216		
NP (OD) for induced-movement alternation	1.068	0.369	0.938	0.722	1.750	60.000	0.481 <sup>1</sup>
NP (OD) for Change-of-State verbs	1.484	0.990	0.974	0.793	3.958		
PP for induced-movement alternation	1.472	0.802	1.326	0.716	3.360	0.719	0.114 <sup>2</sup> (df=18)
PP for Change-of-State verbs	1.270	0.380	1.255	0.723	1.913		

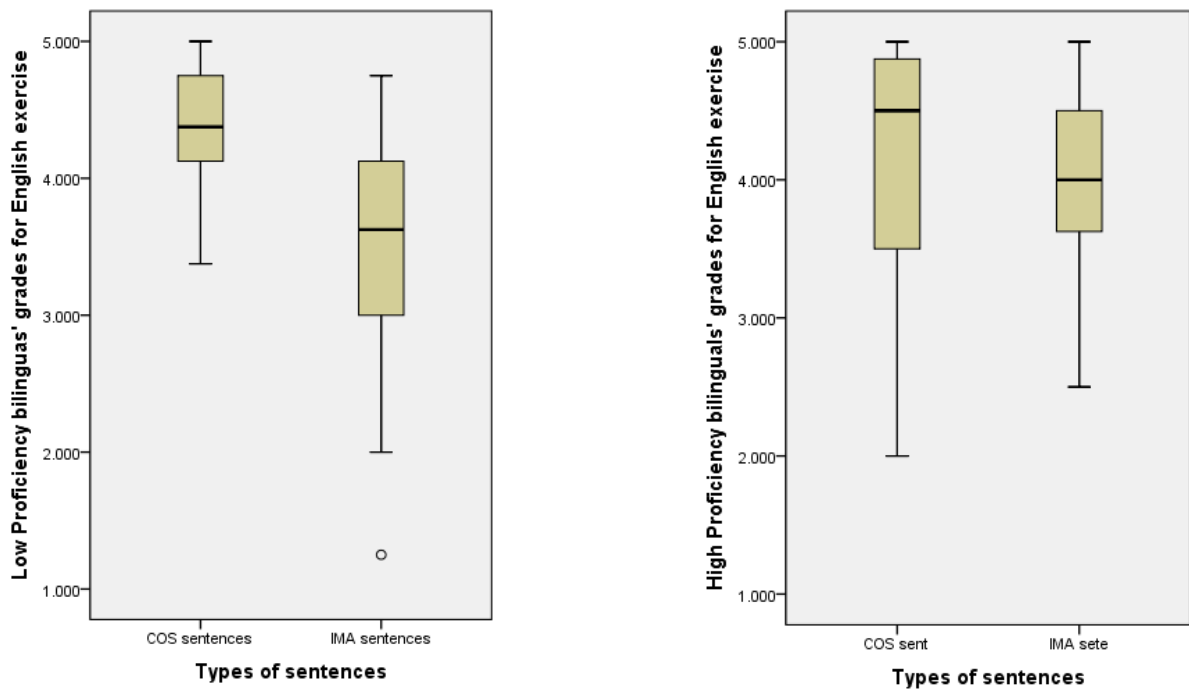
Note. \*p=significant value <0.05; <sup>1</sup>= Test Mann-Whitney (U); <sup>2</sup>= Student's t-test (t), df= degrees of freedom; SD=Standard Deviation

Similar to the experiment in Spanish, the LPB present once again a significant statistic difference when processing both VPs and PPs (p=0.023 and p=0.033 respectively). However, such cost of processing does not appear in any of the PCs of the HPB sample, indicating a possible better familiarity with the IMA and COS constructions since both of them would be considered as grammatical in their L2 syntactic

representations. Hence, something that could be concluded about this experiment is that any higher costs of language processing related to COS and IMA verbs is overcome with a higher proficiency in L2.

During the analysis of the grades given to the COS and IMA sentences in the judgment part of the experiment the following charts present the results of the LPB and HPB:

Figure 11. Comparison of the grades given to the COS and IMA sentences in all samples (English experiment).



As it can be observed, no significant difference is perceived when both groups grade COS and IMA sentences, considering both kinds of sentences as grammatical ones.

Based on the results obtained in both experiments, the following chapter describes the conclusions and implications of this study.

## Chapter V: Conclusions

As mentioned since the beginning of chapter I, the main objective of this research was to recreate those experiments from Fernandez and Souza (2016) in order to explore the tolerance that Mexican Spanish monolinguals and Mexican Spanish-English bilinguals had when presented a syntactic structure that was not licensed in their L1 (Spanish) but acceptable in their L2 (English). Such structure was the induced movement alternation.

During the process of this research, we tried to recreate as much as possible those experiments and requirements in Fernandez and Souza (2016) but unfortunately, such recreation was partially obtained. However, we gathered sufficient data to answer (or at least speculate about) the research questions established at the beginning of this research.

### 5.1 Final conclusions

Answering to research question 1, we could highly accept the fact that Mexican-Spanish monolinguals discriminate IMA sentences the same way that Brazilian Portuguese monolinguals do in Fernandez and Souza (2016), since both populations present higher RT when processing IMA sentences, and the grades given to the sentences after reading them are considerably lower than sentences that contain a COS verb.

In research question 2, we could partially agree with the results obtained in Fernandez and Souza (2016), since only the results of LPB are similar to the ones in their research. The turning point in this research is when the results of the HPB are compared to those in Fernandez and Souza (2016), since the Mexican Spanish-English bilinguals present higher RT in the self-paced reading task and lower grades in the grammatical judgment task, considering then IMA sentences as ungrammatical in their L1.

In research question 3, we could hardly agree with the theory presented in Fernandez and Souza (2016) based on the data obtained in this research, since there are no indicators of a possible integration of IMA processing nodes into the L1 syntactic structures of Mexican Spanish-English bilinguals. Moreover, such results could be influenced by the number of participants considered HPB (n=10) and the fact that not all of them reached the level 5 from the VLT test. These are the reasons why we are unable to accept or deny an answer for this question.

In research question 4, we are highly likely to agree on the fact that the differences between Brazilian Portuguese and Mexican Spanish have an impact in the performance of the HPB when discriminating sentences that are not licensed in their L1. We base our answer in two factors: i) As reviewed in Chapter II, there is evidence that suggests a higher usage of Synthetic causative sentences in Brazilian Portuguese (Silva, 2009) which could lead to a higher flexibility to causative sentences, resulting in a more possible acceptance of sentences that contained a IMA structure. On the other hand, such flexibility is not present in Spanish (Montrul, 2001). ii) The RTs of the HPB in Mexican Spanish suggest to corroborate such assumption, since they presented higher costs in time to process those sentences that contained a IMA structure.

In regard to the hypotheses presented at the beginning of this research, we could conclude the following:

We possess enough data to confirm the first hypothesis that establishes that just like Brazilian Portuguese monolinguals, Mexican Spanish monolinguals judge sentences that contain the induced-movement alternation in their L1 as ungrammatical sentences. We can confirm this hypothesis based on the results of their RTs and grades from the judgment task.

When it comes to the second hypothesis, however, we could hardly confirm it. The main reason is that Mexican Spanish-English bilinguals behaved very different to those in Fernandez and Souza (2016), since we do not have data that would suggest a possible modification in the arguments that a motion verb may require in order to be present a causative reading in a sentence.

## 5.2 Limitations of the study.

As previously mentioned in chapter III, the main limitation for this study was the number of people that fit into the criteria of HPB. Originally, the subjects that were going to be answering the experiments were students from the Master's degree in English teaching from the Autonomous University of Puebla. However, due to the earthquakes that hit the cities of Oaxaca, Mexico city and Puebla city during the month of September, 2017, the classes were suspended and it prevented us from evaluating these candidates, as well as to give continuity to the second part of the experiments in LPB from the Languages School from the same university.



As a second limitation, there were some students that volunteered as candidates to this research, but they only presented the first part of the experiments (the questionnaire and the Spanish experiment) so we could not use those results into our research.

Apart from those, no other limitations were found during this research.

### 5.3 Recommendations for further research.

Since the number of HPB was not as big as expected, a new research with a higher number of High Proficiency Mexican Spanish-English bilinguals should be gathered in order to evaluate their performance in both experiments and reinforce the data obtained in this research.

Other varieties of Spanish should be tested using similar experiments to the ones in this research in order to reinforce or reject the hypothesis of this being a local effect.

Similar to the recommendations of Fernandez and Souza (2016), other structures and languages should be analyzed in order to have a broader vision of the possible change of arguments in other languages.

## REFERENCES

- Bernolet, S., Hartsuiker, R. J., Pickering, M. J., (2013). *From language-specific to shared syntactic representations: the influence of second language proficiency on syntactic sharing in bilinguals*. *Cognition*. Volume 127, Issue 3, June 2013, Pages 287-306
- Berg, I., Duarte, D., Souza, R. A. (2015). *A avaliação de habilidades linguísticas em L2: Uma questão metodológica em estudos de influências translinguísticas*. IN: BUCHWEITZ, A.; MOTA, M. B. (orgs.). *Linguagem e Cognição: Processamento, Aquisição e Cérebro*. Porto Alegre: EDIPUCRS, p. 267-292, 2015
- Bialystok, E. (2010). *Bilingualism*. Department of Behavioral Sciences, York University, Toronto, Canada. 2010.
- Caplan, D. (1994). *Language: Structure, Processing, and disorders*. Massachusetts Institute of Technology. (1994).
- Cook, V. (2003). *Changing the first language in the L2 user's mind. Introduction to L2 Effects on the L1*. Retrieved from: <http://www.viviancook.uk/Writings/Papers/EffectsIntro.htm>
- Cook, V. (2004). *Bilingual Cognition and Language Teaching*. Retrieved from: <http://www.viviancook.uk/Writings/Papers/BilCog&Teaching.htm>
- Cook, V. (2007). *The goals of ELT: Reproducing native-speakers or promoting multi-competence among second language users?* Retrieved from: <http://www.viviancook.uk/Writings/Papers/EFLGoals.htm>
- Da Silva, Y., (2010). *Causativas sintéticas no dialeto mineiro: Novas evidências a favor da estrutura bipartida do VP?* *Revista da ABRALIN*, v. 9, n. 2, p. 149-171. December, 2010.
- Fernández, E. M.; Souza, R. A., (2016). *Walking bilinguals across language boundaries: On-line and Off-line techniques*. IN: HEREDIA, R.; ALTARRIBA, J. CIESLICKA, A. (orgs.). *Methods in Bilingual Reading Comprehension Research*. New York: Springer. p. 33-60.
- Garrod, S. (2006). *Psycholinguistic Research Methods*. University of Glasgow, Glasgow, UK
- Heredia, R. R., (2008). *Mental models of bilingual memory*. In: Altarriba, J.; Heredia, R. (orgs.). *An Introduction to Bilingualism: Principles and Processes*. New York: Lawrence Erlbaum Associates, 2008.

- Heredia, R. R., In Altarriba, J., & In Cieślicka, A. B. (2016). *Methods in bilingual reading comprehension research*. Springer Science + Business Media. New York, 2016.
- Milano, G.; Vitral, L., (2015). *As causativas sintéticas no português brasileiro: Uma abordagem minimalista*. Revista SOCIODIALETO. v. 6, n. 17. November, 2015.
- Moradi, H., (2014). *An investigation through different types of bilinguals and bilingualism*. International Journal of Humanities & Social Science Studies (IJHSS) v. 1, n. 2. India, 2014.
- Montrul, S. (2001). *Agentive verbs of manner of motion in Spanish and English as second languages*. Cambridge University Press. USA. 2001.
- Peirce, J. W.(2009). *Generating stimuli for neuroscience using PsychoPy*. Frontiers in Neuroinformatics, v. 2, n. 10, p. 1-8, 2009.
- Silva, J. S.(2016) *Exploring a vocabulary test and a judgment task as diagnoses of early and late bilinguals' L2 proficiency*. Tese (Doutorado) – Faculdade de Letras, Universidade Federal de Minas Gerais, Belo Horizonte. 2016.
- Souza, R. A., (2012). *Two Languages in One Mind and the Online Processing of Causatives with Manner-of-Motion Verbs*. Revista Virtual de Estudos da Linguagem (ReVEL). vol. 10, no. especial 6, p. 220-239.
- Souza, R. A., Oliveira, F. L., (2011). *Is knowledge of a non-dominant L2 activated by bilinguals using their dominant L1? Insights from an on-line psycholinguistic study*. Organon. No. 51. p. 103-128.
- Souza, R. A; Silva, J. S.; Silva, G. G., (2016). *Brazilian Portuguese-English bilingualism does not affect metalinguistic awareness of an L1 constraint on two argument structure constructions*. Revista Ilha do Desterro - A Journal of English Language, Literatures in English and Cultural Studies, vol. 69, no. 1. p. 17-31.
- Souza, R. A; Silva, J. S. *Exploring the measurement of vocabulary size to differentiate Brazilian Portuguese-English bilinguals' access to grammatical knowledge in the L2*. Revista Linguística, v. 11, n. 1, p. 187-204, 2015.
- Steinberg, D. D., (1996). *An introduction to psycholinguistics*. London ; New York: Longman.

## Appendix 1. Request to apply our research in Tehuacan BUAP Campus

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Tehuacán, Puebla a 14 de febrero del 2018.

Alonso Erick Gómez Trujillo  
Av. 2 norte #38, Col. Centro.  
Tlacotepec de Benito Juárez, Puebla.  
2224468543  
aerickgt@gmail.com

**Asunto:** Solicitud

Dra. Mariana Vaquero Martínez  
**Directora del Complejo Regional Sur**  
**Benemérita Universidad Autónoma de Puebla**

**P R E S E N T E :**

El que suscribe, Alonso Erick Gómez Trujillo, me dirijo a usted con la intención de invitar a los estudiantes y profesores de su institución a participar como sujetos de estudio en la investigación de maestría con el título "Spanish-English Bilinguals' syntactic processing", en el cual estudiamos cómo es que los sistemas sintácticos de dos lenguas están organizados en la mente de una persona bilingüe.

En esta investigación, estamos buscando a personas hablantes nativas de español con algún grado de contacto con la segunda lengua (personas monolingües, y bilingües con nivel de competencia intermedio y alto en inglés). Para participar como sujeto de estudio en esta investigación, los participantes presentarán tres pruebas:

1. Cuestionario de exposición a la L2 y prueba de conocimientos: En el cual preguntaremos, entre otras cosas, cuantos años han estudiado inglés y a qué edad iniciaron a aprenderlo. Después de eso, la prueba Vocabulary Levels Test (VLT) será aplicada para identificar el nivel de competencia del participante (tiempo total estimado: 10 - 15 minutos).
2. Prueba psicolingüística en español: Serán presentadas 56 oraciones en español y el usuario tendrá que dar una calificación del 1 al 5 a cada oración presentada según su criterio (1 para oraciones completamente incorrectas y 5 para oraciones sin errores gramaticales).
3. Prueba psicolingüística en inglés: Del mismo modo que el experimento en español, el experimento en inglés seguirá la misma dinámica; sin embargo, esta prueba se aplicará una semana después de la prueba en español.

De la misma forma pido su apoyo para tener acceso a su laboratorio de computación, ya que las pruebas a contestar son creadas en la plataforma Python 3.6.2, bajo el programa Psychopy.

Agradezco de antemano la atención prestada y espero una respuesta positiva de su parte a la presente invitación. Quedo a sus órdenes para aclarar cualquier tipo de duda a los teléfonos arriba escritos y al email adjunto.

Queda de usted su seguro servidor:

  
Alonso Erick Gómez Trujillo

Maestrando en Estudios Lingüísticos  
Universidade Federal de Minas Gerais

Archivo adjunto 1: Aprobación del proyecto por la Universidad Federal de Minas Gerais.

## Appendix 2. Questionnaire

Nombre completo:

\_\_\_\_\_

Edad: \_\_\_\_\_

Nivel de inglés: \_\_\_\_\_

Edad del primer contacto con la lengua inglesa: \_\_\_\_\_

¿En qué nivel escolar comenzaste a estudiar inglés? \_\_\_\_\_

¿Has tenido algún otro curso de inglés además de los de la escuela? \_\_\_\_\_

¿Cuánto tiempo duró? \_\_\_\_\_

Lengua materna: \_\_\_\_\_

## Appendix 3. Vocabulary Levels Test (VLT).

Prova VLT - aerrickt@g... x ClassroomClipboard.com x

Não seguro | www.classroomclipboard.com/635396/Test/05EF6851AD1147D88E569E72BAA3269E

Vocabulary Levels Test 9 minutes remaining.

# 1 - 0

This is a vocabulary test. You must choose the right word to go with each meaning. Match the words on the left to the meanings on the right.

Here is an example:

1. business a) part of a house  
2. clock b) animal with four legs  
3. horse c) something used for writing  
4. pencil  
5. shoe  
6. wall

The correct matchings are: 6 (wall) and a (part of a house), 3 (horse) and b (animal with four legs), 4 (pencil) and c (something used for writing).

< Back Next > Review

11:59 a.m. 01/03/2018

Prova VLT - aerrickt@g... x ClassroomClipboard.com x

Não seguro | www.classroomclipboard.com/635396/Test/05EF6851AD1147D88E569E72BAA3269E

Vocabulary Levels Test 8 minutes remaining.

# 1 - 6

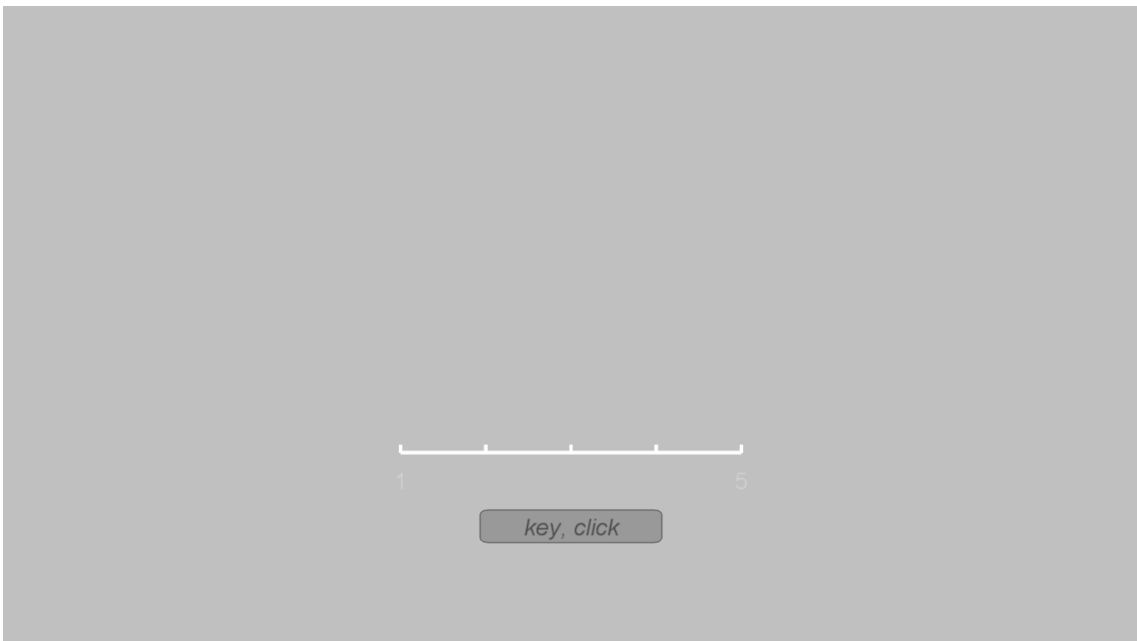
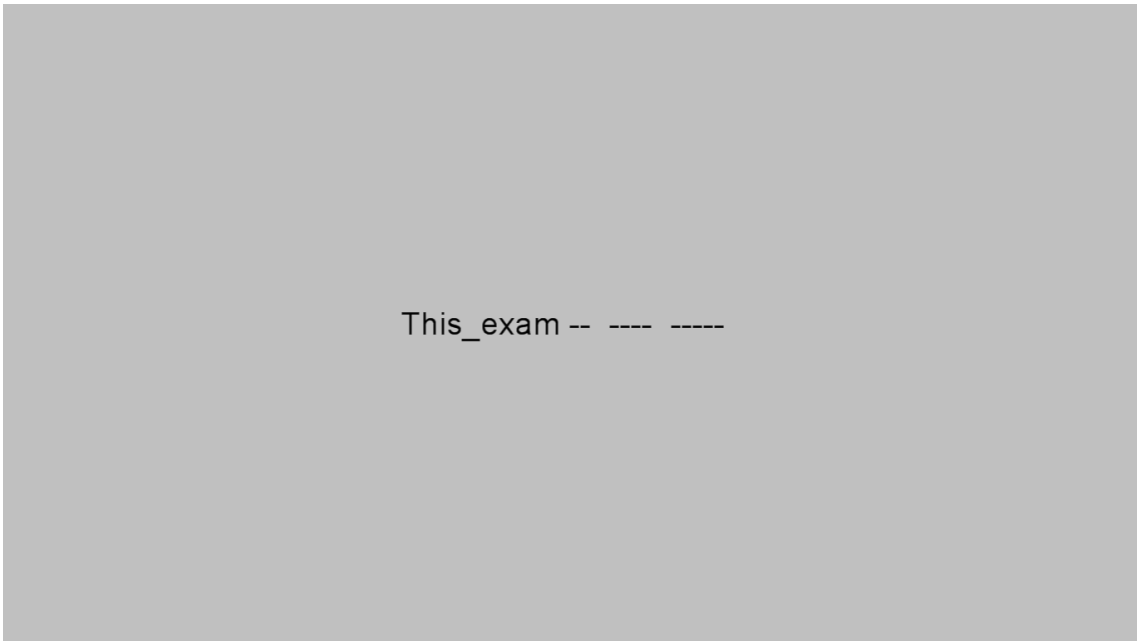
1) original  
2) private  
3) royal  
4) slow  
5) sorry  
6) total

a) first  
b) not public  
c) complete

< Back Next > Review

12:00 p.m. 01/03/2018

#### Appendix 4. Experiments modifications.



## Appendix 5. Sentences used in the Spanish experiment.

El\_entrenador corrió los\_estudiantes a\_lo\_largo\_de\_cancha.  
La\_anciana caminó su\_esposo hasta\_su\_asiento.  
El\_niño voló el\_ave fuera\_de\_la\_caja.  
El\_salvavidas nadó el\_grupo en\_toda\_la\_alberca.  
El\_domador saltó el\_caballo sobre\_la\_barda.  
La\_capitana marchó sus\_tropas por\_las\_calles.  
El\_bailarín bailó su\_compañera por\_toda\_la\_pista.  
El\_magó brincó el\_conejo dentro\_de\_su\_sombrero.  
El\_vendedor congeló la\_carne en\_su\_tienda.  
El\_joven enfrió las\_cervezas para\_ver\_el\_partido.  
La\_secretaria calentó su\_comida en\_el\_microondas.  
La\_niña secó sus\_calcetas en\_el\_patio.  
La\_alumna rompió la\_ventana con\_una\_piedra.  
El\_cocinero quemó la\_sopa de\_la\_última\_orden.  
Mi\_mamá abrió la\_puerta de\_la\_casa.  
La\_joven derritió el\_chocolate para\_sus\_fresas.  
¿Dónde son mis llaves?  
Él está mucho guapo.  
¿Podríamos venir a\_buscarme?  
La\_gente son muy\_amigables y\_gentiles.  
Yo gusto la\_cerveza.  
¿Qué es tu\_nombre?  
¿Qué hará Francisco ayer\_por\_la\_noche?  
Jaime es viendo la\_televisión en\_la\_sala  
Yo en\_tu\_lugar, le\_diría sus\_verdades.  
¿Les importaría acompañarme a\_la\_sala?  
Deberías ir al médico.  
La\_fiesta será en\_el\_salón del\_centro.  
Existen varios tipos de\_flores.  
Las\_mejores\_playas están en\_el\_Caribe.  
Nos encantaría volverlos a\_ver.  
No hay nada que\_no podamos\_discutir.  
Te prometo que Luisa no\_hará eso.  
Carlos es uruguayo.  
El\_concierto es mañana a\_las\_ocho.  
No hagas nada que\_moleste a\_tu\_hermano.  
Mis\_padres irán de\_vacaciones la\_semana\_que\_viene.  
Se\_calcula que\_habrán 50\_incendios en\_todo\_el\_pais este\_verano.  
Tendré que\_ponerme a\_trabajar si\_quiero ese\_carro.  
¿Me trae la\_cuenta, por\_favor?  
Este está el\_hermano de\_Alberto.  
Yo voy correr todos\_los\_dias.  
La\_profesora nos\_dijeron que\_hay una\_beca\_disponible.  
Ella conocimos a\_Andrés hace\_tres\_meses.  
Juan\_y\_Alejandro saldrán para\_España hace\_una\_semana.



Paco vendió su\_barco el\_próximo\_año.  
Mis\_amigos saldremos de\_Torreón mañana.  
La\_manzana yo mañana comí.  
La\_televisión mi\_hermana en\_la\_sala es\_viendo.  
El\_acento\_de\_Colombia es muy\_bonita.  
No creo que\_él puedo\_ir.  
Daniel es una buen\_persona.  
No he\_conocido nunca a\_alguien tanto\_inteligente.  
Haré las\_tareas, cuando\_mi\_madre llegó.  
La\_casa\_de\_Paula ser\_muy\_grande, parecer\_una\_mansión.  
Si estudiaré, seguramente apruebo.

## Appendix 6. Sentences used in the English experiment.

The\_researcher ran the\_mouse through\_the\_box.  
The\_farmer walked his\_horse to\_the\_river.  
The\_magician flew the\_pigeons over\_the\_lake.  
The\_lifeguard swam her\_son across\_the\_pool.  
The\_trainer jumped a\_lion through\_the\_ring.  
The\_general marched his\_soldiers to\_their\_tents.  
The\_prince danced the\_girl out\_of\_the\_hall.  
The\_kids leapt their\_dog into\_the\_field.  
The\_assistant cooled the\_cake by\_the\_window.  
The\_girl warmed her\_soup in\_the\_microwave.  
The\_researcher froze her\_samples in\_the\_campus.  
The\_dancers dried their\_shirts at\_the\_theater.  
The\_police\_officer broke the\_window of\_the\_hotel.  
The\_soldiers burned the\_villages during\_the\_war.  
The\_lady opened the\_windows to\_let\_the\_air\_in.  
The\_chef melted the\_butter on\_a\_pan.  
The\_girl give the\_cats milk\_yesterday.  
Does the\_professor talk\_often about\_his\_research?  
Where are the\_articles that\_contains the\_information?  
I didn't waited for\_him.  
Who did Jane call her\_friend after\_she\_saw?  
What did Steven read the\_book that\_Helen talked\_about?  
Moses imagined to\_whom what\_he\_said.  
Which\_case did the\_detective say\_was\_worried?  
How\_long was your\_journey from\_New\_York\_to\_Atlanta?  
Alice is\_making a\_slow\_recovery from\_his\_illness.  
Why don't you throw\_away that\_old\_blouse?  
We usually\_buy our\_food from\_the\_local\_market.  
I can't\_wait to\_see you again.  
I never buy live\_albums.  
No\_one does as\_badly as\_she\_does.  
She is proud of\_her\_achievements.  
My\_teacher isn't very interested in\_her\_work.  
I was so\_tired after\_that\_walk.  
We are\_getting a\_friend to\_repair the\_roof.  
Maria began to\_play tennis in\_2015.  
She is unlikely to\_go\_out.  
Paul loves giving\_away other\_people's\_secrets.  
Two\_men were\_arrested yesterday at\_the\_mall.  
I have\_had enough of\_the\_neighbour's\_noise.  
Are you good at\_doing\_decisions?  
Pick\_down your\_stuff when\_you\_finish.  
I don't\_like neither\_apples nor\_peaches.  
Peter are\_able to\_speak three\_languages.  
The\_lady thanked him to\_help\_her.

They often are too\_tired.  
I got such\_bored during\_the\_movie I\_fell\_asleep.  
It was an\_extremely frightened\_scene.  
His\_exam\_mark was so\_a\_disappointment.  
I wasn't\_allowed to\_watching much\_TV.  
You should to\_wear formal\_clothes.  
You were\_supposed to\_being here\_at\_time.  
You mustn't wearing jewerllery to\_school.  
I were born in\_Mexico in\_1990.  
That could\_be a\_few dangerous.  
Did you bought all from\_the\_list?