THE EFFECTS OF WORKING MEMORY, INHIBITORY CONTROL, ACADEMIC TRAINING, AND PROFESSIONAL EXPERIENCE ON THE TRANSLATION OF SELF-DIRECTED MOTION BY ENGLISH-SPANISH TRANSLATORS, TRANSLATION NOVICES, AND NON-TRANSLATOR BILINGUALS

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ABSTRACT OF THE DISSERTATION

The Effects of Working Memory, Inhibitory Control, Academic Training,

and Professional Experience on the Translation of Self-Directed Motion

by English-Spanish Translators, Translation Novices, and non-Translator Bilinguals

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This dissertation explores the translation of self-directed motion expressions (such as "The boat floated into the cave"/"*La barca entró en la cueva flotando*") from Spanish into English by bilinguals, novice translators, and professional translators from a psycholinguistic point of view. It provides a theoretical model, the SPaM Translation Model, that draws from Kroll and Stewart (1994) and Jackendoff (1997, 2009, 2011, 2015) to account for the under-representation of the English satellite-framed expression in translated texts and investigates the effects of working memory, inhibitory control, academic training, and professional experience on the translation of these expressions.

Previous research on the effects of working memory and inhibitory control on the linguistic performance of bilingual individuals indicates that subjects with higher cognitive abilities tend to do better in second language tasks and processes (Mackey and

Sachs, 2012; Sagarra and Herschensohn, 2010; Dussias and Piñar, 2010; French, 2006; Alptekin and Erçetin, 2010; Mercier *et al.*, 2014; Blumenfeld and Marian, 2011; Abutalebi and Green, 2007; Korko and Williams, 2017; Pivneva *et al.*, 2012). However, no research has tested how these cognitive individual differences affect the translation performance of professional translators or non-translator bilinguals. On the other hand, Translation Studies research evaluating the influence of educational and professional experience on translation performance has yielded inconclusive, contradicting results (Ronowicz *et al.*, 2005; Jääskeläinen, 1990, 1996, 1999; Tirkkonen-Condit, 1987, 1992; Jakobsen, 2000, 2003; Göpferich, 2013; Kiraly, 1990; Cifuentes, 2015; De Rooze, 2003; Flores *et al.*, 2012; Massey and Ehrengsberger-Dow, 2011; Ehrengsberger-Dow and Massey, 2013).

In order to test the SPaM Translation model and examine how the aforementioned factors affect the translation performance of translators and non-translators alike, three experimental groups (English-Spanish bilinguals without translation training, English-Spanish translation students, and English-Spanish translators) completed two translation tasks. The first task was presented as a self-paced reading task to emphasize memory and inhibition efforts. The second one was a traditional translation task designed to explore academic training and professional experience effects. Additionally, the participants' working memory was measured with the Letter-Number Sequencing Task, and their inhibitory control was assessed with the Flanker Test.

Statistical analyses show that translation students and professional translators perform very similarly while significantly outperforming the bilinguals in both translation tasks. Additionally, working memory was not a significant covariate in either task, but

Flanker test total score was significant in the self-paced reading translation task, and Flanker test no-go trial score was significant in both tasks.

These results translate into three main findings: (1) Translation students can perform as professional translators in regard to this structure after a short period of training; that is, professional experience did not seem to determine translation performance but training did; (2) working memory capacity does not appear to play a role in translation tasks; and (3) inhibitory control, in particular, the ability to refrain from responding to a prepotent stimulus, may modulate the translation product in the case of self-directed motion. These findings may have implications in how translation training is designed and underscore the need for cognitive training in translation classes.

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And last, but definitely not least, I have to give credit to seventy very special people: my participants. Without you this dissertation would have never come to fruition, literally (no pun intended).

Thank you.

DEDICATION

To my lovely husband, who bravely endured listening to the sentence

"*La barca entró flotando en la cueva*" N number of times, where $N \rightarrow \infty$.

Thanks for everything. I love you.

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CHAPTER 1: INTRODUCTION

1.1. Introduction

Ever since I started teaching, my students have inspired me in meaningful and deep ways. However, this dissertation undeniably represents the most impactful way in which they have affected me, both personally and professionally. While grading assignments and exams, a specific structure that seemed to cause difficulties among my translation students (particularly when translating from Spanish into English) caught my eye: self-directed motion expressions. These expressions, at first sight simple and harmless, contained a moving figure, a spatial reference, and two semantic components to characterize the movement itself, manner and path. Additionally, the moving figure was also the motion agent in these expressions, hence why I refer to them as "self-directed expressions[1]". An example is shown below in (1).

(1)	*La*	*barca*	*entró*	*en*	*la*	*cueva*	*flotando.*
	The	boat	entered	in	the	cave	floating.

"The boat floated into the cave."

While, in Spanish, main clause verbs are the preferred grammatical mechanism to encode path of motion and other linguistic devices are employed to express manner of motion, in English these complex motion events tend to be lexicalized in the opposite fashion, having the manner encoded by the verb and the path expressed in a satellite. These lexicalization divergences have been documented extensively, from Talmy's

[1] In opposition to "caused motion expressions", in which the moving figure and the motion agent are different entities. An instance of these expressions is the sentence "The boy rolled the barrel into the cellar", where "the boy" is the agent and "the barrel" is the moving figure.

(1985) seminal work on motion lexicalization frames (verb-framed languages versus satellite-framed ones), to crosslinguistic explanations as to why these preferred patterns are more or less productive in different languages (Aske, 1989; Fábregas, 2007; Zubizarreta and Oh, 2007, among others).

Regardless of the apparent lack of complexity of said expressions, students consistently showed a large range of variability in regard to their possible solutions when translating them from Spanish into English and only a fraction of the students arrived at the most adequate target language translation. This sparked my interest and led me down a road of research and study that culminates in this dissertation.

Based on these observations, both from a theoretical point of view and from an empirical one, my first intuition was that these expressions would be perfect Unique Item candidates in the Spanish→English language pair and directionality, and I hypothesized that they would be under-represented in English translated texts. Tirkkonen-Condit (2004) explains that a possibly universal process in translation leads to the under-representation of Unique Items in the target text. This is caused by their uniqueness, that is, these items "lack straightforward linguistic counterparts" (Tirkkonen-Condit 2004, 177), "they are not similarly manifested (e.g. lexicalized) in other languages" (Tirkkonen-Condit 2004, 177). This results in a somewhat literal translation with a significantly lower number of Unique Items. Tirkkonen-Condit suggests that "…nothing in the source text… would trigger off [the target text's Unique Item] as immediate equivalents" (Tirkkonen-Condit 2004, 183); therefore, the translator resorts to an expression that remains very close and literal to the source text (or even to a different not-so-literal possibility that also causes the target translation to be overlooked).

Consequently, the first step was to conduct a corpus-based study on the relative prevalence of these motion expressions in translated and spontaneously produced texts in which their Unique Item status could be tested (Gonzalez Darriba, *under review*). To this end, I focused on motion expressions that involved both manner and path semantic components and where the moving figure was also the motion agent. I analyzed the number of self-directed motion occurrences in translated (from Spanish) English texts and spontaneously produced English texts employing two comparable corpora, the Translational English Corpus (Baker, 2003) and the Corpus of Contemporary American English (Davies, 2008). This contrastive analysis yielded very revealing findings: The number of self-directed motion occurrences per million words in translated English (M = 1.76) was close to half the number of occurrences per million words in spontaneously produced English (M = 3.32), and this striking difference was statistically significant according to the quantitative analyses conducted on the data. Hence, confirming the initial hypothesis, I concluded that self-directed motion expressions were in fact a Unique Item in the Spanish→English language pair and directionality.

Naturally, given that even professional translators seemed to grapple with complex motion expressions crosslinguistically, the next step was to investigate why these structures would be so challenging, cognitively speaking, what psycholinguistic processes may be involved in their translation, and what factors may mediate or condition the outcome of the translation process. Thus, this dissertation aims at providing a psycholinguistic explanation for the translation outcomes of this Spanish→English Unique Item as well as to explore the role of working memory, inhibitory control, academic training, and professional experience on said outcomes. It represents an

integrated, multidisciplinary approach to study translation in a scientific way and it applies theoretical foundations and methodologies from Psycholinguistics, Second Language Acquisition, and Translation Studies to investigate these expressions and their translation products from a novel stance.

This dissertation set out to accomplish three main goals: (1) to propose and test a model that builds on linguistic and psycholinguistic theories to explain the lexicalization frame switch (or lack thereof) performed by bilinguals when translating self-directed motion expressions from Spanish into English, (2) to examine the role of cognitive factors in the success of said frame switch, and (3) to explore the effects of academic training and professional experience on the translation performance of non-translators and translators. These goals are detailed in the next section.

1.1.1. Goals of the present dissertation

Theoretical Linguistics, Psycholinguistics, and Translation Studies have been concerned with providing theories and explanations for crosslinguistic differences in complex motion expression, first and second language processing and production, and linguistic and cognitive processes behind translation production, respectively. As a consequence, we have a large body of literature on language typologies according to how they express motion (Talmy, 1985, 1991, 2000; Slobin, 1996; Levin and Rappaport, 2016, among others), a growing research trend that explores how second language learners may behave differently among them depending on their cognitive resources (e.g., Bartolotti *et al.*, 2011; Linck, Osthus, and Koeth, 2013; Lev-Ari and Peperkamp, 2013; Darcy *et al.*, 2014, 2016), and a rich amount of literature that compares novice and

professional translators (see Jääskeläinen, 2003 for a review). However, so far, these three strands have not been integrated to provide a model to account for how target language translation production occurs for complex motion expressions and to understand to what extent the underlying processes in said model may be affected by internal and external individual differences. In this dissertation, I bring together theories from the realm of Bilingualism and Linguistics to put forth a model for the translation of self-directed motion expressions, and apply previous findings from Psycholinguistics and Translation Studies to see the effects of several individual differences on translation performance.

Therefore, three gaps in the literature will be addressed by this dissertation. First of all, a model for the translation of self-directed motion expressions from Spanish into English will be conceived and sketched drawing from previous works by Kroll and Stewart (1994), Jiang (2000), and Jackendoff (1997, 2009, 2011, 2015). The first two works lay the foundation for how bilinguals may perform a translation from their L2 into their L1: At early acquisitional stages, when the learners encounter an L2 word, they must reach into their conceptual base through the L1 lexical items in order to produce a translation, therefore, their concept access is lexically mediated. In later stages of L2 proficiency development, the learners may reach the appropriate conceptual representation directly from the L2 lexical item without associating it with L1 translation equivalents. Then, as the fluency grows, the translation can proceed via conceptual (and not lexical) mediation.

Kroll and Stewart (1994) and Jiang (2000) provide an initial, rudimentary account for the potential under-representation of satellite-framed self-directed motion expressions

in translated English: The bilingual may produce their translation proceeding in a word by word manner and letting the process be lexically mediated. However, it falls short as soon as we consider that the lexicalization of the motion expressions under study goes beyond the word level and that conceptual access must occur in order to make the frame switch possible.

In order to overcome this drawback, Jackendoff's notions on the word as an interface rule and his treelets are brought into consideration to come up with a more encompassing model that accounts for the lexicalization frame switch sought after in the translation of self-directed motion. Under Jackendoff's notion of the word as an interface rule (1997, 2011), complex units (whether lexical, syntactic or phonological) may be plugged into linguistic operations in order to participate in sentence formation and parsing, similar to how idiomatic expressions are stored, retrieved and produced. In parallel, Jackendoff (1997, 2009, 2015) introduces the concept of "treelets" in order to explain how storing of complex syntactic units may work. A treelet represents a piece of a larger syntactic phrase that can be inserted at a specific position in said larger phrase, in other words, a treelet is a piece of structure that encompasses the self-contained expression of a productive phrasal rule. Therefore, if English satellite-framed self-directed motion expressions are characterized as complex lexical-syntactic units with a set of treelet positions, they can be thought of as pieces that may be accessed from the Spanish verb-framed expressions or from an English verb-framed counterpart prior to producing a satellite-framed translation.

By incorporating these premises and applying them to Kroll and Stewart's Revised Hierarchical Model, the *Spanish Path and Manner (SPaM) of Motion*

Translation Model may be laid out. The SPaM Motion Translation Model (which will be laid out in detail in Chapter 2) describes the steps that need to occur in order for a bilingual (translator or not) to perform a frame switch while translating a self-directed motion expression from Spanish into English. The model relies heavily on the Revised Hierarchical Model and its tenets on language proficiency and lexical links between the L1, the L2, and the conceptual level. But the model does not account for the translation of individual words as the Revised Hierarchical Model would; instead, it exploits the idea of a syntactic treelet being activated and retrieved from the bilingual's syntactic storage in order to process, parse, and produce a multi-word expression, such as "floated out".

Secondly, this dissertation identifies and tackles a gap in psycholinguistic studies by exploring the role of two cognitive individual differences, namely working memory and inhibitory control, on the frame switch performance of the bilingual subjects when translating Spanish self-directed motion expressions into English. Working memory and inhibitory control are thought to be important factors in second language acquisition because these cognitive skills are crucial in both monolingual and bilingual language processing and language production. While working memory allows the speaker to hold on to information for a period of time for later manipulation, inhibitory control plays a vital role in non-relevant language suppression. Therefore, psycholinguists have hypothesized that bilinguals with higher working memory capacity and better inhibitory skills may experience learning, processing, and production gains in their second language compared to those with lower capacities. These claims have been borne out in recent studies on second language acquisition (e.g. Sagarra, 2008; Sagarra and Herschensohn, 2010; Bergsleithner, 2010; Mackey and Sachs, 2012; Pivneva *et al.*, 2012; Darcy *et al.*,

2014, 2016; Mercier *et al.*, 2014; Korko and Williams, 2017). Additionally, a number of studies have looked at potential performance advantages derived from better cognitive skills in interpreters (e.g. Tzou *et al.*, 2011; Van Dijk *et al.*, 2012). However, to my knowledge, no study has looked at how these factors may condition bilinguals' performance in translation tasks so far. Consequently, this dissertation aims at understanding how these factors affect (if at all) the translation performance of bilinguals, non-translators and translators alike. In order to do that, participants were tested on both skills and their scores were included in the analysis as covariates in order to probe their effect on frame switch percentages.

The final gap that the study addresses is the role of academic training and professional experience on the frame switch performance of non-translator bilinguals, novice translators, and professional translators. From a commonsensical point of view, better translation performance would be expected from translation students when compared to bilinguals without translation training, on the one hand, and from professional translators if compared to translation trainees, on the other hand. This enhanced performance may be the result of a combination of knowledge acquisition, corrective feedback, and extensive practice, and it may be manifested in increased translation solution appropriateness, efficiency, or resourcefulness, among other features.

A number of studies have tested if this sensible hypothesis was true by comparing non-translator bilinguals, novice translators, and professional translators in general translation tasks (e.g. Gerloff, 1988; Jääskeläinen, 1990; Kiraly, 1995; Kußmaul, 1995; Jakobsen, 2003; Ronowicz *et al.*, 2005; Göpferich, 2013; PACTE, 2000, 2003, 2005, 2009, 2011), yielding inconclusive results, and after specific training in the translation of

self-directed motion expressions (Cifuentes, 2015). While some scholars have found significant differences in favor of the professionals, others report no differences at all or, even more disconcerting, inform that the non-translators outperformed the professional translators. However, only two studies so far have compared the performance of novices and professionals in translating self-directed motion expressions without a specific pre-translation training or treatment (Cifuentes and Rojo, 2015; Alonso Alonso, 2017). These studies did not include a group of non-translator bilinguals and found that there were no significant differences in regard to the translation solutions adopted by translation students and professional translators when translating motion expression from English into Spanish and from English into Galician, respectively.

Given this lack of agreement as to the effects of training and experience on translation performance, and the lack of literature on these factors specifically related to motion expressions, this dissertation looks at how these two external individual differences may mediate the production of target-preferred motion expressions in English by including three experimental groups: English-Spanish bilinguals with no translation training, English-Spanish bilinguals with some translation training, and English-Spanish bilinguals who are professional translators.

In summary, this study contributes to the fields of Bilingualism, Psycholinguistics and Translation Studies with a model that may explain how bilinguals (translators and non-translators) produce (or fail to produce) target preferred lexicalization patterns when translating divergent multi-word expressions from Spanish into English and that may be used to explain and predict translation outcomes for different expressions and language combinations. Moreover, for the first time, it applies previous research on individual

cognitive differences to determine the effects of working memory and inhibitory control over translation processes, which entail reading in a second language but writing in a dominant language. Finally, it examines the role of academic training and professional experience in these translation processes to assess how they are conditioned and/or enhanced by these factors.

1.2. Research questions

In this section I will briefly introduced the research questions addressed in the dissertation as well as the hypotheses I considered prior to collecting the experimental data. For a more detailed description of the questions and their respective hypotheses, please refer to Chapter 2.

Three research questions were posited in order to accomplish the three overarching goals introduced in the previous section. The first research question is more descriptive in nature and aims at testing the plausibility of a psycholinguistic model that may explain the possible outcomes in the translation of Spanish verb-framed self-directed motion expressions into English satellite-framed motion structures. Consequently, the first question reads as follows:

> Do English-Spanish bilinguals (translators and non-translators alike) treat self-directed motion expressions in Spanish as syntactically and conceptually complex units before translating them into English in order to perform a relexicalization and syntactic remapping process? If so, may the SPaM Model depict a felicitous representation of the underlying processes?

The psycholinguistic model I propose to explain the two potential outcomes of the translation of self-directed motion expressions from Spanish into English rests on Jackendoff's treelets and the notion of the word as an interface rule but, first and foremost, it is based on the tenets of the Revised Hierarchical Model (Kroll and Stewart, 1994). The Revised Hierarchical Model places great emphasis on the fact that its predictions apply to fluent but unbalanced bilinguals and on the role of fluency in its design. Taking into account these two factors, I hypothesized that, in offline untimed tasks, the experimental participants (regardless of the experimental group they belong to) will be able to treat self-directed motion expressions in Spanish as syntactically and conceptually complex units and perform a relexicalization and syntactic remapping process because (1) they are highly proficient unbalanced bilinguals whose most dominant language is English and whose less dominant language is Spanish, and (2) their Spanish proficiency level is one that would grant strong links between the L2 lexical items and the conceptual level.

The second and third research questions are more explanatory in nature, since they aim at revealing the effects of internal (cognitive) and external (translation-related) factors on the translation performance of the experimental subjects. More specifically, the second question asks:

> Do working memory capacity and inhibitory control resources affect the frame switch percentages of translator and non-translator bilinguals when translating self-directed motion expressions from Spanish into English?

On the one hand, my hypothesis in regard to the role of working memory was that individuals with higher working memory would be more accurate than those with low capacity, based on two facts observed in the previous literature: 1) individuals with high working memory capacity are more likely to notice the differences in the lexicalization patterns in English and Spanish, and 2) they are more likely to maintain the words active in memory while processing the word-by-word sentence presented to them for later manipulation.

On the other hand, based on Green's Inhibitory Control Model and Hasher, Lustig, and Zacks's Inhibitory Processes account, my hypothesis in regard to the role of inhibitory control was that individuals with higher inhibitory control would be more successful in performing a frame switch than those with low inhibitory control given that they would be able to suppress the word-by-word translation strategy by restraining the prominent response, retaining the Spanish path verb longer for later re-evaluation of their hypothesis, and by delaying the deletion of active items until the ultimate goal (a satellite-framed English translation) is achieved.

Lastly, the last research question deals with the role of two external individual differences, academic training and professional practice, on the translation performance of the participants and it asks the following:

> Do academic training and professional experience affect the frame switch percentages of untrained non-translator bilinguals, translation trainees, and experienced professional translators when translating self-directed motion expressions from Spanish into English?

Based on the findings from previous studies that explore the role of academic training and professional experience on translation in general and on the translation of self-directed motion expressions particularly, I hypothesized that experienced translators will be more accurate (i.e., they will be more successful in performing the lexicalization frame switch) than novice translators, who in turn will be more accurate than non-translator bilinguals. This hypothesis is based on the fact that translators (novices and experienced ones alike) have acquired a more complex translation competence via academic instruction and through their own professional practice. This will enable them to tackle longer translation units and to recognize structures like this one, where an emphasis on the conceptual level over the lexical expression is paramount, and in which attention to target language preferred forms also plays a very important role in the appropriateness of the translation solution. However, this level of awareness and appropriateness may not play a role in bilingual, non-translation related communication, which would result in lower frame switch percentages on the part of the non-translator bilinguals.

1.3. Outline of the remaining chapters

This dissertation is organized as follows. The present chapter serves as an introduction to state the phenomenon under study and the rationale behind it. Next, Chapter 2 presents the theoretical framework on which the SPaM Model is founded, as well as previous research on the effects of working memory, inhibitory control, academic training, and professional translation on bilinguals' and translators' performance. Additionally, the research questions are explained in detail in Chapter 2 and hypotheses

based on the existing literature in Psycholinguistics, Second Language Acquisition, and Translation Studies are offered. Subsequently, Chapter 3 introduces the methodology employed in order to answer the research questions and characterizes the experimental groups and tasks of the present dissertation.

The results of the experimental tasks and the statistical analyses performed to reveal potential significant effects of the studied variables are reviewed in Chapter 4. Then, in Chapter 5, these results are integrated and interpreted to provide answers to the research questions. Moreover, a discussion of those results, along with the main implications for the fields of Second Language Acquisition and Translation Studies, are put forth in Chapter 5. Lastly, that same chapter concludes by recapping the main findings of the dissertation and taking into consideration both the limitations of the current study and future research lines.

CHAPTER 2: THE RELATIONSHIP AMONG MOTION EXPRESSION, BILINGUAL LEXICON STORAGE, AND INDIVIDUAL FACTORS IN TRANSLATION PROCESSES

2.1. Introduction

Translation Studies and translation tradition have long defined and debated over the notion of "literal translation" (Catford, 1965; Chesterman, 2011; Ivir, 1981, 1997; Shuttleworth and Cowie, 1997, Toury, 2012; Vinay and Darbelnet, 1995). However, most literature from this discipline focuses on the product of the literal translation itself, that is, a target text segment that closely resembles in syntax, word order, or lexical choices the original source text segment, or consequences of it, in terms of text perception, quality, and normative evaluation (see Halverson, 2015 for an extensive review). However, there is a scarcity of literature focusing on the psycholinguistic basis for the literal translation phenomenon and even fewer studies that apply linguistic and psycholinguistic theoretical frameworks in order to explore literal translation, explain the mechanism behind it, and predict what structures could be candidates for literal translation based on their syntactic and lexical features. Only in recent years, a focus shift from product-oriented approaches to process-oriented ones has been on the rise, with studies that explore not only the result of literal translation but the processes behind it (Balling *et al.*, 2014; Halverson, 2015; Muñoz Martín, 2012; Schaeffer, 2013; Schaeffer and Carl, 2013, 2014; Tirkkonen-Condit *et al.*, 2008).

Additionally, related to literal translation and drawing from Linguistics, language processing, and bilingualism, the term "natural translation" has also been put forth in order to describe how bilinguals without translation training may be able to produce

translations on their own accord if/when needed. Harris (1977) and Harris and Sherwood (1978) define "natural translation" as "...translation done by bilinguals in everyday circumstances without special training for it" and call it "the third competence of a bilingual," along with knowledge of their first language and their second language. Nonetheless, less interest has been devoted to the exploration of what factors may be at play in natural translation adequacy and to the psycholinguistic processes that may set apart natural translators from novice translators and professionals.

This dissertation tries to provide a psycholinguistic explanation for the literal non-target-preferred translation of self-directed motion expressions from Spanish into English, as the one shown in (1) below and in Chapter 1. These expressions are lexicalized in different ways in the source language (Spanish) and the target language (English), which may increase the cognitive effort on the part of the bilingual/translator as well as trigger a word-by word translation strategy. This might cause the adoption of a literal English translation that closely resembles the syntax, word order, and lexical items of the Spanish source text, or may activate a paraphrasing strategy that produces an alternative that diverges from the target-preferred satellite-framed expression. Additionally, a model that intends to help predict what complex linguistic constructions may be subject to literal translation, employing findings and theories on bilingual lexical storage and retrieval, is offered, along with an in-depth view of the internal (cognitive) individual factors and external (professional) individual factors that play a role in the translation process. In order to do so, three experimental groups are employed: a group of professional translators, a group of translation students, and a group of natural translators, i.e., bilinguals without translation training.

(1) *La barca entró en la cueva flotando.*

Lit. "The boat entered in the cave floating."

"The boat floated into the cave."

Moreover, this dissertation provides a theoretical account for phenomena that have been previously studied in Corpus Linguistics research applied to Translation Studies - the under-representation of linguistic expressions that are lexicalized differently in two languages when translating from one to the other. This line of research has found out that translated texts tend to exhibit atypical frequencies of certain linguistic features of the target language when the translation involves a meaning unit that diverges significantly in its lexicalization in the source language and the target language. Previous studies report under-representation of manner of motion expressions in French→English translated texts (Cappelle, 2012); atypical patterns of use of the referative, final, and temporal non-finite constructions in Finnish texts translated from English and Russian (Eskola, 2004); under-representation of self-directed manner of motion in Spanish→English translated texts (Gonzalez Darriba, submitted); atypical patterns of use of pre-modifying adjectives in English→Spanish translated texts (Rabadán *et al.*, 2009); atypical uses of the progressive and the present perfect tenses in English→Portuguese translated texts (Santos, 1995), under-representation of some modal verbs in translated Finnish (Tirkkonen-Condit, 2000), and under-representation of clitic pragmatic particles in English→Finnish translated texts (Tirkkonen-Condit, 2005).

In this chapter, I will lay out the theoretical framework of the dissertation and outline the objectives I wish to accomplish, along with the research questions I intend to

answer. The remainder of this chapter is organized as follows: a detailed and contrastive analysis of the expression under study is provided first; then, the relevant linguistic theories and translation hypotheses employed and explored in this dissertation are introduced; afterwards, internal and external individual factors are discussed. Lastly, a description of the goals of the present study along with the research questions addressed and the hypotheses yielded by the theoretical framework are presented.

2.2. Expression of manner of motion events

Motion events have been described in detail by several scholars. Foundational works by Fillmore (1977), Talmy (1985), and Levin and Rappaport (1992), among others, have put forth the basis for the characterization of such complex events. In this dissertation, I will follow Talmy's (1985) motion typology because it perfectly fits the motion expressions I am concerned with, those that involve manner of motion and path of motion simultaneously.

The characterization of motion events relies on the conjunction of several semantic components. Following Talmy (1985) and his seminal work on typologies in regard to the expression of motion across languages, these components are *Motion* (defined as the presence per se of motion), *Figure* (represented by the conceptually movable object), *Ground* (described as the reference point with respect to which the *Figure*'s *Path* is defined), and *Path* (understood as the course followed by the Figure). These four components can be observed in the example below. In (2), “the pencil” represents the *Figure*, “the table” is the *Ground*, and “off” encodes the *Path*. The verb “rolled” expresses *Motion* and happens to indicate manner simultaneously.

(2) The pencil	rolled	off	the table.
Figure	Motion	Path	Ground

(Talmy, 2000:26)

These four components define the *framing event* (Talmy, 2000). Although not included in the original proposal, additional semantic components may be present and define a *co-event*, that is, a subordinate event that further characterizes the *framing event*. In this sense, it is worth mentioning a fifth semantic component, *Manner*. As seen in (2), the verb "to roll" conflates *Motion* and *Manner*, but conflation of other semantic components is possible too. In (3), conflation of *Motion* and *Path*, *Motion* and *Cause*, and *Motion* and *Figure* is illustrated.

(3) a. *Motion* and *Path*: "The elevator ascended to the top floor very quickly."

b. *Motion* and *Cause*: "The napkin blew off the table" (Talmy, 2000:30).

c. *Motion* and *Figure*: "It rained in through the bedroom window" (Talmy, 2000:57).

In the sentences in (2) and (3), it can be observed that there is a complex event that encompasses the combination of *Motion* and an additional semantic component, along with a path. According to Talmy (2000), of these semantic components, Path acts as the main event (*framing event*) while the others are *co-events* (*Manner*, *Cause*, etc.). Consequently, Talmy classifies languages into their respective typologies according to how they encode *Path*, that is, the *framing event*. Leaving aside other semantic components such as *Cause*, *Precursion*, *Enablement*, etc. (Talmy, 2000), and focusing on

Motion in conjunction with *Manner* and *Path* of motion exclusively, these typologies are in turn affected by language-specific conflation patterns, i.e., by how languages lexicalize motion events that involve two semantic components.

Traditionally, according to Talmy (1985), Slobin (1996), Beaver *et al.* (2010), and Levin and Rappaport (2016), among others, English (along with other Germanic languages) is a satellite-framed or manner language. This entails that the *framing event* (the main event) is encoded by the satellite[2]. Satellite-framed languages encode manner of motion in the verb ("to run," "to bounce," "to jump", etc., conflating motion and manner in the verb), whereas path is expressed using a "satellite" (such as "on," "under," "through," "in"). On the other hand, Spanish (and other Romance languages) is a verb-framed or path language, that is, the *framing event* is encoded by the verb[3]. Verb-framed languages express path in the verb (*entrar* (to enter), *cruzar* (to cross), *salir* (to exit), conflating motion and path in the verb) and manner is indicated not by the verb, but rather using different linguistic devices (gerunds, PPs, coordination, subordination, etc.)[4].

In the following subsections, an analysis of the expression of manner of motion in English and Spanish is presented. In this study, I focus on the expression of self-directed

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[2] This view entails the assumption that *Path* is the main event or semantic component across languages (it is lexicalized both in English and Spanish) whereas manner is the co-event (it is lexicalized in English but it is optional in Spanish).

[3] A third language typology has been put forth by Slobin (2004), Slobin and Hoiting (1994), and Zlatev and Yangklang (2004), among others, to account for motion lexicalizations that do not match verb-framed and satellite-framed events. This third typology is that of equipollently-framed languages. Emai, Thai, and Algonquian are examples of equipollently-framed languages. These languages encode both manner and path as verbs in serial verb constructions of different kinds. Since English and Spanish do not employ this lexicalization pattern, it will not be discussed in detail.

[4] These lexicalization patterns are general tendencies; they represent the preferred frames for their respective languages and at the same time, opposite ends in the motion expression spectrum. However, they are not absolute distinctions or classifications; instances of both patterns are encountered regardless the main pattern in a particular language: verb-framed languages can make use of satellite-framed structures and vice versa, satellite-framed languages can display verb-framed events.

motion, understood as motion events in which the Figure acts as the motion agent, that is, Figure and agent are the same entity (self-agentive motion, according to Talmy's (2000) terms), as illustrated in (1) above. The expression of caused directed motion (agentive motion, according to Talmy (2000)), i.e. events in which the Figure and the agent are not the same (for instance, "The usher walked the guests to their seats"), is not discussed.

2.2.1. Expression of self-directed motion in English

As mentioned in the previous section, English, being a satellite-framed language (Talmy, 1985, 1991, 2000), encodes certain complex events using a verb (that carries the manner aspect of the event) and a satellite (that holds the path component of the event). Therefore, English is very rich in constructions in which directed motion is expressed by a manner of motion verb followed by a path-denoting PP introduced by a satellite (in Talmy's (1985) sense).

Before proceeding to giving an account of the expression of self-directed motion in English, several assumptions must be laid out. Following Beavers *et al.* (2010), the expression of manner of motion in a single-verb clause is determined by two premises:

(i) The verb is the only clause-obligatory lexical category: Although the verb is only one of the several lexical categories that could encode manner or path, it is the only obligatory category in a non-verbless clause.

(ii) A verb can lexicalize only manner or only path. A constraint on non-stative verbs proposed by Levin and Rappaport (1991, 1992, 1998) limits the lexicalization of both manner and result semantic components by one verbal lexical item.

Considering path to be a type of result, this entails that the verb in a single-clause manner of motion event may lexicalize either manner or path.

Taking (i) and (ii) together, it follows that the verb will be "the single common element across all clausal descriptions of motion events and thus central to how path and manner are encoded and combined cross-linguistically" (Beavers *et al.*, 2010: 337). In the case of English, this means we could equally encounter verbs such as "float" (manner of motion) or "enter" (path of motion) in a single-clause motion event. However, it is patent that English constructions more often than not employ a lexicalization pattern in which the verb encodes manner rather than path, and a satellite is responsible for encoding path. In example (1), this is exemplified by the verb "floated" and the selected PP complement "into the cave," which is introduced by the satellite "into." As indicated before, it is the satellite that encodes the main semantic component – direction, in this case, from the outside towards the inside of the cave – and the verb encodes the co-event – manner, in this example, buoying in a fluid.

(1) The boat floated into the cave.

The question now turns to be why English is so rich in these V+PP structures that become very productive in the lexicalization of self-directed motion. Following the second analysis presented in Zubizarreta and Oh (2007)[5], verbs that encode manner of motion ("to run," "to bounce," "to limp"…) are not stored as a different lexical entry in the mental lexicon, that is, there are not two different entries in the speaker's mental

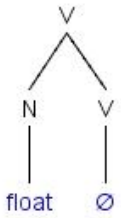
[5] The first analysis presented in Zubizarreta and Oh (2007) will be discussed in the next section.

dictionary (one for the nominal form - for instance, "run"- and one for the verbal form - "to run"). Instead, in order to productively make use of these verbs, they must necessarily undergo a compound process in which the lexical item in question (I use “float” for illustrative purposes) and a light verb form a new verbal head. The light verb that takes part in the compound process is a verb without p-features (that, is without a phonological realization) and without c-features (it does not point to a concept in the mental dictionary) (Zubizarreta and Oh, 2007). Zubizarreta and Oh claim that this light verb V is similar to "go" or "come," but it merely represents an aspectual meaning related to a change of location and it is lexically unspecified.

Zubizarreta and Oh claim that this process is the application of a compound rule, similar to the very productive N-N compound in Germanic languages, except that in this case the compounding occurs between a phonologically specified lexical item (*float*) and a phonologically unspecified verbal category (V, see (4)). A similar process is proposed by Mateu (2002) in order to account for typological differences between English and Spanish. Mateu claims that English manner of motion verbs are the result of a conflation process in which the phonologically unspecified verb is provided with the phonological content of a lexical root (as in (5)), and that Spanish, along with other Romance languages, lacks conflation.

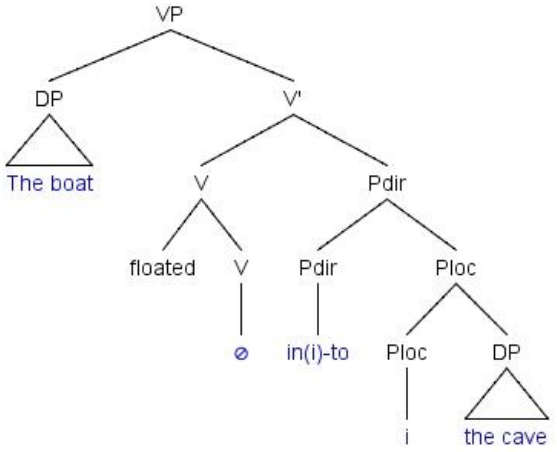
(4) [*float* V]

(5)



The head resulting from the compounding process is indeed the manner of motion verb, and it may take PP complements because the light verb is the one licensing them. Thus, the verb encodes one semantic component of directed motion (namely, manner) and the PP complement encodes the other semantic component (that is, path).

(6)



Hence, it is necessary to point out that the expression of directed motion in English entails the following: (a) the PP complement is not optional in order to fully encode the *Manner* and *Path* motion event, and (b) these expressions involve the syntax-lexicon interface due to the lexical and syntactic selection exerted by the compound verbal head over its complement. In summary, the "manner of motion + satellite" structure is possible and very productive in English due to two major factors: (1) the possibility to form a complex verbal head from a light verb and a manner of motion lexical item, thus conflating motion and manner, and (2) the licensing of a PP complement by the light verb.

2.2.2. Expression of self-directed motion in Spanish

Contrary to the examples and the analysis presented for English, in Spanish the semantic components of directed motion are expressed in a reverse pattern when compared to English, adopting a pattern typical of verb-framed languages. In Spanish, the verb encodes path (the framing event) and the manner co-event may be expressed in a variety of ways:

(7) Adjunction of TP: *La barca entró flotando en la cueva.*

(Lit. "The boat entered in the cave floating." "The boat floated into the cave.")

(8) Adjunction of PP: *El niño salió de la cocina a la pata coja.*

(Lit. "The boy exited the kitchen [hopping] on one leg." "The boy hopped out of the kitchen.")

(9) Subordination: *La pelota se escondió bajo el sofá mientras rodaba.*

(Lit. "The ball hid under the couch while rolling." "The ball rolled under the couch.")

(10) Coordination: *La pelota botó y salió por la ventana.*

(Lit. "The ball bounced and went out through the window." "The ball bounced through the window.")

Several accounts have tried to explain the typological differences between English and Spanish (Aske, 1989; Fábregas, 2007; Zubizarreta and Oh, 2007). These accounts suggest that the differences in the way these two languages frame complex events have different origins. First, Aske (1989) posits that event telicity determines the grammaticality of self-directed motion expressions in Spanish, and while atelic predicates

can be satellite framed (*La barca flotó hacia la cueva* – The boat floated towards the cave), telic predicates need to employ a verb framed structure (*La barca entró flotando en la cueva* (lit. The boat entered floating in the cave) instead of **La barca flotó en la cueva* – The boat floated into the cave). This account falls short in providing an explanation for motion expressions that involve verbs such as *bailar* (to dance), *tropezar* (to trip), *temblar* (to shiver)… (verbs of internal bodily motion, i.e., they imply motion but do not entail change of position (Fábregas, 2007)) since sentences like "… *tropezó hacia la puerta*…" ("… tripped towards the door…") or "…*baila hacia la ventana*…" ("… dances towards the window…") are not acceptable. Secondly, Fábregas (2007) claims that the lexicalization differences stem from the nature of the preposition "a" in Spanish versus "to" in English. However, in this analysis, expressions such as *cojear a X* (to limp to X) or *gatear a X* (to crawl to X) are deemed grammatical, and no attention is directed to expressions with satellites other than Spanish "a." Lastly, an initial account presented in Zubizarreta and Oh (2007) hypothesizes the presence of a complex PP that is not completely spelled out at the moment of the utterance of the self-directed motion expression. This complex PP includes an origin point and a destination point, but the origin point is phonologically deleted from the utterance.

(11) *La barca flotó [de la isla]$_{\varnothing}$ a la cueva.*

The boat floated [from the island]$_{\varnothing}$ to the cave.

Nevertheless, these accounts fail to provide a cohesive, broad approach that can be largely applied to observed speakers' utterances and they seem to provide narrow explanations for specific cases. For these reasons, I turn again to Zubizarreta and Oh

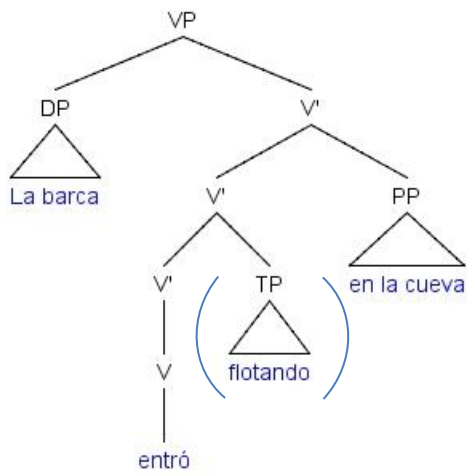
(2007) and their second analysis of the divergent typologies exhibited by English and Spanish. This analysis appears to be the account with a wider and less restricted application as well as a straight-forward correspondence with linguistic phenomena observed in translation, especially keeping in mind that the main focus of the present study is to discuss the end point (the translated English motion expression) rather than the starting point (the motion expression in the Spanish source text).

The question is why is it not possible to use a satellite-framed structure in Spanish ("*flotar a*") while it is grammatically possible (although dispreferred) to use a verb-framed structure in English ("go in while floating")? The key to answering this question is that, as mentioned before, manner of motion verbs cannot take PP complements. This is not a problem in English because the manner of motion verb is the result of the conflation of a PP complement-licensing light verb and a manner of motion lexical item, so that restriction is bypassed by the conflation mechanism. However, this mechanism is not available in Spanish, given that the productivity of the compound rule explained by Zubizarreta and Oh is limited in Spanish and it is not applicable to verbal heads.

From the inventory of possibilities available to the Spanish speaker, gerunds and PPs are probably the more prominent options employed in order to encode manner in directed motion expressions. A crucial difference between the options employed in Spanish and the ones employed by the English speaker is that gerunds and PPs are not complements in Spanish, they are adjuncts and, therefore, optional (Chomsky, 1995, 1998, 1999; Sportiche, 1988, 1994; Zubizarreta, 1982, 1987). Reversely, in English, under Zubizarreta's and Oh's analysis, the PP complement is selected by the verb and it is an argument, and accordingly, mandatory. This reflects a deeper ramification derived

from this syntactic divergence in English and Spanish: when encoding the two semantic components of directed motion, that is, manner of motion and path, only the path component seems to be fundamental and indispensable. This is congruent with Talmy's view of path as the framing event in manner of motion structures). This difference in the relative weight of each semantic component is especially visible in Spanish: there is no lexical or syntactic selection exerted by the path-denoting verb over the manner-encoding adjunct, which, in fact, can be absent altogether ("*La barca entró flotando en la cueva*" versus "*La barca entró en la cueva*").

(12)



In summary, the "manner of motion + satellite" structure is not possible and not productive in Spanish due to two major reasons: (1) manner of motion verbs cannot take PP complements, and (2) Romance languages lack conflation (Mateu, 2002)[6]. As I will

[6] It is necessary to acknowledge that for some speakers of Spanish, the "manner of motion + satellite" structure is indeed acceptable. This may be explained by the coexistence of satellite-framed and verb-framed events in Spanish, although the former frame is dispreferred. Moreover, it can be posited that such instances are easily interpreted and understood from the discursive and pragmatic context in which they are embedded, especially when the verbs involved are highly frequent. Additionally, even in those instances, a key difference between the English and the Spanish construction is that, in the latter, the PP that denotes path must still be an adjunct, given that manner of motion verbs do not take PP complements and conflation is not available. Those

explain in the coming sections, this will have important consequences on the translation process of these expressions from Spanish into English.

2.2.3. Summary of the divergences between English and Spanish in their respective motion lexicalization patterns and implications for the translation process

This section briefly summarizes the main findings from the two previous sections. In Spanish, self-directed motion involves syntactic adjunction and meaning is constructed from the lexical items employed in the codification of path as a framing event (a verb) and manner as a co-event (and adjunct). However, these items are not in a lexical selection relationship with respect to each other, they only interact syntactically. On the other hand, the expression of self-directed motion in English requires a complex manner-encoding verbal head that selects a path-denoting PP complement, therefore these expressions cross the syntax-lexicon interface. This asymmetry poses a difficulty for bilinguals (translators and non-translators alike) and it is interesting to study in order to understand how bilingual individuals successfully cope with it both linguistically and cognitively.

Table 2.1 summarizes the mismatch at the conceptual, lexical, syntactic, and semantic levels between English and Spanish when it comes to self-directed motion expressions. If we take into consideration only the main verb employed in each language (considering that the verb is non-optional and that it encodes in Spanish the mandatory semantic component), it becomes apparent that both languages differ at every level and

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constructions in Spanish may be the result of lexical-semantic selection of the directional PP by the manner of motion verb rather than lexical-syntactic selection, which drives the English counterpart. Feist, Rojo and Cifuentes (2007) seems to corroborate this assumption; they found that the “manner of motion + satellite” structure is acceptable for Spanish speakers for expressions that are contextually salient or culturally salient.

that lexical reliance on the verb leads the translator down a wrong path when he/she encounters this expression in a source text during a translation task.

	ENGLISH	SPANISH	MATCH OR MISMATCH?
CONSTRUCTION	***FLOAT*** in	***ENTRAR*** *flotando*	***Mismatch***
CONCEPT	MANNER OF MOTION	PATH OF MOTION	***Mismatch***
LEXICON	\floʊt\	\ẽ n̪ t ɾ a ɾ\	***Mismatch***
SYNTAX	V + COMPLEMENT	V + ADJUNCT	***Mismatch***
SEMANTICS	Rest or move on or near the surface of a liquid without sinking[7]	*Ir o pasar de fuera adentro*[8] (to move from the outside in)	***Mismatch***

Table 2.1. English and Spanish mismatches on the expression of self-directed motion.

By examining Table 2.1, the divergences that these typologies give rise to and the difficulties the frame switch entails are easily understood, given the mismatch between the main verb at all linguistic levels in the source language, Spanish, and the target language, English. Consider the following example in order to understand how these mismatches interplay and may lead to dispreferred lexicalizations of self-directed motion in translated English: An L1 English L2 Spanish individual is translating a text from Spanish into English and encounters the sentence I have been employing previously, "*La barca entró flotando en la cueva*" (literally, "The boat entered floating in the cave"). When this individual gets to "*entró*" ("entered"), he/she might adopt a literal translation strategy and translate such verb using an English cognate, "enter," or a verb that denotes movement but underspecifies manner of motion, such as "go" or "get" (+ in). This

[7] From http://www.oxforddictionaries.com/
[8] From http://dle.rae.es/

strategy will lead the individual to maintain a verb-framed structure in English, rather than re-expressing the meaning utilizing the more target-appropriate satellite-framed structure. On the other hand, this individual may instead read the whole sentence and then proceed to translate it, but this does not guarantee that they will adopt a satellite-framed expression in English either.

By looking at Table 2.1, we can easily understand why this might be the case, given the mismatch between the main verb in the source language, Spanish, and the target language, English. The bilingual will not arrive at "float" departing from "*entrar*" if a word-by-word approach is taken because those two lexical items differ at a conceptual level ("float" vs. "enter"), at a lexical level (they are two distinct lexical items, with different phonological forms and do not have a cognate relationship), at a syntactic level (they select different arguments and appear in different syntactic configurations), and at a semantic level. Therefore, the translation that entails a frame switch is rather complex and must involve processes that operate at a level beyond the individual word.

Corpus studies that compare spontaneously produced English and translated English confirm that the translation of this particular structure is underrepresented in translated language, an indication of its complexity. Gonzalez Darriba (submitted) found that self-directed motion expressions were significantly less prevalent in texts translated into English from Spanish than in texts originally produced in English. Similarly, Cappelle (2012) concluded that texts translated into English from French (a verb-framed language) contained fewer expressions with manner of motion verbs than texts originally produced in English, but texts translated into English from German (a satellite-framed language) did not. Considering that the corpora employed in the aforementioned studies

are comparable in nature, there is no reason to believe the ratio or percentage of self-directed motion or manner expressions should differ across languages. Nevertheless, these studies proved that this is not the case and that translation of these structures poses a challenge for the translators, which leads us to believe that other factors must play a role in the end product.

In view of this inter-linguistic contrastive analysis, in the next section I will explain why these motion expressions in English and Spanish are excellent candidates to be considered "Unique Items" as well as useful experimental stimuli to test a cognitive and linguistic translation model, and how Translation Studies literature has explained why they are under-represented in translated language.

2.2.4. The Unique Item Hypothesis (Tirkkonen-Condit, 2004)

Since the consolidation of Corpus-Based Translation Studies, the study of translated texts in relation to spontaneously produced texts has been a popular approach in the field. Consequently, translated texts are often described in terms of how similar/dissimilar they are when compared to spontaneously produced texts. This descriptive analysis brought about the term *translated language* (Baker, 1993), which refers to a language variety that deserves to be studied in its own right and that differs from non-translated language due to language pair contact (Mauranen, 2000; Baker, 1999; Toury, 1980). Rabadán *et al.* (2009) mention that this term generally designates prototypical lexical distribution found in target texts, but as Santos (1995) suggests, there is no reason that prevents this term from being applied to syntactic, stylistic or rhetorical uses observed in target texts. In turn, the study of translated language, also referred to

“the third code” (Baker, 1998) or “interlanguage[9]” (Toury, 1980) gave rise to theorization and research on translation universals, i.e., universal features caused by characteristics of either source texts or target texts involved in translation processes. Although the notion of translation universal had been previously explored (see Toury (1977)), it was Baker’s publication “Corpus linguistics and translation studies: Implications and applications” (1993) that brought new theoretical and research attention to this concept. In this paper, Baker argues for the equal status of translated texts, instead of subjugating their worth and quality to their relationship with the source text, while simultaneously claiming that they are different from non-translated texts. This sparked generous subsequent interest in the search for and definition of the features that make translated texts different, and this interest resulted in the division of translation universals (or *translation tendencies*, according to Chesterman (2004, 2010a)[10]) into *source text tendencies* and *target text tendencies* (Chesterman, 2004, 2010a). Source text tendencies relate to differences observed between source texts and their translations. Instances of source text tendencies are lengthening (translations are longer than their source text), dialect normalization, or reduction of complex narrative voices (such as indirect speech). Target text tendencies refer to the divergences observed between translated and non-translated texts. Target text tendencies are atypical lexical patterns or conventionalization, to name a couple.

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[9] "Interlanguage" in Translation Studies is used as a synonym for "third code" and relates to the unusual distribution of linguistic features in a translated text. It should not be mistaken with the term "interlanguage" as used in Second Language Acquisition, which refers to the linguistic system that underlies the learner's production and that is related to the native and the target languages while being independent from them both (Selinker, 1972).

[10] "Translation universal" is a highly controversial term in the field. Chesterman disapproves the use of “universals of translation” and prefers to refer to them as “typical features of translations” (2010a:40), or “translation tendencies” (2004:46), highlighting the probabilistic essence of these characteristics.

An example of a target text translation tendency that may result in atypical syntactic configurations is the Unique Item Hypothesis. Tirkkonen-Condit (2004) explains that a possibly universal process in translation leads to the under-representation of target language unique items in the target text. This is caused by their uniqueness, that is, these items "lack straightforward linguistic counterparts" (Tirkkonen-Condit, 2004:177) and "they are not similarly manifested (e.g. lexicalized) in other languages" (Tirkkonen-Condit, 2004:177). This results in a somewhat literal translation with a significantly lower number of unique item occurrences. Tirkkonen-Condit suggests that "there is nothing in the source text that would trigger off [the target text's unique item] as immediate equivalents" (Tirkkonen-Condit, 2004:183); therefore, the translator resorts to an expression that remains very close and literal to the source text.

From a psycholinguistic point of view, the hypothesis by Tirkkonen-Condit seems to be an accurate depiction of what actually happens in the translation process and it leads to a prediction that neatly fits what is observed in unique item studies such as Cappelle (2012), Eskola (2004), Gonzalez Darriba (*submitted*), Rabadán *et al.* (2009), and Santos (1995). Reconsider now the example used to explain Table 2.1: An L1 English L2 Spanish translator works on a text from Spanish into English and encounters "*La barca entró flotando en la cueva*." When this translator gets to "*entró*" ("entered"), he/she might adopt a literal translation strategy and translate such verb using an English cognate, "enter," or a verb that denotes movement but underspecifies manner of motion, such as "go" or "get" (+ in). This strategy will lead the translator to maintain a verb-framed structure in English, rather than re-expressing the meaning utilizing the more target-appropriate satellite-framed structure. The translator will not arrive at "to float + PP"

departing from "*entrar* + TP" if a word-by-word approach is taken because those two lexical items differ at a conceptual level ("float" vs. "enter"), at a lexical level (they are two distinct lexical items, with different phonological forms and do not have a cognate relationship), at a syntactic level (they select different arguments and appear in different syntactic configurations), and at a semantic level. Therefore, the successful translation must involve processes that operate at a level beyond the individual word. Additionally, although a seasoned translator may read the full sentence before proceeding to translate, this still is not enough to guarantee an adequate target solution. The translator still must process the verb-framed expression as a chunk (a complex, multi-word unit) and avoid a lexically-driven translation strategy.

The cognitive and linguistic mechanisms involved in such processes are the main focus of this dissertation, along with what internal and external factors may influence the (un)successful lexicalization frame switch when translating Spanish verb-framed self-directed motion expressions into English. In the following section, I introduce notions and theories related to the bilingual mental lexicon relevant for the theoretical translation model I propose and said model is outlined. First, I focus on the Revised Hierarchical Model (Kroll and Stewart, 1994) as a tool to understand translation processes at the word level. Then, I link the idea of Word as an Interface Rule (Jackendoff, 1997) to this model in order to extend the Revised Hierarchical Model beyond the word level and attempt to explain the underlying mechanisms involved in the translation of these multi-word motion expressions from Spanish into English.

2.3. Bilingual Lexicon Storage: The Revised Hierarchical Model (Kroll and Stewart, 1994) and the notion of Word as an Interface Rule (Jackendoff, 1997)

Research in the realm of bilingual lexicon storage and bilinguals' language interdependence has long debated whether the two languages in the bilingual mind are stored in a connected manner or separately. Different models in an interconnectedness spectrum have been proposed (and later rebutted in some cases), from accounts with no connections at all between languages to models with shared lexical and semantic relations in both languages (Kirsner *et al.*, 1984; Meyer and Ruddy, 1974; Weinreich, 1968). In recent years, empirical studies have shown that bilingual lexical access from the semantic level to the phonological level occurs thanks to parallel activation flows in both languages and therefore, it is language-nonspecific (Costa, Miozzo, and Caramazza, 1999; Costa, 2005; de Bot, 1992; Dewaele, 2001; Gollan and Acenas, 2004; Poulisse, 1999). For this study, I assume the proposal by Kroll and Sholl (1991,1992) and Kroll and Stewart (1990, 1994) in which the two languages of a bilingual individual share conceptual representations but have separate lexical representations for each of them.

Regardless the level of connectedness between the two languages, some bilingual storage models focus more on word recognition and lexical access (as the Bilingual Interactive Activation Model (Grainger and Dijkstra, 1992; Dijkstra and Van Heuven, 1998) or the Bilingual Interactive Model of Lexical Access (Léwy and Grosjean, 1997)), while others emphasize meaning associations (as the Distributed Feature Model (De Groot, 1992a; De Groot, 1992b; De Groot, 1995; De Groot, Dannenburg, and Van Hell, 1994; Van Hell, 1998; Van Hell and De Groot, 1998)). However, I focus on Kroll and Stewart's (1994) Revised Hierarchical Model because it is a model that arouse from

translation tasks and that accounts for translation asymmetries, therefore making it very suitable for application in the study of the translation of self-directed motion expressions. Other competing accounts, from Levelt's (1989) work to more recent proposals, as the Bilingual Interactive Activation Model + (Dijkstra and Van Heuven, 2002), focus mainly on bilingual lexical storage and retrieval for speech production and word recognition purposes. On the contrary, the Revised Hierarchical Model allows us to easily apply its main tenets not only to speech or oral production of translation equivalents, but also to written translation tasks and it becomes valuable in understanding how literal translations may be produced by the bilingual, translator or not.

As I explain in the following section, the Revised Hierarchical Model was proposed to explain results obtained in translation tasks at the word level, therefore, this model is not sufficient to explain the complex process of translating multi-word self-directed motion expressions from Spanish into English and to put forth a model that explains the linguistic processes that take place during such translation process. For this reason, I employ Jackendoff's notion of the word as an interface rule and the idea of treelets in order to shed some light on this phenomenon. In doing this, the Revised Hierarchical Model can be extended beyond the word level in order to propose a model that accounts for the literal (or not) translation of complex motion structures.

2.3.1. The Revised Hierarchical Model (Kroll and Stewart, 1994)

In an attempt to explain L1→L2 and L2→L1 translation time asymmetries observed in word translation tasks, Kroll and Stewart (1990, 1994) put forth the Revised Hierarchical Model. In this model, proposed for fluent but unbalanced bilinguals, L1

words have stronger links to the conceptual level than the L2 words do, which are strongly linked to the L1 via lexical association as a result of the nature of the acquisition process and its early stages. As a consequence of this link strength asymmetry, L2 to L1 translation occurs faster than the L1 to L2 translation, due to the fact that the former is lexically mediated and the latter is conceptually mediated. This asymmetry entails that the translation from the L1 into the L2 requires concept mediation, that is, it involves two connecting steps: (1) L1 lexical item → Concept, and (2) Concept → L2 lexical item. This is shown in Figure 1.

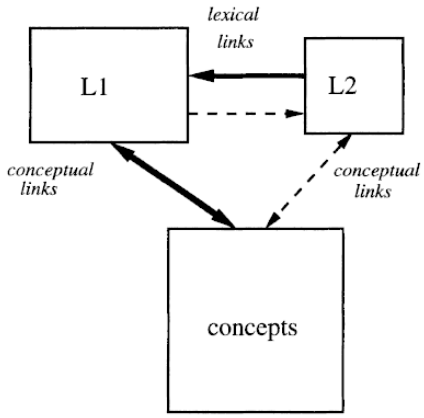


Figure 2.1. Revised Hierarchical Model of lexical and conceptual representation in bilingual memory (Kroll and Stewart, 1994:198).

The asymmetry predicted by the Revised Hierarchical Model in regard to translation direction and translation time is represented in Figure 2.1 by bold solid arrows (stronger connections) between the L1 lexical items and the conceptual level and between L2 lexical items and L1 lexical items, and by dotted arrows (weaker connections) between L2 lexical items and the conceptual level and L1 lexical items and L2 lexical items. Additionally, a second asymmetry is offered in Figure 2.1: L1 lexicon size is

represented by a larger square and L2 lexicon size is graphically symbolized by a smaller square. When translating L2 words into the L1, this entails that translation times are shorter because of strong lexical links. On the other hand, the translation of L1 words into the L2 is predicted to take longer because before the L2 lexical item is retrieved, first the bilingual must access the conceptual level. This model lies on two presuppositions: (1) in order for this asymmetry to become apparent, the bilinguals must have acquired their second language after early childhood (though a specific age cutoff is not provided in Kroll and Stewart (1994)), and (2) as proficiency increases, the connections between the L2 lexical items and the conceptual level become stronger, reducing the asymmetry.

Along with Kroll and Stewart's Revised Hierarchical Model, Jiang (2000) also expresses that lexical representation in the L2 evolves as proficiency increases with language experience and explains how the process may occur. In the early stages of L2 acquisition, lexical items can be considered to be stored without lemmas; therefore, the use of the L2 words entails activating their L1 translation counterparts. At these stages, the lexical representation lacks semantic, syntactic, and morphological specifications, and only phonological and orthographical information is attached to the lexical entry. As the bilingual's experience in the L2 increases, links between the L2 lexical item and the conceptual level are developed and strengthened progressively, allowing for concept access from the L2, and the semantic, syntactic, and morphological specifications are filled with those of the L1 item first and with those of the L2 item finally. These stages are illustrated, from top to bottom, in Figure 2.2 below.

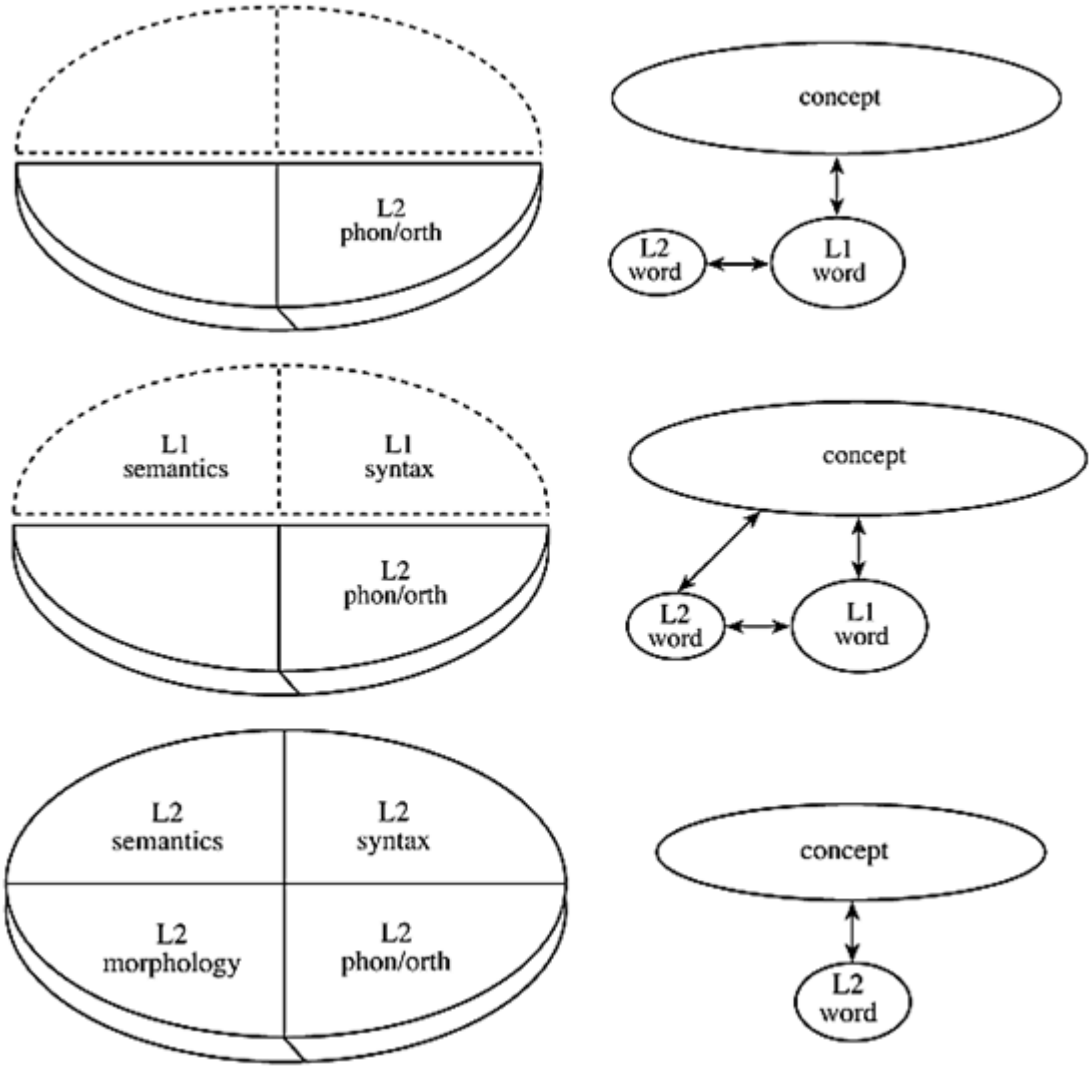


Figure 2.2. Early, intermediate, and final developmental stages in L2 lexical acquisition, adapted from Jiang (2000).

In the present study, only L2 to L1 translation tasks will be employed and translation time will not be measured, so no hypotheses in regard to the translators' performance in the reverse direction or in terms of translation speed are predicted. On the contrary, these aforementioned theoretical accounts are employed as a foundation for a translation model specific to self-directed motion expressions. Additionally, the participants' L2 is Spanish (that is, the source language) and English is their L1 (the

target language) and they are very advanced bilinguals, a feature that places them in later stages in terms of lexical representation both in Kroll and Stewart's and Jiang's models. Consequently, if we apply the main claims of these storage models to the translation of self-directed motion expressions, we may gain a better understanding of where the difficulty of this process lies and why a literal translation may be the end product.

I use the following sentence for illustrative purposes: "*La barca salió de la cueva flotando*" ("The boat exited the cave floating"). When the bilingual reaches the verb "*salió*," he/she is lead to "exited" given that the lexical connection between the L2 lexical item and the L1 lexical item is very strong. After that, he/she must translate "*de la cueva*" before encountering "*flotando*." Once "*flotando*" is reached, there are two options: (1) the lexical connection between "*flotando*" and "floating" is so strong that the bilingual proceeds to translate the sentence literally, or (2) the bilingual realizes that a word-for-word translation is not appropriate for this motion expression and reevaluates his/her original hypothesis (the literal translation), concluding that a syntactic, lexical and semantic operation is needed in order to arrive at a different motion lexicalization pattern ("floated out"). As we will see shortly, this seemingly simple process relies on more complex stages and it needs additional linguistic operations in order for the frame switch to occur successfully.

The Revised Hierarchical Model has received many criticisms (see Kroll *et al.*, (2010) and Brysbaert and Duyck (2010) for a comprehensive view of the weaknesses that have been put forth after its publication). A main criticism is the role of proficiency in the strength of the conceptual connections to either language lexical items. Since this model was tested experimentally with "relatively fluent but unbalanced bilinguals" (Kroll and

Stewart, 1994:168), the L2 proficiency may have had an effect of the participants' performance. With higher levels of L2 proficiency, however, stronger connections between the conceptual level and the L2 lexical items are expected to develop, therefore altering the original results. For the structure under study, if the connections between L2 lexical items and the conceptual level are expected to be stronger at higher L2 proficiency levels, as the ones expected in translators, this only means that more proficient bilinguals will have an easier time accessing the motion concept, which should result in higher frame switch rates. Therefore, this particular criticism does not invalidate the application of the Revised Hierarchical Model in the proposed context.

A second major criticism is related to the nonselective nature of lexical access. The Revised Hierarchical Model did not consider cross-linguistic interaction during word recognition and spoken word production. Later research has found linguistic non-selectivity to be in place even in contexts where restrictions suggest it should be otherwise and in which language selection should be enabled (Duyck *et al.*, 2007; Libben and Titone, 2009; Schwartz and Kroll, 2006; Van Hell and De Groot, 2008). However, the main implications derived from dual activation affect primarily word recognition but not translation production and parallel activation should not interfere with the translation process in the case under study.

Given the previous analysis and taking into account that the Revised Hierarchical Model was proposed to explain results obtained in translation tasks at the word level, this model is not sufficient to explain the complex process of translating the self-directed motion expressions from Spanish into English and to put forth a model that attempts to explain the linguistic processes that take place during such translation process. For this

reason, I now turn to Jackendoff's notion of the word as an interface rule and the idea of treelets in order to shed some light on this phenomenon.

2.3.2. The notion of Word as an Interface Rule (Jackendoff, 1997)

The Revised Hierarchical model allows us to provide an initial account for the potential under-representation of satellite-framed self-directed motion expressions in translated English. However, it falls short as soon as we consider that the lexicalization of these expressions goes beyond the word level. In order to overcome this drawback and extend these findings, I resort to Jackendoff's theory and combine his proposal on the word as an interface rule and the notion of treelets to come up with a more encompassing model that accounts for the lexicalization frame switch sought after in the translation of self-directed motion.

Jackendoff (1997, 2011) points at the necessary distinction between the notion of syntactic word (which defines a head around which phrases and arguments revolve), the phonological word (which specifies certain prosodic conditions) and the lexical item, which has been traditionally equated to the syntactic/phonological word but may be indeed comprised of smaller units (such as the morpheme –s) or larger ones (such as idioms). Under Jackendoff's notion of the word as an interface rule, complex units (whether lexical, syntactic or phonological) may be plugged into linguistic operations in order to participate in sentence formation and parsing. These complex units are stored as indivisible items and undergo modifications as a whole (although linguistic operations internal to the complex unit are also possible). In the lexical-syntactic realm, this is easily observed in idiomatic expressions. The mental entry for an idiomatic expression such as

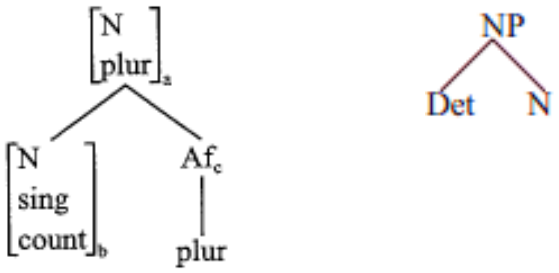
“I worked my head off” (Cappelle, 2008) might include the phonological content of the idiom, the syntactic structure, the meaning and its stylistic value, as well as prominent alternative realizations of the idiom. This is illustrated in Figure 2.3 below, from Cappelle (2008:176).

$[_{VP}$ V $[_{NP}$ pro’*s* $[_{N}$ *head*]] $[_{Prt}$ *off*]$]_{infml}$
⇔ $[_{VP}$ V $[_{NP}$ pro’*s* $[_{N}$ *ass*]] $[_{Prt}$ *off*]]$_{infml\ \&\ slang}$
⇔ $[_{VP}$ V $[_{NP}$ pro’*s* $[_{N}$ *butt*]] $[_{Prt}$ *off*]$]_{infml\ \&\ slang}$
‘V very much’, ‘V intensely’, ‘V to excess’

Figure 2.3. Long-term memory representation of the
“V someone’s head off” idiom.

Regarding syntactic units, Jackendoff (1997, 2009, 2015) introduces the concept of “treelets” in order to explain how storing of complex syntactic units may work. A treelet represents a piece of a larger syntactic phrase that can be inserted at a specific position in said larger phrase; it is a piece of structure that encompasses the self-contained expression of a productive phrasal rule in the same way that a lexical rule dictates how to form lexical constituents. Treelets are syntactic schemas that “connect” at the nodes they share in order to create a full sentence tree. The heads and phrases included in a particular treelet are related in a set syntactic way and have to fulfill specific lexical-semantic restrictions, just as the constituents that take part in a lexical rule.

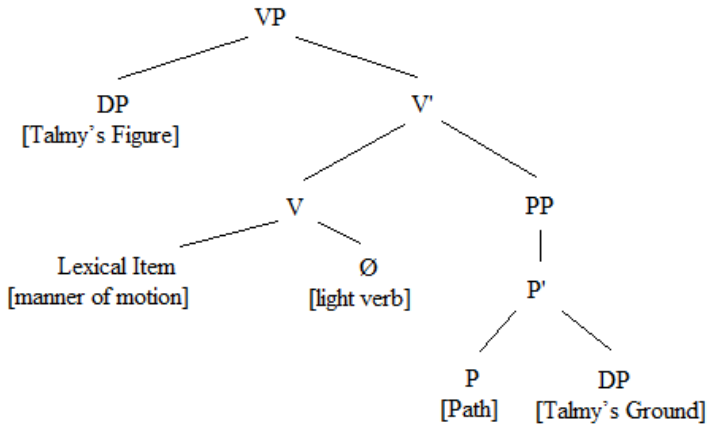
(13)



In (13), the left treelet represents the morphosyntactic formation of the plural of a noun (Jackendoff, 1997:118), whereas the right treelet shows NP formation. Each treelet includes the syntactic relations of the participating constituents along with specific restrictions. In the case of plural formation, the noun fed to the operation must be count and singular. For the NP formation, a noun must be the head of the phrase and it must be merged with a determiner.

This concept of treelets has been previously applied to bilingualism and second language acquisition in Giancaspro (2017), where treelets are employed to understand how subjunctive selection may work in intensional contexts, and can be taken even further to hypothesize how a treelet might be especially helpful in the expression, access, and retrieval of self-directed motion. What would the stored treelet of an English satellite-framed motion event look like? In this case, the VP treelet that encodes manner and path of motion must contain (1) the compounding rule that merges a manner of motion lexical item with a light verb, (2) a path-denoting PP (licensed by the light verb) whose head is a path satellite, with a DP complement to encode the *Ground* semantic component, and (3) a specifier position for the moving *Figure*. This annotated fragment of a larger syntactic tree (shown in (14)) includes all the necessary elements in an English satellite-framed self-directed expression and needs to be available for the bilingual (consciously or unconsciously) for the satellite-framed expression to be produced.

(14)



The storage and availability of an abstract treelet as the one in (14) may facilitate the access and retrieval of the English satellite-framed expression during the translation process. The mechanisms behind this process and how the frame switch might come to fruition through conceptual links and treelets are explained in the following section, where the model proposal is laid out.

2.3.3. The *SPaM* (Spanish Path and Manner) *Motion Translation Model*: A psycholinguistic proposal for the translation of self-directed motion from Spanish into English

Although Jackendoff's proposal was not originally put forth to explain bilingual lexicon storage or translation processes, in the case of self-directed motion structures, this idea of a larger unit comprised of several syntactic, lexical and/or phonological units could be of great help in depicting the cognitive process that takes place in the translation on self-directed motion events. Returning to the translation process outlined in previous sections, when the bilingual reaches "*flotando*" in the sentence "*La barca salió de la cueva flotando*," there are two possibilities. The first possibility, sketched above, is that

the lexical connection between the L2 word "*flotando*" and the L1 word "floating" triggers a literal translation. If this is the case, the bilingual individual is actually behaving in a way predicted by the Revised Hierarchical Model: accessing the conceptual level is more difficult when translation occurs from the L2 to the L1, and lexical bias leads him/her to complete the task proceeding in a word-by-word manner. The second possibility comes into play if the bilingual individual reconsiders his/her previously lineal, unit-by-unit translation of the sentence and treats the expression "*salió ... flotando*" as a lexically and conceptually complex unit and carries out online revisions. If this occurs, accessing the conceptual level initiates three inter-related and successive processes. The first process entails accessing the conceptual level through the English literal translation. The second process is the relexicalization of the motion event, that is, the mapping of the L2 lexical items onto L1 ones; what in the L2 encodes path (the verb) must now become a satellite that will head a PP complement in the L1, while the L2 adjunct encoding manner of motion needs to be now the L1 verbal head. Lastly, the third process represents the insertion of these lexical items in a stored treelet, *a la* Jackendoff, that is very productive in the L1 and that matches the satellite-framed typology. This second possibility would be the one expected on the part of the translators, since they should be able to process multi-word translation units as chunks instead of tackling this textual segment in a word-by-word fashion (Gerloff, 1986; Kenny, 2009, 2011; Alves *et al.*, 2009).

This approach does not signify that these motion structures are stored as single, complex lexical units in the mental lexicon in English or Spanish as an idiom would be, but rather that it is the syntactic treelet what is mentally stored as a complex syntactic

structure with slots that can be filled as needed in a specific context. Jackendoff (2002:152) states that we must distinguish between "[…] parts of an utterance [that] must be stored in long-term memory, and […] aspects [that] can be constructed online in working memory." Under this assumption, idioms, for instance, would be stored in long-term memory (with a set of specifications, as indicated in Figure 2) but the infinite number of possible self-directed motion expressions are not necessarily. On the contrary, the mental representation of the satellite-framed lexicalization pattern would involve only the syntactic structure and probably a set of semantic restriction on the type of constituents that can be part of the verbal phrase. Consequently, during the online processing, the speaker can make use of a stored treelet that reflects the productive phrasal structure and it is through real-time sentence formation that the slots in the treelet get filled with the language-specific lexical items.

Figure 2.4 below depicts the whole *SPaM Motion Translation Model* proposal of how the translation process may proceed in the case of Spanish self-directed motion expressions that are translated into English with and without a lexicalization pattern switch, incorporating the Revised Hierarchical Model and Jackendoff's (1997) proposal. In a nutshell, a successful translation of self-directed motion expressions from Spanish into English (understood as a translation in which a typology switch is accomplished) requires the following steps: (1) identifying the motion event as a complex event, (2) accessing the conceptual level from the L2 or the L1 lexical items in order to trigger a lexicalization pattern change, (3) a relexicalization of the event using English lexical items, and (4) mapping those lexical items onto the appropriate syntactic treelet. In

Figure 2.4, bold solid lines indicate stronger connections and dotted lines indicate weaker connections.

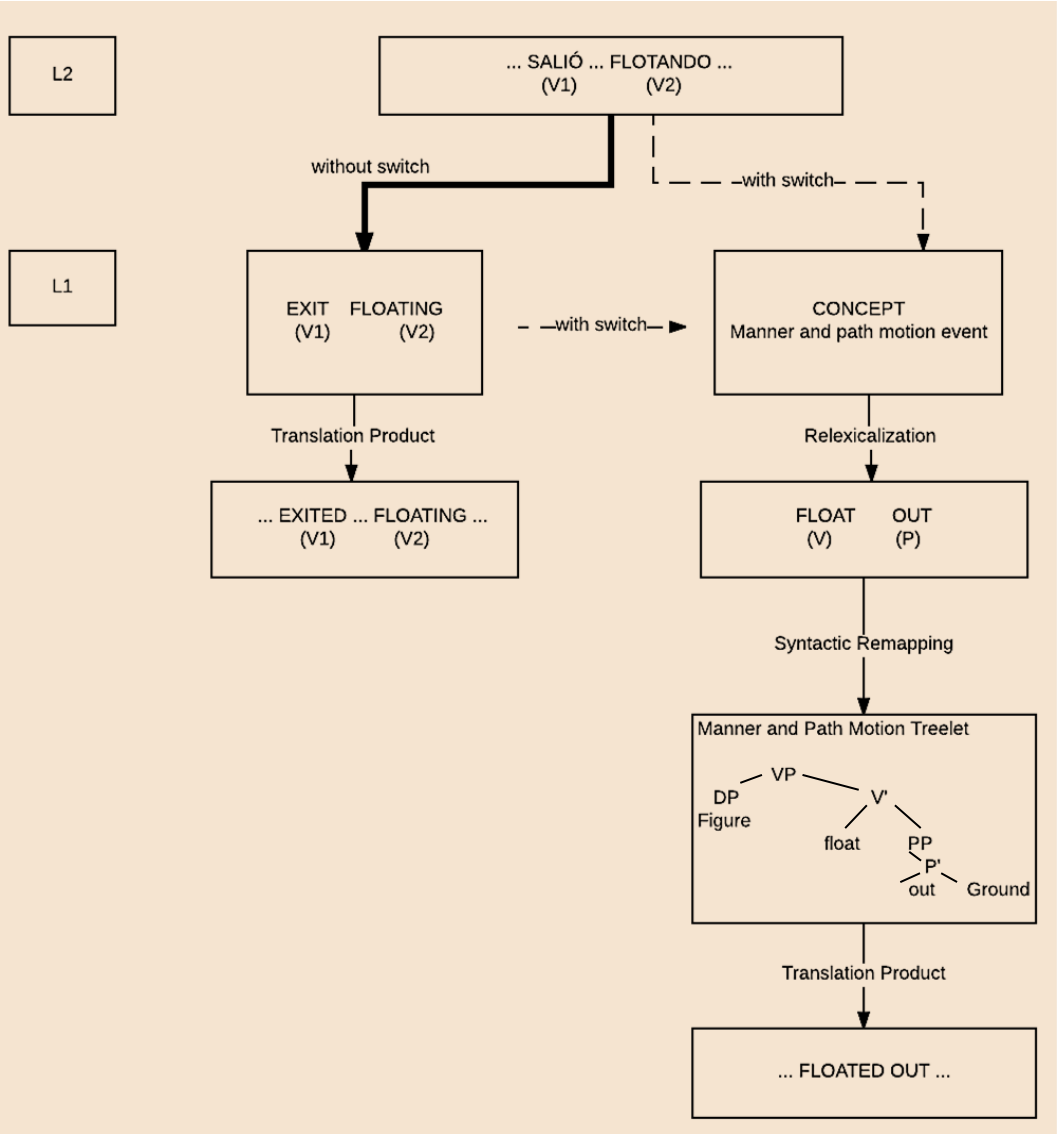


Figure 2.4. *SPaM Motion Translation Model*: Sequence of steps in translation of self-directed motion expressions from Spanish into English with and without frame switch.

This is a cognitively complex process that bilinguals who are not trained in translation or who do not practice this profession do not necessarily need to go through in

their daily interactions or while communicating with others in either language because it is probably not a fundamental piece instrumental to successful interpersonal communication. A non-translator bilingual may fail to recognize the complex nature (in conceptual and syntactic terms) of the self-directed motion expression and proceed with a literal translation that does not involve or skips the steps of relexicalization and syntactic remapping. This would result in a target sentence that closely resembles the source sentence in lexicon and surface structure, but it still allows for communication.

Even more importantly, this lexically biased process may explain the Literal Translation Hypothesis (Chesterman, 2011) or the Gravitational Pull Hypothesis (Halverson, 2010). On the one hand, Chesterman's Literal Translation Hypothesis states that "during the translation process, translators tend to proceed from more literal versions to less literal ones" (Chesterman, 2011: 26). Tirkkonen-Condit (2005) claims that literal translations are the result of automatic processes, “a default rendering procedure, which goes on until it is interrupted by a monitor that alerts about a problem in the outcome. The monitor’s function is to trigger off conscious decision-making to solve the problem” Tirkkonen-Condit (2005:408). Therefore, if the translator does not perceive that the initially selected literal translation violates any target language principles, the monitor does not trigger any actions to proceed from the more literal solution to less literal ones, as Chesterman (2011) suggests. Under the light of the Revised Hierarchical Model, these automatic processes may be the consequence of very strong links between the L2 lexical items and the L1 lexical items, and only when the concept is accessed, “the monitor” is triggered and the multi-step process outlined above is unchained. On the other hand, Halverson (2010) argues that in cases where the source language and the target language

lack inter-linguistic connectivity in regard to a specific structure, prototypical items in the target language will be under-represented due to the pull exerted by the source language items. This is also referred to as "default translation" (Halverson, 2015:315) or a "first response translation universal" (Malmkjær, 2011). The Revised Hierarchical Model in conjunction with the idea of syntactic treelets would provide support for this prediction; assuming that the conceptual level is shared by two languages A and B, the lexicalization pattern of the source language B might drive the translation product in language A when the syntactic specifications for a particular expression in A and B are quite disconnected from the each other.

At any rate, it is important for translators to produce target-appropriate translations[11] and to be aware of complex units that can represent potential pitfalls in their

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[11] This statement requires further analysis and clarification since there is a decades-long debate around it. Different translation approaches and traditions (see seminal works by House (1981, 2001), Gutt (1989), and Newmark (1981), on translation types, as well as Nord (1991, 1997, 2007) on functionalist approaches and *Skopostheorie*) have defined translation products that may be source-text oriented or target-text oriented. Whereas source-text oriented translations (denominated *overt, direct, semantic* by the authors above) remain closely tied to the source language, community, and culture, and are products where the original text may even "shine through", a target-text oriented translation (*covert, indirect, communicative*) exists as an independent text that "enjoys the status of an original source text in the target culture" (House, 2001). As Newmark puts it:

> "Communicative translation attempts to produce on its readers an effect as close as possible to that obtained on the readers of the original. Semantic translation attempts to render, as closely as the semantic and syntactic structures of the second language allow, the exact contextual meaning of the original" (Newmark 1981: 39).

The reasons behind producing one or the other may be based on textual genre demands, translators' ideologies, or the translation brief itself, among others. For instance, texts that are not originally produced as user-oriented ones, such as legal documents (contracts, trial depositions, etc.) may be translated in a more source-text oriented manner in an attempt to safeguard faithfulness to the source content for later use in legal settings or proceedings. Moreover, translators may decide to adopt foreignizing strategies in their work to visibilize the translator's role as well as to promote foreign cultural awareness in their readers (Venuti, 1995). All these factors may cause a translator to produce target-deviant translated texts. Having said that, in the current experimental design, the participants (translators or not) were not given any specific instructions as to what strategies or approach they should adopt and were told to translate the sentences "to the best of their ability." For this reason, I assume they will try to produce target-appropriate solutions in English for the Spanish source sentences, hence my original statement.

performance. For this reason, I am interested in studying the evolution of this process (whether via translation education or via professional practice) and exploring how the acquisition of translation competence through formal education and professional practice might trigger changes in how these expressions are processed by comparing non-translators and translators. I am also interested in analyzing which internal and external factors may mediate the success rates of these groups when dealing with self-directed motion expressions. These changes may be related to conceptual link strength, treelet availability and activation levels, metalinguistic awareness, automaticity, or increased cognitive abilities, and this dissertations hopes to be a stepping stone in assessing the effects of training and practice on translation processes.

Now that the lexicalization of self-directed motion expressions in English and Spanish has been described and that the foundation for a psycholinguistic model that may explain the under-representation of satellite-framed expressions in translated English has been laid out, I turn to the individual differences that may play a role in the translation process of these expressions. In the following section, previous literature on the role of working memory capacity, inhibitory control resources, academic training, and professional experience on L2 and translation processes is presented.

2.4. Individual Factors

Psycholinguistic research places a large weight on the role of individual cognitive differences (also referred to as internal individual differences in this dissertation) on the performance of L2 learners and their ability to process their L2, particularly exploring how well (or not) individuals with different capabilities in working memory and

inhibitory control do in language processing and language production tasks. On the other hand, Translation Studies have explored the effect of academic training and professional experience (also referred to as external individual differences in this dissertation) on the performance of professional translators and translation trainees. However, no studies to this day have employed these four factors jointly in order to explore translators' and non-translators' performance when completing online or offline translation tasks. In the following sections, I present research on these individual differences and discuss how they can affect the translation of self-directed motion expressions from Spanish into English. First, a review of literature on cognitive differences is provided; next, external factors are introduced and discussed.

2.4.1. Internal Factors

2.4.1.1. Working Memory

In contemporary research and literature, working memory refers to the cognitive system responsible for the control, regulation, and active maintenance of information (Linck *et al.*, 2013). Despite theoretical differences across working memory models regarding its resources and domain specificity (Baddeley and Hitch, 1974; Schneider and Detweiler, 1987; Cowan, 1988; Just and Carpenter, 1992; Waters and Caplan, 1996, Baddeley, 2000; Engle, 2002; MacDonald and Christiansen, 2002; Engle and Kane, 2003; Conway *et al.*, 2007), all models describe how working memory functions in a similar fashion: “It orders, stores, and manages immediate sensory details until they can be properly incorporated into the cognitive process that must integrate the data.” (Linck

et al., 2013:2). Now I present a review of the evolution of working memory models in recent decades and how they differ from one another.

Baddeley and Hitch (1974) described working memory as a three-component system that included a ‘central executive’, which controlled attention, and two domain-specific dependent systems, the ‘articulatory loop’, later renamed as ‘phonological loop’, and the ‘visuo-spatial scratch-pad’, later renamed as ‘visuospatial sketchpad’. These three systems are illustrated in Figure 2.5 below.

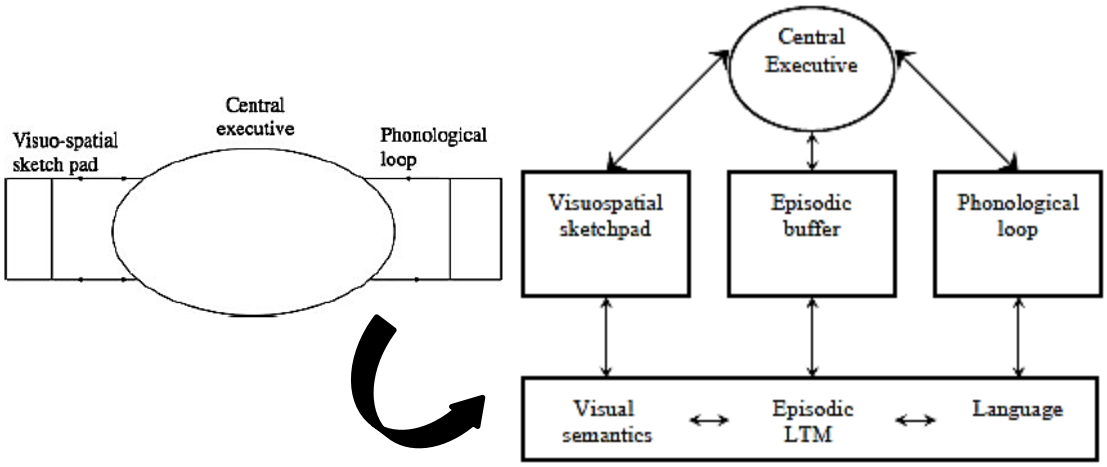

Figure 2.5. Original Baddeley and Hitch's (1974) Model of Working Memory (left) and Baddeley's (2000) Model of Working Memory after including the Episodic Buffer to the original proposal (right).

The two dependent systems hold information relevant to their domains: auditory information in the case of the phonological loop, and visual/spatial information in the case of the visuospatial sketchpad. Baddeley and Hitch suggested that WM consisted of a ‘work space’ with limited capacity, which can be divided into storage and control processing components, although it is unclear if this division is flexible or set.

Baddeley and Hitch's model argues for a domain-specific view of working memory and breaks away from previous models that employ the short-term storage

versus long-term storage dichotomy (Atkinson and Shiffrin, 1968). Their model was the seminal work for subsequent works that tried to refine the concept and that included data obtained in later years and that presented challenges to the original account. Baddeley (2000) includes an additional component to explain problematic data, that is, the episodic buffer, as shown in Figure 2.5. The episodic buffer provides a mechanism to explain data from individuals with short-term memory deficits and, according to Baddeley (2000), it stores serial recall and possibly integrates phonological, visual, and other types of information, providing short-term limited-capacity storage controlled by the central executive. This addition to Baddeley and Hitch's (1974) model reinforced the notion of a multi-component working memory model.

Nevertheless, Cognitive Psychology scholars have proposed alternative working memory accounts after Baddeley and Hitch's proposal that contend with their idea of a multi-component model. Several lines of research have developed and have presented working memory models that differ in fundamental portions. Some models claim that working memory is a subset of long-term memory (Schneider and Detweiler, 1987; Cowan, 1988), some defend that working memory is a single-capacity construct (Just and Carpenter, 1992), while others argue that working memory involve several, independent resources (Waters and Caplan, 1996). Below, I present three alternative research lines: first, Cowan's (1988) Embedded Processes Model; secondly, Daneman and Carpenter's (1980) Individual-Difference Based Model, and lastly, computational models of working memory are briefly summarized.

Cowan's (1988) Embedded Processes Model takes from a second school of thought within research on working memory that claims that working memory is both a

unitary mechanism and a subset of long-term memory. His theory involves a limited-capacity attentional focus that operates across areas of activated long-term memory as well as a linear approach as to how a stimulus is received and acted upon. Baddeley himself remarks that "[...] Cowan's theories might seem to be totally different from my own. [...] I regard our differences as principally ones of emphasis and terminology" (Baddeley, 2012:20).

Abandoning the multi-component model by Baddeley and Hitch and expanding further the idea of working memory as an activated subset of long-term memory, Daneman and Carpenter's (1980) model of working memory bases cognitive performance differences not in memory capacity differences but in individual differences in efficiency and inhibitory resources. Following this line of research, Engle *et al.* (1999) and Engle and Kane (2004) present a theoretical account that argues that working memory capacity depends on inhibitory processes, susceptibility to interference, attentional resources, and executive control as a whole. Once again, Baddeley (2012) argues that these theoretical proposals are consistent with the multi-component model and that "overall similarities may be obscured by terminological differences" (Baddeley, 2012:21). Work by Engle and colleagues led to a proposal by Engle, Cantor, and Carullo (1992), which claims that knowledge units in the memory system vary in their activation levels and that working memory consists of recently activated knowledge units. In turn, activation differences create individual differences, and according to their experimental results, Engle *et al.* (1992) reported evidence for a domain-general working memory storage capacity that was task-independent.

In an attempt to model working memory employing computer simulation, Anderson *et al.* (1996), Anderson *et al.* (2004), Barnard (1985,1987) and Oberauer (2009) have put forth several proposals that can simulate most aspects of working memory. While Anderson *et al.* (1996), Anderson *et al.* (2004), and Barnard (1985) include areas and elements that resemble Baddeley and Hitch's model and are able to simulate both language processing and human-computer interactions, Oberauer (2009) represents a departure from it. Oberauer argues that "[t]he main function of WM is to serve as a blackboard for information processing on which we can construct new representations with little interference from old memories, knowledge, and perceptual input..." (Oberauer, 2009:92), and establishes a long list of requirements for a working memory system to operate, tying it back ultimately to the concept of "activated long-term memory." The complexity of this model, however, makes it hard to test experimentally.

As previously mentioned, all these proposals I just described characterize working memory and its implementation differently, but they all agree on the buffering purpose of this cognitive construct and the important role of serial retention. At any rate, for the purpose of analyzing translation processes though a psycholinguistic lens, working memory's domain specificity or the idea of a single- versus multiple-resource model may not be as important as it is for other language areas and research. It is well known that depleting an individual's storage capacity or maxing out their processing ability will have an effect on the recall and/or the efficiency of said individual (MacDonald *et al*., 1992; Fiebach *et al*., 2002; Mackey *et al*., 2002). However, translators may not find themselves under circumstances that grant these constraints often. First of all, a classic translation task does not rely heavily on memory resources because the source text is available to the

translator, who needs not memorize the segment to be translated. Secondly, time constraints at the second or millisecond level are usually not a pressing issue in translation tasks, in the way they are in simultaneous and conference interpreting, for instance. However, a crucial part of the translation process is to maintain certain words active until the ultimate goal, the satisfactory translation of the segment, is achieved[12]. To this end, working memory may play an important role, especially in the online self-paced reading translation task designed for this dissertation and explained in Chapter 3, which is designed to emphasize memory efforts (please, refer to Chapter 3, section 3.3.4 for a full description of the task). Additionally, if the translation of self-directed motion expressions involves the retrieval and manipulation of a treelet like the one shown in (14), working memory resources may also have an effect on how the bilingual maintains and operates with such treelet as well as the linguistic constituents that will be plugged in. More resources in working memory would mean the bilingual has at their disposal the possibility to apply larger cognitive efforts to carry out the linguistic operations specified in the *SPaM Motion Translation Model*; this would in turn be expected to lead to higher frame switch rates.

Recent studies have looked at how working memory may play a role in the individual differences displayed by L2 learners in their degree of attainment or linguistic competence in their second language and have explored cognitive abilities as an important factor in said competence. The literature shows that working memory capacity mediates L2 processing (Sagarra, 2008; Sagarra and Herschensohn, 2010; Miyake and

[12] The attainment of the final goal must also take into account text features and demands at the macroscopic level (text context, translation brief, etc.), not only at the sentence or segment level. However, in this dissertation, participants will only rely on microscopic-appropriate strategies since they will be presented with individual, non-related sentences, void of context.

Friedman, 1998; Dussias and Piñar, 2010), L2 proficiency development (Mackey and Sachs, 2012), word learning (Baddeley, 2003; French, 2006; Service, 1992), word-level translation (Kroll, Michael, Tokowicz, and Dufour, 2002; Tokowicz, Michael, and Kroll, 2004), as well as sentence and text comprehension (Alptekin and Erçetin, 2010; Abu-Rabia, 2003). Additionally, working memory capacity has been found to have an effect on L2 production (Fortkamp and Bergsleithner, 2007; Kormos and Sáfár, 2008; Payne and Ross, 2005; Bergsleithner, 2010), noticing grammatical violations (Sagarra, 2008, 2014; Sagarra and Herschensohn, 2010), noticing morphological divergences between the L1 and the L2 (LaBrozzi, 2009), and noticing interactional feedback (Mackey *et al*., 2002).

Stemming from these findings, which stress the effects of the ability to retain serial-order information for a period of time, it seems compelling to research the effects of working memory on the translation effectiveness of translators and non-translators alike when translating the structure under study. Continuing with the example employed above, in order to produce an English satellite-framed translation of the Spanish verb-framed self-directed motion expression, the bilingual individual that translates "*La barca salió de la cueva flotando*" must retain in memory the path-encoding verb while reading and comprehending the remainder of the sentence until he/she reaches "*flotando*." If this condition is met, the bilingual individual may be able to access the complex motion concept from the L2 (Spanish) lexical items and bypass or avoid the more lexical/literal translation. Therefore, I hypothesize that the retention of the verb until the adjunct is encountered will aid in triggering the reevaluation of the first hypothesis (the lineal word-by-word translation), increasing the odds of producing the preferred pattern in English

when compared to a bilingual that has not maintained the verb active in his/her memory. Hence, individuals with higher working memory capacity stand at an advantageous point with respect to those with low capacity, who may have committed to the literal translation (both in lexical and syntactic terms) before reaching the manner-encoding adjunct due to their processing limitations. This represents a univocal prediction with regard to the effect of working memory capacity on translation success: individuals with higher working memory may maintain and manipulate the path-encoding verb for a longer time span, which can initiate the access of the concept, and therefore they will exhibit larger frame switch percentages than those with low capacity (regardless of their academic training in translation or professional experience as translators)[13].

2.4.1.2. Inhibitory Control

Research on how bilinguals switch from one language to the other in comprehension and production tasks and how they resolve linguistic competition led scholars to hypothesize the existence of an inhibitory mechanism that regulates attentional resources in order for the bilingual to allow and sustain activation of the

[13] Under the proposed model, no assumptions on the effects of training or professional practice on working memory capacity or inhibitory control resources are made. In order to be able to assess such effects, a longitudinal study would be needed and such a study is beyond the scope of this dissertation. Nevertheless, it is worth mentioning that studies that evaluate the effects of interpreting (but not translation) on the cognitive abilities of professional interpreters have yielded inconclusive results. As far as working memory is concerned, a large number of studies suggest that interpreters actually outperform non-interpreter bilinguals in working memory tasks (Bajo, Padilla & Padilla, 2000; Christoffels, de Groot & Kroll, 2006; Kopke & Nespoulous, 2006; Padilla, Bajo, Cañas & Padilla, 1995; Padilla, Bajo & Macizo, 2005; Signorelli, Haarman & Obler, 2012; Stavrakaki, Megari, Kosmidis, Apostolidou & Takou, 2012; Tzou, Eslami, Chen & Vaid, 2012). However, multiple studies failed to report any advantage in working memory between groups (Chincotta and Underwood, 1998; Kopke and Nespoulous, 2006; Liu, Schallert and Carroll, 2004).
Regarding differences in inhibitory control between interpreters and non-interpreters, only negative evidence has been found (Kopke and Nespoulous, 2006; Yudes, Macizo and Bajo, 2011).

relevant language and suppress the one that must not be produced. Next, I will present two theories on inhibitory control that are particularly relevant for the translation process: Green's (1998) Inhibitory Control Model, and Hasher, Lustig, and Zacks's (2007) Inhibitory Mechanisms Model. It is important to note that both models include a component that controls attention toward task-relevant information and inhibits potential distracting information. This aspect plays an important role when hypothesizing the behavior of individuals with high inhibition, as I will explain later.

Green's (1998) Inhibitory Control Model states that language forms that compete simultaneously are inhibited or activated according to the needs and intentions of the speaker and focuses on the importance of the demands posed by different tasks and the control that language users can exert on their language processing by modifying activation levels of the linguistic items. This is performed employing language tasks schemas that specify the necessary processing steps to carry out a particular language task. A language task schema "regulates the output from the word identification system by altering the activation levels of representations within that system and by inhibiting outputs from the system" (Green, 1998:69). Dijkstra (2005) illustrates how these language task schemas come into play in inter-linguistic translation in the following manner:

> "...when a bilingual switches from one language to another in translation, a change in the language schema that is applied must take place. When an English word must be translated into French, this requires the language users to switch from the input language of the item, English, to the output language, French. Otherwise, the presented English word would be repeated (read out loud) instead of translated. Thus, the task schema for translation must actively suppress the word representations (or lemmas) with an English language tag (membership) at the stage of output selection. Because this suppression can take place only after the (lemma) representations are activated, inhibition is called reactive. However, the exerted inhibition of English words needs to be overcome later if such words are presented on the next trial" (Dijkstra, 2005:196).

In virtue of this model, non-target forms must be suppressed to allow the production of the target forms at each moment. Additionally, activation level is a very important factor in inhibitory processes: an item must remain active until the goal is achieved, that is, the individual's intentions can affect the activation levels of the items. Therefore, inhibition not only involves suppressing the non-target linguistic form, but also requires the individual to sustain the activation of the form being processed until the individual's goals are achieved.

On the other hand, Hasher, Lustig, and Zacks (2007) put forth a model that defines inhibition through the implementation of three crucial processes that are at the service of achieving the intended goal: (1) access, (2) deletion, and (3) restraint. Access is referred to preventing irrelevant information from attaining the focus of attention; deletion involves removing no-longer relevant items from consideration, and restraint entails suppressing prepotent responses momentarily so that initially weaker responses can be evaluated and influence behavior towards the individual's goals. Their emphasis on inhibitory processes rather than constructs such as capacity or resources is the main differentiating factor in their model. Under this view, superior inhibition is a combination of these processes and their timely deployment.

Inhibitory control has been linked to better word processing in bilinguals (Mercier *et al.*, 2014; Blumenfeld and Marian, 2011), L2 comprehension and production processes (Abutalebi and Green, 2007; Korko and Williams, 2017; Pivneva *et al.*, 2012); smaller cognate effects during L2 picture naming (Linck, Hoshino, and Kroll, 2008), smaller language switch costs during trilingual language switching (Linck, Schwieter, and Sunderman, 2012), L2 phonological acquisition (Darcy *et al.*, 2016), L2 learning gains

(Gass *et al.*, 2013), and higher accuracy in switching contexts (Liu *et al.*, 2016), among others.

Inhibitory control appears to be especially relevant for the translation process, since translators must inhibit the language from the source text (ideally, their L2) in order to produce an appropriate target text in the target language (ideally, their L1). When the inhibition of the source language lexical items fails, literal translation occurs, which in turn makes the translated target text deviate from non-translated texts produced by native speakers of the target language. This phenomenon is crucial in the translation of the self-directed motion expressions. Therefore, it is safe to assume that inhibitory control resources will play a role in the written production of translators.

However, and contrary to the case of working memory, the role of inhibitory control in the translation of these expressions is harder to anticipate. If an individual with high inhibitory control resources can apply such resources selectively and in a timely manner, he/she may be able to delay the production of the target item (restrain the first prominent solution and delay deleting relevant items, in Hasher, Lustig, and Zacks's words) in order to keep the source language lexical items active for later assessment of the original hypothesis, what would lead to higher rates of frame switch. This scenario fits Green’s Inhibitory Control Model and Hasher, Lusitg, and Zacks's model nicely. These models argue that activation (in Green's model) and restraint (in the case of Hasher, Lusitg, and Zacks's model) are crucial in inhibition processes: an item must remain active and prepotent responses must be restrained until the intended goal is achieved. In this case, the activation of the source language path verb should remain long enough until the adjunct has been processed by the participant, and a target-language

translation (satellite-framed or not) has been formed. It is only then that these lexical items can be discarded (deleted from consideration). This is why the attention control component shared by both models becomes so important: Activation or suppression of the source language item must be performed in a specific timeframe for the lexicalization frame switch to happen. Attention must be directed not only to the lexical item at hand but also towards lexical items to appear subsequently. The selective and time-sensitive application of attention resources and suppression/restraint will most likely determine the success of this frame switch.

On the contrary, if we consider inhibition in a stricter sense, that is, suppression of the source language item in order to produce the target language one, individuals with higher inhibitory control resources might be less successful in performing a frame switch when translating from Spanish into English because they successfully inhibit the Spanish path-denoting verb in order to produce the equivalent English lexical item and when the syntactic adjunct is reached, the verb is already inhibited, which makes re-evaluation of the original hypothesis harder. Consequently, the prediction with respect to the role of inhibitory control in this translation process is contradictory and twofold, and therefore it is an interesting subject to be tested experimentally.

After this review of the literature on working memory and inhibitory control, and a careful consideration of how they may affect the translation process in view of previous studies, now I turn to explore the role of external factors in the performance of translators and non-translators. In the following section, the notion of "natural translation" is introduced and research on academic training and practicing experience on translation as a profession is presented.

2.4.2. External Factors

While cognitive (internal) factors such as working memory and inhibitory control have not been explored as potential mediators of translation appropriateness (to my knowledge), external factors have been extensively studied in order to determine the role of academic training and professional experience of translators' performance. It seems quite intuitive to pose that previous academic training and professional experience in the translation discipline must play an important role on the translation of any structure, even more on the translation of expressions that require the conscious (or unconscious if automatized) application of a chain of processes as the ones involved in the *SPaM Motion Translation Model* presented earlier in this chapter. For this reason, previous research on translators with different academic attainments and professional practice length is reviewed below and used to hypothesize how these two factors may influence the experimental participants' performance. First, I focus on the notion of "natural translators" and the role of academic training in the adequacy of translation as a product; next, I introduce the importance of professional practice and previous research related to professional experience.

2.4.2.1. Academic Training

Traditionally and to this date, translation (either in written form or in its oral counterpart) has been thought of as a skill or ability possessed by bilinguals with or without translation training. This common belief is reflected on many everyday situations, from using children to interpret for their parents in medical, school, or

community settings, to employing untrained volunteers to translate websites and online content in new translation paradigms such as crowdsourced translation. This popular conception has even been formally described in the literature, which brought about the term "natural translators" (Harris, 1977; Harris and Sherwood, 1978). These works define "natural translation" as "[t]he translating done in everyday circumstances by people who have had no special training for it" (Harris, 1977:2; Harris and Sherwood, 1978:1) and claim the following: (1) natural translation is an innate ability, (2) all bilinguals are able to translate within the limits of their mastery of the two languages, (3) translating is coextensive with bilingualism. Recently, this notion has also been referred to as “circumstantial” translators-interpreters as opposed to “elective” ones (Angelelli, 2010a, 2010b). Research into the components that make up a professional translator has been mostly motivated due to the need for a solid foundation for training purposes (e.g., Bell, 1991; Kiraly, 1995; PACTE, 2000, 2003, 2005, 2009, 2011).

Nevertheless, it seems quite intuitive to pose that previous academic training in the translation discipline must play an important role on the adequacy of a translation product, regardless the field or specialization of the text, and carry an even more crucial weight in the translation of expressions whose lexicalization patterns diverge in the source and target languages, such as English satellite-framed and Spanish verb-framed self-directed motion expressions. Through academic instruction, the bilingual can develop a "thinking for translating" mindset (Slobin, 1997, 2000, 2005), and learn to recognize the asymmetry between English and Spanish when it comes to these structures, which leads to increased metalinguistic awareness. In doing so, they can identify specific source and target language mechanisms and establish stronger connections not only at the

word level but the multi-word level. In turn, these awareness and lexical processes may drive larger frame switch percentages when translating. Therefore, significant performance differences between translation-trained bilinguals and untrained bilinguals ("natural translators") should be expected.

Relevant research that assesses academic training effects has yielded mixed results. As expected, previous studies that explore the role of academic training in the performance of translators and non-translators have concluded that there is a positive correlation between the academic training the translator possesses and their translation performance, measured differently by different scholars: more efficient dictionary use (Ronowicz *et al.*, 2005; Jääskeläinen, 1996), increased problem awareness (Tirkkonen-Condit, 1987; Jääskeläinen, 1999), tackling of longer translation units (Jakobsen, 2003), holistic top-down approach as opposed to bottom-up strategies (Tirkkonen-Condit, 1992).

However, some studies have reported no differences between bilinguals and trained translators: while Göpferich (2013) reports no difference in the deployment of translation-specific or electronic tools, or in the application of language-pair-specific transfer operations (both competences are jointly labeled as strategic competence by the author) between first-semester translation students and fourth-semester counterparts, Kiraly (1990) observed no difference between new students and recent graduates of a translation program in regard to inverse translation quality. Even more shockingly, Jääskeläinen (1990) and Gerloff (1988) found that non-translator bilinguals outperformed translation students in some translation tasks. These unexpected results were explained as a sub product of task effects: the translation students had been trained to attend to very

specific cues while translating, and the experimental tasks did not reflect these cues, therefore they lost their training advantage compared to untrained bilinguals.

In the realm of English and Spanish manner of motion expressions, the most recent experimental research focuses on explicit training rather than in the length of translation education. Cifuentes (2015) concludes that explicit training on the lexical divergences of English and Spanish in regard to motion lexicalization improves the translators' performance when translating motion expressions from English into Spanish.

2.4.2.2. Professional Experience

As previously stated, one can intuitively hypothesize that professional experience in the translation discipline may lead to increased translation quality or adequacy. Applying to novice and experienced translators similar reasoning to the one used for the role of academic training would lead us to similar conclusions: extended professional practice may drive the increase of multi-word bilingual awareness and storage as well as the automatization of the relexicalization and syntactic remapping involved in the frame switch. Moreover, it can be hypothesized that translation experience may strengthen L2 conceptual links, enhance access and retrieval of complex abstract treelets, as well as be conducive to more efficient deployment of working memory and inhibition resources. Thus, experienced translators should outperform novice translators when translating Spanish verb-framed self-directed motion expressions into English satellite-framed counterparts.

Research that compares the performance of novice and experienced translators shows that the more experience the translator has, the better their overall performance is.

Göpferich (2013) found that experienced translators outperformed novices in strategic competence; Jensen and Jakobsen (2000) and De Rooze (2003) revealed that more experience resulted in better performance under time pressure (measured by the use of strategies in the former and overall quality in the latter). While Jääskeläinen (1999) found that experienced translators show an increasing ability to process more complex translation problems rather than just lexical equivalence searches, Jääskeläinen and Tirkkonen-Condit (1991) stated that experienced translators automatize some complex tasks but also shift between automatized routine ones and conscious ones. Jonasson (1998) describes that professionals exhibited increased text awareness that led them to more appropriate translations than those of the novices. Moreover, experienced professional translators have been found to regularly translate and tackle longer chunks than novices in their tasks, as well as demonstrate heightened awareness of translation problems, and find more solutions to them (Krings, 1988; Jääskeläinen, 1999). Furthermore, they also use a wider range of resources (Massey and Ehrengsberger-Dow, 2011), are more discerning about their use for specific problem types (Massey and Ehrengsberger-Dow, 2011), and are better at adapting their approach in response to the challenges presented by a particular text (Ehrengsberger-Dow and Massey, 2013).

However, as mentioned above, Jääskeläinen (1990) and Gerloff (1988) found that some untrained bilinguals outperformed the professional translators in some translation tasks (results attributed to unexpected task effects). Additionally, in the field of Medical Interpreting, Flores *et al.* (2012) found that the number of errors produced by professional medical interpreters was lower the more hours of training the interpreter had completed, but not the more years of experience the interpreter had.

While more years of professional practice might be expected to lead to target language conforming results in translation of motion expressions, Cifuentes and Rojo's (2015) results contradict this prediction. They found no significant differences between expert and novice professional translators when translating manner of motion expressions from English into Spanish.

This line of research comparing professional translators, novice translators, and natural translators, which yielded what Jääskeläinen (2010) labelled as "uncomfortable findings" as far as translation quality is concerned, sparked a healthy amount of interest on what being a professional translator means, how to define this notion of professionalism, and the differences between professionalism and expertise (Shreve, 2002; Sirén and Hakkarainen, 2002; Englund Dimitrova, 2005; Jakobsen, 2005). Additionally, these findings made clear that all experts are professionals, but not all professionals are experts. Ericsson (1996:3) defines "expertise" as "consistently superior performance in a domain," but it may very well be the case that an individual who practices translation as their professional activity does not reach this standard. As Sirén and Hakkarainen (2002:75) put it, "the mere fact that a person has worked as a translator leaves open the question about expertise."

Consequently, in view of these contradicting results as to the effects of training and experience on translation quality or appropriateness, this dissertation aims at confirming or refuting whether different levels of academic training and professional experience do in fact have any impact on the translation performance of the participants, specifically in regard to the translation of Spanish verb-framed self-directed motion expressions into English satellite-framed ones. Moreover, previous findings have been

concluded from limited experimental groups with very low recruitment numbers. In this dissertation, at least 20 participants (actual number to be determined) will populate each experimental group in order to be able to draw conclusions more confidently.

2.5. The present study

In this chapter, so far, I have presented a contrastive analysis of self-directed motion expressions in English and Spanish, explained why these structures are interesting tools to study translator and non-translator bilinguals from a multidisciplinary approach that bridges the gap between Translation Studies and Linguistics, reviewed the relevant linguistic theories that encompass the theoretical framework for this dissertation, as well as described in length the individual factors, both internal and external, that will be considered in the analysis. I have claimed that the Revised Hierarchical Model is an appropriate depiction of word translation processes and argued that it can be extended to account for multi-word expressions employing Jackendoff's treelets. In doing so, I have set the foundation for a model that intends to theorize on the (un)successful sequence of steps that underlie the translation of a unique item in the Spanish→English language pair and directionality -self-directed motion expressions that simultaneously convey path of motion and manner of motion- taking into account how different individual factors may affect said translation.

Under the light of this framework, the goal of this dissertation is three-fold: (1) to propose a psycholinguistic model (the *SPaM Motion Translation Model*) that explains the different behaviors regarding the translation of self-directed motion expressions from Spanish into English, (2) to examine the role of cognitive factors in the translation of said

expressions, and (3) to explore the effects of academic training and professional experience on the translation performance of non-translators and translators. In the following section, I present the research questions that this dissertation set out to answer in order to accomplish these three goals, as well as the hypotheses derived from the proposed theoretical model and afore-discussed previous literature.

2.5.1. Research Questions and Hypotheses

As I just mentioned, this dissertation intends to accomplish three goals: (1) to propose a model that builds on linguistic and psycholinguistic theories to explain the lexicalization frame switch (or lack thereof) performed by bilinguals when translating self-directed motion expressions from Spanish into English, (2) to examine the role of cognitive individual factors in the success of said frame switch, and (3) to explore the effects of academic training and professional experience on the translation performance of non-translators and translators. In order to accomplish these three goals, a multidisciplinary approach that encompasses conceptual frameworks from Translation Studies and Psycholinguistics has been employed, along with a methodology that involves both online and offline tasks, as well as background information and cognitive measures. Alongside the three stated goals, this dissertation set out to answer three main research questions. These research questions and their corresponding hypotheses based on the literature review are presented below.

Research Question 1. Do English-Spanish bilinguals (translators and non-translators alike) treat self-directed motion expressions in Spanish as syntactically and

conceptually complex units before translating them into English in order to perform a relexicalization and syntactic remapping process or do they process them as sequences of independent lexical units and translate these expressions word by word, maintaining the surface and syntactic structure of the source language?

The psycholinguistic model I propose to explain the two potential outcomes of the translation of self-directed motion expressions from Spanish into English (basically, success or failure to perform a lexicalization frame switch) heavily relies on the Revised Hierarchical Model, which in turn places emphasis on the fact that its predictions apply to fluent but unbalanced bilinguals and on the role of fluency in its design. Taking into account these two factors, I hypothesize that, in offline untimed tasks, the experimental participants (regardless of the experimental group they belong to) will be able to treat self-directed motion expressions in Spanish as syntactically and conceptually complex units and perform a relexicalization and syntactic remapping process because (1) they are highly proficient unbalanced L1 English - L2 Spanish bilinguals and (2) their Spanish proficiency level is one that would grant stronger links between the L2 lexical items and the conceptual level.

This hypothesis seems to be initially confirmed based on a small pilot study conducted with 400-level college translation students whose L1 is English and whose L2 is Spanish[14]. In this pilot study, the students performed a successful frame switch at a higher than chance rate when translating self-directed motion expressions from Spanish into English in an offline untimed task. Therefore, I predict that both translators and non-

[14] Nevertheless, Colina (1997) found that language proficiency was not sufficient to produce target-language appropriate structures in a study conducted at the University of Illinois. However, the linguistic feature under study in that case was not motion expressions but article usage; therefore, the extrapolation of said findings for the purpose of this research needs to be carefully considered.

translators in this dissertation will perform a frame switch at a higher than chance rate in an offline, untimed translation task.

If that were in fact the case, this result could be taken as evidence of a multi-step process as the one described in the *SPaM Motion Translation Model*, which involves concept access, relexicalization, and syntactic remapping as essential stepping stones in the frame switch process. While the successful frame switch would show the final picture of the completed process posed in my model, a translated sentence that retains the Spanish lexicalization pattern would be evidence of a failure at some point in the steps, although the specific failed step cannot be teased apart.

Research Question 2. Do individual internal (cognitive) differences mediate the translation of Spanish verb-framed self-directed motion expressions into English? Specifically, does working memory capacity affect the frame switch percentages of translator and non-translator bilinguals? Do inhibitory control resources affect the frame switch percentages of translator and non-translator bilinguals?

My hypothesis in regard to the role of working memory is that individuals with higher working memory will be more accurate than those with low capacity, based on two facts observed in the previous literature: 1) individuals with high working memory capacity are more likely to notice the differences in the lexicalization patterns in English and Spanish, and 2) they are more likely to maintain the words active in memory while processing the word-by-word sentence presented to them for later manipulation.

Based on Green's Inhibitory Control Model and Hasher, Lustig, and Zacks's Inhibitory Processes account, my hypothesis in regard to the role of inhibitory control is

that individuals with higher inhibitory control will be more accurate than those with low inhibitory control given that they will be able to suppress the word-by-word translation strategy via restraint of the prominent response, retain the Spanish path verb longer for later re-evaluation of their hypothesis by delaying the deletion of active items, and treat the self-directed motion as a complex unit.

Research Question 3. Do individual external differences modulate performance when translating self-directed motion expressions? Specifically, does academic training affect the frame switch percentages of untrained non-translator bilinguals and translation trainees? Does professional experience affect the frame switch percentages of translation trainees and experienced translators?

Based on the findings from previous studies that explore the role of academic training and professional experience on the translation of self-directed motion expressions, I hypothesize that experienced translators will be more accurate (i.e., they will be more successful in performing the lexicalization frame switch) than novice translators, who in turn will be more accurate than non-translator bilinguals. This hypothesis is based on the fact that translators (novices and experienced ones alike) have acquired a more complex translation competence via academic instruction and through their own professional practice. This will enable them to tackle longer translation units and to recognize structures like this one, where an emphasis on the conceptual level over the lexical expression is paramount, and in which attention to target language preferred forms also plays a very important role in the appropriateness of the translation solution (Shreve, 2002). However, this level of awareness and appropriateness may not play a role

in bilingual, non-translation related communication, which would result in lower frame switch rates on the part of the non-translator bilinguals (natural translators).

CHAPTER 3: METHODS

3.1. Introduction

The objective of this chapter is to detail the methodology employed in the present dissertation, which includes two screening tasks (a portion of the DELE test and a background questionnaire), two cognitive tests (a task to measure the participants' working memory capacity and one to measure their inhibitory control resources), and two experimental translation tasks (one that employs a self-paced reading paradigm, and another task that is embedded in a key logging paradigm). First, a description of the subjects, screening tasks, experimental tasks, and cognitive tests is offered. Then, the experimental procedure and scoring for each experimental task is explained.

3.2. Participants

Three experimental groups were recruited for the experimental tasks. The first group was comprised of 34 L1 English - L2 Spanish non-translator bilinguals, the second group was comprised of 16 L1 English - L2 Spanish bilinguals who are novice translators, and the third group included 20 L1 English - L2 Spanish professional translators. In order to be included in the experiment, all participants needed to score at the advanced level in the DELE proficiency test (40 points or higher), they had to be bilinguals whose dominant language is English and whose less dominant language is Spanish. Participants had to be 60 years of age or younger at the time of testing.

The novice translators had completed translation training ranging from one semester to a college-level translation credential (bachelor’s major, college certificate, associate's degree, master’s degree), whereas the professional translators had statistically

similar education to that of the novices plus 2 years or more of full-time professional experience. Non-translator bilinguals had no academic training on translation.

All participants' working memory capacity was measured using the letter-number sequencing test (adapted from Wechsler (1997) by Sagarra (2014)). All participants' inhibitory control resources were tested using the Flanker test (adapted from Eriksen and Eriksen, 1974). All subjects completed a background questionnaire about their linguistic and academic history. A summary of the descriptive statistics for each experimental group is reported in Table 3.1 below (please refer to Chapter 4 for additional descriptive information).

	N	**Mean age at time of participation (SD)**	**Mean DELE Score (SD)**	**Mean WM (SD)**	**Mean IC (SD)**
Non-translator bilinguals	34	25.79 (9.00)	42.03 (3.82)	15.71 (3.70)	91.38 (9.05)
Novice translators	16	35.13 (14.08)	44.06 (3.19)	17.00 (2.63)	93.81 (4.85)
Professional translators	20	48.55 (12.94)	46.65 (2.37)	16.15 (3.07)	95.55 (3.02)

Table 3.1. Descriptive statistics for the three experimental groups.

3.3. Tasks

3.3.1. Spanish Proficiency Test (DELE Test)

In order to measure the participants' Spanish proficiency and assure they met the proficiency criterion, the multiple choice test and cloze test sections from the Diploma de Español como Lengua Extranjera (DELE) test were employed as independent proficiency measures. These two sections of the DELE amount to a total of 50 questions, for a maximum score of 50 points. Participants needed to answer 40 questions or more

correctly in order to be included in the experimental session. The Spanish Proficiency Test was administered via Qualtrics. Participants were instructed to answer the questions to the best of their abilities without any external help and no time limit was set for the test. Please, refer to Appendix A for the complete test.

3.3.2. Background Questionnaire for Participants.

A background questionnaire was developed for all participants to complete before participating in the experimental session. This background questionnaire has two parts: the first part was to be completed by all participants and collected important information about the subject's language knowledge, language use, education, and translation-related training and experience, whether in informal settings or in academic/professional ones; the second part of the questionnaire was to be completed by translation students and professional translators only and it asks about the translation education and translation practice of the participants. The background questionnaire was untimed and administered via Qualtrics. Please, see Appendix B for the complete questionnaire.

3.3.3. Offline Translation Task (OTT)

In the OTT, all participants translated Spanish sentences into English at their own pace. Employing the keylogging software InputLog (Leijten and Van Waes, 2013), the Spanish sentence was presented to the participant as a whole and the English translation provided by the participant was recorded, as well as pauses and revisions. Specifically, along with frame switch percentages, four additional behaviors were to be analyzed: (1) time elapsed from the presentation of a target sentence to the participant to the moment

the participant starts typing their translation, (2) pauses longer than 1000ms after having typed the sentence subject, (3) deletions that involve a verb-framed expression being rewritten employing a satellite-framed expression, and (4) deletions that involve a verb-framed expression being rewritten employing a verb-framed expression.

Pause behavior has been previously used by a number of translation scholars as a measure of cognitive operations (Immonen, 2006; Jakobsen, 2002; Krings, 2001; Kruger, 2016; Lacruz, Shreve, and Angelone, 2012; Mellinger, 2014; O'Brien, 2006b). Butterworth (1980:155-156) laid out the rationale for using pauses as evidence of cognitive activity: "the more the delays[15], the more cognitive operations are required by the output." Therefore, the existence of a pause between the moment when a target sentence is presented to the participant and the time when the participant starts typing the translation may reflect not only the necessary reading time but the additional processing taking place in order to translate the target sentence.

Moreover, after typing the sentence subject and getting to the sentence predicate, further considerations on the part of the participant may occur. If these considerations indeed happen, additional pauses may be observed as evidence of ongoing cognitive processes. Previous literature has established 1000ms as an appropriate pause threshold to be employed when detecting intrasentential pauses in writing processes (Jakobsen, 1998; Krings, 2001; Mellinger, 2014; Lacruz, Shreve, and Angelone, 2012; O'Brien, 2006a). In consequence, 1000ms is the pause threshold employed in this dissertation as well.

A second indication of translation reconsideration would be the presence of revisions. In the current study, revisions, in the form of deletions, were taken to represent

[15] Drawing from language production research, Butterworth (1980:156) defines a "delay" as "a period of silence, a pause."

an interruption prompted by the participant's monitor (Tirkkonen-Condit, 2005), which would be alerting about a potential translation problem. Thus, the monitor would be triggering conscious decision-making to solve said problem, whether successfully or not. For this reason, deletions that involve the lexicalization pattern were also quantified and classified into two categories: deletions that involve a motion frame switch and those that don't.

The task contains 6 sentences with a verb-framed structure in Spanish that the participants will have to translate into English, along with 12 fillers from two categories (6 sentences each): (A) Spanish resultative expressions that can be translated into English employing resultative structures but do not require a frame switch in order to be target appropriate in English, and (B) Spanish sentences that contain verbs with prepositional collocations that diverge in Spanish and English. The number of Spanish verb-framed motion expressions that have been translated into English employing a frame switch will be measured. See Table 3.2 for examples for the target sentences and the filler sentences, and please refer to Appendix C for the full stimuli list.

TYPE	SPANISH	ENGLISH
TARGET (x6)	La tortuga salió del puerto flotando.	Lit.: "The turtle exited from the harbor floating."/ S-framed: "The turtle floated out of the harbor."
FILLER A (x6)	El cerrajero aplastó la llave con el martillo.	Lit.: "The locksmith flattened the key with the hammer." Resultative: "The locksmith hammered the key flat."
FILLER B (x6)	La temperatura depende de la presión atmosférica.	"Temperature depends on atmospheric pressure."

Table 3.2. Examples of target sentences and filler sentences in OTT.

All target sentences are either 6 or 7 words long and share the same structure: the subjects are singular animate nouns; the verbs are in present tense of the indicative mood, and the locations are singular nouns introduced by a definite determiner. In order to assure that there are no frequency effects on the results, frequencies for all the Spanish lexical items and their English translations were controlled for using the LexEsp Spanish Corpus (Sebastián-Gallés (2000)) and the SUBTL Word Frequency Database (Brysbaert & New (2009)).

Before proceeding to the experimental sentences, participants were told to translate each sentence to the best of their ability and they were instructed to use the keyboard arrows to navigate the document and not to use the computer mouse during the task[16]. Three practice sentences are presented for translation and participants are directed to ask any questions they might have before proceeding to translate the experimental sentences. No feedback on correctness or appropriateness is provided to the participants after they complete the practice sentences or the whole task.

This task is designed to closely resemble what a true, authentic translation task encompasses in a professional environment and to minimize memory efforts (and therefore, potential memory effects) on the part of the participant. The participants have access to the whole sentence while working on it, they are not under time pressure, can regress and make changes as needed on their translated sentences, and pauses are allowed. This offline task is very similar to how computer-assisted translation tools operate, since these tools present individual, full sentences to the translator in a sequential

[16] This is for data extraction and data processing purposes.

manner, without a time limit. This task is completed on Microsoft Word while having InputLog record the participant's key logging and pauses simultaneously.

3.3.4. Self-Paced Reading Translation (SPR-T)

In the SPR-T, participants read sentences in Spanish at their own pace on a computer screen, one word at a time. Participants were instructed to press any key to begin the task, then a fixation cross was shown for two seconds on the center on the screen, and after two seconds, the first word in the sentence appeared. In order to progress from one word to the next, participants pressed the spacebar. When the spacebar was pressed, the current word disappeared and the next word was shown on the screen, right where the previous one was before. After reading the whole sentence, word by word, they were prompted to type their translation in English for the sentence. Participants had a 30-second time limit to enter their translations. They pressed ENTER to advance to the next sentence when they were done. On the other hand, if the time limit was reached, the fixation cross that preceded the next sentence appeared automatically and the whole process started over, with the following sentence. The task was programmed and presented to participants employing Psychopy (Peirce, 2007). A sample sentence is shown on Figure 3.1 to illustrate the task procedure.

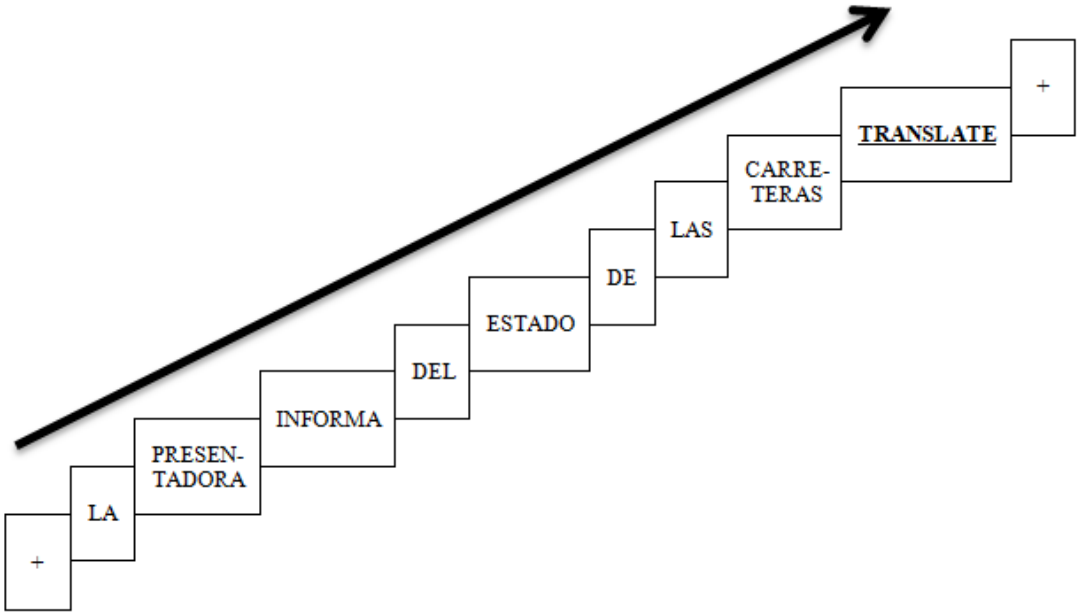

Figure 3.1. Sample sentence and task procedure in SPR-T[17].

The task contains 6 sentences with a verb-framed structure in Spanish that the participants had to translate into English, along with 12 fillers from two categories (6 sentences each): (A) Spanish resultative expressions that can be translated into English employing resultative structures but do not require a frame switch in order to be target appropriate in English, and (B) Spanish sentences that contain verbs with prepositional collocations that diverge in Spanish and English. The number of Spanish verb-framed motion expressions that have been translated into English employing a frame switch by each participant was measured. See Figure 3.2 in the previous section for examples for

[17] Please, keep in mind the following limitations of Figure 3.1:
a. Some of the words appear divided in two lines for the sake of size, but they were shown as single-line words during the experimental task.
b. The screen size seems to change, but it remained constant during the task.
c. Although words seem to move upwards in the figure, they were shown in the center of the screen. When one word disappeared after pressing the spacebar, the following one appeared and occupied the space previously taken by the preceding word.

the target sentences and the filler sentences, and please refer to Appendix D for the full stimuli list.

All target sentences are 8 words long and share the same structure: the subjects are singular animate nouns; the verbs are in present tense of the indicative mood, and the locations are singular nouns introduced by a definite determiner. In order to assure that there are no frequency effects on the results, frequencies for all the Spanish lexical items and their English translations were controlled for using the LexEsp Spanish Corpus (Sebastián-Gallés (2000)) and the SUBTL Word Frequency Database (Brysbaert & New (2009)). The experimental lexical items employed in the SPR-T and the OTT are the same but they never appeared in the same order or combined with the same lexical items in both tasks.

Before proceeding to the experimental sentences, three practice sentences were presented for translation and participants are instructed to ask any questions they might have before proceeding to translate the experimental sentences. No feedback on correctness or appropriateness was provided to the participants after they completed the practice sentences or the whole task.

This task was designed to capitalize on the effects of the participants' working memory capacity and inhibitory control resources. The task is online in nature and requires a memory effort to commit to memory the individual word of each sentence. At the same time, it emphasizes the need to inhibit a word-by-word translation strategy triggered by the word-by –word self-paced reading experimental paradigm, and to maintain each word active until the final goal (translating the whole sentence) is accomplished.

3.3.5. Working Memory Capacity Test: Letter-Number Sequencing Test (LNST)

The working memory test was adapted from Wechsler Adult Intelligence Scale test (WAIS) (Wechsler, 1997) and Sagarra (2014). In this task, participants are shown series of letters and numbers (for instance, "Q-1-B-3-J-2"), and asked to recall them, numbers first in ascending numerical order, then letters in alphabetical order (the correct recalled sequence would be "1-2-3-B-J-Q"). Letters and numbers appear one-by-one in the center of the screen. Participants are instructed to press the spacebar to progress from one character to the next. Each series is preceded by a 1000-ms fixation cross. After the whole series is presented, participants are prompted to recall and type in their answers. After entering their answers, participants must hit ENTER to end the trial and start the next series. While letters and numbers are presented at the participant's pace, no time limit is imposed to recall them. Participants are told that accuracy is more important than speed in this task. Figure 3.2 shows the procedure for the test.

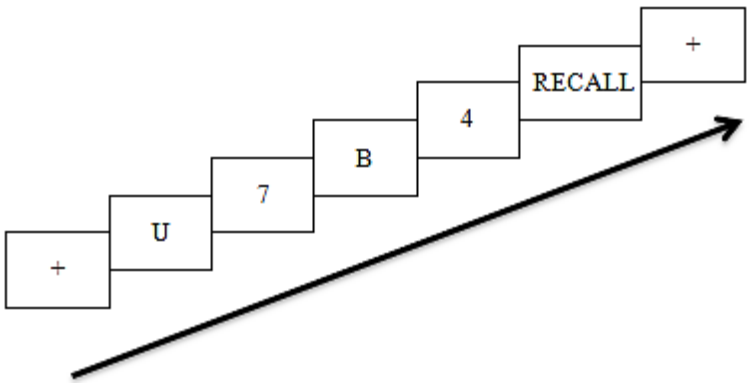

Figure 3.2. Sample procedure for Working Memory Test.

The test has 21 letter-number series and begins with series of two items (one number and one letter) and continues to a maximum of eight items (four numbers and four letters). See Appendix E for the complete list of stimuli. Participants completed three practice trials before the test and three trials at each series length. The test is programmed and presented to participants in Psychopy.

3.3.6. Inhibitory Control Resources Test: Flanker Test

The inhibitory control resources test was adapted from Eriksen and Eriksen (1974). In the Flanker test, participants are instructed to respond to the direction of a target arrow head that may be surrounded by various other symbols using the left and right keyboard arrows. The arrow head appears by itself (baseline trials), or in combination with diamonds (neutral trials: no facilitation or interference effect), four flanking arrow heads pointing in the same direction as the target (congruent trials: facilitation effect), four flanking arrow heads pointing in the opposite direction to the target (incongruent trials: interference effect), or four Xs indicating participants to refrain from responding (no-go trials). Before proceeding to the test, participants responded to 10 practice trials. The test has 20 baseline trials (10 trials with 2 chevron directions) and 80 experimental trials (10 trials with 4 conditions and 2 chevron directions). Figure 3.3 shows examples for all five conditions.

BASELINE TRIAL	CONGRUENT TRIAL
▶	▶▶▶▶▶
◀	◀◀◀◀◀
NEUTRAL TRIAL	INCONGRUENT TRIAL
♦♦▶♦♦	▶▶◀▶▶
♦♦◀♦♦	◀◀▶◀◀
NO-GO TRIAL	
X X▶X X	
X X◀X X	

Figure 3.3. Sample screens of Flanker Test stimuli

For each trial, participants see a 500-ms fixation cross, a 1500-ms stimulus, and a 400-ms blank screen. If the participant takes more than 1000ms to answer, a message appears on the screen to remind them they need to speed up. If the participant has not responded after 1500 ms, the next trial starts automatically. Figure 3.4 shows the procedure for the test employing a random sequence of trials from the congruent, baseline, and no-go conditions.

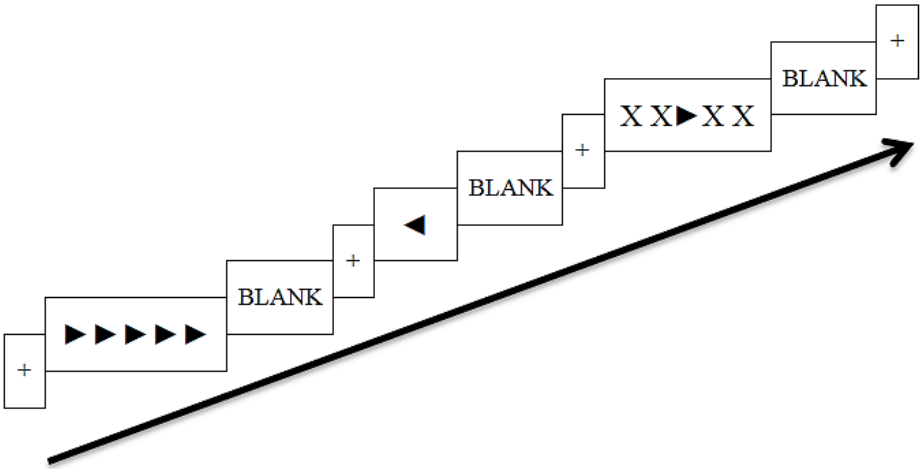

Figure 3.4. Flanker Test sample screens.

Participants are told that accuracy and speed are equally important for this task. This test is programmed and presented to participants in Psychopy. The ten stimuli shown on Figure 3.3 (two per condition) are randomized and presented to the participants ten times in loops that ensure that all ten stimuli must be presented before they can be presented again, that is, any given stimulus cannot appear several times on consecutive trials.

3.4. Procedure

The totality of the experimental session took approximately 1.5 hours to complete and it proceeded as follows: First, the participants took the DELE, then they completed the background questionnaire. Both the DELE and the questionnaire were administered employing Qualtrics and completed online. Before proceeding to the rest of the tasks in the methodology, the participant's answers to both screening tasks were reviewed to assure that the participant met the mandatory requirements to be included in the study. If the inclusion criteria were met, the participant met in person with the researcher to complete the remaining tasks. First, they took the working memory test. Afterwards, they complete the first experimental task (SPR-T), followed by the inhibitory control test. Lastly, they complete the second experimental task (OTT)[18]. Test items were randomized within each task. Figure 3.5 below illustrates the experimental procedure.

[18] At the early stages of data collection, task order was counterbalanced across groups. Exploratory data analysis revealed an order effect by which the participants that completed the OTT first and the SPR-T second were behaving statistically different from those who completed the session in reverse order in regard to their frame switch in the SPR-T. For this reason, a decision was made to discard the data from the OTT+SPR-T order and have all participants completed first the SPR-T and then the OTT.

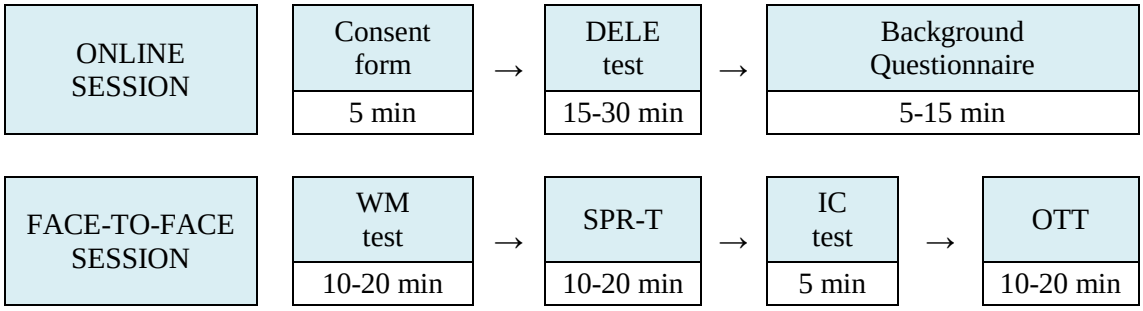

Figure 3.5. Experimental procedure for all groups

3.5. Scoring

Below, the scoring schema for the DELE test, the cognitive tests, and the experimental tasks are provided. No scoring is necessary for the background questionnaire, as it just serves as a screening filter to make sure participants belong to the previously detailed experimental groups.

The portion of the DELE test employed to measure the participants' Spanish proficiency has a total of 50 questions. Each question is worth 1 point and participants cannot get partial credit for their answers, therefore, participants earn 1 point per correct answer and 0 points per incorrect answer. A minimum of 40 points is necessary in order to participate in the experimental tasks.

In the OTT, participants read experimental sentences in Spanish in which verb-framed self-directed motion expressions are employed to encode a motion event. Then, they are asked to type in their English translations without any time constraint. The percentage of target sentences that have been translated employing a frame switch, that is, encoding the motion event as a satellite-framed self-directed motion expression in English, is calculated. This is the base for the quantitative analysis to be performed on the

participants' answers for this task. Additionally, time elapsed from the presentation of a target sentence to the participant to the moment the participant starts typing their translation, pauses longer than 1000ms after having typed the sentence subject, deletions without rewrite that involve the lexicalization pattern, as well as deletions with rewrite involving the lexicalization pattern are to be analyzed quantitatively and qualitatively to explore and compare the behavior of the experimental groups further.

The time elapsed from sentence presentation to translation typing and the pauses over 1000ms after typing the subject can be obtained from the outputs produced by InputLog. An example of an InputLog report is presented in Figure 3.6 and a close-up detail is offered in Figure 3.7. As shown in Figure 3.7, after typing the space right after the word "GIRL," the participant takes a 7330-ms pause, then the first letter of "RETURNED" is entered.

	id	type	output	startTime	startClock	endTime	endClock	actionTime	pauseTime	pauseLocation	pauseLocationFull	RevisionType
1845	2287	keyboard	T	920359	00:15:20.359	920480	00:15:20.480	121	2462	2	BEFORE WORDS	PRODUCTION
1846	2288	keyboard	H	920490	00:15:20.490	920599	00:15:20.599	109	131	1	WITHIN WORDS	PRODUCTION
1847	2289	keyboard	E	920648	00:15:20.648	920810	00:15:20.810	162	158	1	WITHIN WORDS	PRODUCTION
1848	2290	keyboard	SPACE	920769	00:15:20.769	920880	00:15:20.880	111	121	3	AFTER WORDS	PRODUCTION
1849	2291	keyboard	G	921713	00:15:21.713	921836	00:15:21.836	123	944	2	BEFORE WORDS	PRODUCTION
1850	2292	keyboard	I	921899	00:15:21.899	921976	00:15:21.976	77	186	1	WITHIN WORDS	PRODUCTION
1851	2293	keyboard	R	922043	00:15:22.043	922118	00:15:22.118	75	144	1	WITHIN WORDS	PRODUCTION
1852	2294	keyboard	L	922240	00:15:22.240	922348	00:15:22.348	108	197	1	WITHIN WORDS	PRODUCTION
1853	2295	keyboard	SPACE	922521	00:15:22.521	922593	00:15:22.593	72	281	3	AFTER WORDS	PRODUCTION
1854	2296	keyboard	R	929851	00:15:29.851	929949	00:15:29.949	98	7330	2	BEFORE WORDS	PRODUCTION
1855	2297	keyboard	E	930840	00:15:30.840	930935	00:15:30.935	95	989	1	WITHIN WORDS	PRODUCTION
1856	2298	keyboard	T	931067	00:15:31.067	931139	00:15:31.139	72	227	1	WITHIN WORDS	PRODUCTION
1857	2299	keyboard	R	931511	00:15:31.511	931553	00:15:31.553	42	444	1	WITHIN WORDS	PRODUCTION
1858	2300	keyboard	U	931626	00:15:31.626	931689	00:15:31.689	63	115	1	WITHIN WORDS	PRODUCTION
1859	2301	keyboard	BACK	932063	00:15:32.063	932163	00:15:32.163	100	437	11	REVISION	DELETE
1860	2302	keyboard	BACK	932485	00:15:32.485	932556	00:15:32.556	71	422	11	REVISION	DELETE
1861	2303	keyboard	U	932726	00:15:32.726	932811	00:15:32.811	85	241	1	WITHIN WORDS	PRODUCTION
1862	2304	keyboard	R	932893	00:15:32.893	932971	00:15:32.971	78	167	1	WITHIN WORDS	PRODUCTION
1863	2305	keyboard	N	933125	00:15:33.125	933233	00:15:33.233	108	232	1	WITHIN WORDS	PRODUCTION
1864	2306	keyboard	E	933894	00:15:33.894	933961	00:15:33.961	67	769	1	WITHIN WORDS	PRODUCTION
1865	2307	keyboard	D	934190	00:15:34.190	934414	00:15:34.414	224	296	1	WITHIN WORDS	PRODUCTION
1866	2308	keyboard	SPACE	934396	00:15:34.396	934494	00:15:34.494	98	206	3	AFTER WORDS	PRODUCTION

Figure 3.6. Pause behavior recorded by InputLog (participant BIL10)

output	startTime	startClock	endTime	endClock	actionTime	pauseTime
T	920359	00:15:20.359	920480	00:15:20.480	121	2462
H	920490	00:15:20.490	920599	00:15:20.599	109	131
E	920648	00:15:20.648	920810	00:15:20.810	162	158
SPACE	920769	00:15:20.769	920880	00:15:20.880	111	121
G	921713	00:15:21.713	921836	00:15:21.836	123	944
I	921899	00:15:21.899	921976	00:15:21.976	77	186
R	922043	00:15:22.043	922118	00:15:22.118	75	144
L	922240	00:15:22.240	922348	00:15:22.348	[illegible]	197
SPACE	922521	00:15:22.521	922593	00:15:22.593	[illegible]	281
R	929851	00:15:29.851	929949	00:15:29.949	98	7330
E	930840	00:15:30.840	930935	00:15:30.935	95	989
T	931067	00:15:31.067	931139	00:15:31.139	72	227
R	931511	00:15:31.511	931553	00:15:31.553	42	444
U	931626	00:15:31.626	931689	00:15:31.689	63	115
BACK	932063	00:15:32.063	932163	00:15:32.163	100	437
BACK	932485	00:15:32.485	932556	00:15:32.556	71	422
U	932726	00:15:32.726	932811	00:15:32.811	85	241
R	932893	00:15:32.893	932971	00:15:32.971	78	167
N	933125	00:15:33.125	933233	00:15:33.233	108	232
E	933894	00:15:33.894	933961	00:15:33.961	67	769
D	934190	00:15:34.190	934414	00:15:34.414	224	296
SPACE	934396	00:15:34.396	934494	00:15:34.494	98	206

Figure 3.7. Close-up detail of Figure 3.6.

Similarly, the deletions with and without rewrite can be observed on the InputLog outputs. Figure 3.8 reproduces a deletion with rewrite and Figure 3.9 reproduces a deletion without rewrite. In Figure 3.8 a frame switch is observed: the participant first decides on "go back swimming" as a plausible translation, then a second solution is evaluated (come back), and finally a manner of motion + path satellite pattern is adopted ("swim back"). In Figure 3.9 a verb-framed lexicalization is chosen, deleted and maintained. First, "leave" is considered as a temporary translation solution but it is finally replaced by "return swimming".

	SPANISH SOURCE SENTENCE *LA CHICA VOLVIÓ DE LA BOYA NADANDO*
INITIAL SOLUTION	The girl went back to the stream swi
DELETION 1	~~went back to the stream swi~~
SECOND SOLUTION	came back from the stream
DELETION 2	~~came back from the stream~~
FINAL SOLUTION	swam back from the stream.

Figure 3.8. Typing flow involving a deletion with rewrite (participant PROF15).

	SPANISH SOURCE SENTENCE *LA CHICA VOLVIÓ DE LA BOYA NADANDO*
INITIAL SOLUTION	The girl left the
DELETION	~~girl left the~~
FINAL SOLUTION	girl returned to the shore swimming.

Figure 3.9.Typing flow involving a deletion without rewrite (participant NOVICE2).

In the SPR-T, participants read experimental sentences in Spanish in which verb-framed self-directed motion expressions are employed to encode a motion event, word by word, and then are asked to type in their English translation within a 30-second time limit. The percentage of target sentences that have been translated into English employing a frame switch, that is, encoding the motion event as a satellite-framed self-directed motion expression, is calculated.

The working memory test has a total of 21 letter-number series, with series length starting at 2 characters (one letter and one number) and progressing to a maximum of 8 characters (four letters and four numbers). Three series are shown at each series length. In order to calculate a participant's working memory capacity, the participant receives 1 point per correct series recalled, that is, numbers first in ascending order and letters right

after in alphabetical order. The maximum score is 21 points. Participants do not receive partial credit, so any series recalled with one or more errors receives 0 points.

In the Flanker test, participants are instructed to respond to the direction of a target arrow head that is surrounded by various other symbols using the left and right keyboard arrows. This test elicits two types of scores: accuracy and reaction time. Accuracy and reaction time, in turn, are analyzed per condition (baseline trials, neutral trials, congruent trials, incongruent trials, and no-go trials) First of all, some data cleaning is in order. Trials that have been answered incorrectly are removed from the accuracy data and reaction times for those trials are discarded. Then, for the trials that have been answered correctly, average accuracy per condition and average reaction time per condition are calculated. Once average reaction times in correct neutral and correct incongruent trials are obtained, a participant's inhibitory control resources can be assessed. In order to do so, interference effects are calculated by subtracting average reaction time for neutral trials (shorter reaction time) from average reaction time for incongruent trials (longer reaction time).

The interference effect reflects the ability of the participant to inhibit task-irrelevant information when deciding the direction of the target arrow head. Since the interference effect is the difference between reaction times in incongruent trials and reaction times in neutral trials, the smaller the interference effect, the more inhibitory control the participant exhibits, since this reflects little difference in the participant's speed response in these two conditions. This suggests the participant is able to focus on task-relevant information and block task-irrelevant information. On the contrary, larger interference effect reveals less inhibitory control on the part of the participant.

Similarly, facilitatory effects may be obtained by subtracting average reaction time for congruent trials (shorter reaction time) from average reaction time for neutral trials (longer reaction time). The facilitatory effect measures the degree to which a participant is able to make use of task-relevant information when deciding the direction of the target arrow head. The larger the facilitatory effect, the more the participant seems to benefit from incorporating reinforcing and task-congruent information. However, facilitatory effects are not as telling as interference effects, since participants with best inhibitory control may be able to suppress the task-congruent information as much as the task-incongruent information.

Lastly, the Flanker effect is calculated by subtracting the average reaction time in correct congruent trials (shorter reaction time) from the average reaction time in correct incongruent trials (longer reaction time). Similar to the interference effects, and given that the Flanker effect is the difference between reaction times in incongruent trials and reaction times in congruent trials, the smaller the Flanker effect, the more inhibitory control the participant exhibits, since this reflects little difference in the participant's speed response in these two conditions.

Previous literature (Luk, 2008; Hanson, 2012) has shown that the facilitatory effects and the Flanker effects may not be as significant a predictor of L2 learners' behavior as interference effects are, or to be strongly correlated among them. In this study, the three measures will be calculated in order to determine if they predict the participants' translation behavior in the case of self-directed motion expressions, and to explore if any correlations among them are present.

CHAPTER 4: RESULTS

4.1. Introduction

In this chapter, experimental data, both quantitative and qualitative, and statistical analyses run to uncover main effects and interactions are presented. First, the descriptive statistics for the experimental groups are introduced. Then, the data obtained in the Self-Paced Reading Translation Task (SPR-T) and the Offline Translation Task (OTT) in regard to the role of cognitive individual differences, translation training, and professional experience in the translation of self-directed motion by bilinguals without translation training, translation students, and professional translators are discussed separately. First, I focus on data from the SPR-T and I discuss data from the OTT subsequently. Finally, a summary of the experimental results is offered.

4.2. Descriptive Statistics for the Experimental Groups

A total of 70 subjects participated in the experimental tasks between November 2017 and June 2018 and were assigned to one of the three experimental groups. The first group was comprised of 34 bilinguals whose most dominant language is English and whose second language is Spanish. The second group consisted of 16 translation students whose most dominant language is English and whose second language is Spanish. The third group was composed of 20 professional translators whose most dominant language is English and whose second language is Spanish. Table 4.1 shows mean values and standard deviations for age at the time of participation, age when they started acquiring Spanish, translation training length and translation experience for each experimental group. Three one-way Analyses of Variance (ANOVA) revealed significant differences

across groups in age at the time of participation, translation training length, and translation experience. Crucially, a one-way ANOVA revealed no significant differences across groups in their Spanish age of acquisition.

GROUP	Age when participating Mean (SD)	Spanish AoA Mean (SD)	Years of Translation Training Mean (SD)	Years of Professional Translation Experience Mean (SD)
Bilinguals (N = 34)	25.79 (9.00)	8.50 (8.38)	0 (0)	0 (0)
Novices (N = 16)	35.13 (14.08)	9.69 (7.07)	1.27 (0.74)	0.03 (0.13)
Professionals (N = 20)	48.55 (12.94)	13.75 (6.73)	1.74 (1.13)	10.55 (7.72)

Table 4.1. Mean values and SD for age, Spanish age of acquisition, translation training, and professional experience by group.

In order to assess the participants' cognitive abilities, all participants completed the Letter-Number Sequencing Task (LNST) as a measure of their working memory. In the LNST, participants were shown sequences of letters and numbers and had to recall and reorder the sequences. The maximum score for this task is 21 points. Their inhibitory control was evaluated employing the Flanker Test, where participants must react to the direction of an arrow head shown on the center of the screen and can get a maximum score of 100 points. Despite the difference in age at the time of the experiment, two one-way ANOVAs indicated that there were no significant differences in these cognitive measures across groups. Additionally, Spanish proficiency was measured with the *Diploma de Español como Lengua Extranjera* (DELE) test (maximum score = 50 points). A one-way ANOVA revealed significant differences in proficiency the three groups ($p <$

.001); pairwise comparisons revealed that the significant difference was driven by the proficiency gap between non-translator bilinguals (*M* = 42.03) and professional translators (*M* = 46.65) but a one-way ANCOVA with DELE score as a covariate assured that this measure was not a significant covariate in the analysis of the lexicalization frame switch percentages across groups in both experimental tasks ($p > .05$). Table 4.2 below presents group means and standard deviations for each cognitive score as well as the DELE score.

GROUP	**DELE Score Mean (SD)**	**LNST Score Mean (SD)**	**Flanker Test Score Mean (SD)**
Bilinguals	42.03 (3.82)	15.71 (3.70)	91.38 (9.05)
Novices	44.06 (3.19)	17.00 (2.63)	93.81 (4.85)
Professionals	46.65 (2.37)	16.15 (3.07)	95.55 (3.02)

Table 4.2. Mean values and SD for DELE score, working memory score, and Flanker Test score by group.

The Flanker test provided three more measures along with the overall test score; these measures are the facilitatory effect, the interference effect, and the Flanker effect. First, the facilitatory effect is calculated for each participant by subtracting the mean reaction time in correct congruent trials from the mean reaction time in correct neutral trials. The larger this number, the better the participant is at integrating relevant task information. Secondly, the interference effect is calculated for each participant by subtracting the mean reaction time in correct neutral trials from the mean reaction time in correct incongruent trials. The smaller this number, the better the participant is at inhibiting irrelevant task information. Finally, the Flanker effect is calculated by subtracting the mean reaction time in correct congruent trials from the mean reaction time in correct incongruent trials. The smaller the Flanker effect, the better the participant is at

ignoring task-irrelevant information and/or exploiting task-relevant information. Table 4.3 gathers group means and standard deviations for all three effects. Three one-way ANOVAs indicated that there were no significant differences in these cognitive measures across groups.

		Mean	SD
FACILITATORY EFFECT	**NON-TRANSLATORS**	0.015	0.036
	NOVICES	0.037	0.038
	PROFESSIONALS	0.033	0.040
INTERFERENCE EFFECT	**NON-TRANSLATORS**	0.065	0.054
	NOVICES	0.074	0.062
	PROFESSIONALS	0.044	0.052
FLANKER EFFECT	**NON-TRANSLATORS**	0.050	0.064
	NOVICES	0.036	0.080
	PROFESSIONALS	0.011	0.086

Table 4.3. Mean values and SD for the facilitatory effect, the interference effect, and the Flanker effect by group.

Sections 4.3 and 4.4 below present how the three experimental groups performed in the Self-Paced Reading Translation and the Offline Translations tasks, in which they had to translate from Spanish into English a series of target sentences that contained V-framed self-directed motion expressions along with a number of filler sentences. Additionally, statistical and qualitative analyses that reveal the effects of individual differences are introduced.

4.3. Self-Paced Reading Translation (SPR-T) Results

In this task, participants were instructed to read sentences in Spanish at their own pace on a computer screen, one word at a time, and to enter their English translation after

reading a full sentence. The task was programmed and presented to participants employing Psychopy (Peirce, 2007) and contained 6 target sentences (sentences with self-directed motion expressions) and 12 distractors. The SPR-T was designed to emphasize the potential effects of working memory and inhibitory control on the performance of the participants, as well as an instrument to assess group differences. In the following section, frame switch data collected with this instrument is presented.

4.3.1. Frame Switch Data

The number of target sentences translated from Spanish into English employing a lexicalization frame switch was measured. Each translated sentence was coded as "Yes" (translated employing a frame switch) or "No" (no frame switch in the translation). The total number of sentences coded as "Yes" was counted (0 out of 6, 1 out of 6, and so on and so forth) and this number was transformed into a percentage. Therefore, the lowest score is 0 (no sentences with frame switch) and the highest possible score is 1 (all the sentences translated using a frame switch).

Sentences translated into English with a frame switch but employing a wrong satellite or a wrong verb were accepted. For instance, *crawled down* (instead of *bounced down*) was counted as correct for *bajó botando*, and *galloped towards* (instead of *galloped away*) was counted as correct for *se alejó galopando*. These instances do show the ability of the participant to perform the lexicalization pattern switch, regardless of their choice of manner verb or path satellite.

The descriptive data regarding frame switch rates per group in this task are presented in Table 4.4. In addition to Table 4.4, Table 4.5 offers a more in-depth view to

the switch percentages by group taking into account differences in working memory and inhibitory control.

GROUP	SPR-T Frame Switch Mean (SD)
Bilinguals (N = 34)	0.32 (0.32)
Novices (N = 16)	0.66 (0.37)
Professionals (N = 20)	0.77 (0.33)

Table 4.4. Mean values and SD for lexicalization frame switch percentages in the SPR-T by group.

GROUP		SPR-T Frame Switch Mean (SD)
Bilinguals (Total N = 34)	Low WM Score[19] (*M* = 12.5; N = 17)	0.33 (0.39)
	High WM Score (*M* = 18.9; N = 17)	0.31 (0.38)
	Low IC Score[20] (*M* = 86.5; N = 18)	0.30 (0.38)
	High IC Score (*M* = 96.9; N = 16)	0.35 (0.39)
Novices (Total N = 16)	Low WM Score (*M* = 14.6; N = 7)	0.74 (0.38)
	High WM Score (*M* = 18.9; N = 9)	0.59 (0.38)
	Low IC Score (*M* = 89.9; N = 8)	0.56 (0.39)
	High IC Score (*M* = 97.8; N = 8)	0.75 (0.37)
Professionals (Total N = 20)	Low WM Score (*M* = 14.3; N = 13)	0.68 (0.39)
	High WM Score (*M* = 19.6; N = 7)	0.93 (0.38)
	Low IC Score (*M* = 91.5; N = 6)	0.92 (0.39)
	High IC Score (*M* = 97.3; N = 14)	0.70 (0.37)
Participant Population (Total N = 70)	Low WM Score (*M* = 13.5; N = 37)	0.53 (0.39)
	High WM Score (*M* = 19.1; N = 33)	0.52 (0.38)
	Low IC Score (*M* = 88.3; N = 32)	0.48 (0.39)
	High IC Score (*M* = 97.2; N = 38)	0.57 (0.38)

Table 4.5. Mean values and SD for lexicalization frame switch percentages in the SPR-T by group and cognitive skills[21].

Statistical analyses performed on the frame switch data are discussed now. A one-way analysis of covariance (ANCOVA) was conducted to explore the effects of working memory, inhibitory control, translation training, and translation experience on the successful translation of Spanish verb-framed motion expressions into English satellite-framed motion expressions in the SPR-T. The independent variable, *Group*, included

[19] Maximum WM score is 21 points.
[20] Maximum total IC score is 100 points.
[21] Participants were assigned to low/high WM, low/high IC, and low/high no-go groups performing a median split.

three levels: non-translator bilinguals, novice translators, and professional translators. The dependent variable was the percentage of target sentences translated from Spanish into English employing a lexicalization pattern switch in the SPR-T. The covariates considered were the participants' working memory score, their Flanker test no-go trial score[22], and their Flanker test total score.

The ANCOVA was significant, $F(2, 64) = 12.951$, $p < .001$, indicating that there are statistically significant differences among the frame switch percentages of the experimental groups. Follow-up tests were conducted to evaluate pairwise differences among the groups. Pairwise comparisons revealed that non-translator bilinguals ($M = 0.32$) were statistically less successful at performing the frame switch than the novices ($M = 0.66$, $p = .001$) and that the professional translators ($M = 0.77$, $p < .001$). Furthermore, percentage differences between novices and professionals were not significant.

Additionally, the ANCOVA revealed that working memory score was not a significant covariate. Moreover, Flanker test no-go trial score and Flanker test total score were significant covariates, $F(1, 64) = 5.240$, $p = .025$, and $F(1, 64) = 4.825$, $p = .032$, respectively. These results suggest that there is a significant relationship between the switch percentage and these two Flanker test scores, but there is no effect of the working

[22] Participants' accuracy on the Flanker test tended to reach ceiling levels in base trials (responding to the direction of an arrow presented without flanking shapes), neutral trials (responding to the direction of an arrow presented with flanking diamond shapes), congruent trials (responding to the direction of an arrow presented with flanking arrows that point in the same direction), and incongruent trials (responding to the direction of an arrow presented with flanking arrows that point in the opposite direction). More variability in accuracy exists in no-go trials, in which the participant must refrain from pressing any key and just let the trial run and wait for the next trial. This no-response behavior appears to be more cognitively difficult than the rest of the trials and, moreover, this measure seems to go in line with the inhibitory processes needed to translate from language A to language B. Therefore, Flanker test no-go trial score may be a better reflection of the participant's true inhibitory control resources. For these reasons, this dissertation argues in favor of including the Flanker test no-go trial score as a covariate in the analysis.

memory score on the independent variable. This can be clearly observed in the data on Table 4.5 and Table 4.6 below: Considering all experimental subjects, participants with low Flanker test no-go trial score (*M* = 0.41) perform significantly worse than participants with high Flanker test no-go trial score (*M* = 0.64; *p* = .006) and participants with low Flanker test total score (*M* = 0.48) perform worse than participants with high Flanker test total score (*M* = 0.57), although this difference turned out to be not statistically significant when considering all participants. Nevertheless, a difference does not become apparent between participants with low and high working memory scores (*M* = 0.53 and *M* = 0.52, respectively).

GROUP		**SPR-T Frame Switch Mean (SD)**
Bilinguals (Total N = 34)	Low IC no-go Score[23] (*M* = 12.2; N = 19)	0.23 (0.38)
	High IC no-go Score (*M* = 18.1; N = 15)	0.44 (0.38)
Novices (Total N = 16)	Low IC no-go Score (*M* = 12.9; N = 8)	0.50 (0.40)
	High IC no-go Score (*M* = 18.6; N = 8)	0.81 (0.37)
Professionals (Total N = 20)	Low IC no-go Score (*M* = 13.9; N = 7)	0.79 (0.40)
	High IC no-go Score (*M* = 18.3; N = 13)	0.73 (0.38)
Participant Population (Total N = 70)	Low IC no-go Score (*M* = 12.7; N = 34)	0.41 (0.39)
	High IC no-go Score (*M* = 18.3; N = 36)	0.64 (0.37)

Table 4.6. Mean values and SD for lexicalization frame switch percentages in the SPR-T by group and Flanker test no-go trial score.

Moreover, further statistical tests were run to explore how the aforementioned significant covariates affected the performance of the participants by group and cognitive skills. Independent t-samples compared low and high individuals in each of the experimental groups and revealed that (1) bilinguals with high Flanker test no-go trial

[23] Maximum IC no-go score is 20 points.

score (M = 0.44) performed significantly better than bilinguals with low score in the same variable (M = 0.23, p = .024), and that (2) novices with high Flanker test no-go trial score (M = 0.81) performed significantly better than novices with low score in the same variable (M = 0.50, p = .048).

Subsequently, a second ANCOVA was conducted to determine if facilitatory, interference, and Flanker effects were significant covariates in the performance of the participants in the SPR-T. The ANCOVA revealed that these effects were not significant covariates ($p > .05$). These results will be discussed at length in the Chapter 5.

4.4. Offline Translation Task (OTT) Results

In this task, participants were instructed to translate Spanish sentences into English at their own pace. The sentences were presented in Microsoft Word and the participants' key strokes were recorded employing the keylogging software InputLog (Leijten and Van Waes, 2013). The OTT was designed to mimic as closely as possible a real translation task in order to evaluate the effects of translation training and translation experience on the participants' performance and not so much the potential influence of cognitive skills on said performance.

The number of sentences translated from Spanish into English employing a lexicalization frame switch was measured. Each translated sentence was coded as "Yes" (translated employing a frame switch) or "No" (no frame switch in the translation). The total number of sentences coded as "Yes" was counted (0 out of 6, 1 out of 6, and so on and so forth) and this number was transformed into a percentage. Therefore, the lowest score is 0 (no sentences with frame switch) and the highest possible score is 1 (all the

sentences translated using a frame switch). As in the SPR-T, sentences translated into English with a frame switch but employing a wrong satellite or a wrong verb were accepted.

Furthermore, four additional measures were studied: (1) time elapsed from the presentation of a target sentence to the participant to the moment the participant starts typing their translation, (2) pauses longer than 1000ms after having typed the sentence subject, (3) deletions that involve a verb-framed expressions being rewritten employing a satellite-framed expression, and (4) deletions that involve a verb-framed expressions being rewritten employing a verb-framed expression.

Descriptive data and statistical analyses performed on the frame switch data are discussed in the next section. Descriptive data as well as a quantitative and qualitative analysis of the aforementioned four additional measures is offered in section 4.4.2.

4.4.1. Frame Switch Data

In this section, data related to the translation product itself collected from the participants in the OTT are discussed. First, let us have a look at the descriptive data. The data regarding frame switch rates per group in this task are presented in Table 4.7. In addition to Table 4.7, Table 4.8 offers a more in-depth view to the switch percentages by group taking into account differences in working memory and inhibitory control and Table 4.9 includes switch percentages by group and Flanker test no-go trial scores.

GROUP	OTT Frame Switch Mean (SD)
Bilinguals (N = 34)	0.54 (0.36)
Novices (N = 16)	0.83 (0.26)
Professionals (N = 20)	0.87 (0.23)

Table 4.7. Mean values and SD for lexicalization frame switch percentages in the OTT by group.

GROUP		OTT Frame Switch Mean (SD)
Bilinguals (Total N = 34)	Low WM Score (*M* = 12.5; N = 17)	0.53 (0.34)
	High WM Score (*M* = 18.9; N = 17)	0.55 (0.32)
	Low IC Score (*M* = 86.5; N = 18)	0.48 (0.35)
	High IC Score (*M* = 96.9; N = 16)	0.6 (0.33)
Novices (Total N = 16)	Low WM Score (*M* = 14.6; N = 7)	0.88 (0.33)
	High WM Score (*M* = 18.9; N = 9)	0.80 (0.33)
	Low IC Score (*M* = 89.9; N = 8)	0.79 (0.32)
	High IC Score (*M* = 97.8; N = 8)	0.87 (0.30)
Professionals (Total N = 20)	Low WM Score (*M* = 14.3; N = 13)	0.86 (0.33)
	High WM Score (*M* = 19.6; N = 7)	0.88 (0.31)
	Low IC Score (*M* = 91.5; N = 6)	0.89 (0.32)
	High IC Score (*M* = 97.3; N = 14)	0.86 (0.31)
Participant Population (Total N = 70)	Low WM Score (*M* = 13.5; N = 37)	0.71 (0.34)
	High WM Score (*M* = 19.1; N = 33)	0.68 (0.33)
	Low IC Score (*M* = 88.3; N = 32)	0.64 (0.35)
	High IC Score (*M* = 97.2; N = 38)	0.75 (0.32)

Table 4.8. Mean values and SD for lexicalization frame switch percentages in the OTT by group and cognitive skills.

GROUP		OTT Frame Switch Mean (SD)
Bilinguals (Total N = 34)	Low IC no-go Score (*M* = 12.2; N = 19)	0.39 (0.36)
	High IC no-go Score (*M* = 18.1; N = 15)	0.72 (0.32)
Novices (Total N = 16)	Low IC no-go Score (*M* = 12.9; N = 8)	0.75 (0.33)
	High IC no-go Score (*M* = 18.6; N = 8)	0.92 (0.31)
Professionals (Total N = 20)	Low IC no-go Score (*M* = 13.9; N = 7)	0.93 (0.35)
	High IC no-go Score (*M* = 18.3; N = 13)	0.86 (0.32)
Participant Population (Total N = 70)	Low IC no-go Score (*M* = 12.7; N = 34)	0.59 (0.36)
	High IC no-go Score (*M* = 18.3; N = 36)	0.80 (0.31)

Table 4.9. Mean values and SD for lexicalization frame switch percentages in the OTT by group and Flanker test no-go trial score.

A one-way analysis of covariance (ANCOVA) was conducted to explore the effects of working memory, inhibitory control, translation training, and translation experience on the successful translation of Spanish verb-framed motion expressions into English satellite-framed motion expressions in the OTT. The independent variable, *Group*, included three levels: non-translator bilinguals, novice translators, and professional translators. The dependent variable was the percentage of target sentences translated from Spanish into English employing a lexicalization pattern switch in this task. Following the same reasoning applied to the SPR-T, the covariates considered were the participants' working memory score, their Flanker test no-go trial score, and their Flanker test total score.

The ANCOVA was significant, $F(2, 64) = 7.978$, $p = .001$, indicating that there are statistically significant differences among the frame switch percentages of the experimental groups. Follow-up tests were conducted to evaluate pairwise differences

among the groups. Pairwise comparisons revealed that non-translator bilinguals (M = 0.54) were statistically less successful at performing the frame switch than the novices (M = 0.83, p = .002) and that the professional translators (M = 0.87, p = .001). Furthermore, percentage differences between novices and professionals were not significant.

Additionally, the ANCOVA revealed that working memory score and Flanker test total score were not significant covariates. Moreover, Flanker test no-go trial score was a significant covariate, $F(1, 64) = 8.171$, p = .006. These results suggest that there is a significant relationship between the switch percentage and the Flanker test no-go trial score, but there is no effect of the working memory score or the Flanker test total score on the independent variable. This can be easily understood by reviewing the data on Table 4.8 and Table 4.9 above: Considering all experimental subjects, participants with low Flanker test no-go trial score (M = 0.59) perform significantly worse than participants with high Flanker test no-go trial score (M = 0.80; p = .004) in the OTT. Nevertheless, no statistically significant differences exist between participants with low and high working memory scores (M = 0.71 and M = 0.68, respectively) or with low and high Flanker test total score (M = 0.64 and M = 0.75, respectively).

Moreover, further statistical tests were run to explore how the aforementioned significant covariate affected the performance of the participants by group and cognitive skills. Independent t-samples compared low and high individuals in each of the experimental groups and only yielded a statistically significant difference between bilinguals with high Flanker test no-go trial score (M = 0.44) and bilinguals with low Flanker test no-go trial score (M = 0.23, p = .024).

A second ANCOVA was conducted to determine if facilitatory, interference, and Flanker effects were significant covariates in the performance of the participants in the OTT. The ANCOVA revealed that these effects were not significant covariates ($p > .05$). These results will be discussed at length in the Chapter 5.

4.4.2. Pauses and Deletions Data

This section offers data and analyses related to pause and deletion behavior exhibited by the participants in the OTT. First, descriptive data broken down by group are reviewed.

Table 4.10 reflects the total and mean times elapsed between target sentence presentation and typing, mean number of pauses over 1000ms, total and mean lengths of said pauses, mean number of deletions[24] with rewrites, and mean number of deletions without rewrites per experimental group, along with their respective standard deviations.

[24] The total number of deletions with and without rewrite is an integer number equal or greater than 0 for each participant. Since not all participants made deletions in the OTT, the mean number of deletions becomes a decimal number (0.xxx) larger than 0 but smaller than 1.

		MEAN	SD
TOTAL TIME FROM TARGET SENTENCE PRESENTATION TO TYPING (ms)	**BILINGUALS (N = 31)**	24476.2	15606.3
	NOVICES (N = 12)	17362.6	4272.6
	PROFESSIONALS (N = 17)	16898.6	8818.2
	TOTAL = 60		
AVERAGE TIME FROM TARGET SENTENCE PRESENTATION TO TYPING (ms)	**BILINGUALS (N = 31)**	4079.4	2601.0
	NOVICES (N = 12)	2893.8	712.1
	PROFESSIONALS (N = 17)	2973.7	1492.9
	TOTAL = 60		
NUMBER OF PAUSES OVER 1000 ms	**BILINGUALS**	11.56	6.21
	NOVICES	8.38	3.98
	PROFESSIONALS	4.80	4.53
TOTAL PAUSE DURATION (ms)	**BILINGUALS**	40129.0	28678.7
	NOVICES	23503.0	12663.5
	PROFESSIONALS	14625.6	14398.4
AVERAGE PAUSE DURATION (ms)	**BILINGUALS**	3263.7	1011.2
	NOVICES	2745.8	679.6
	PROFESSIONALS	2691.4	1528.6
AVERAGE NUMBER OF DELETIONS WITH REWRITE	**BILINGUALS**	0.68	0.91
	NOVICES	0.81	0.98
	PROFESSIONALS	0.50	0.69
AVERAGE NUMBER OF DELETIONS WITHOUT REWRITE	**BILINGUALS**	0.68	1.25
	NOVICES	0.13	0.34
	PROFESSIONALS	0.15	0.37

Table 4.10. Total and mean time from presentation to typing, mean number of pauses over 1000ms, total and mean length of pauses, number of deletions with and without rewrites in the OTT by group.

As shown on Table 4.10, data from 10 participants had to be discarded when quantifying the time from the sentence presentation to typing (and consequently, from the average time from presentation to typing as well) because the participants did not follow the task instructions and used the mousepad on the researcher's laptop instead of the keyboard to navigate the MS Word document containing the experimental sentences. When participants use the DOWN, UP, LEFT, RIGHT arrows, it is very easy to identify their progression from a sentence to the next in the session outputs provided by InputLog. However, when they use the mousepad, it becomes very unclear how they advanced between sentences or where they spent their mousepad time. Therefore, these

values were removed from the analysis and only data from 60 participants were included. No data needed to be excluded from the other dependent variables and, therefore, data from all 70 participants entered the statistical analysis.

Seven one-way analyses of variance (ANOVA) were conducted to explore the effects of translation training and translation experience on the variables on Table 4.10. The independent variable, *Group*, remained the same in all the ANOVAs and included three levels: non-translator bilinguals, novice translators, and professional translators. The dependent variables were (1) total time from sentence presentation to typing, (2) average time from sentence presentation to typing, (3) number of pauses over 1000ms after typing the sentence subject, (4) total pause duration of pauses over 1000ms after typing the subject, (5) average pause duration, (6) number of deletions with lexicalization pattern rewrite, and (7) number of deletions without lexicalization pattern rewrite.

The ANOVA was significant for number of pauses over 1000ms, $F(2, 69) = 10.236$, $p < .001$), and total pause duration, $F(2, 69) = 8.831$, $p < .001$, indicating that there are statistically significant differences on the number of pauses over 1000ms and the total pause duration among the experimental groups. Follow-up tests were conducted to evaluate pairwise differences among the groups.

Pairwise comparisons revealed that non-translator bilinguals ($M = 11.56$) took more pauses over 1000ms after they have typed the sentence subject than the professionals ($M = 4.80$, $p < .001$), and that the novices ($M = 8.38$) took more pauses over 1000ms than the professionals ($M = 4.80$, $p = .049$). The number of pauses that the bilinguals and the novices took was not statistically different.

Pairwise comparisons also revealed that the total pause duration was significantly longer in the case of the bilinguals (M = 40129.0) when compared with the novices (M = 23503.0, p = .044) and when compared with the professionals (M = 14625.6, p < .001). However, the total pause duration of novices and professionals did not differ significantly.

Moreover, the ANOVA exhibited a clear trend towards statistical significance in the case of deletions without lexicalization pattern rewrite, $F(2, 69) = 3.040$, p = .054), indicating that the behavior of the three groups in regard to this measure exhibits important differences. These differences are apparent from the data on Table 4.9: While all three groups had a low number of deletions without rewrite, this number is substantially higher in the bilingual group (M = 0.68) than in the novice group (M = 0.13) and the professional group (M = 0.15).

Lastly, the ANOVAs did not yield significant differences for the rest of the dependent variables, therefore, similar behaviors across experimental groups are assumed for these variables. However, from a qualitative standpoint, two more reflections on the data obtained in this task are in order. The first reflection is related to the total and average time elapsed from sentence presentation to typing.

As shown on Table 4.10, the bilinguals took a total of 24476.2 ms (4079.4ms per sentence on average) to start typing their answers in the OTT, while novices took 17362.6 ms (2893.8ms per sentence on average) and professionals took 16898.6ms (2973.7ms per sentence on average). This means that the bilinguals took considerably longer pauses when confronting a new sentence than the novices and the professionals, who performed very similarly in regard to this variable. Although the ANOVA did not yield significant

results for these values, an independent sample t-test revealed statistically significant differences between the bilinguals and the professionals in both measures (p = .019 and p = .034, respectively). Shorter pauses may be a product of increased efficiency, process automatization, and general translation competence; consequently, differences would be expected across groups, and they were partially confirmed by the t-test.

The second reflection is related to the mental processes that operate in the participants' mind while translating, as perceived by the participants themselves. Upon completion of the OTT, which was the last task in the experimental session, many participants expressed great interest in learning what the experiments were about. After receiving a short explanation of the study as a whole, most of them volunteered their thought process, aiming at providing answers to how the translation process of self-directed manner of motion from Spanish into English actually proceeds cognitively. In similar fashion to a retrospective interview, the participants were prompted by the researcher to share their translation process by asking if they could explain the steps they followed in order to translate the target sentences from Spanish into English. These were some of the participants' post-OTT considerations:

- Bilingual group:
    - BIL1 on translating "*El conejo subió a la silla saltando*" ('The rabbit hopped onto the chair'): "*Estaba traduciendo palabra por palabra pero dije 'No, lee todo en español y entonces piensa una forma mejor en inglés'*." (I was translating word by word but I said to myself 'No, read the whole thing in Spanish and then think of a better way [to express it] in English').

- BIL9 on translating "*La mosca entró en la cocina volando*" ('The fly flew into the kitchen'): "In Spanish you say the verb and then the way. In English we use another verb to say there was some sort of movement and then the preposition to show there's another part, to show the direction of the movement."
- BIL16, on translating "*La mosca entró en la cocina volando*" ('The fly flew into the kitchen'): "*Lo estaba tomando literalmente,'entró' y el modo fue 'volando'. Me di cuenta luego de que la direccionalidad se puede expresar de otra manera.*" ("I was taking it literally, 'entered' and the manner was 'flying'. I later realized that directionality can be expressed in a different way.").

- Novice group:
  - NOVICE2 on translating "*El caballo se alejó del establo galopando*" ('The horse galloped away from the stable'): "'Alejó' means 'to go away', so I feel it's weird to say 'went away galloping'. Instead of directly translating it, 'galloped away' is how we say it in English."
- Professional group:
  - PROF11 on translating "*El gusano cayó de la mesa rodando*" ('The worm rolled off the table'): "'Fell off rolling' doesn't sound good. So I thought 'What is it trying to say?' I found the more natural way."

- PROF16 on translating "*La tortuga salió del puerto flotando*" ('The turtle floated out of the port'): "*Primero hago un borrador en la cabeza,* 'left floating' *no me suena natural, entonces busco una alternativa.*" ("First I compose a draft in my head, 'left floating' doesn't sound natural, so I look for an alternative").
- PROF18 on translating "*La tortuga salió del puerto flotando*" ('The turtle floated out of the port'): "There's a more literal way but it sounds weird. You can use float and show direction adding a preposition."

These qualitative findings as well as the quantitative data presented so far will be addressed in the next chapter. The following section summarizes all the results presented in this chapter.

4.5. Summary of Results

Chapter 4 so far has presented data from the SPR-T and the OTT, designed as collection instruments for this dissertation. These data include quantitative analyses on frame switch percentages observed in both tasks, quantitative data on pause and deletion behavior exhibited by all participants in the OTT, and qualitative data on presentation-to-typing data and retrospective reflections offered by the participants. Results from both tasks are summarized below.

The SPR-T was primarily conceived to explore the effects of working memory and inhibitory control on the translation performance of non-translator bilinguals, novice

translators, and professional translators, specifically in the case of translating self-directed manner of motion expressions from Spanish into English. The data collected in this task also provides insights regarding the effects of translation training and translation experience on the participants' performance.

Statistical analyses performed revealed a main effect for *Group*, with novices and professionals performing significantly better than the non-translator bilinguals, and a significant interaction between the frame switch percentages and the Flanker test no-go trial score. Additionally, when assessing low and high cognitive abilities participants per group, bilinguals and novices with high Flanker test no-go trial score performed significantly better than their group peers with low Flanker test no-go trial score.

On the other hand, the OTT was created to closely mimic a more authentic translation task, still within a controlled experimental setting. This task yielded data related to frame switch percentages by group as well as important information how cognitive abilities may play a role in a traditional translation task. Furthermore, it also provides relevant data about the participants' behavior in regard to how they approached and tackled the target sentences and about their pauses and deletions while producing the final translation product.

From a quantitative point of view, statistical analyses again revealed a main effect for *Group*, with novices and professionals performing significantly better than the non-translator bilinguals, and a significant interaction between the frame switch percentages and the Flanker test no-go trial score. In addition to these significant results, further comparisons indicated that bilinguals with high Flanker test no-go trial score performed significantly better in this task than those with low Flanker test no-go trial score.

Besides frame switch percentages, the OTT also provided data on seven additional dependent variables. Analyses of variance revealed a main effect for *Group* for two of the variables: Total number of pauses over 1000ms after typing the subject sentence and average pause duration. This meant that the professionals were taking significantly fewer pauses than the novices and than the bilinguals, and therefore, their total pause duration was also significantly shorter. Although the Group effect did not reach the significance threshold, a marginally significant effect was found for the number of deletions without lexicalization pattern rewrite, being bilinguals the ones that executed the largest number of deletions without rewrite, followed by novices and then professionals.

From a qualitative standpoint, the OTT also supplied crucial information on two fronts. First, it showed that the bilinguals took longer to start typing after being showed a target sentence, while the novices and the professionals took a shorter time to do so. Secondly, participants furnished the researcher with retrospective explanations as to what they were thinking while processing the target sentences for translation production. Their insights point at the need to adopt a non-literal translation strategy and at the potential iterative process involved in the translation of the self-directed manner of motion expressions.

Chapter 5 will focus on integrating and interpreting these results in order to answer the research questions posited in Chapter 2, and to explain how all the experimental evidence presented may support the SPaM Motion Translation Model explained in Chapter 2.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

5.1. Introduction

In this chapter I summarize, integrate, and interpret the results presented in the previous chapter in order to answer the research questions at the core of this dissertation. The discussion will be organized as follows: First, data as a whole are reviewed; then, each research question and respective hypotheses are reintroduced and discussed under the light of the results; and subsequently, conclusions are put forth. The chapter finally ends with the limitations of the present study and directions for future research.

5.2. Results revisited

The results obtained in the different analyses performed on the experimental data and presented in Chapter 4 are now revisited. Previously, the results were introduced first dealing with data from the Self-Paced Reading Translation (SPR-T) and then with data from the Offline Translation Task. This time, however, this exposition will be organized in a way that emphasizes the effect of each factor on the translation performance of the participants and sets the stage so that the research questions this dissertation set out to answer can be easily and effectively approached.

First, I will focus on the lexicalization switch percentages of the groups in each task and the group differences in their pause and deletion behavior. Figure 5.1 presents the mean lexicalization switch percentages of each group in the SPR-T and the OTT, and the statistically significant comparisons.

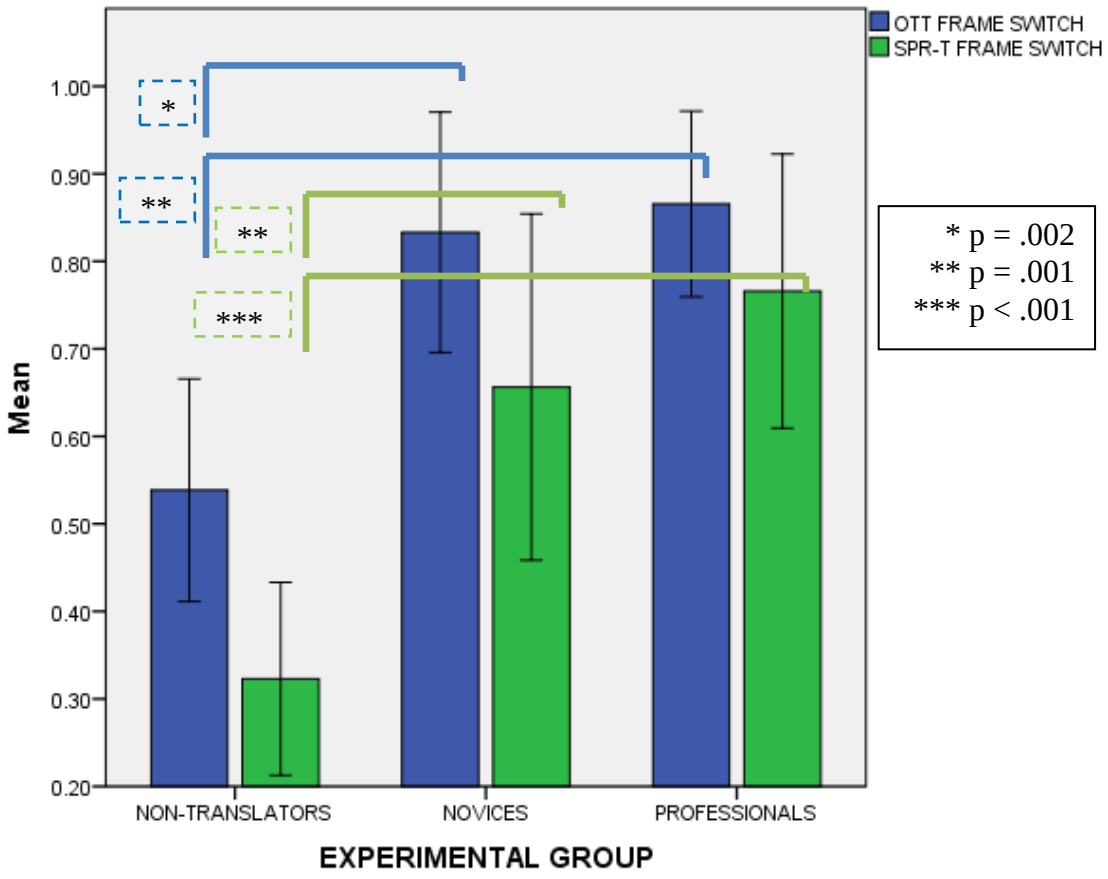

Figure 5.1. Mean lexicalization switch percentages of bilinguals, novices, and professionals in the SPR-T and the OTT.

As shown on Figure 5.1, the novices and the professionals clearly outperformed the bilinguals in regard to their lexicalization switch percentages in both experimental tasks. These differences were ratified by the statistical analyses, which indicated that Group membership had a significant effect on the translation performance of the participants in the SPR-T and the OTT. On the other hand, no statistical differences were found between the novice translators and the professional translators.

Next, Figure 5.2 presents the means of each group for the following variables: number of pauses over 1000ms after typing the sentence subject and total pause duration

from pauses over 1000ms. These data were obtained from the OTT. Statistical comparisons are marked where significant.

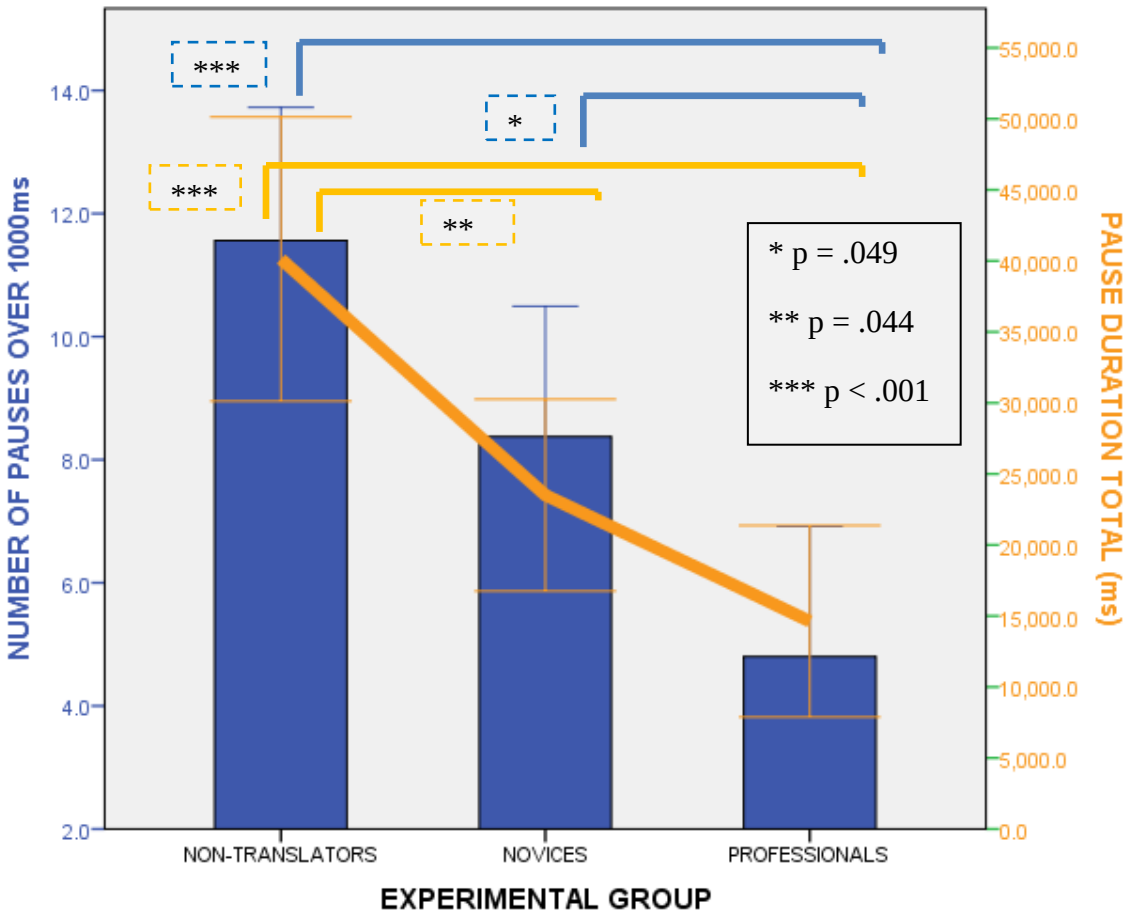

Figure 5.2. Mean number of pauses over 1000ms and mean total pause duration by group obtained in the OTT.

Figure 5.2 visually presents the important differences in pause behavior exhibited by the bilinguals, the novices, and the professionals while translating the sentences in the OTT. The figure shows that the professional translators took fewer pauses than the novices and the non-translator bilinguals. Moreover, total pause duration was significantly larger in the case of the bilinguals when compared with the novices and the

professionals. Statistical analyses again revealed that Group had a significant effect on the dependent variables under scrutiny.

Furthermore, the groups also behaved differently in regard to their deletions without lexicalization pattern rewrite in the OTT. Although the differences did not reach statistical significance ($p = .054$), the mean deletions without rewrite were notably larger in the bilingual group ($M = 0.68$) than in the novice group ($M = 0.13$) and than the professional group ($M = 0.15$). This may be an indicator of monitoring processes at work in the bilinguals, nonetheless they remain unable to provide a better solution for the target sentence and settle for the one they originally wrote. This idea will be expanded in Section 5.5.

From a qualitative point of view, group differences can also be recognized in the time elapsed from target sentence presentation to typing. While the bilinguals took a total of 24476.2 ms (4079.4ms per sentence on average) to start typing their answers in the OTT, the novices took 17362.6 ms (2893.8ms per sentence on average) and professionals took 16898.6ms (2973.7ms per sentence on average). This seems to point to an efficiency advantage on the part of the novices and the professionals when tackling a source sentence. This will be explained in more depth in Section 5.5.

After reviewing the Group effects observed in lexicalization switch percentages, pause and deletion behavior, and typing patterns, now the effect of the covariates included in the statistical analyses can be set forth. Figure 5.3 contains the mean lexicalization switch percentages of low and high working memory participants in both tasks.

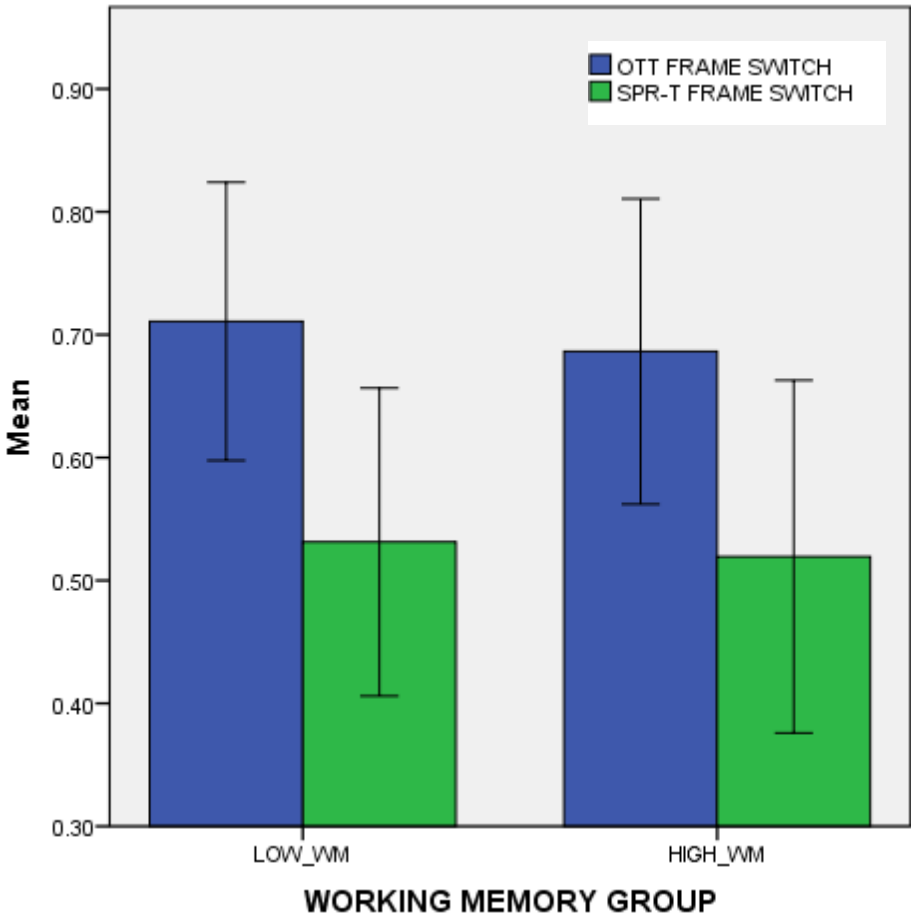

Figure 5.3. Lexicalization switch percentages of low and high working memory participants in the SPR-T and the OTT.

The ANCOVA did not reveal a significant effect of the working memory scores in either experimental task. Additionally, an independent samples t-test failed to reveal statistically significant differences between the low and high working memory groups and, as shown in Figure 5.3, the switch percentages were quite consistent across groups in both experiments. Next, Figure 5.4 contains the mean lexicalization switch percentages of low and high inhibitory control participants in both experimental tasks.

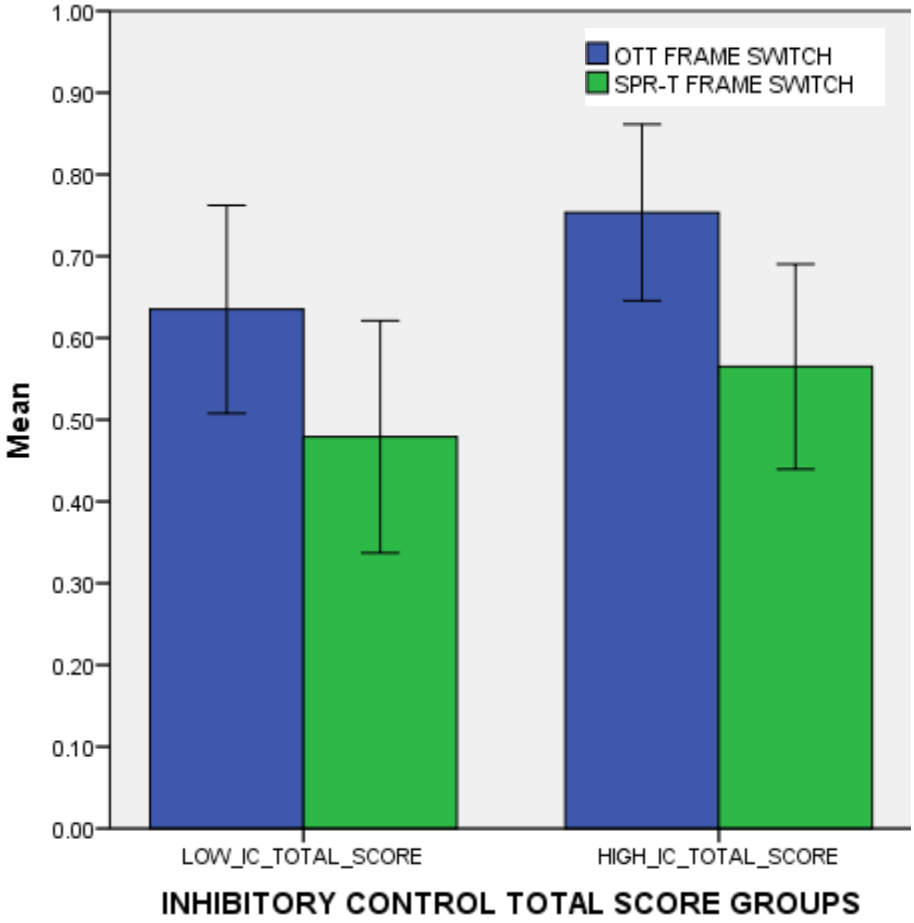

Figure 5.4. Lexicalization switch percentages of low and high inhibitory control participants in the SPR-T and the OTT.

Figure 5.4 shows that the percentages did not increased dramatically when comparing high inhibitory control individuals with low inhibitory control individuals. In fact, no statistically significant differences were found between both groups with an independent samples t-test; however, Flanker test total score was deemed significant in the SPR-T by the ANCOVA (p = .032), indicating that this covariate has indeed an effect over the dependent variable, that is, the switch percentage.

Figure 5.5 contains the mean lexicalization switch percentages of low and high Flanker test no-go trial score participants. Statistically significant differences are marked at the .004 level and the .006 level. As explained in the previous chapter, all participants

performed with great accuracy across all trials in the Flanker test, except for the no-go trials, where a larger variability was found. Similar at-ceiling performance has been observed experimentally and, when no-go trials were not included in the test, inhibition control was not a significant variable (see Hanson, 2012). Consequently, I argue in favor or considering this score as an additional covariate in the analysis because it may provide a more fine-grained exploration of the true inhibitory abilities of the participants.

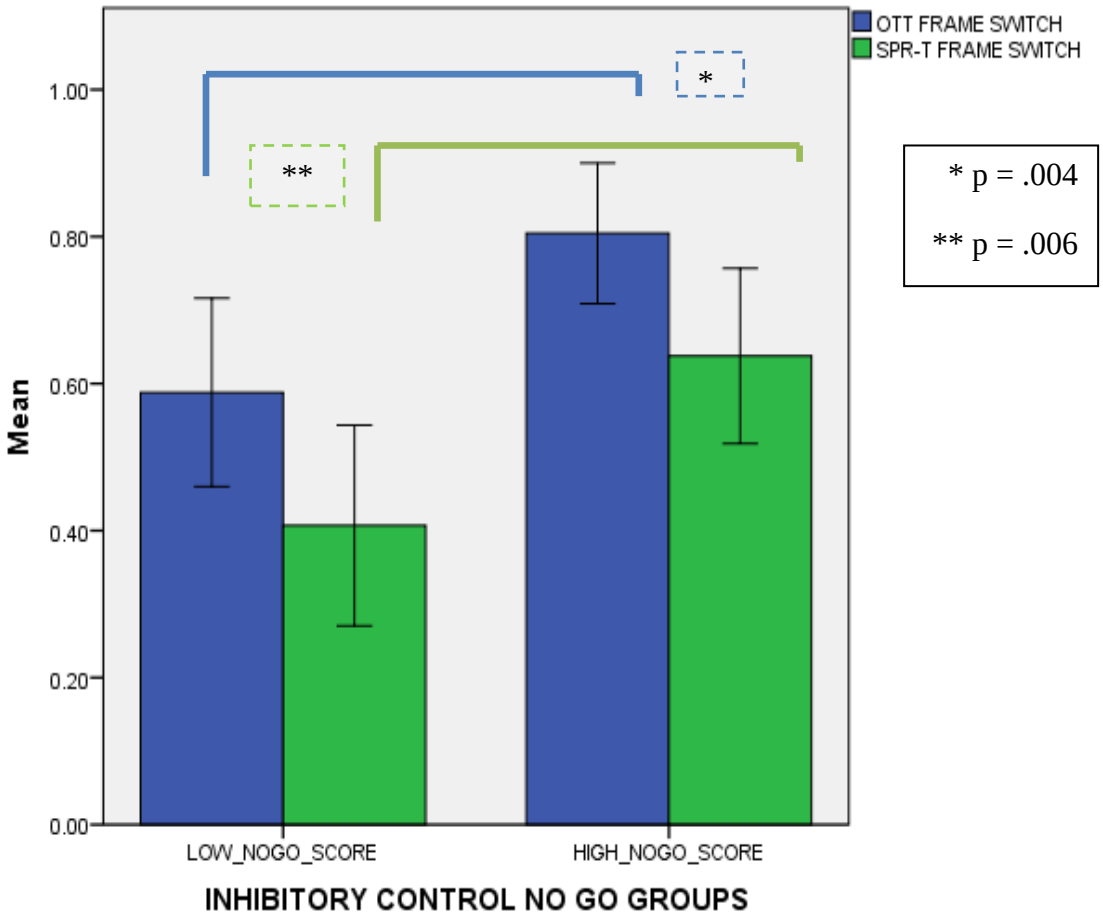

Figure 5.5. Lexicalization switch percentages of low and high Flanker test no-go trial score participants in the SPR-T and the OTT.

This assertion was confirmed by the ANCOVA, which deemed this covariate as significant, and an independent samples t-test, which revealed the significant differences included in Figure 5.5 between low and high no-go trial score individuals.

Facilitatory, interference, and Flanker effects were also included as covariates in the statistical analysis. These effects were not deemed to be significant covariates in either task, indicating that they are not strong predictors of frame switch percentages in the SPR-T or the OTT. Figure 5.6 shows frame switch percentages in the SPR-T for participants exhibiting small and large facilitatory, interference, and Flanker effects, and Figure 5.7 shows frame switch percentages in the OTT for participants with small and large effects. None of the differences shown on Figure 5.6 and Figure 5.7 were significant.

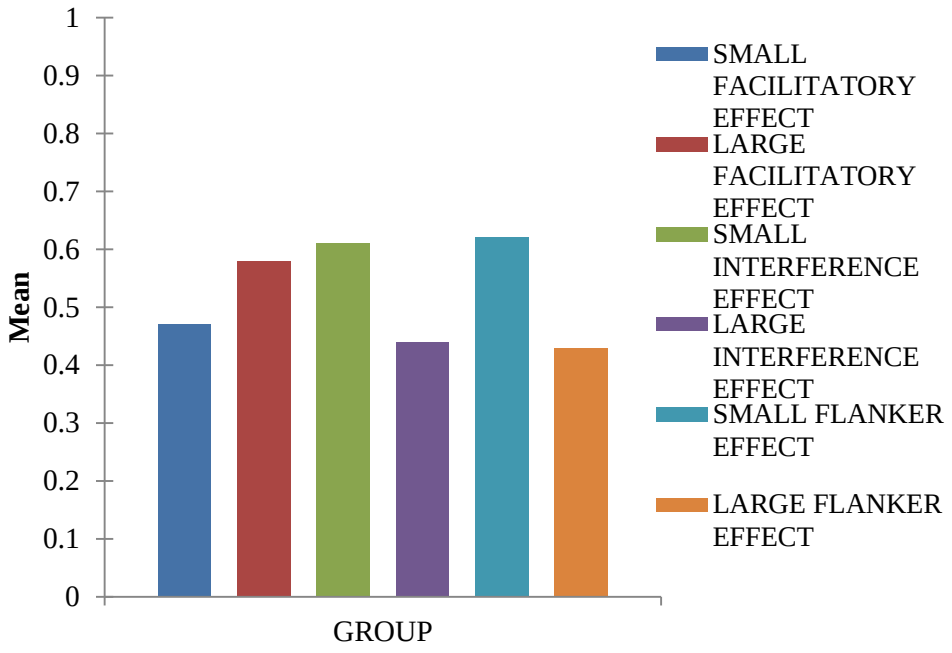

Figure 5.6. Mean lexicalization switch percentage in the SPR-T per facilitatory, interference, and Flanker effect groups.

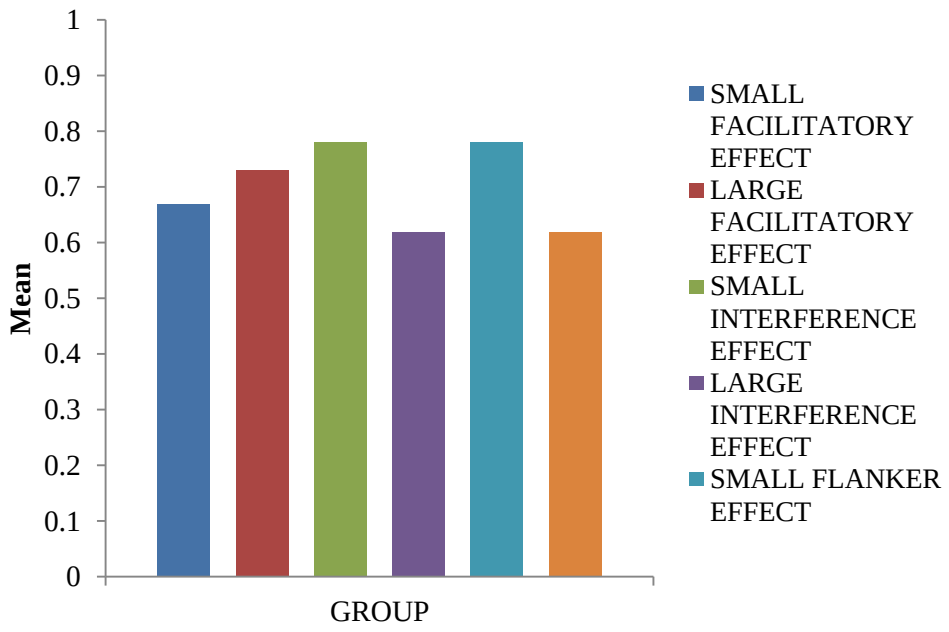

Figure 5.7. Mean lexicalization switch percentage in the OTT per facilitatory, interference, and Flanker effect groups.

All the quantitative data presented so far are complemented by the qualitative data provided by the participants after completing the experimental session. These data consisted on the reflections of participants who shared what they thought to be their internal processes while translating once they were done, that is, they were not obtained in traditional think-aloud protocols but rather from informal retrospective interviews. This information must be taken with a grain of salt due to inherent and well known limitations of self-reported mental processes (i.e., subjectivity, inability to access unconscious processes, incompleteness...) but it still provides interesting insights that might shed light on how appropriately the model proposed in this dissertation fits what happens, cognitively speaking, when a bilingual performs a translation task.

These reflections revolve around three main interconnected ideas: (1) a literal word-by-word translation is not the appropriate solution when translating Spanish verb-framed self-directed manner of motion expressions into English satellite-framed

counterparts, (2) the importance of noticing lexical-syntactical differences in how self-directed manner of motion is expressed in English and Spanish, and (3) working through an iterative process that starts with a rough draft that gets polished in subsequent attempts aids in the production of a more natural and idiomatic translation.

These intuitions play an important role in answering the first research question and therefore, in the next section, the focus will shift from the raw results to their interpretation. First, I will integrate all the information at my disposal to answer the first research question and then I will address the role of working memory, inhibitory control, academic training, and professional experience on the translation of self-directed manner of motion expressions from Spanish into English.

5.3. Research Question 1 and Hypothesis

The first research question formulated in this dissertation asked if English-Spanish bilinguals (translators and non-translators alike) were able to treat self-directed motion expressions in Spanish as syntactically and conceptually complex units in order to translate them into English employing a relexicalization process or if they would process these expressions as sequences of independent lexical units and translate them word by word, reproducing the surface and syntactic structure of the source language in the target language.

The Spanish Path and Manner Motion Translation Model (SPaM Model) I propose to explain the two potential outcomes of the translation of self-directed motion expressions from Spanish into English (basically, success or failure to perform a lexicalization frame switch) heavily relies on the Revised Hierarchical Model, which in

turn places emphasis on the fact that its predictions apply to fluent but unbalanced bilinguals and on the role of fluency in its design. Taking into account these two factors, I hypothesized that, in offline untimed tasks, the experimental participants (regardless of the experimental group they belong to) would be able to treat self-directed motion expressions in Spanish as syntactically and conceptually complex units and perform a relexicalization and syntactic remapping process because (1) they are highly proficient but unbalanced English dominant - L2 Spanish bilinguals and (2) their Spanish proficiency level is one that would grant strong links between the L2 lexical items and the conceptual level.

This hypothesis was confirmed by the data obtained in the OTT, where all participants exhibited high lexicalization switch percentages when translating complex verb-framed motion events from Spanish into satellite-framed expressions in English. The mean switch percentages were above chance rate in the OTT for all three groups (M = 0.54 for the non-translator bilinguals, M = 0.83 for the novice translators, and M = 0.87 for the professional translators). Moreover, and although the mean switch percentages were lower in the online, timed task, all the groups were successful in demonstrating their ability to translate a Spanish verb-framed expression into an English satellite-framed one in the SPR-T (M = 0.32 for the bilinguals, M = 0.66 for the novices, and M = 0.77 for the professionals). In view of these numbers, it can be safely stated that, for translation purposes, all three groups treated Spanish self-directed motion expressions as syntactically and conceptually complex units instead of dealing with them at the word level.

Taken together with the participants' reflections, I argue that this result can be interpreted as evidence of a multi-step process as the one described in the SPaM Model, which involves concept access, relexicalization, and syntactic remapping as essential stepping stones in the frame switch process. The retrospective considerations shared by the participants were aligned with the steps presented in the model in Chapter 2 and further support the idea that this multilayered process in fact takes places during the translation production. Some of the reflections are now presented again below to exemplify how these conscious processes may correspond to the steps outlined in the SPaM Model:

i) Identifying the motion event as a complex event and accessing the conceptual level from the L2 or the L1 lexical items in order to trigger a lexicalization pattern change.

→ On translating "*El conejo subió a la silla saltando*" ('The rabbit hopped onto the chair'), BIL1 said: "*Estaba traduciendo palabra por palabra pero dije 'No, lee todo en español y entonces piensa una forma mejor en inglés'*." (I was translating word by word but I said to myself 'No, read the whole thing in Spanish and then think of a better way [to express it] in English').

→ On translating "*El gusano cayó de la mesa rodando*" ('The worm rolled off the table'), PROF11 commented: "'Fell off rolling' doesn't sound good. So I thought 'What is it trying to say?' I found the more natural way."

ii) Relexicalization of the event using English lexical items and syntactic mapping.

→ BIL9, on translating "*La mosca entró en la cocina volando*" ('The fly flew into the kitchen'), indicated: "In Spanish you say the verb and then the way. In English we use another verb to say there was some sort of movement and then the preposition to show there's another part, to show the direction of the movement."

→ BIL7, on translating "*La tortuga salió del puerto flotando*" ('The turtle floated out of the port'), asserted: "*Combiné 'salió' y 'del' para usar '*out of*' y luego tuve en cuenta la gramática del inglés para poner '*float*' delante.*" (I combined *'salió'* and *'del'* to use 'out of' and then I took into account English grammar to add 'float' in the front).

These results have several implications for the fields of Second Language Acquisition and Translation Studies. The first implication is that the SPaM Model can be posed as a viable theoretical and psycholinguistic explanation for the processes that occur during the translation of a complex multi-word unit of meaning, whether in traditional translation tasks or in second language production tasks. This model might explain how highly proficient but unbalanced bilinguals produce multi-word target-preferred and target-dispreferred utterances by integrating the Revised Hierarchical Model (Kroll and Stewart, 1994) and Jackendoff's treelets. On the one hand, target-preferred expressions are the result of a sequential process that may proceed in a linear way or in an iterative manner and that entails noticing the complex nature of the structure at hand and activating target language syntactic treelets where the appropriate lexical units can be plugged in. On the other hand, target-dispreferred expressions are the external manifestation of a breakdown in the aforementioned process, which causes a failure in the production of the preferred translation, and generate translation alternatives that do

not correspond to the preferred target lexicalization pattern. Unfortunately, with the current experimental design, the specific part of the process that fails cannot be identified.

The second implication derived from adopting the SPaM Model as a description of the translation process is that the role of translation training and/or translation experience on translation performance may be explained as an enhancement of the model sequence. Translation training and professional experience bring about better problem awareness (Tirkkonen-Condit, 1987; Jääskeläinen, 1999), increased use of holistic top-down approach as opposed to bottom-up strategies (Tirkkonen-Condit, 1992), enhanced strategic competence (Göpferich, 2013; Hurtado Albir, 2017), ability to tackle longer units (Krings, 1988; Jääskeläinen, 1999) among other advantages. However, those gains have rarely been linked to specific cognitive processes. The SPaM Model may provide an anchor to those gains, that is, improvement in translation performance might be explained as a combination of the following:

(i) Better noticing of source language lexicalization patterns and lexicalization divergences.

(ii) Better concept accessing through the source and/or the target language.

(iii) Better syntactic and lexical remapping.

After answering Research Question 1, in Section 5.4 I retrace Research Question 2 and focus on integrating the experimental data to discern what the effects of working memory and inhibitory control on the participants' translation performance are.

5.4. Research Question 2 and Hypothesis

The second research question was concerned with the role of individual internal differences in the translation of Spanish verb-framed motion expressions into satellite-framed expressions in English. The internal or cognitive differences included in the study are working memory capacity and inhibitory control resources and therefore, the second research question was twofold: On the one hand, it asked about the role of working memory on the participants' performance and, on the other hand, it asked about the role of inhibition as well.

My hypothesis in regard to the role of working memory was that individuals with higher working memory would be more accurate than those with low capacity, based on two facts observed in the previous literature: 1) bilingual individuals with high working memory capacity are more likely to notice the differences in the lexicalization patterns in the languages they speak, and 2) they are more likely to maintain the words active in memory for later manipulation while processing the sentence presented to them.

This hypothesis was not supported by the experimental results given that working memory turned out to be not a significant covariate in either translation task. This lack of significance may be the consequence of a synergy of circumstances:

i. Working memory may have not been recruited during the translation process in the OTT because the whole sentence is available to the participant and he/she may reread and regress to the critical region, that is, the verb-framed expression, at their will as many times as they need. Therefore, committing the sentence or part of it to memory for later manipulation is not necessary and, even if certain working memory effort is required to

keep track of the overall sentence structure, it is not enough to cause tangible differences among individuals with different capacities.

ii. Working memory might have not been recruited during the translation process in the SPR-T because the sentences presented word by word to the participants were too short to strain or deplete this cognitive resource during the incremental processing of the Spanish source text, or at least, these memory resources were not exerted to a degree that would make cognitive differences among participants apparent. This length effect has been previously established in Psychology and Second Language Acquisition Studies in which recall, comprehension, and processing were dependent on word length, sentence length, and list length (e.g., Bourdin and Fayol, 1994; Kaushanskaya, Gross, and Buac, 2014, or Marton and Schwartz, 2003 on special populations).

iii. Following Jackendoff's notion of the word as an interface rule and the idea of treelets, the SPaM Model does not presuppose that the English satellite-framed motion treelet is stored in the same way an idiom would be. Whereas in the case of an idiom, both the lexical items and their syntactic configuration are committed to memory and presumably require a robust retrieval effort, in the case of a motion expression, only a productive treelet with a number of spots for the necessary motion semantic components is stored. Therefore, if the participant is able to retrieve the manner of motion verb, which should not be a difficult endeavor, given the strong lexical links between the L2 verb and the L1 translation, the memory effort in activating the treelet in which to plug that lexical item might be significantly reduced. Under this assumption, it is possible that the retrieval of the treelets is not so taxing as to cause observable differences among participants with different working memory capacities.

Now, I turn to the second part of this research question, which concerns the effect of inhibitory control on the participants' performance. Based on Green's Inhibitory Control Model and Hasher, Lustig, and Zacks's Inhibitory Processes account, my hypothesis in regard to the role of inhibitory control was that individuals with higher inhibitory control would be more accurate than those with low inhibitory control given that they would be able to suppress the word-by-word translation strategy via restraint of the prominent response, they would retain the Spanish path verb longer for later re-evaluation of their hypothesis by delaying the deletion of active items, and that would help them in treating the self-directed motion as a complex unit.

This hypothesis was partially supported by the data. Firstly, facilitatory effects, interference effects, and Flanker effects, calculated from the data obtained in the Flanker test, were not significant covariates in either task. This lack of significance is not as surprising as it may seem at first sight given the lack of agreement as to what these measures actually represent or what they in actuality tell us about the individuals' inhibitory control resources. Hanson (2012) also employed these effects as a measure of inhibitory control and found that these effects were not significant predictors of L2 learners' performance in sentence processing. Additionally, Hanson (2012:71) explains that "the majority of the work done with the Flanker Task concerns bilingual advantages over monolinguals" instead of a comparison among bilingual groups. Therefore, these measures may not be the most appropriate to characterize the inhibitory control abilities of the participants in this dissertation and other tasks, such as the Simon or the Stroop

tasks[25], may have been more useful in capturing inhibitory differences among the experimental groups.

Moreover, looking at the mean lexicalization switch performed by participants in small and large (facilitatory, interference, and Flanker) effect groups, it becomes apparent that the information that can be inferred from these numbers is not very clear. On the one hand, the facilitatory effect measures the ability of the participant to integrate relevant task information and is calculated by subtracting mean reaction times in correct congruent trials from mean reaction times in correct neutral trials. A larger difference should indicate a stronger ability to integrate said information. On the other hand, the interference effect measures the ability of the participant to suppress non-relevant task information and is calculated by subtracting mean reaction times in correct neutral trials from mean reaction times in correct incongruent trials. A smaller difference should indicate a stronger ability to suppress said information. These cognitive advantages were to some extent reflected in the performance of the participants: subjects with large facilitatory effect and subjects with small interference effect did better switch-wise than those with small facilitatory effect and those with large interference effect.

Now, when it comes to the Flanker effect, this correlation is not evident. Flanker effect is calculated by subtracting mean reaction times in correct congruent trials from mean reaction times in correct incongruent trials. On principle, the smaller the difference,

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[25] The Flanker test was favored over the Simon and the Stroop tasks for two main reasons:

(1) It is non-linguistic in nature, as opposed to the Stroop task. This is desirable because the individuals under examination are bilinguals and, in some cases, professionals who provide language services. Therefore, it would be safe to assume that their linguistic previous experience may affect their performance.

(2) It includes no-go trials, as opposed to the Simon task. As argued before, no-go trials provide useful and straightforward information about the individuals' abilities; however, the Simon task (although non-linguistic in nature, just as the Flanker test) does not include such trials.

the better the participant is at inhibiting, that is, he/she is not thrown for a loop by the irrelevant, contradicting information as much as others with a larger difference in reaction times. Yet, when looking at the switch percentage results, the trend now is the opposite to the one expected: the participants with larger Flanker effect are outperforming those with small Flanker effect. Although it is necessary to keep in mind that neither effect was a significant covariate in the analysis, whatever information could have been inferred from these measures remains uncertain and needs to be interpreted cautiously.

Therefore, if these effects were to be used as the only inhibition-based performance predictors, we would conclude that inhibition plays no part in the translation of verb-framed self-directed motion expressions from Spanish into English. However, as indicated in the methodology, the Flanker test yielded additional information. I focus next on the total Flanker test score and discuss its effect on the translation performance.

Total Flanker test score was included in the statistical analyses as a covariate in both tasks. This covariate turned out to be significant in the SPR-T but not significant in the OTT. Based on the theoretical assumptions and the nature of the SPR-T, specifically designed to emphasize inhibition effects, this result is expected and partially confirms the hypothesis presented for this question. In contrast, the lack of significance of the total Flanker test score in the OTT may be due to inhibition required in said task not being as strenuous: Although the crosslinguistic influence is ever present in the translation process, the OTT allowed the participant to access the source language sentence fully and continuously, which may entail a smaller inhibition effort than in the SPR-T, where the participant also needed to suppress a word-by-word reaction triggered by the presentation mode.

Lastly, the final measure provided by the Flanker test is the no-go trial score, i.e., the total number of no responses in the no-go trials. As expounded in Chapter 4, I argue in favor of the use of this score as a measure of inhibition due to three main reasons that I expand below:

(1) It gives a larger range of variability in regard to the participants' inhibitory control resources because not all participants perform at ceiling in this type of trial (as opposed to baseline, neutral, congruent, and incongruent trials), providing thus a finer grain division of the participants.

(2) It represents a more demanding refraining effort, inhibition-wise, since it requires the suppression of a very powerful, automatized physical response. No-go trials, in which the participant must abstain from responding to the arrow direction when it appears surrounded by Xs and let the trial run until the next one is shown on the screen, seem to align with the inhibition needed in order to translate the target sentences from Spanish into English. The participant must suppress their urge to translate the sentence word by word and allow for appropriate meaning extraction, relexicalization and syntactic parsing prior to writing their translation product.

(3) While the cognitive processes that drive the response in congruent and incongruent trials are not easy to pinpoint and it is extremely hard to know if the participant is indeed integrating relevant information and suppressing contradicting information, in the case of the no-go trials it is much easier to understand how a successful response is reached: The participant has to process the elements that flank the target arrow and has to suppress the physical response of pressing the keyboard arrow

that corresponds to it. Thus, it can be inferred that inhibition is undoubtedly taking place in these cases.

Consequently, no-go trial score was included as a covariate in the analyses and it turned out to be a significant covariate in both translations tasks, that is, the frame switch was affected by the no-go trial score and higher switch percentages can be predicted for those participants whose no-go trial score is also higher. This seems to indicate that this measure may in fact be a better way to characterize the inhibitory control of the participants or, at least, a better way to predict the translation outcome.

Additionally, pairwise comparisons were carried out to explore how this score affects the translation performance by group. Low and high no-go trial score participants were compared within their respective experimental groups and significant differences were found in the non-translator bilinguals and the novice translators but not among the professional translators. In other words, the cognitive processes involved in the translation of self-directed motion from Spanish into English seem to be mediated to a larger degree by no-go trial scores in the bilinguals and the novices but not in the case of the professionals. This can be interpreted as follows: bilinguals and novices still lack sufficient appropriate translation training and it is their no-go ability what controls their translation processes rather than their professional training. In the case of the professionals, both training and experience kick in and mediate these processes, whether they have low or high no-go scores. Similarly to second language acquisition, output (or translation production, rather) through training and experience promotes automaticity and the routinization of language use (Gass and Mackey, 2007). Automatization in the translation of these motion structures is brought about by mapping the source language

structure to the target preferred expression over many trials (McLaughlin, 1987). Consequently, continued practice in translation production brings more automatic frame switch performance.

In summary, the experimental data failed to support the hypothesis in regard to the role of working memory but they did support the prediction regarding the effect of the inhibitory control resources. This has ramifications that extend beyond the realm of translation. The first repercussion relates to second language acquisition, particularly, adult second language acquisition. A large body of research claims that more working memory resources lead to better L2 processing, L2 proficiency development, L2 sentence and text comprehension (please, see Chapter 2 for references). However, the results in this dissertation suggest that the memory advantage does not show in written production tasks. This can be explained as a consequence of two main factors:

i. The production of a written text with no (or little) time pressure allows for pauses and regressions to previous linguistic material in a way that is not possible in listening comprehension tasks and oral production. Therefore, the memory resources can be replenished as needed before continuing with the writing task.

ii. The experimental participants were reading a sentence in their L2 but their output was a target text in their dominant language, therefore, working memory may have modulated to some extent their source text comprehension but it may have not conditioned their dominant language production.

Along with this implication, an additional reflection on the effect of inhibition can be offered. Previous psycholinguistic research demonstrated that inhibition is an

important factor in bilingualism in oral production tasks, L2 picture naming tasks, and language switching tasks (please, refer to Chapter 2 for references). These results extend the previous findings beyond the realm of oral production and show that inhibitory control is also a determining variable during written production by bilingual individuals.

A second derivative concerns interpreting as a cognitive skill, since translation and interpreting do share some underlying processes and some inferences about the latter can be made from the former. The SPR-T employed in this dissertation was actually closer to a sequential interpreting (also referred to as liaison interpreting) task than a traditional translation task: there were reading turns (similar to the listening in sequential interpreting) and writing turns (akin to the actual interpretation production), it was completed under moderate time pressure, the participants did not have the opportunity to reaccess the source text once read, and they had very little time (if any at all) to make corrections after producing a target text solution. So the fact that working memory was not significant in this task but inhibitory control was leads us to make future experimental predictions about how these cognitive variables may affect interpreters' performance. In view of the aforementioned results, inhibitory control, but not working memory, may have a significant effect on interpreters' performance in sequential interpreting tasks. However, no predictions may be advanced in regard to the role of these cognitive factors in simultaneous and long sequential interpreting modes, or in sight translation tasks.

A final and worth mentioning reflection based on the experimental data might add further insight into previous literature on what has been named "the bilingual advantage" and "the interpreter advantage". In the present study, there were no statistically significant differences in any of the cognitive measures among the experimental groups,

that is, non-translator bilinguals, novice translators, and professional translators obtain similar mean group scores in the working memory test and in all the measures provided by the Flanker test. So, contrary to what has been denominated "the bilingual advantage" (e.g., Bialystok, 1999, 2006; Yang *et al.*, 2005; Feng *et al.*, 2007; Morales *et al.*, 2013) and to the evidence found by Signorelli *et al.* (2012), Stavrakaki *et al.* (2012), and Tzou *et al.* (2012) (to name a few) on the "interpreter advantage", these data fail to support what could be thought of as "the translator advantage" and align with previous research done by Köpke and Nespoulous, (2006), Yudes *et al.* (2011), Paap and Greenberg (2013), or Duñabeitia *et al.* (2014) (among others) showing no apparent advantage in cognitive tasks performed by bilinguals and interpreters. Given that only two cognitive tests were employed and that there are contradicting and inconclusive results on the bilingual and the interpreter advantage, further testing should be performed to corroborate this claim.

Once that Research Question 1 and Research Question 2 have been discussed, now the effects of academic training and professional experience are addressed in Section 5.5, where Research Question 3 is reintroduced and the data interpreted in order to provide an answer to said question.

5.5. Research Question 3 and Hypothesis

The third and final research question put forth in this dissertation dealt with the role of individual external differences on the performance of translators and non-translators when translating self-directed motion expressions from Spanish into English. Specifically, two external factors were considered in the analysis: academic training and professional experience. Consequently, the research question encompassed the following

two questions: (i) Does academic training (or lack thereof) modulate the performance of non-translator bilinguals and novice translators when translating verb-framed expressions into satellite-framed expressions? and (ii) does professional experience affect the frame switch percentages of novice translators and experienced translators?

Based on the findings from previous studies that explore the role of academic training and professional experience on the translation of self-directed motion expressions, I hypothesized that experienced translators would be more accurate (i.e., they would be more successful in performing the lexicalization frame switch) than novice translators, who in turn would be more accurate than non-translator bilinguals. This hypothesis was based on the fact that translators (novices and experienced ones alike) have acquired a more complex translation competence (linked to gains in the steps in the SPaM Model) via academic instruction and through their own professional practice. This would enable them to tackle longer translation units and to recognize structures like this one, where an emphasis on the conceptual level over the lexical expression is paramount, and in which attention to target language preferred forms also plays a very important role in the appropriateness of the translation solution. However, this level of awareness and appropriateness may not play a role in bilingual, non-translation related communication, which would result in lower frame switch rates on the part of the non-translator bilinguals or natural translators (Harris, 1977; Harris and Sherwood, 1978).

This hypothesis was partially sustained by the results. Statistical analyses revealed that, in the SPR-T, non-translator bilinguals were outperformed by the novice translators (M = 0.32 and M = 0.66, respectively). However, although the professional translators performed a frame switch in a higher percentage than the novices (M = 0.77), this

difference was not statistically significant. The results of the OTT mimic closely what was obtained in the SPR-T: the novices were statistically more successful than the bilinguals in the frame switch (M = 0.83 and M = 0.54, respectively) and, in turn, the professionals were more successful than the novices (M = 0.87) but the difference between these two groups was not significant.

Consequently, translation training appears to have a very clear and strong effect on the translation performance of the novices when compared to the bilinguals. Nonetheless, the professional practice effect fades away when comparing the novices to the professionals, since these two groups did not behave differently, statistically speaking. This suggests that the ability to produce a successful lexicalization frame switch may be acquired early on in the translation competence acquisition process as opposed to other processes that may be acquired at later stages.

Applying the Noticing Hypothesis[26] (Schmidt, 1990, 2001, 2010) from the field of Second Language Acquisition to this particular translation phenomenon, it could be argued that once the trainees have noticed, that is, consciously registered, the lexicalization pattern divergences between Spanish and English through appropriate academic training, they might acquire the ability to perform the necessary frame switch. Along the same line, a similar idea was introduced in Translation Studies by Shreve in the late 90s and early 2000s. Shreve expresses that a translator's perspective on translation shifts as pattern recognition skills improve progressively (Shreve, 2002). This

[26] In a nutshell, the Noticing Hypothesis claims that linguistic input does not become intake for the learner unless it is explicitly noticed or consciously registered, and that second language acquisition depends on what the learner pays attention to and becomes aware of. Additionally, this hypothesis argues that while understanding of rules may facilitate learning, it is noticing and attention to linguistic forms what drives learning. Please refer to Schmidt (2010) for a review of the hypothesis and its main critics.

notion of "pattern recognition" was imported from Ericsson's work on defining expertise from a Cognitive Psychology viewpoint and implemented by Shreve and colleagues in an attempt to characterize models on translation competence and translation expertise (Shreve, 1997, 2002; Shreve and Angelone, 2010, among others). Shreve (2002) states that expertise in translation can be seen as an "increased capacity to recognize and represent the problems of translation" as well as an "increased ability to effectively resolve those problems." This entails that the translator must first recognize linguistic patterns in the source text to be able to consider if they are a translation problem and then decide if a solution must be applied.

In essence, translation training may be key in bringing these divergences and patterns to the foreground and in promoting divergence awareness in the trainees. This awareness, in turn, causes the trainees to develop an increasing sensitivity towards the linguistic complexity of this translation unit, which brings about higher frame switch percentages. This process translates in comparative gains associated with early processes in the SPaM Model and while it may be a reflection of training, it is in no way exclusively caused by it, i.e., bilinguals without translation training but with increased metalinguistic awareness may also perform the frame switch.

The training effect is also noticeable in the case of the deletions than involve self-directed motion expressions in which there is no lexicalization rewrite. Despite the fact that the differences did not reach statistical significance ($p = .054$), the mean number of deletions without rewrite is notably larger in the bilingual group ($M = 0.68$) than in the novice ($M = 0.13$) and the ($M = 0.15$) professional groups, and these last two groups performed very similarly, exhibiting very small differences between them. This may be

the external manifestation of a yet to be trained but incipient translation monitor as the one put forth in Tirkkonen-Condit's Monitor Model (2005) at work in the bilinguals:

> "It looks as if literal translation is a default rendering procedure, which goes on until it is interrupted by a monitor that alerts about a problem in the outcome. The monitor's function is to trigger off conscious decision-making to solve the problem" (Tirkkonen-Condit, 2005:408).

What it is observed from these deletions without rewrite is that the non-translators seem to produce a literal translation that closely resembles the lexical and syntactic configuration of the source text in an automatic fashion until they become aware of the inadequacy of their initial target language response. In other words, they proceed to produce a translation product without the lexicalization switch, as indicated on the left path of the SPaM Motion Translation Model in Figure 2.4 in Chapter 2. After noticing this inadequacy, they proceed to delete their original response in an attempt to come up with a target solution they believe to be more appropriate for the source sentence, that is, they go backwards and return to the starting point, the Spanish verb-framed motion expression. At this point, the non-translators may attempt to access the complex motion concept either from the source text in front of them or from the literal translation they have provided, and consequently proceed to relexicalize and remap the source language lexical items, as spelled out in the right hand path in the SPaM Model. However, this regulation process appears to be unsuccessful when a lexicalization pattern rewrite is not produced. After the deletion, they are still unable to provide a better solution and settle for the one they initially wrote, which they retype without any changes whatsoever or change slightly. Thus, a self-regulation monitoring process gets triggered in these

participants but it ultimately breaks down and production of a target-appropriate self-directed motion structure is unprosperous[27].

Significant differences were observed between the non-translator bilinguals and the novice translators in regard to frame switch percentages in the SPR-T and the OTT, as well as in regard to the number of deletions without rewrite. On the contrary, the present data failed to show similar differences between the novices and the professional translators in those measures. This result partially supports the original prediction and underlines the importance of formal training over professional practice. Similar results were obtained by Flores *et al.* (2012), whose results showed that the number of errors produced by professional medical interpreters was negatively correlated with the number of hours of training completed by the interpreter but not with their number of years of experience.

Nonetheless, significant differences between novice translators and professional translators were found in one important independent variable: the number of pauses over 1000 ms after having typed the sentence subject in the OTT. Whereas the novices took an average of 8.38 pauses over 1000 ms after having typed the sentence subject, the professionals averaged at 4.80 pauses, and this difference was significant at the $p < .05$ level. While the number of pauses that the professionals took was significantly smaller than the number of pauses the novices did, there was no significant difference in regard to

[27] It is necessary to note that even if/when participants do not delete and rewrite (with or without a lexicalization frame switch) a fragment of the target language sentence, important cognitive processes may be occurring during the pauses in the translation production. Kruger (2016), employing a combination of eyetracking and keylogging technologies, found that pauses longer than 3s occurring during translation drafting are associated with source text reading and with reading that involves both the source and the target texts. Additionally, she suggests that pause location in the target text (sentence boundary, clause boundary, phrase boundary, word boundary, and word-medial) also affects pause frequency and duration, evidencing cognitive effort involved in content transfer processes.

the average length of said pauses (*M* = 2745.8 ms for the novices and *M* = 2691.4 ms for the professionals). The comparative gap in number of pauses does not entail an advantage in translation appropriateness on the part of the professionals, since it does not pertain to the frame switch percentages in the OTT. It rather represents an increase in the automatization exhibited by these individuals that, in turn, makes them more efficient in their translation production. Professional practice may bring about faster access to the motion concept, better retrieving of the necessary treelet, enhanced abilities in lexical and syntactic remapping, a reduced number of iterations through the SPaM Model while translating, or a combination of all the mentioned possibilities. This occurs through frequent activation of the linguistic structures under study, increased awareness of the typological divergences, and sustained translation output of the target language structure. Consequently, it gives the professionals an observable efficiency advantage.

Additionally, the data also support previous studies by Ronowicz *et al.* (2005), Jääskeläinen (1996, 1999), Jakobsen (2003, 2005), Tirkkonen-Condit (1987, 1992), and Cifuentes (2015), who noted the positive effects of academic training on translation performance, and partially supports previous results by Göpferich (2013), who reported significant differences between novices and professionals. Furthermore, the present results corroborates Cifuentes and Rojo's (2015) and Alonso Alonso's (2017) findings, which reported no significant differences between expert and novice translators in the translation of motion expressions from English into Spanish and from English into Galician, respectively.

5.6. Conclusions

Three main findings have been set forth in this dissertation. The first finding is related to the linguistic and cognitive processes underlying the production of a translation. The SPaM Translation Model has been proposed from a strong foundation on Second Language Acquisition theoretical tenets that apply two primary strands: one that accounts for lexical retrieval in bilinguals (the Revised Hierarchical Model) and another one that represents a mechanism for the construction of highly productive structures (Jackendoff's treelets). These two notions allow us to conceptualize a model that explains a plausible psycholinguistic process for the Spanish→English translation of self-directed motion expressions with lexicalization pattern switch.

This process involves a series of steps that may occur sequentially, only once or through a number of iterations, and includes the identification of the self-directed motion expressions as a complex motion event with two semantic components (path and manner of motion), the access to the conceptual representation of said event (either through the Spanish source text or through an initial English translation draft), the relexicalization of the source language expression employing target language lexical items, and a syntactic remapping onto a satellite-framed motion treelet that matches the English preferred lexicalization for complex motion events.

Both the quantitative and the qualitative data collected from the participants provide positive evidence for the felicitousness of the SPaM Model. The model, which relies heavily on Kroll and Stewart's (1994) predictions on bilingual lexical retrieval, hypothesized that the participants should be able to provide a successful frame switch in their English translations. This hypothesis was supported by the quantitative data for all

the experimental groups in both tasks. Additionally, the qualitative reflections offered by the subjects upon completion of the study remark three crucial ideas: (1) a literal word-by-word translation is not the appropriate solution for the translation problem at hand, (2) there is a striking divergence in how English and Spanish express self-directed manner of motion, and (3) a rough, more literal draft may serve as a starting point for subsequent iterations when trying to produce a more natural and idiomatic translation. These thoughts seem to alineate very nicely with the steps the SPaM model is comprised of and, although cautiously, I take them to be befitting evidence for it.

The second finding involves the cognitive factors that were included for consideration in the experimental design. The results show that, while working memory seems to have no effect on the participants' performance, inhibitory control does in fact play a role in the frame switch percentages accomplished by them. The reasons behind working memory being not significant are several and varied in nature. The first reason lies in the SPaM Model itself. Even though I hypothesized that working memory would be a significant covariate in the participants' performance based on previous research findings in the Psycholinguistics of Second Language Acquisition, the model itself may have spelled out the opposite prediction from the beginning. I stated that the way in which English path and motion treelets work is not as idioms would, that is, they are constructed from a basic structure that encodes a productive rule, but they are not stored in memory as a monolithic entity. Thus, memory might have been out of question from the beginning. Furthermore, the nature of the translation tasks themselves (short sentences in both tasks, full sentence available the whole time in the OTT) may have had also an important effect on working memory not being statistically significant.

On the other hand, inhibitory control was a significant covariate in both tasks in the case of the no-go trial score and a significant covariate in the SPR-T in the case of the Flanker test total score. This finding was expected from applying Green's and Hasher, Lustig, and Zacks's Inhibition models to translation as a cognitive process. The bilingual (translator or not) must suppress both the source language and non-preferred target forms to allow the production of preferred target forms at every step of the process, however, the activation of the source language lexical items must last until the bilingual's goal , that is, a target text translation, is achieved. This may be accomplished by deploying the three mechanisms described by Hasher, Lustig, and Zacks (2007): preventing irrelevant non-preferred target forms from gaining access to the focus of attention, deleting lexical items that are no longer relevant for the final goal from consideration, and exerting restraint to inhibit prepotent target responses so that other responses can be evaluated[28]. Therefore, inhibitory control resources modulate how effectively the bilingual can navigate these steps to produce a preferred target language solution.

The findings on cognitive factors are particularly relevant for translation training and may have very clear implications for how translators are trained. Whereas interpreter training usually incorporates a combination of cognitive training that aims at developing the trainee's memory and inhibition capabilities, to my knowledge, these tasks are not often part of the translation academic curriculum. In light of these results, I argue that

[28] As anecdotal evidence, although strongly related to inhibition during the translation process, I would like to briefly comment on the reflections made by participant PROF 11. This participant said, about translating the sentence "*La chica volvió de la boya nadando*", "'*Volvió*' impacted me, I stuck with '*volvió*' and it marked my use of 'returned'". What PROF11 is actually expressing with simple words is that her inhibition failed her in the following manners: First, her inhibitory control resources could not prevent 'returned' (which drives the verb-framed lexicalization pattern) from gaining access to the focus of attention; secondly, she couldn't delete it from consideration, and finally restraint from producing the prepotent response was not exerted. As a result, the translation produced for the sentence was "The girl returned swimming from the *boya*".

more attention should be paid to the development and enhancement of these cognitive factors in the translation classroom along with the inclusion of research-informed decisions on what best practices look like for this specific training. In particular, I suggest two potential routes of application: The first one implies bringing into the classroom inhibitory control training independent from the trainees' working languages and assessing if such training is successful in cognitive development and has an effect over the appropriateness of the students' translations; the second one would entail working with language-dependent inhibition training instead. Thus, comparison and evaluation of an array of cognitive training would be attainable.

The third finding is related to how academic training affects translation performance versus how professional experience does. Significant differences in frame switch percentages were observed between the non-translator bilinguals and the novice translators in both experimental tasks but the data failed to show similar differences between the novices and the professional translators. Consequently, the competitive edge in frame switch ability seems to come from training not practice. This refutes the common belief that any bilingual may act as a translator. Although non-translator bilinguals may in fact produce usable translations, they will deviate from optimal target solutions more than bilinguals who have completed translation training, even if it is as short as a semester long. It appears that the nature of the academic training, such as acquisition of a strong theoretical foundation, guided practice, and meaningful feedback, may be driving a big performance gap between the non-translators and novices. This training brings about a series of gains that are reflected in the switch percentages and gives the trainees not only enhanced linguistic-based translation skills but also a

theoretical knowledge that allows them to make decisions as to what represents a faithful non-literal translation. Although professionals performed at the highest switch percentages, those were enough to differentiate themselves from the non-translators but not from the novices. However, professionals did show enhanced efficiency when compared to the novices, since they took fewer pauses when translating. This may indicate that the task required less cognitive effort on their part because through professional practice they have learnt how to deal with self-directed motion expressions and have automatized the processes (as understood in the SPaM Model) necessary to produce a frame-switched English expression.

So far, this chapter has focused on integrating the results of this dissertation to answer the research questions initially posited. This section has summarized the main merits of this dissertation; it is now necessary to mention its limitations and to suggest future lines of research to address them in the two final sections of the chapter.

5.7. Limitations

As previously reported in Section 5.6, the current study offers valuable insights in three main areas, which are the psycholinguistic processes at work during the translation of verb-framed self-directed motion expressions from Spanish into English satellite-framed expressions, and the role of cognitive and external factors on said translation.

This dissertation argues that the translation process necessary to achieve a successful frame switch relies on the following psycholinguistic processes: concept access, relexicalization, syntactic remapping. The data seem to support this translation model. Yet, this design does not allow for pinpointing where the process fails when the

participant is unable to produce a frame switch. While the successful frame switch would show the final picture of the completed process posed by the model, a translated sentence that retains the Spanish lexicalization pattern would be evidence of a failure at some point in the steps, although the specific failed step cannot be teased apart. As a consequence, the first and main limitation of this dissertation is that it cannot provide a concrete response to what happens when the frame switch does not occur.

A second limitation is related to the measurement of inhibition and memory in the present study. In order to have all the experimental tasks completed in one session, only one test of each cognitive factor was employed. Consequently, the lack of statistical significance found for working memory capacity, facilitatory effects, interference effects, and Flanker effects may be an artifact derived from insufficient assessment of these variables. Different results may have been obtained if inhibitory tests such as the Simon or the Stroop tasks had been used or if additional working memory testing had been included.

A third limitation concerns the experimental design in two ways: First, although the bilingual group reached a healthy number of participants (N = 34), the novice and professional groups did not achieve a similar number (N = 16 and N = 20, respectively). Therefore, more subjects should be sought to confirm the trends observed with the current recruitment numbers. Secondly, a consideration about the number of target sentences and the ratio of target sentence and fillers is in order. While six target sentences per task is an adequate number of stimuli, a larger number of sentences would allow to further tease apart other factors that may affect the translation product, such as lexical frequency or cognate status. Moreover, a larger number of fillers would also help mask

what the task is really testing, hence a smaller target sentence to filler ratio would be advisable.

A final limitation pertains to the language pair, directionality, and unique item studied in this dissertation. The conclusions herein inferred are intrinsically linked to the translation of self-directed motion expressions from Spanish into English and need further support from experimental studies in other language pairs, directionality, and on other unique items. For instance, is the translation of self-directed motion from English into Spanish and from French into English similarly affected by the internal and external factors discussed in this dissertation? Is the translation of resultative expressions from Spanish into English conditioned by said factors?

Notwithstanding these limitations, inhibitory control, academic training, and professional practice emerged as reliable predictors in the translation of Spanish verb-framed self-directed motion expressions into English satellite-framed self-directed motion expressions. Further research needed to overcome these shortcomings and build on the current results is discussed next.

5.8. Future research

The questions raised by this dissertation aimed at providing a psycholinguistic model to explain and predict potential translation outcomes, as well as at understanding what the role of several internal and external factors in translation performance is. These questions have been discussed and responded in depth in this chapter, however further work needs to be done in order to establish the reliability and applicability of these results and to farther our current knowledge of translation processes beyond the current study.

The issue of where the frame switch failure lies in the SPaM Model Test is one of paramount importance. Being able to pinpoint which of the steps is the weakest link in this model would allow language and translation instructors to tackle those processes and work on the development of strategies to overcome such failures. Novel experimental designs that provided clear-cut distinctions among the main processes delineated in the model will be needed in order to be able to answer this question. A first approach to achieve this might involve a multi-step experimental design where source language sentence comprehension and target language sentence production are tested in separate stages. A preliminary design would look as follows: Participants read a Spanish verb-framed motion expression and must choose an appropriate paraphrased sentence (also in Spanish) that matches the motion event from a number of alternatives. This step would allow us to determine if the participants can successfully interpret the motion event as a complex one. Then, participants would be asked to translate a Spanish verb-framed motion expression into English. If comprehension was successful but the frame switch was not, a failure in relexicalization and syntactic remapping processes may be to blame. Obviously, this is a very rough and rudimentary approach but, after further refining, a better understanding of the weakest link in the translation process may be acquired.

Additionally, both the model and the role of the individual factors included in this dissertation must continue to be tested in a number of ways to establish a greater degree of accuracy on the conclusions previously discussed. First of all, the experiments could be replicated employing the same structures and language pair but switching the translation direction and the language dominance of the participants. That is, Spanish-dominant bilinguals whose second language is English would translate "The boat floated

into the cave" into Spanish. Moreover, similar experiments could be carried out with French-English bilinguals.

On the other hand, a very relevant question has been left unanswered by the results put forth in this dissertation. Considering that working memory scores and all of the inhibition measures except for the Flanker no-go trial score turned out not to be significant covariates in the frame switch analyses, one is left wondering what other internal factors, if any, may play a significant role in said switch frames. In other words, besides academic training and professional experience, what cognitive individual differences may drive performance differences across groups in both tasks? A plausible answer to that question that needs to be substantiated with further research is attentional resources. Attention control is defined as "the ability to switch attention between different dimensions relevant to a task" (Darcy *et al.*, 2014:116). Attention control has been found to be a factor in second language learning and development (Francis *et al.*, 2000; Segalowitz and Frenkiel-Fishman, 2005; Safronova and Mora, 2013; Darcy *et al.*, 2014; Mora and Darcy, 2017, among others). Consequently, it can be hypothesized that attentional resources, that is, the ability to appropriately allocate attention and to switch and alternate the focus of said attention among different aspects of the task at hand, may play a role in the translation of self-directed motion expressions. Particularly, more attentional resources or more efficient attention might allow the bilingual or the translator to notice not only the surface structure of the source text, but also productive schematic constructions, particular linguistic relationships, and complex semantic events both in the source and the target language. Therefore, I argue for the inclusion of attention measurements (whether from the dual-task paradigm, the attention-shifting paradigm, or

a novel translation-specific design) in future research in order to explore how attentional resources modulate translation production.

Further investigation and experimentation is strongly recommended to support or refute the role of the aforementioned factors on additional unique items that involve lexical and syntactic operations, such as the resultative structures used as distractors in this dissertation, as well as unique items that may entail only a mostly lexical or mostly syntactic operation (for instance, decreased lexical creativity in translated texts versus spontaneously produced texts, the use of imperfect/preterit past tenses in translated Spanish (from English), or adjectival positioning in translated Spanish (from English)).

Crucially, following experimental designs as the one used in Kruger (2016), the integration of stage-of-the-art technologies, such as eyetracking, with more traditional methodologies, as the key-logging used in the present dissertation, must be employed in order to obtain a more complete picture of the processes and factors at play during the translation process of self-directed motion expressions from Spanish into English, as well as other unique items.

Moreover, final considerations as to how the findings presented here may be utilized in enhancing translation training and how translation education affects translation production are pertinent. As previously stated, being able to discern where the translation process fails within the SPaM Model frame would be of invaluable usefulness equally for the field of second language acquisition and for translation theories. Nevertheless, a second outcome can be greatly exploited in the translation classroom and that is the fact that inhibitory control, but not working memory, seems to play a key role in translation success. Therefore, further research must also be conducted to determine ways to bring

executive function training into the translation classroom and to evaluate the effectiveness of such training on the evolution of the trainees' translation performance. Lastly, future studies must explore the effect of instruction (having undergone instruction and which types) versus the effect of professional practice alone. In other words, is performance by translation trainees different from performance by professional translators without formal training? If so, how are they different and what triggers those differences? Is performance by translation trainees different according to the type of instruction they received (intensive professional training versus undergraduate-/graduate-level courses?

APPENDICES

Appendix A: Spanish Proficiency Test (DELE Test)

Part I: Multiple Choice Test

Each of the following sentences contains a blank indicating that a word or phrase has been omitted. Select the choice that best completes the sentence.

1. Al oír del accidente de su buen amigo, Paco se puso _____.
a. alegre b. fatigado c. hambriento d. desconsolado

2. No puedo comprarlo porque me_____.
a. falta b. dan c. presta d. regalan

3. Tuvo que guardar cama por estar _____.
a. enfermo b. vestido c. ocupado d. parado

4. Aquí está tu café, Juanito. No te quemes, que está muy _____.
a. dulce b. amargo c. agrio d. caliente

5. Al romper los anteojos, Juan se asustó porque no podía _____ sin ellos.
a. discurrir b. oír c. ver d. entender

6. ¡Pobrecita! Está resfriada y no puede _____.
a. salir de casa b. recibir cartas c. respirar con pena d. leer las noticias

7. Era una noche oscura sin _____.
a. estrellas b. camas c. lágrimas d. nubes

8. Cuando don Carlos salió de su casa, saludó a un amigo suyo: -Buenos días,____.
a. ¿Qué va? b. ¿Cómo es? c. ¿Quién es? d. ¿Qué tal?

9. ¡Qué ruido había con los gritos de los niños y el _____ de los perros!
a. olor b. sueño c. hambre d. ladrar

10. Para saber la hora, don Juan miró el _____.
a. calendario b. bolsillo c. estante d. despertador

11. Yo, que comprendo poco de mecánica, sé que el auto no puede funcionar sin _.
a. permiso b. comer c. aceite d. bocina

12. Nos dijo mamá que era hora de comer y por eso _____.
a. fuimos a nadar c. comenzamos a fumar
b. tomamos asiento d. nos acostamos pronto

13. ¡Cuidado con ese cuchillo o vas a _____ el dedo!
a. cortarte b. torcerte c. comerte d. quemarte

14. Tuvo tanto miedo de caerse que se negó a _____ con nosotros.
a. almorzar b. charlar c. cantar d. patinar

15. Abrió la ventana y miró: en efecto, grandes lenguas de _____ salían llameando de las casas.
a. zorros b. serpientes c. cuero d. fuego

16. Compró ejemplares de todos los diarios pero en vano. No halló _____.
a. los diez centavos c. la noticia que deseaba
b. el periódico perdido d. los ejemplos

17. Por varias semanas acudieron colegas del difunto profesor a _____ el dolor de la viuda.
a. aliviar b. dulcificar c. embromar d. estorbar

18. Sus amigos pudieron haberlo salvado pero lo dejaron _____.
a. ganar b. parecer c. perecer d. acabar

19. Al salir de la misa me sentía tan caritativo que no pude menos que _____ a un pobre mendigo que había allí sentado.
a. pegarle b. darle una limosna c. echar una mirada d. maldecir

20. Al lado de la Plaza de Armas había dos limosneros pidiendo _____.
a. pedazos b. paz c. monedas d. escopetas

21. Siempre maltratado por los niños, el perro no podía acostumbrarse a ____ de sus nuevos amos.
a. las caricias b. los engaños c. las locuras d. los golpes

22. ¿Dónde estará mi cartera? La dejé aquí mismo hace poco y parece que el necio de mi hermano ha vuelto a _____.
a. dejármela b. deshacérmela c. escondérmela d. acabármela

23. Permaneció un gran rato abstraído, los ojos clavados en el fogón y el pensamiento ____.
a. en el bolsillo b. en el fuego c. lleno de alboroto d. Dios sabe dónde

24. En vez de dirigir el tráfico estabas charlando, así que tú mismo _____ del choque.
a. sabes la gravedad c. tuviste la culpa
b. eres testigo d. conociste a las víctimas

25. Posee esta tierra un clima tan propio para la agricultura como para _____.
a. la construcción de trampas c. el costo de vida
b. el fomento de motines d. la cría de res

26. Aficionado leal de obras teatrales, Juan se entristeció al saber _____ del gran actor.
a. del fallecimiento b. del éxito c. de la buena suerte d. de la alabanza

27. Se reunieron a menudo para efectuar un tratado pero no pudieron _____.
a. desavenirse b. echarlo a un lado c. rechazarlo d. llevarlo a cabo

28. Se negaron a embarcarse porque tenían miedo de _____.
a. los peces b. los naufragios c. los faros d. las playas

29. La mujer no aprobó el cambio de domicilio pues no le gustaba _____.
a. el callejeo b. el puente c. esa estación d. aquel barrio

30. Era el único que tenía algo que comer pero se negó a _____.
a. hojearlo b. ponérselo c. conservarlo d. repartirlo

Part II: Cloze Test

In the following text, some of the words have been replaced by blanks numbered 1 through 20. First, read the complete text in order to understand it. Then reread it and choose the correct word to fill each blank from the answer sheet. Mark your answers by circling your choice on the answer sheet, not by filling in the blanks in the text.

El sueño de Joan Miró

Hoy se inaugura en Palma de Mallorca la Fundación y Joan Miró, en el mismo lugar en donde el artista vivió sus últimos treinta y cinco años. El sueño de Joan Miró se ha _____(1). Los fondos donados a la ciudad por el pintor y su esposa en 1981 permitieron que el sueño se ___(2); más tarde, en 1986, el Ayuntamiento de Palma de Mallorca decidió ____(3) al arquitecto Rafael Moneo un edificio que _____(4) a la vez como sede de la entidad y como museo moderno. El proyecto ha tenido que ___(5) múltiples obstáculos de carácter administrativo. Miró, coincidiendo _____(6) los deseos de toda su familia, quiso que su obra no quedara expuesta en ampulosos panteones de arte o en _____(7) de coleccionistas acaudalados; por ello, en 1981, creó la fundación mallorquina. Y cuando estaba _____(8) punto de morir, donó terrenos y edificios, así como las obras de arte que en ellos _____(9).

El edificio que ha construido Rafael Moneo se enmarca en _____(10) se denomina "Territorio Miró", espacio en el que se han _____(11) de situar los distintos edificios que constituyen la herencia del pintor.

El acceso a los mismos quedará _____(12) para evitar el deterioro de las obras. Por otra parte, se _____(13), en los talleres de grabado y litografía, cursos _____(14) las distintas técnicas de estampación. Estos talleres también se cederán periódicamente a distintos artistas contemporáneos, _____(15) se busca que el "Territorio Miró" ___(16) un centro vivo de creación y difusión del arte a todos los ____(17).

La entrada costará 500 pesetas y las previsiones dadas a conocer ayer aspiran ___ (18) que el centro acoja a unos 150.000 visitantes al año. Los responsables esperan que la institución funcione a _(19) rendimiento a principios de la _____ (20) semana, si bien el catálogo completo de las obras de la Fundación Pilar y Joan Miró no estará listo hasta dentro de dos años.

Cloze Test Answer Sheet

1.	a. cumplido	b. completado	c. terminado
2.	a. inició	b. iniciara	c. iniciaba
3.	a. encargar	b. pedir	c. mandar
4.	a. hubiera servido	b. haya servido	c. sirviera
5.	a. superar	b. enfrentarse	c. acabar
6.	a. por	b. en	c. con
7.	a. voluntad	b. poder	c. favor
8.	a. al	b. en	c. a
9.	a. habría	b. había	c. hubo
10.	a. que	b. el que	c. lo que
11.	a. pretendido	b. tratado	c. intentado
12.	a. disminuido	b. escaso	c. restringido
13.	a. darán	b. enseñarán	c. dirán
14.	a. sobre	b. en	c. para
15.	a. ya	b. así	c. para
16.	a. será	b. sea	c. es
17.	a. casos	b. aspectos	c. niveles
18.	a. a	b. de	c. para
19.	a. total	b. pleno	c. entero
20.	a. siguiente	b. próxima	c. pasada

Answer Key: Multiple Choice Test

1. d	7. a	13. a	19. b	25. d
2. a	8. d	14. d	20. c	26. a
3. a	9. d	15. d	21. a	27. d
4. d	10. d	16. c	22. c	28. b
5. c	11. c	17. a	23. d	29. d
6. a	12. b	18. c	24. c	30. d

Answer Key: Cloze Test

1. a	6. c	11. b	16. b
2. b	7. b	12. c	17. c
3. a	8. c	13. b	18. a
4. c	9. b	14. a	19. b
5. a	10. c	15. b	20. b

Appendix B: Background Questionnaire for Participants

A. <u>ALL PARTICIPANTS*** Please answer questions 1-6 to the best of your ability.</u>***

1. Please complete the table below.

Today's Date		*Participant Code*	
Years of translation training			
Years and months of translation experience (divide part-time experience by 2 and add it to your full-time experience)			

2. Please list all the languages you know <u>in order of acquisition</u> (your native language first) and your highest education degree in each language.

Language	*Age of acquisition*	*Highest education diploma*

3. Please list all the languages you know <u>in order of dominance.</u>

1		*2*		*3*		*4*		*5*	

4. In a regular week, what percentage of time do you use each language in the following settings/situations? (L1 is most dominant language, L2 is second most dominant language, etc.)

	L1:	***L2:***	***L3:***	***L4:***	***L5:***
At home	*%*	*%*	*%*	*%*	*%*
At work	*%*	*%*	*%*	*%*	*%*
At school	*%*	*%*	*%*	*%*	*%*
With relatives	*%*	*%*	*%*	*%*	*%*
With friends	*%*	*%*	*%*	*%*	*%*
Reading	*%*	*%*	*%*	*%*	*%*
TV/radio	*%*	*%*	*%*	*%*	*%*

5. Please list countries where you have lived. Include the US if you were born abroad.

Country	*Years*	*Months*	*Your age at that time*

6. Have you translated or interpreted in informal, non-professional contexts for family members, friends, coworkers, etc.?

Yes ☐ Please, explain briefly:

No ☐

B. <u>TRANSLATORS ONLY*** Please answer questions 7-9 in regard to your professional experience to the best of your ability.</u>***

7. Please list all the language combinations (indicate translation direction as well) you use in your professional practice and the percentage of time you work on each language combination in a regular month.

Language combination and direction	*Percentage of time you work on it*

8. Please list all your academic degrees related to Translation. Include all training/certifications, and indicate the issuing institution (college, professional organization, etc.). If you took courses on Translation that did not lead to a degree or certification, please list those as well.

Degree/Certification/Course	*School/Organization*

9. Please indicate the percentage of time you work on each of the following text types in a regular month.

Text type	*Percentage of time you work on it*
Legal	
Medical	
Scientific	
Literary	
Business/Economy	
Technical/Technology	
Marketing/Advertisement/ Copywriting	
Localization	
News (hard copy or digital format)	
Other (enter text type):	
Other (enter text type):	

Appendix C: Stimuli for OTT

Practice 1. A Carlos le gustan las playas de California.

Practice 2. Las clases empiezan a las ocho de la mañana.

Practice 3. El verano pasado mi hermana leyó cinco libros.

1. El cerrajero aplanó la llave con el martillo.
2. El aparato circulatorio consiste en tres sistemas independientes.
3. La mosca entró en la cocina volando.
4. La temperatura depende de la presión atmosférica.
5. El pastelero aplastó la masa con el rodillo.
6. La tortuga salió del puerto flotando.
7. La profesora cuenta con la estudiante asistente.
8. La señora limpió la acera con la pala.
9. El conejo subió a la silla saltando.
10. La criada secó los platos con la toalla.
11. El gusano cayó de la mesa rodando.
12. El cantante se acordó de felicitar a su hermano.
13. El sastre alisó la camisa con la plancha.
14. El caballo se alejó del establo galopando.
15. El tenista trató de ganar a su rival.
16. La chica volvió de la boya nadando.
17. La limpiadora abrillantó el suelo con cera.
18. La secretaria ha preguntado por el horario de verano.

Appendix D: Stimuli for SPR-T

Practice 1. Mi tío pasó seis meses en China como profesor de español.

Practice 2. Nosotros pensábamos que la clase de física empezaba a las nueve.

Practice 3. Alejandra quiere comprar una televisión para ver películas en su cuarto.

1. La presentadora informa del estado de las carreteras.
2. El vendedor abrió la avellana con el cascanueces.
3. El pájaro rojo salió de la casa volando.
4. La experta suavizó las uñas con la lima.
5. El peluquero coreano soñó con la modelo rubia.
6. La mariposa azul entró en la cueva flotando.
7. La niña se ha reído de su compañera de clase.
8. El limpiador frotó el sofá con el cepillo.
9. El burro blanco volvió a la granja galopando.
10. El estudiante ha traducido la novela al inglés.
11. El niño se alejó de la roca nadando.
12. La doctora mojó la herida con el spray.
13. La enfermera felicitó al paciente por su mejoría.
14. El carpintero recortó el tronco con la sierra.
15. La araña negra bajó por la escalera botando.
16. La ardilla oscura subió a la rama zigzagueando.
17. La abuela limpió la alfombra con la aspiradora.
18. El padre se quejó del comportamiento del hijo.

Appendix E: Stimuli for LNST

TYPE	STIMULUS	CORRECT ANSWER
Practice	5PB	5BP
	H47	47H
	R3M	3MR
2 CHARACTERS	2J	2J
	C6	6C
	F8	8F
3 CHARACTERS	4G1	14G
	J7N	7JN
	9S4	49S
4 CHARACTERS	5W3L	35LW
	A8C1	18AC
	2Y8E	28EY
5 CHARACTERS	P4H6K	46HKP
	9B7H2	279BH
	3I1QM	13IMQ
6 CHARACTERS	4N9B5R	459BNR
	T8V6C1	168CTV
	3Y2D7K	237DKY
7 CHARACTERS	F8L2N5V	258FLNV
	6N7H3D4	3467DHN
	9R4Q1M8	1489MQR
8 CHARACTERS	X5A8S4K2	2458AKSX
	W1H9P7Q3	1379HPQW
	5X9N3R6C	3569CNRX

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