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L2 Effect on Bilingual Spanish/English Encoding of Motion Events: Does Manner Salience Transfer?

Heidi E. Parker
Purdue University

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Is approved by the final examining committee:

Robert M. Hammond
Chair

Lori A. Czerwionka

Elaine J. Francis

Daniel J. Olson

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L2 EFFECT ON BILINGUAL SPANISH/ENGLISH ENCODING OF MOTION EVENTS: DOES MANNER SALIENCE TRANSFER?

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A mi familia. Los amo con toda mi alma.

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ABSTRACT

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This study explores the potential effect of a second language (L2) on first language (L1) encoding of motion events. The domain of interest is MANNER and the goal is to investigate if the degree of *manner salience* can be restructured under the effect of a L2. Slobin (2004, 2006) proposes an expansion of Talmy's (1985, 1991, 2000) binary typology and observes that the degree of *manner salience* varies cross-linguistically. The two languages investigated in this study, Spanish and English, are at divergent points along the cline of manner salience. In addition, Slobin (1996b) suggests dividing MANNER into tier one (T1) manner and tier two (T2) manner. T1-MANNER is available in both Spanish and English, but T2-MANNER is not readily available in Spanish.

Thus, it is postulated that if L2 transfer of *manner salience* occurs, a strong piece of evidence would be to observe an increase in the encoding of T2-MANNER in Spanish. In order to test this idea, the methodology and some of the stimuli from Sakurai (2014) were adapted. The experimental group consisted of adult L1-Spanish/L2-English bilinguals (n = 11 females; n = 19 males; M = 34.23 years of age, with SD = 10.32)

and the control group consisted of adult L1-English speakers (n = 7 females; n = 13 males; M = 33.55 years of age, with SD = 11.91). There were two linguistic tasks and two non-linguistic tasks. The linguistic tasks involved narrating stories from Mayer's (1969) picture book *Frog, Where Are You?* and from a custom-made animation created from episodes of *Gazoon* (Villemaine & Trouvé, 2007). The two non-linguistic tasks consisted of a MANNER/PATH categorical task and a MANNER/PATH similarity task originally designed by Sakurai (2014) and modified in the current study. In addition, the Bilingual Language Profile, BLP (Birdsong et al., 2012) was administered to the experimental group in order to assess the relationship (if any) between the L2 dominance scores and the performance in the tasks.

The results show that both groups encoded more MANNER in the second linguistic task (the animation) as compared to the first linguistic task (the picture book). There are no statistically significant differences between groups for the proportions of MANNER encoded in the linguistic tasks. However, there is a significant positive correlation ($p < 0.01$) between the L2 dominance scores and the encoding of T2-MANNER in the animation. This suggests that the effect goes beyond variances in stimulus type: subjects with high L2 dominance scores produced more MANNER expressions characteristic of their L2. The results for the non-linguistic tasks show that the L1-English speakers preferred MANNER to a significantly greater degree than the bilinguals in the first task ($p < 0.01$). These results conform to the expected lexicalization patterns. There are no significant differences among groups for the second non-linguistic task in regards to MANNER. However, there are significant correlations ($p <$

0.05) between L2 dominance score and these results. The higher the L2 dominance score, the higher the average MANNER rating and the lower the average PATH rating. Further analyses reveal that the initial between-group difference in the categorical task disappears when the degree of L2 dominance is taken into account. That is, the subjects with L2 dominance scores above the median preferred and rated MANNER in a similar way to the control group in both non-linguistic tasks. Overall, these preliminary findings support the idea of a L2 effect on motion event cognition which could make MANNER more salient in the L1. These results have implications in the fields of cognitive linguistics, linguistic relativity, linguistic typology, second language acquisition, and motion-event experimentation. More data needs to be collected to further validate these results.

CHAPTER 1. INTRODUCTION

1.1 Purpose of this Study

The current study explores if learning a second language (L2, henceforth) has an effect on motion-event description and cognition. It treats the L2 speaker as a many-sided whole in whom both languages interact with several mental systems, not only as a holder of grammar and lexicon, but with the understanding that there is a complex relationship between language and cognition (Cook, 2015). Following Sakurai (2014), the aim is to combine well-documented research that has a cognitive lexical semantics approach i.e., studies following Talmy's (1985) typology and Slobin's (1996a) Thinking-for-Speaking view, with investigations that use a psycholinguistic approach to L2 cognition (see Table 1.3 at the end of this chapter for related references). Regardless of using one approach or the other (or both), the goal of this study is to shed some light on the controversial question posed by linguistic relativity (Lucy, 1992a, 1992b; Whorf 1956; Whorf, Carroll, Levinson, & Lee, 2012): *Does the language we speak influence the way we think?* Bylund and Athanasopoulos (2015) extend this question to second language acquisition (SLA, henceforth) and state that if the answer to this question is affirmative, then:

What happens when we learn another language? Do we acquire the thought patterns of the speakers of that language?

The intention of this introductory chapter is not to argue for or against the proposals that linguistic relativity brings forth; this debate has been going on for decades and much has been written about it (see Table 1.3). Neither is it to redefine Talmy's (1985) typology or discuss Slobin's (1996a) Thinking-for-Speaking hypothesis; these topics have also been extensively discussed from various perspectives in the literature (see Table 1.3). Rather, the focus of this chapter is to discuss the key concepts investigated in the current study from a neutral position and with the expectation that the data collected in the experiments will yield interesting results to enrich this growing L2 research area.

1.2 The Linguistics of Motion Events

As Levinson remarks in Whorf et al. (2012, p. xiv), since 1954 researchers argued that language and thought should be experimentally separated in order to better understand the relationship and potential correlation between them. The author explains that this is how the long tradition of studying language-specific coding in a particular domain (and the corresponding potential effect in cognition) began. The first domain to be studied was the color domain, with other domains like number (grammatical and lexical), mass/count distinctions, sound systems, time, space, motion, gender (among others) following years later after the interest in the effect of language

and cognition was revived in the 1990s (see Sakurai 2014 for a review of studies investigating the color domain). Relevant to the current study is the motion domain and a brief discussion of the relevant concepts follow.

As noted by various researchers (McNeill, 2000; Papafragou, Massey, & Gleitman, 2006; Papafragou & Selimis, 2010; Sakurai, 2014), one of the main advantages of studying the motion domain is the vast cross-linguistic data that have been collected over the years. A key player in triggering the interest in studying motion was Leonard Talmy (1985, 1991, 2000) whose typology gave raise to various cross-linguistic studies in this area.

When humans conceptualize an event involving motion (a motion event), the scene generally contains what Talmy defines as a FIGURE, the object or entity undergoing the movement, and the GROUND, the surface where the motion is occurring (e.g., a road, a table, the floor). In addition, there are other aspects that define the motion event such as the PATH, the direction the movement follows, and the MANNER, the specific way in which the motion happens. For instance, one can say *I walked along the beach* or *I ran along the avenue*. Both cases have the same PATH and FIGURE, but vary in GROUND (beach and avenue) and MANNER (walked and ran). The typology arose when Talmy observed that the way in which different languages encode MANNER and PATH vary; and the two languages explored in this study, Spanish and English, are a prime example of the dichotomy. Thus, even though the current understanding is that Talmy's initial binary division may be too simplistic given the data yielded from other languages (Brown & Chen, 2013; Chen & Guo, 2009; D. Slobin, 2006), both English and

Spanish seem to fit this typology well, so these notions are taken into consideration in this work. The dominant patterns for these languages is explained below.

The overwhelmingly common pattern in Spanish is for PATH to be encoded in the verbs, for instance *entrar* 'go in', *salir* 'go out', *subir* 'go up', *bajar* 'go down'. When a Spanish speaker reads or hears these verbs, the PATH of motion in clearly understood by the person, without the need of any additional information. If the expression of more detailed MANNER becomes necessary to describe an event, Spanish has the option to express it using another verb: *entrar caminando* 'go in walking' or *entrar corriendo* 'go in running'. In contrast, English overwhelmingly encodes MANNER in the verb with the exception of verbs derived from Latin, such as *enter* from Latin *intrāre* 'to enter' which just as in Spanish, encode PATH. To express PATH, English uses another particle, usually a preposition as in *he walked in* or *he walked out*. Note that these examples have the same MANNER (walked) but different PATH (in or out). Talmy labeled these two contrasting lexicalization patterns as *verb-framed languages* (V-languages henceforth) which are languages that encode PATH in the verb, like Spanish; and *satellite-framed languages* (S-languages henceforth) which are languages that encode PATH using a satellite, like English.

An important observation is that PATH is a necessary component of all motion events and cannot be omitted when encoding or expressing them (Slobin, 2004). In other words, the expression of specific MANNER in a motion event is often optional in Spanish, you can either say *subo las escaleras* 'I go up the stairs' or *subo las escaleras corrriendo* 'I go up the stairs running'. In English, PATH is never optional and expressions

like *I ran house*, *I crawled floor* or *I climbed tree* are ungrammatical because the PATH of motion is not encoded in those expressions. Thus, the distinction should not be understood as one language prefers PATH and the other language prefers MANNER. Both languages will always encode PATH, but S-languages (in general) have a much broader inventory of MANNER verbs and thus express more fine-grained MANNER descriptions of motion events in comparison to V-languages. Some examples illustrating this tendency are presented by Slobin (2004) and shown in Table 1.1 below (the Spanish and English examples are highlighted in grey). The sentences contrast how speakers from V-languages and speakers from S-languages tend to describe one single motion event: an owl coming out of a tree.

Table 1.1 Examples from Slobin (2004, p. 6) illustrating the motion verbs used among speakers from V-languages and S-languages when describing the same motion event. V-languages tend to use the same single PATH verb (to exit) while S-Languages tend to use some kind of MANNER verb together with a PATH satellite to add dynamic information about the event.

V-languages
a. Spanish: ***Sale*** *un buho.* (=**Exits** an owl.) b. French: *D'un trou de l'arbre* ***sort*** *un hibou.* (=From a hole of the tree **exits** an owl.) c. Italian: *Da quest' albero* ***esce*** *un gufo.* (=From that tree **exits** an owl.) d. Turkish: *Oradan bir baykus* ***çıkıyor****.* (=From there an owl **exits**.) e. Hebrew: ***Yaca*** *mitox haxor yanšuf.* (=**Exits** from:inside the:hole owl.)
S-languages
a. English: *An owl* ***popped out***. b. German: *…weil da eine Eule plötzlich* ***raus-flattert***. (=…because there an owl suddenly **out-flaps**) c. Dutch: *…omdat er een uil* ***uit-vliegt***. (=…because there an owl **out-flies**) d. Russian: *Tam* ***vy-skočila*** *sova.* (=There **out-jumped** owl.) e. Mandarin: ***Fei1-chu1*** *yi1 zhi1 mao1 tou2 ying1.* (=**Fly out** one owl.)

This lexicalization pattern seems to cause English speakers to interpret and recall more MANNER when presented with motion-event stimuli, even when presented with novel motion verbs. Cifuentes-Férez & Gentner (2006), used a novel word mapping technique to test whether English and Spanish speakers would show differences in inferring meaning of novel nouns and verbs. The technique consisted in subjects reading eight short passages containing a novel verb or a novel noun. Cifuentes-Férez & Gentner (2006, p. 447) provide the following examples of novel verbs:

English:	Spanish:
he *bordeured* the tree;	Así que *bordeuró* al árbol;
he *truffeted* his clothes;	Lo *truffeteaba* por la ropa;
and *managed to blick* The Rock.	y *logró blicker* a La Roca.

After reading the passages, subjects were asked to answer questions like ‘‘what does X mean?’’ and ‘‘what is an X?’’. They found that participants showed systematic differences in which elements they mapped from context depending on whether the novel term was a noun or a verb. When presented with novel motion verbs, English speakers were more likely to infer a MANNER interpretation and Spanish speakers were more likely to infer a PATH interpretation. They did not find any language-specific effects with the inferred meanings of novel nouns. Cifuentes-Férez and Gentner concluded that the semantic patterns identified by Talmy do indeed play a generative role in verb understanding and in inferring new verb meanings, but noted that MANNER

is the domain that is habitually encoded differently in S-languages. Figure 1.1 below shows the results for the proportions of MANNER and PATH verbs in their study.

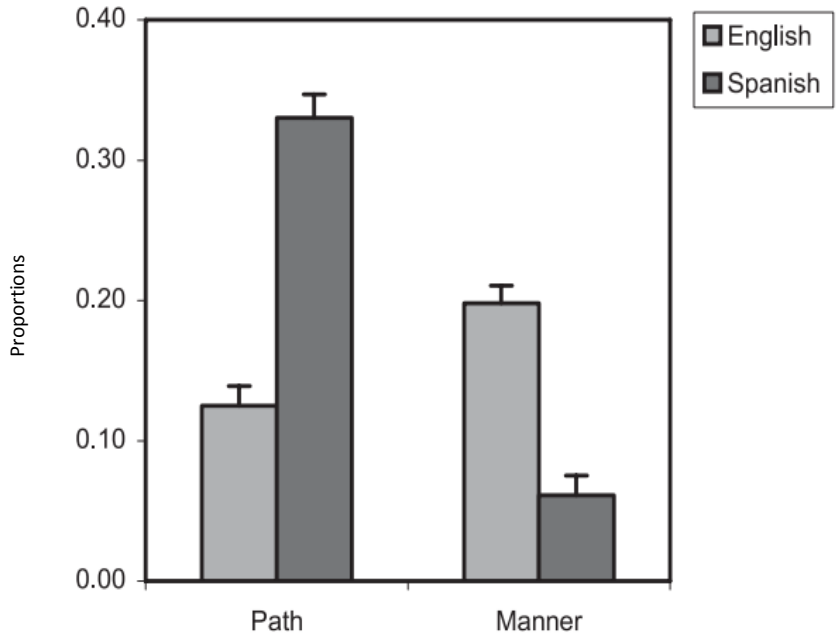

Figure 1.1 Results from Cifuentes-Férez & Gentner (2006). Proportions of manner and path main verbs in participants' interpretations of novel verbs. Spanish speakers produced significantly higher number of PATH verbs than English speakers and English speakers produced significantly more MANNER verbs than Spanish speakers when encoding novel verbs. Adapted from "Naming motion events in Spanish and English" by P. Cifuentes-Férez and D. Gentner, 2006, Cognitive Linguistics 17–4 (2006), p. 450. Copyright 2006 by Walter de Gruyter. Adapted with permission.

Strong effects have also been found when studying infants and children's ability to discriminate and encode MANNER and PATH (see note 1 for references). For instance, Allen et al. (2007) investigated the syntactic packaging of MANNER and PATH for Turkish, English and Japanese children. Their stimuli contained salient instances for both MANNER and PATH and the domains occurred simultaneously. The researchers found

that children used the semantic-syntactic mappings preferred by adult speakers of their native languages.[1]

An additional intriguing piece of evidence about the uniqueness of these motion event dimensions comes from neuroscience. Even though there seems to be a growing number of studies in this field that look at the way meaning is encoded in the brain (see Kemmerer 2010 for a review of relevant studies), very few have looked specifically at MANNER. Part of the reason MANNER has not been carefully analyzed may be, as Kemmerer (2010) notes, that cross-linguistic variation in lexical-semantic systems has been ignored by most researchers who are investigating the organization, representation, and processing of conceptual knowledge in the brain. He remarks that perhaps as the spatial resolution of brain mapping techniques improves, researchers will be able to eventually test more hypotheses related to the meaning of motion verbs and their respective neural correlates. Still, there are some examples:

[1]Allen et al. (2007) also found that some complex semantics-syntax mappings were more difficult in terms of acquisition; in these cases all children seemed to employ the same strategies (e.g. expressing MANNER and PATH in two verbal clauses). This result is in tune with some of Sakurai's (2014) findings and Allen et al. suggest that there may also be some universal tendencies that can be captured as children are acquiring complex spatial expressions. This seems like a sensible idea but, in the end, after the complex special domain is fully developed, we consistently observe the various cross-linguistic patterns that have been reported in the literature. Since the current study deals with adults, this topic is not elaborated on in detail, see (Allen et al., 2007; Hickmann, Taranne, & Bonnet, 2009; Ochsenbauer & Hickmann, 2010; Pruden, Göksun, Roseberry, Hirsh-Pasek, & Golinkoff, 2012; Pulverman, Song, Hirsh-Pasek, Pruden, & Golinkoff, 2013; Sakurai, 2014; Song, Pruden, Golinkoff, & Hirsh-Pasek, 2016; Wu, 2008) for additional discussions of infants and children's developmental data for this domain.

Wu (2008), employed custom made short animated clips of a starfish and utilized functional magnetic resonance imaging (fMRI henceforth) to test the hypothesis that the perception of and the attention to MANNER and PATH of motion is segregated at the neural level. Wu's results showed that attention to MANNER and PATH are indeed associated with activities in different regions of the brain (fronto-temporal regions and dorsal-parietal areas, respectively). As Wu concludes, these findings strongly support the idea that the nervous system splits motion in a way that parallels the linguistic parsing of a spatial event.

Further investigation took place to see if similar results could be obtained using fMRI when the subjects were reading about (rather than watching) motion events (Quandt, Cardillo, Kranjec, & Chatterjee, 2015). Their stimuli consisted of 72 written triads describing either MANNER (jump, hug, kick, pull, punch, push) or PATH (across, along, around, through, into, up). The subjects had to quickly select the best term that would complete the sentence. The results showed that, just as with the video stimuli, there was more activation in the fronto-temporal regions when describing MANNER of motion. However, they did not find greater activity in the frontal and parietal regions or any other regions during the processing of PATH information. Quandt et al. suggest that this may be due the abstract nature of spatial language in comparison to dynamic visual representations of spatial events (i.e. observing moving objects might engage the path-sensitive regions in the brain more strongly). During that same study, they also found additional areas that were activated during MANNER trials; some of these areas have been previously linked to the generation and inflection of action verbs and to greater

semantic processing. The implications of these findings are that a motion event expression (the authors call it an *action language*) relies on some of the same neural mechanisms involved in the perception of motion events. The noticeable activation when processing MANNER indicates that in a linguistic task, the grammatical distinctions between typical expressions of MANNER and PATH drive further differentiation between these domains. In sum, the findings provide evidence for commonalities between verbal, conceptual and perceptual representations of motion events (labeled simply as *action* by the same authors).

Studies like the ones mentioned above and Slobin's observations (2004, 2006; Slobin et al., 2014) about the varying degrees of *manner salience* in the languages of the world raise the question of whether focusing on MANNER provides a better sense of the effects of this lexicalization pattern in cognition and/or L2 transfer. In addition, PATH is salient in all languages regardless of where they fall in the typologies, so MANNER seems to be a more pertinent construct to explore. Therefore, instead of studying the differences between MANNER and PATH usage (which we already know exist for the languages in question) this study focuses on MANNER.

As mentioned earlier in this chapter, the current study draws from Sakurai (2014) in which his analysis he found significant cross-linguistic differences for MANNER verbs, but not PATH verbs (in the linguistic task). This is not surprising given what is known about the PATH domain. Therefore, the approach followed in the current study is examining differences (if any) in the degree of MANNER descriptions and encoding captured in the data. It is presumed that if an effect from the L2 (English) is to be

observed in the bilingual subjects, the effect is most likely to be seen (if at all) in the way they elaborate MANNER in their descriptions or show a preference for MANNER in the non-linguistic tasks. Additionally, the degree of deviation from the L1 (Spanish) could be affected by the level of dominance in the L2. As will be explained in the following chapter, the degree of L2 dominance was assessed using Birdsong et al. (2012) Bilingual Language Profile (BLP henceforth). The following section further explores the key concept of *manner salience*.

1.3 Key Concept: Manner Salience

Before defining *manner salience*, a better understanding of the MANNER domain is important. As Slobin et al. (2014) note, the concept of MANNER has been poorly defined in the literature:

> A second goal is to refine the poorly-defined dimension of Manner of motion ("an additional activity that the Figure of a Motion event exhibits" – Talmy 2000: 45); "an ill-defined set of dimensions that modulate motion, including motor pattern, rate, rhythm, posture, affect, and evaluative factors" (Slobin 2004, p. 255).

To make things more complicated, not all MANNER verbs can necessarily be considered equal. When Slobin (1996b) first proposed a two-tiered system for these verbs, he classified *neutral* verbs, which are commonly used motion verbs like *go*, *walk*, *climb* and a second tier with more expressive verbs like *dash*, *scramble*, *swoop*. A further illustration to contrast English and Spanish are verbs like *run* or *jump*. In Spanish, there

is basically one first-tier manner verb for each of these actions: *correr* 'run' and *saltar* 'jump'. The English correspondences for these two verbs also fall into Slobin's first-tier manner verbs, but more fine-tuned expressions of running/jumping behavior fall in the second tier, e.g. *sprint*, *scurry*, *scamper*, *hurtle*, *bounce*, *skip*, *spring*, *leap*, *hop*.

Slobin et al. (2014, p. 704) further explain that in S-languages, first-tier verbs are used to classify, for instance, the default way a creature moves. They give the examples *the fish swam to the island* and *the bird flew into the cage* and state that the corresponding (more commonly used) expressions in Spanish would utilize PATH verbs: *el pez fue a la isla* 'the fish went to the island' and *el pájaro entró a la jaula* 'the bird entered the cage' respectively. It is unclear where the supporting evidence comes from for this particular statement, since a Spanish speaker could very well say *el pez nadó a la isla* 'the fish swam to the island'. However, the crucial point becomes evident when looking at the second, more expressive tier: Spanish MANNER verbs usually correspond to those neutral, first-tier motion verbs and thus, it has a much smaller inventory of second-tier manner verbs in comparison to English. From this point forward, we label first-tier manner verbs/expressions as T1-MANNER and second-tier manner verbs/expressions as T2-MANNER.

Slobin (2004, 2006) suggests that the fact that S-languages often encode PATH outside of the main verb with a satellite allows the speakers of these linguistic systems to elaborate more MANNER distinctions in the main verb. This can be easily attested by simply looking at the vast difference in the T2-MANNER inventory among S-languages and V-languages. Then, as Slobin et al. (2014) found, this is where one of the significant

differences reported in literature lies: S-languages show greater lexical diversity (MANNER verb types) in comparison to V-languages, but the significant difference seems to be related to T2-MANNER. This distinction has also led some researchers (Papafragou, Massey, & Gleitman, 2002) to redefine Talmy's labels and to call these contrasting languages simply *Manner languages* (e.g. English, German, Russian, Swedish) and *Path languages* (e.g. Spanish, Japanese, Turkish, Hindi, Modern Greek). As will be seen in the research questions presented later in this chapter, this marked difference between how S-languages and V-Languages encode MANNER presents us with the first opportunity to investigate L2 transfer effects.

Another idea was presented by Slobin (2004, 2006): the concept of *manner salience*. The author proposed that rather than having a binary typology, it is more useful to organize languages on a continuum of *manner salience*. The *cline of manner salience* allows us to re-think the way languages encode MANNER, since as mentioned above, both S-languages and V-languages contain MANNER verbs in their lexical inventories. Slobin (2004) notes that a better question to ask is *how easy or natural is it to add manner information to path expressions in a particular language?* The answer to this question allows us to place languages on varying degrees of *manner salience* and this is how Slobin formulated the *cline of manner salience* (2004 p., 26) shown in table 1.2 below.

Table 1.2 Cline of manner salience, adapted from Slobin (2004, 2006). The High-manner-salient languages have an accessible slot for MANNER, which is made available in various ways. The two relevant language groups for this study are highlighted in grey.

High-manner-salient languages		
LANGUAGE	**MANNER VIA**	**TIPICAL CONSTRUCTION TYPE**
S-Languages (e.g. English, German, Slavic)	main verb	verbMANNER + satellitePATH
Serial-verb languages (e.g. Sino-Tibetan, Tai-Kadai)	manner verb	verbMANNER + verbPATH
Bipartite verb languages (e.g. Hokan, Penutian)	manner morpheme	[manner + path]VERB
Generic verb languages (e.g. Jaminjungan)	manner preverb	coverbMANNER + coverbPATH + verbGENERIC
Various languages (may) use	ideophones	
Low-manner-salient languages		
		TIPICAL CONSTRUCTION TYPE
All languages where **MANNER is subordinated to PATH** via additional morphology: gerunds, converbs or adverbial expressions, ideophones		verbPATH + subordinate verbMANNER
Prototypical V-languages like Spanish other Romance, Turkic and Korean languages		

The author explains that in high-manner-salient languages like English (HMS-languages henceforth), speakers regularly and easily provide MANNER information when describing motion events and in low-manner-salient languages such as Spanish (LMS-languages henceforth), MANNER information is only provided when MANNER is foregrounded (made noticeable) for some specific reason. He also notes that it is possible to move along the cline (in either direction) over time, as is the case with modern Italian which allows combinations equivalent to *swim away* or *run onto the street*[2]; and this behavior can be seen as a movement towards becoming more of an

[2]The reason why the sentence *run onto the street* is particular is because it has been suggested that V-languages limit the use of MANNER in boundary-crossing events (Slobin, 2004, p. 28). However, some studies have shown that if MANNER is manipulated to become more salient, even Spanish speakers accept MANNER verbs in boundary-crossing circumstances. For a detailed discussion see (Feist, Rojo, and Cifuentes, 2007).

S-language. The author hypothesizes that this change could be caused by contact in the north with German and remarks that similar patterns have been observed for French in Belgium as a consequence of being in contact with Dutch.

Slobin also states that Italian *frog stories* are richer in MANNER verbs and MANNER-PATH combinations in comparison to French and Spanish. This observation also contributed to the current research agenda: if it were true that the change in Italian towards a pattern closer to that of an S-language is due language contact with German, would we observe similar patterns in L2 learners who are living in a country where the dominant language has a different degree of MANNER salience than their L1? In other words, would a speaker from a LMS-language (like Spanish) living in a HMS-country (like the United States) and whose L2 has become dominant showcase a movement toward the HMS-language (English) when presented with the stimuli? Is there any evidence to support this idea from other SLA studies?

The examples mentioned thus far, usually involved cross-linguistic comparisons from subjects performing the same tasks in order to investigate differences among contrasting linguistic systems. The preponderance of research in this field has taken this approach and, as Sakurai (2014) notes, there is a still a large gap in related studies involving L2-learners. Both his study and the present study hope to contribute to this more specific area of motion-events investigation. Some of the relevant finding in bilingual studies are discussed next.

There are a few recent publications that explore the topic of motion events and SLA or L2 transfer. Wu (2012) set out to investigate whether the L1 predisposition for spatial organization could influence the L2 acquisition of motion expressions. He compared L1-English (S-language) constructions of motion events in productions of L2-Chinese (a serial-verb language). The author used various tasks including a picture-cued written task, a narration task and an online judgement task. The study utilized L2 Chinese learners at two proficiency levels which were compared to L1 Chinese and L1 English speakers. The results show that the L1 was affecting the development of the L2 motion constructions, but they found other factors as well (e.g. L2 proficiency level, degree of complexity). Thus the author concludes that conceptual changes in the course of L2 acquisition of motion expressions is a dynamic and ongoing process that involves various factors.

Another study (Oh, 2004) compared English (S-language) and Korean (V-language) speakers. Several of the experiments were designed to understand cross-linguistic differences. For instance, they found that the subjects from the S-language expressed MANNER more frequently than those from the V-language. However, one of the experiments involved looking at texts written by bilingual translators and the Korean translations involved more MANNER in the English texts compared with the Korean versions. This is not necessarily due to transfer, but could also be caused by the simple variances of lexical MANNER terms in both of those languages. More interesting would be if one were to find that Korean speakers who are proficient in L2-English are

incorporating more MANNER terms into Korean texts, going against the language patterns of their L1. This is one of the aspects that will be analyzed in the current study.

Larrañaga et al., (2012) investigated if there was L1 transfer in the acquisition of MANNER and PATH in Spanish by L1-English speakers. Their subjects were British students of Spanish at three different proficiency levels. They found that verbs that conflate MANNER and PATH like *enter* and *ascend* are mastered early (but many of those verbs come from Latin and thus become cognates for the students). In addition, learning the appropriate encoding of MANNER in Spanish proved to be difficult, even for high proficiency students who had lived abroad in Spanish speaking countries (namely because English does not have the boundary-crossing constraint that Spanish usually exhibits). In the end they state that English students struggle to acquire MANNER in Spanish given that the inventory of manner verbs in Spanish is so limited in comparison to English. This study seems to have consequences for SLA and applied linguistics.

Other studies have also investigated the degree of attention speakers dedicate to MANNER. Kersten et al., (2010) conducted three experiments to compare monolingual English speakers and monolingual Spanish speakers with bilingual Spanish/English speakers using novel animated visual and verbal stimuli with “bug-like creatures”. They found that the monolingual English speakers and bilingual subjects performed better when tested in an English-speaking context than the monolingual Spanish speakers and bilinguals tested in a Spanish-speaking context. The tasks involved sorting novel, animated objects and events into categories on the basis of MANNER. Not surprisingly, English and Spanish speakers performed in the same way when classifying

PATH. Some effects were seen in terms of age of L2 acquisition, with early bilinguals performing similarly in the two language contexts and late bilinguals showing more variation in each of the two contexts. Relevant to the current study is the conclusion the researchers make that an English language-learning experience together with an English language context encourages greater attention to MANNER of motion, which is consistent with linguistic relativity. In addition, the authors determined that English speakers conceptualize motion events differently than Spanish speakers do, even outside of a context that demands overt language production. Based on their results they state that motion-event conceptualization joins color perception, object categorization, gender classification, time cognition and other studies which have provided evidence of the effects of the L1 on nonlinguistic cognition. As will be seen in Chapter 3 and 4, the results of the current study seem to support this claim.

Another bilingual study involving Spanish and English looked at oral production, memory encoding and categorization of motion events (Filipović, 2011). The author tested if balanced English/Spanish bilinguals (loosely described as speakers who had complete fluency in both languages and had early L2 acquisition) behaved like monolinguals in each of their languages when describing and remembering complex motion events. The experiment looked at semantic referents (i.e. images and concepts), templates of linguistic expression (i.e., lexicalization patterns), and at the particular cognitive domain of motion. The aim was to determine whether the semantic referents that are linked to larger templates of linguistic expression in a particular cognitive domain are stored separately or in some mixed fashion by bilingual speakers. Another

goal was to see if there would be language-specific effects with increased memory load (i.e., when the subjects had to remember and recognize more items). Filipović states that the study was designed to test both the stronger and the weaker version of the linguistic relativity hypothesis. The stimuli were custom-made video clips of people performing various examples of MANNER of motion. The results showed a language effect based on typological difference: the English monolingual speakers performed significantly better than Spanish monolinguals for the recognition tasks (with and without verbalization), confirming their hypothesis that an increase in memory load yields language-specific effects on verbalization and memory. By incorporating neutral filler items in the stimuli, Filipović was able to verify that the discrepancy on performance was specific to MANNER. The bilingual subjects tended to adhere to a single lexicalization pattern which is acceptable in both languages, but gave preference to the L1 pattern. One result that is pertinent to the current study was that the bilingual verbalizations of motion events in Spanish contained more types of MANNER than the monolingual Spanish productions (but fewer than the English verbalizations). The overall results for the bilingual subjects did not correspond to either of the monolingual groups and there seemed to be a preference to follow the Spanish pattern regardless of the language used in each task. The author concludes that the findings present evidence for a language-specific effect in recognition memory for a single storage system in bilingual processing and memory. Filipović discusses that it is still not clear if the disadvantage Spanish subjects show encoding and remembering MANNER is because Spanish speakers fail to register the different manners because they do not have labels for them;

or because they in fact register the manners but fail to use the labels to record them, and thus have difficulty recognizing them later (she believes it is the latter). In her final analysis, after discussing other potential issues, she states that the unquestionable conclusion is that language-specific lexicalization patterns appear to be the overall shaping factor for each language group: explicit verbalization in itself does not affect the quality of the memory recognition, but the language in which the verbalization is carried out makes a difference in the quantity of information that is stored and retrieved.

Languages other than Spanish have also been studied. Brown and Gullberg (2013) investigated L1-L2 convergence (when contrastive features in two or more languages becomes less contrastive) among bilinguals at an intermediate level of L2 proficiency in regard to clausal packaging of MANNER and PATH. The subjects were L1 Japanese speakers with English as a second language and their results were compared to Japanese and English monolinguals. As stimulus they used a cartoon episode of Sylvester and Tweety. The findings showed no significant differences between both monolinguals groups who tended to use single-clause constructions packaging MANNER and PATH together. Brown and Gulberg noted that the general observed pattern was main MANNER verbs with PATH adverbials for English speakers and complex motion predicates with a MANNER participial and deictic PATH verbs as well as other combinations for the Japanese speakers. However, the bilingual speakers used significantly more multi-clause constructions in both the L1 and L2. The authors take this as evidence of L1-L2 convergence with bi-directional influence (a process where the L1 and L2 influence each other). They note that in addition to situations of language

contact between speech communities and individual cases of advanced bilingualism, convergence between linguistic systems may also operate in the context of an individual who is still in the process of developing a second language. And more importantly, this phenomenon may emerge much earlier in natural language development than previously proposed.

In a follow-up recent study Brown (2015) studied bilingual versus monolingual construal of MANNER in speech and gesture among Japanese, Mandarin and English speakers. Her findings showed that the encoding of MANNER in L2 speech is characterized by universal features of development but the construal of MANNER in gesture is characterized by a bidirectional interactions between properties of the L1 and L2. These actions produce a convergence between the two languages, specifically when using manner-highlighted gestures. This new evidence supports the idea that there are complex inter-relationships between the L1 and the L2 in the bilingual mind.

As previously mentioned, there is a large gap in motion-event studies that involve bilingual speakers and explore domains beyond the linguistic domain (e.g. cognitive, neurocognitive). There is even a less number of bilingual studies which focus on MANNER specifically. In addition, many of the studies in this area suffer from some methodological issues and constraints that make it difficult to compare findings (see Sakurai 2014, p. 5). Following Sakurai (2014), the current study attempts to contribute to fill a small portion of this gap by conducting both linguistic-mediated experiments and non-linguistic experiments. The hope is that the behaviors/patterns captured in the linguistic data will also be reflected in the non-linguistic data. As with other studies

attempting to capture covert cognitive processes, the current study is not free from methodological issues. However, until greater advances in technology allows researchers to capture more real-time processes happening in the human brain, we can only continue to conduct experiments with the tools available to us. In addition, it is important to refine the stimuli and procedures as much as possible in order to elicit meaningful data. The next section presents a brief discussion about L2 transfer and its implications for the current study.

1.4 L2 Transfer of Manner Salience

In this section, the terminology used to describe the effects that learning a second language may have on motion-event cognition are discussed. The first important notion is *language transfer*. Moattarian (2013) states that in its most simple terms, language transfer can be defined as the influence of a person's knowledge of one language on that person's knowledge or use of another language. This phenomenon is also described as *crosslinguistic influence* or as *interference* and all of these terms have been used interchangeably in the literature with several researchers advocating for using one term over the other. Still, as Jarvis and Pavlenko (2008) remark, even though the appropriateness of the terms *transfer* and *crosslinguistic influence* can be called into question; they are the most conventional terms to refer to this phenomenon. Thus, for the purposes of the current study, the term *L2 transfer* is used throughout the manuscript. This term is adopted here simply to describe the findings in this particular

context since the experimental group consists of bilingual subjects. Note, however, that the process of language transfer is quite complex and can manifest itself in various forms and areas of language knowledge and use (Jarvis and Pavlenko 2008). In addition, it may involve more than 2 languages and, as discussed earlier in this chapter, the effect can be bidirectional: the L2 can have an effect on the L1 and/or the L1 can have an effect on the L2 (see Moattarian 2015 for further review of related studies).

Even though there is a good amount of research that focuses on the consequences/manifestations of L2 transfer, only until recently have researchers started to investigate the cognitive processes that allow such transfer to occur. With this new research focus, the hope is to better understand how the conceptual structures acquired through one language can affect a person's use of another language (Jarvis et al. 2013). This is the main question posed by the current study: can the conceptual structure determining the degree of *manner salience* in English affect a person's encoding of *manner salience* in Spanish? If a L2 effect is found, what type of transfer process is more likely to be happening in this particular case?

Jarvis and Pavlenko (2008) present a taxonomy of the different kinds of transfer that have been documented: phonological, orthographical, lexical, semantic, morphological, syntactic, discursive, pragmatic, sociolinguistic, and conceptual transfer. The type of transfer explored in the present study belongs to the latter type: *conceptual transfer*. The authors describe this type of transfer as instances where a person's use of one language is influenced by the conceptual categories acquired through another language (p. 115). If one thinks of this notion as a hypothesis, it proposes that these

instances of language use originate from the mental concepts and patterns of conceptualization that the person has acquired as a speaker of another language. The work on conceptual transfer is not generally directed at settling the question of whether speakers of different languages have different concepts or conceptualizations. Rather, it is concerned with testing whether multilingual's language use (i.e. reception, production, or both) is consistent with the existing empirical and theoretical work in cognitive linguistics concerning such differences (Jarvis 2011).

Jarvis and Pavlenko (2008) examine cross-linguistic differences and conceptual transfer in eight foundational domains of reference that allow humans to talk about themselves. The domain of *motion* is one of the domains the authors consider foundational. In the same work, Jarvis and Pavlenko state that if conceptual transfer takes place in the motion domain, it could be visible in the preference to PATH over MANNER by L1 speakers of V-languages, such as Spanish, while they use a S-language as their L2, such as English (p. 147). Conversely, if the same speakers show a greater preference for MANNER while they use their L1, this could also be an indication of conceptual L2-to-L1 transfer. This is the specific scenario that is being investigated in this study.

Another important consideration about conceptual transfer is that it is a dynamic process that takes place throughout someone's lifetime and it occurs naturally during the course of socialization into one or several languages. Jarvis and Pavlenko (2008) present a typology of conceptual change where transfer is seen as involving one or more of the following processes: (a) the internalization of L2-based concepts that are fully

distinct from L1-based concepts; (b) restructuring, by which new elements are incorporated into previously existing concepts or conceptual domains; (c) convergence, whereby a unitary concept or conceptual domain is created, distinct from both L1- and L2-based concepts; (d) shift from L1- to L2-based conceptualization within a particular domain; and (e) the attrition of previously learned concepts that are not relevant for one's daily interaction, often accompanied by a substitution of the previous concepts with new ones. These processes do not necessarily occur in any particular order and they may occur at the same point in different conceptual domains. In addition, none of these changes are final or definitive and a concept or domain may change according to the changes in the interactional circumstances of the speaker (p. 155).

In the current study, the type of L2 transfer investigated falls into the second process: *restructuring under the influence of L2*. As Jarvis and Pavlenko (2008) explain, restructuring involves a partial modification of already existing language-mediated conceptual categories (p. 160). Since the cognitive domain of MANNER of motion exists in both Spanish and English, the restructuring of that domain (in terms of saliency) is the most likely conceptual change that could occur. In other words, if L2 transfer is found, this does not mean that the domain of MANNER per se is being transferred; rather, the degree of *manner salience* is being restructured in the bilinguals' mind (i.e. the characteristic degree of *manner salience* in the L2 is getting transferred into the L1).

As mentioned earlier, a good indicator that L2 transfer is in fact happening would be if the bilingual speakers encode more MANNER as they perform the tasks in Spanish. And an even greater indicator would be if they encode a larger amount of T2-MANNER

in the linguistic tasks and show similar proportions of MANNER preference and ratings as their L1-English counterparts in the non-linguistic tasks. A further discussion of this topic is presented in the last chapter of the manuscript as part of the interpretation of the results. The research questions and hypotheses for the current study are presented in the next section.

1.5 Research Questions and Hypotheses

In order to test the hypotheses and investigate the research questions presented below, the methodology and some of the stimuli from Sakurai (2014) were adapted, with some additions and modifications. The experimental group consisted of bilingual L1-Spanish/L2-English speakers (L1S/L2E henceforth) and the control group consisted of L1-English speakers (L1E henceforth). There were two linguistic tasks and two non-linguistic tasks. The linguistic-mediated tasks involved narrating stories from Mayer's (1969) picture book *Frog, Where Are You?* and from a custom-made animation created from episodes of *Gazoon* (Villemaine & Trouvé, 2007). The two non-linguistic tasks consisted of a MANNER/PATH categorical task and a MANNER/PATH similarity task. These tasks were originally designed by Sakurai (2014) and modified in the current study. In addition, the Bilingual Language Profile, BLP (Birdsong et al., 2012) was administered to the L1S/L2E group in order to assess the relationship (if any) between the L2-English dominance scores and their performance in the tasks. The next chapter will discuss the subjects and tasks in more detail.

Based on the information presented thus far, the current study will investigate the following research questions:

RQ 1: In the picture book storytelling task, will bilingual L1S/L2E living in the United States follow the patterns of their native language or those of their L2 language (English) in terms of descriptions of MANNER?

RQ 1.2: Will the number of occurrences of MANNER produced in the linguistic task vary significantly if a more dynamic animation is presented?

RQ 1.3: If a contrast is found in either or both of the linguistic tasks (picture book and animation), will the BLP English dominance score make a difference in how many occurrences of MANNER are produced in the descriptions?

RQ 1.4: Will there be significant differences in the number of T1-MANNER and T2-MANNER occurrences between stimulus type and between groups?

RQ 1.5: If a high degree of BLP English dominance is found to be correlated to a number and type of MANNER descriptions closer to the L1E group, is this evidence of L2 transfer for this domain?

RQ 2: By using Sakurai's (2014) non-linguistic stimuli consisting of pairs and triad images with MANNER and PATH contrasts, will the L1S/L2E speakers yield similar outcomes to the results in that study (in regard to MANNER)?

RQ 2.1: Will the BLP English dominance scores make a difference in the performance of the non-linguistic tasks?

RQ 2.2: If a high degree BLP English language dominance is found to correlate with the way the L1S/L2E subjects perform in the non-linguistic tasks (and they behave similar to the L1E group), is this further evidence of L2 transfer in this domain?

RQ 3: Overall, can a change in *manner salience* be observed when the degree of L2 dominance is high (indicating L2 transfer)?

Taking the findings in previous studies as well as the above questions into account, the following hypotheses are proposed:

H1: In the first linguistic task (picture book storytelling), the L1S/L2E subjects with high BLP English dominance scores will produce a higher number of tokens and types of MANNER expressions, behaving closer to the L1E group.

H2: In the second linguistic task (narration of an animation), all L1S/L2E subjects will produce more MANNER tokens and types as compared to the first task, but those with higher BLP English dominance scores will behave more like the L1E group.

H3: In the non-linguistic tasks (pairs and triads contrasting MANNER and PATH) the L1S/L2E speakers with higher BLP English dominance scores will behave more like the L1E group.

1.6 Conclusion to Chapter 1

This chapter discusses the relevant linguistic concepts for the current study: the motion event and its components of FIGURE, GROUND, MANNER, and PATH; Talmy's binary typology of S-languages and V-languages; and Slobin's concepts of *manner salience*, HMS-languages, and LMS-languages. In addition, a point is made that, even though there is considerable amount of research that looks at cross-linguistic differences in the way MANNER is encoded in languages from diverging frames of reference, much less is known about the motion domain in SLA; and even less about the potential L2 transfer effects that could cause a change in the degree of *manner salience* in bilingual speakers. The concept of L2-transfer is discussed, as well as the potential processes that may be involved in the issue at hand. Some of the related published investigations are discussed which informed the research questions and hypotheses presented at the end of the chapter. Table 1.3 below presents further references related to these topics. The subjects, methodology and stimuli utilized for the experiments are described in the following chapter.

Table 1.3 Additional references related to the topics discussed in the current chapter.

RELATED TOPIC	**SAMPLE REFERENCES**
Additional studies following Talmy's typology and/or Slobin's Thinking-for-Speaking	Brown & Chen, 2013; Cifuentes-Férez & Gentner, 2006; Everett, 2013; Ibarretxe-Antuñano, 2004; Ji, Hendriks, & Hickmann, 2011; Lucy, 1992a; Naigles, 1998; Ochsenbauer & Hickmann, 2010; Oh, 2003, 2004; Ozcaliskan & Slobin, 2000; Slobin, 2004, 2006; Slobin, Ibarretxe-Antuñano, Kopecka, & Majid, 2014; Talmy, 2000, 2014; Tang & Yang, 2007; Özçalişkan, 2005.
Psycholinguistic approaches to L2 cognition	Boroditsky, 2015; Gentner & Goldin-Meadow, 2003; Murahata, Murahata, & Cook, 2016; Papafragou, Hulbert, & Trueswell, 2008; Pavlenko & Volynsky, 2015; Semin & Smith, 2008; Spivey, Joanisse, & McRae, 2012; Tomczak & Ewert, 2015; Treffers-Daller, 2012; Wagner, Yocom, & Greene-Havas, 2008; Wu, 2011, 2012.
Linguistic Relativity	Cardini, 2010; Gentner & Goldin-Meadow, 2003; Gumperz & Levinson, 1996; Han & Cadierno, 2010; Lee, 1996; Lucy, 1992a, 1992b; Miller, 1968; Pütz & Verspoor 2000; Schultz, 1990; B.L. Whorf et al., 2012.
Redefining/criticizing/discussing Talmy's typology or Slobin's Thinking-for-Speaking	Athanasopoulos, Damjanovic, Burnand, & Bylund, 2015; Brown & Chen, 2013; Bylund & Athanasopoulos, 2015; Caballero, 2015; Chen & Guo, 2009; Cook, 2015; Heine & Narrog, 2010; Hickmann, 2006; Ibarretxe-Antuñano, 2004; Iwata, 2002; Ji et al., 2011; Kemmerer & Eggleston, 2010; Lemmens & Slobin, 2008; Lindsey, 2011; Malt, 2014; McNeill, 2000; Narasimhan, 2003; Oh, 2003, 2004; Pavlenko & Volynsky, 2015; Sakurai, 2014; Shuanfan & Michael, 2005; Slobin, 1996a, 2004, 2006; Slobin, Ibarretxe-Antuñano, Kopecka, & Majid, 2014; Talmy, 1991; Volynsky, 2013; Özçalişkan & Slobin, 1999, 2000; Özçalişkan, 2005.

CHAPTER 2. METHODOLOGY

2.1 Overview of Experimental Design

This chapter presents the experimental design for the current study. First, the overall design is explained, followed by a description of the subjects who participated in the study, the stimuli and overall procedures, and the statistical analyses conducted. The current study was loosely adapted from (Sakurai, 2014), with some important modifications and additions that will be explained later in this chapter. Figure 2.1 illustrates the basic experimental design for this study in terms of the tasks the subjects completed after signing the consent form approved by Purdue University's Human Research Protection Program (IRB).

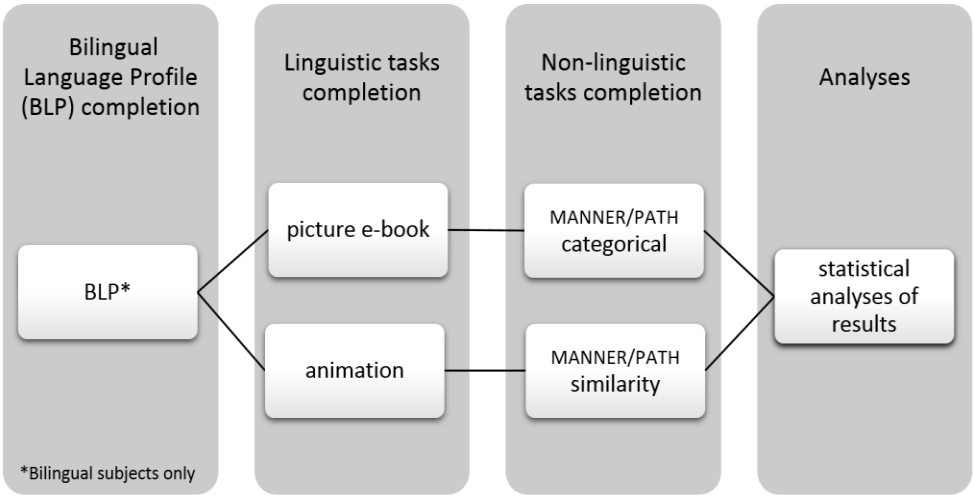

Figure 2.1 Overview of experimental design.

The first task was only performed by the bilingual subjects who participated in this study and it entailed completing the BLP. This is an online questionnaire developed by Birdsong et al. (2012) to assess language dominance in bilingual populations.

The main four experimental tasks were completed by all subjects; there were two linguistic tasks and two non-linguistic tasks. The linguistic tasks consisted of narrating stories based on two types of stimuli: a language-less picture book called *Frog, where are you?* (Mayer, 1969) and an animated clip created from some episodes of a series called *Gazoon* (Villemaine & Trouvé, 2007). The two non-linguistic tasks consisted of a MANNER/PATH categorical task and a MANNER/PATH similarity task. These experiments were designed to assess the degree of salience of those two aspects of the motion domain and the stimuli was adapted from Sakurai (2014). Each of the tasks mentioned above are explained in detail later in this chapter (section 2).

2.2 Subjects

The focus of the current study was on bilingual speakers who are native Spanish speakers and had English as a second language (L1S/L2E), residing in the USA. In addition, there was a control group composed of English native speakers (L1E), also residing in the USA. The L1E group was incorporated to test the novel stimuli that was created for the current experiment and to make comparisons regarding the level of MANNER saliency between the LMS-language (Spanish) and the HMS-language (English), as categorized by Slobin (2004, 2006).

Since previous cross-linguistic and bilingual studies that have looked at MANNER have found significant differences among groups with a rather small number of subjects ranging from as little as 10 per group to 19, on average (Cadierno, 2004; Cadierno & Ruiz, 2006; Larrañaga, Treffers-Daller, Tidball, & Ortega, 2012; Sakurai, 2014; Slobin, Ibarretxe-Antuñano, Kopecka, & Majid, 2014), it was decided to have the following subject distribution:

The L1S/L2E experimental group consisted of 30 subjects who all had Spanish as their native language and English as their second language (*n* = 11 females; *n* = 19 males; *M* = 34.23 years of age, with *SD* = 10.32). As Slobin (2014) notes, socioeconomic status and other demographics may influence participants' vocabulary across languages; thus, care was taken so that all subjects in this study were middle-class speakers who had completed at least an undergraduate degree. Figure 2.2 shows the distribution of bilingual subjects by level of formal education. Table 2.1 provides individual information, per subject.

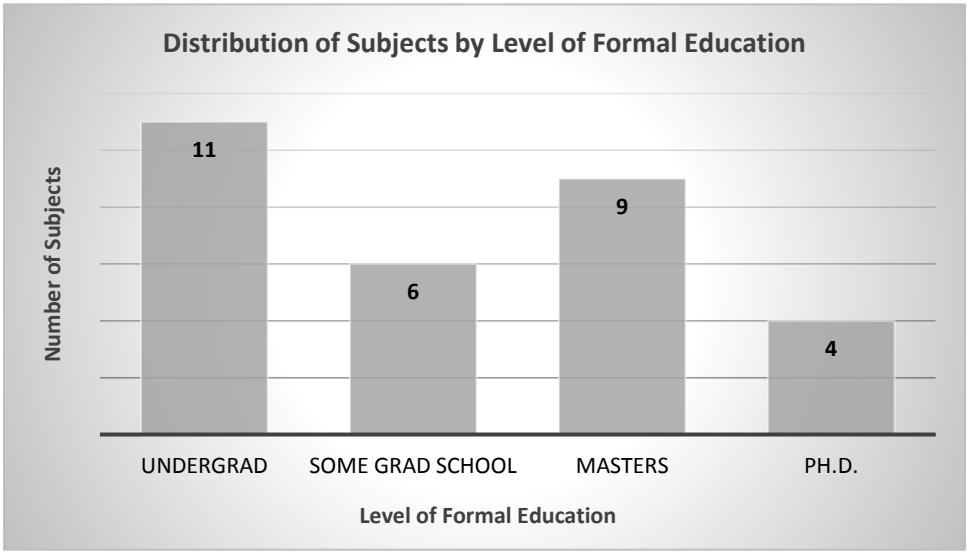

Figure 2.2 Distribution of L1S/L2E Subjects by Level of Formal Education.

Table 2.1 Individual Biographical Data for the L1S/L2E group.

ID	Gender	Age	Highest Level of Education
S1	F	27	Grad School
S2	M	35	Masters
S3	F	53	Undergrad
S4	F	47	Undergrad
S5	F	19	Undergrad
S6	F	36	Masters
S7	M	20	Undergrad
S8	F	27	Grad School
S9	M	19	Undergrad
S10	M	29	Grad School
S11	F	36	Masters
S12	F	36	Grad School
S13	F	57	Undergrad
S14	M	38	Undergrad
S15	F	62	Undergrad
S16	M	34	Undergrad
S17	M	30	Masters
S18	F	46	Undergrad
S19	M	34	Masters
S20	M	30	PhD
S21	M	31	PhD
S22	M	39	PhD
S23	M	31	Masters
S24	M	35	Masters
S25	M	29	PhD
S26	M	25	Grad School
S27	M	32	Grad School
S28	M	33	Masters
S29	M	23	Undergrad
S30	M	34	Masters

The L1E control group consisted of 20 native English speakers, all with similar biographical backgrounds as the bilingual group (*n* = 7 females; *n* = 13 males; *M* = 33.55 years of age, with *SD* = 11.91). Even though there are abundant cross-linguistic studies that could have provided comparison data of L1-English subjects describing the motion

events in Mayer's (1969) story, as well as studies that have utilized more dynamic types of stimuli, like those utilizing The Pear Film (Chafe, 1980) or the video clips used by Slobin (2014), there are no other studies (to the researcher's knowledge) which have utilized the animation developed for this experiment (Villemaine & Trouvé, 2007). Therefore, it was important to test how the L1E group would describe this particular stimulus. Furthermore, the non-linguistic tasks in this study have only been used in one previous study and with a very different age group of speakers (Sakurai, 2014), so it was important to collect further L1E data on those tasks as well.

In order to get a more robust sample for the non-linguistic tasks, supplemental data were collected to compare the results of the experimental group (L1S/L2E) and the control group (L1E) with a larger number of people who completed the tasks online. The two experiments administered to gather this supportive evidence were identical to those completed by the primary subjects in the study, and the results were kept separate from the results yielded by those who completed all four tasks. Data were collected for 44 additional L1-Spanish speakers, but only the results of 35 subjects were included in the analyses; and there were a total of 70 additional L1-English speakers completing these tasks, but only the data of 40 subjects were taken into account (a detailed explanation for the discrepancy in numbers is provided in section 2.3.3). In order to distinguish the supplemental groups from the experimental and control groups, the labels that are assigned to these groups are Spanish-supplemental and English-supplemental. Table 2.2 shows the final distribution for the subjects completing the non-linguistic tasks.

Table 2.2 Distribution and total number of subjects completing the non-linguistic tasks.

	No. of subjects
L1S/L2E (experimental)	30
Spanish-supplemental	35
Total L1- Spanish	**65**
L1E (control)	20
English-supplemental	40
Total L1-English	**60**
Overall number of subjects	**125**

2.3 Stimuli and Procedures

In this section, a more in-depth description of the stimuli and procedures used in the current study is given. All the stimuli for the current experiment were presented and recorded (via internal microphone) using a Dell Precision Mobile Workstation M3800. This machine has a 15.6" UltraSharp™ IGZO 4K HD display, one of the highest possible screen resolutions available at the time this study was conducted (3840x2160 megapixels; over 8 million pixels). The computer screen was approximately 2.5'-3.0' from the subjects. As mentioned in Chapter 1, it was important to see if a L2 effect could manifest when the bilingual speakers used their L1. Thus, when the data for the L1S/L2E subjects were collected, the instructions and language used throughout the experiment was exclusively Spanish. When the data for the L1E subjects were collected, the instructions and language used throughout the experiment was exclusively English. All four tasks were completed in one session.

2.3.1 Bilingual Language Profile (BLP)

The first task, that only the L1S/L2E subjects completed, was the BLP questionnaire (Birdsong, Gertken, L.M., & Amengual, M., 2012). This validated tool (Gertken, Amengual, & Birdsong, 2014) is freely available online under a non-commercial, attribution Creative Commons license. As Gertken (2014) explains, this tool was developed to assess various aspects of language dominance in bilingual speakers. The BLP is a self-report questionnaire and it has been created in a variety of language pairs. When completing the BLP, the subjects answer questions about their languages' history, use, proficiency and attitudes toward the languages. The questionnaire consists of four modules/sections and a total of 19 questions. The entire process takes fewer than ten minutes to complete. Each of the BLP modules is briefly explained below.

The *language history* module collects information such as the age of acquisition of each language, the age at which the speaker felt comfortable using each language, the number of years of schooling in each language, the time spent in a country or region where the languages are predominantly used, and the time spent in different environments where the languages are spoken (i.e. family environment and work environment). The section for *language use* focuses on the amount of time (in percentages) that the speaker spends utilizing each of the languages in different contexts (e.g., with friends, with family, at school, at work). This section also contains some questions to assess metacognitive aspects such as how often they talk to themselves in each of the languages and how often they use each language while

counting. The *language proficiency* module asks the speaker to rate their proficiency in each of the languages, that is, how well they speak, listen, read and write on a scale that ranges from 0 (not well at all) to 6 (very well). The last section of the BLP is designed to assess *language attitudes* and the speaker is presented with questions such as to what degree they feel like themselves when using each language, how much they identify with the culture of each of the languages, how important it is to them to use the language as a native speaker, and how important it is to them to be taken for a native speaker of each of the languages in question. Figure 2.3 below, adapted from Gertken et al. (2014), shows the modules and questions contained in the BLP.

The measures collected in the BLP elicit a profile of each speaker's relative language dominance. The results render a dominance score that ranges from -218 to +218; a score near zero indicates balanced bilingualism and more positive or more negative scores reflect respective language dominance.

The BLP version utilized in the current study was the Spanish/English online self-scoring version, which automatically saves the results into the researcher's personal Google drive database and can be exported to a Microsoft Excel file for further analysis (the results are not available to the respondents). Since all of the experimental group subjects were L1-Spanish speakers, they completed the questionnaire in Spanish. Figure 2.3 provides the questions in English for ease of readability; refer to Appendix A. to see the original BLP items in Spanish that were utilized in this study.

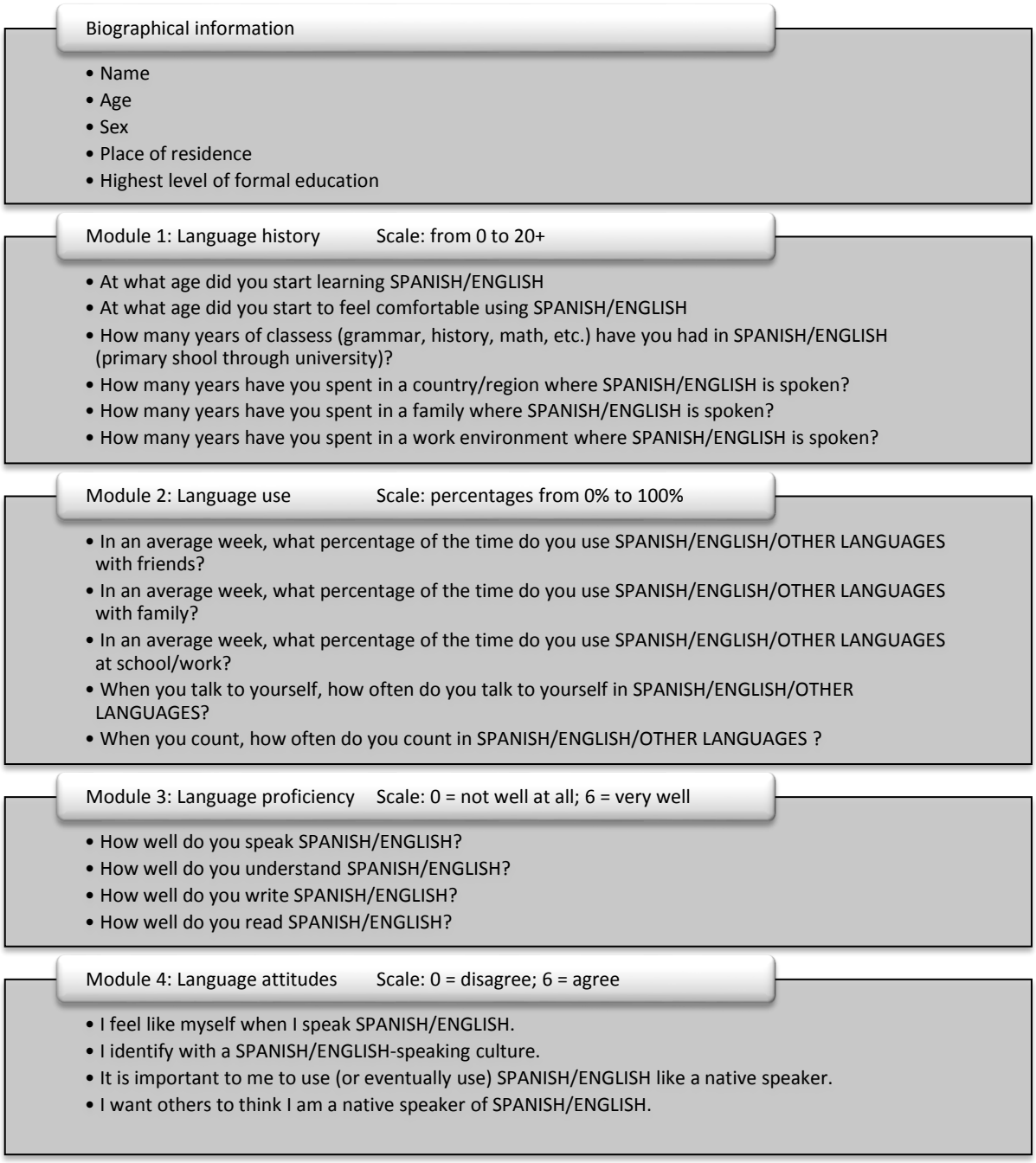

Figure 2.3 Bilingual Language Profile (BLP) modules. The items are presented in English for ease of comprehension. Refer to Appendix A to see the original Spanish items.

The advantage of using the online version of the BLP is that, as mentioned before, the tool automatically calculates the scores for each module, for each language,

and globally (what the tool labels *dominance score*). The resulting dominance score is calculated by subtracting the total scores for Spanish from the total scores for English. Again, a resulting score of zero would suggest that the subject is a balanced bilingual; a positive score would suggest greater dominance in the L1 (Spanish) and a negative score greater dominance in the L2 (English).

It is important for the developers of the BLP to clarify what the concept of dominance means to them. As Gertken (2013) points out, the construct of dominance that the BLP assesses is different from proficiency in the language. There may be two equally balanced bilinguals who differ in proficiency levels (i.e., one speaker may have high proficiency in both languages and the other only in one language). Grosjean (1998) explains that proficiency has to do with mastery of aspects like grammar, vocabulary, and production; whereas language dominance stems from the nature of bilingualism itself, from having two languages in one's mind. She also remarks that balanced bilingualism does not necessarily entail high proficiency, only a state of equilibrium (Hamers & Blanc, 2000). The author notes that there may be immigrants who have many years of immersion in their L2, for whom the L2 could become the most dominant language, even if it remains the less proficient language as measured by tests of grammar and vocabulary (Harris, Gleason, & Aycicegi, 2006: 264). The author states that language dominance refers to which of the languages is generally most accessible in day-to-day life (Harris et al., 2006). In other words, the language with higher dominance is the one that is most highly activated, and can be the default language for speaking and thinking. This is why the BLP is designed to measure the various aspects of language

usage in addition to (perceived) language proficiency. A further discussion of the implications of these ideas is presented in section 2.4.

The resulting global dominance scores for the L1S/L2E subjects are illustrated in Figure 2.4 below. As stated earlier in this section, the negative dominance scores indicate those speakers who tended to have their L2 (English) as their more dominant language at the time they completed the BLP. There were five subjects in this study with negative scores. The global dominance scores ranged from -63.75 to 168.63 (*M* = 60.92; *SD* = 55.50). The L1 (Spanish) dominance scores ranged from 97.16 to 215.67 (*M* = 171.75; *SD* = 33.83). The L2 (English) dominance scores ranged from 43.95 to 200.41 (*M* = 110.61; *SD* = 36.34). Table 2.3 contains individual language dominance scores for each of the L1S/L2E subjects.

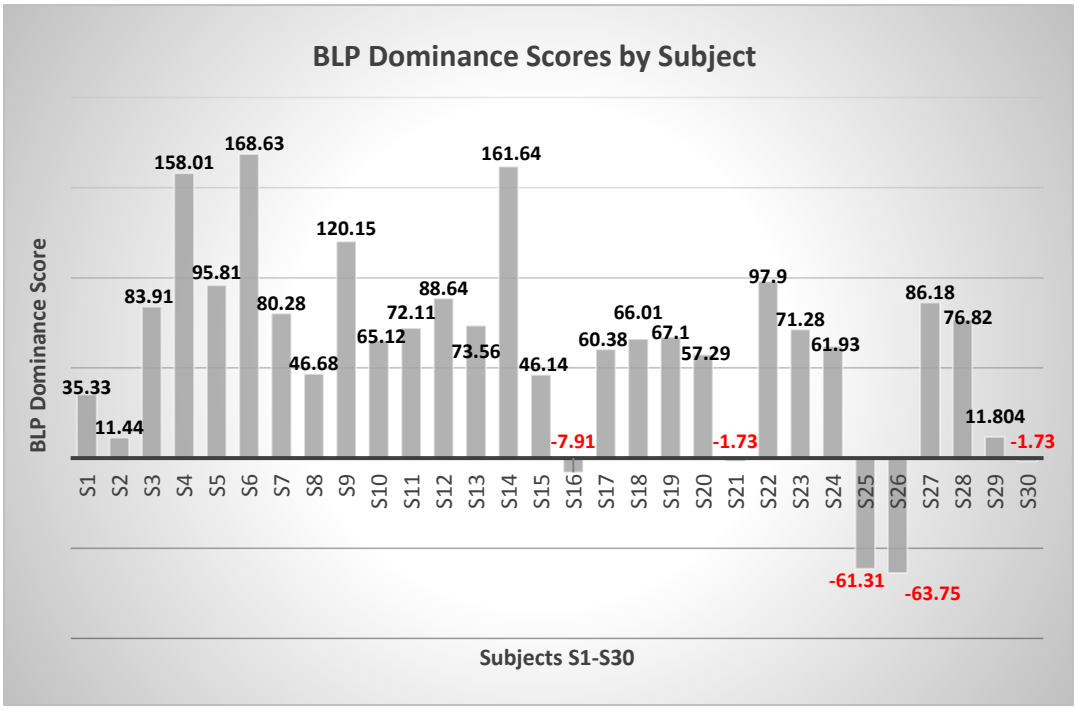

Figure 2.4 BLP global dominance scores by subjects. Positive scores indicate dominance in the L1 language (Spanish) and negative scores indicate dominance in the L2 language (English). Scores close to zero indicate balance bilingualism.

Table 2.3 Individual Language Dominance Scores for the L1S/L2E group.

ID	Spanish Dominance score	English Dominance score	Global Dominance Score
S1	179.53	144.2	35.33
S2	169.63	158.18	11.44
S3	186.43	102.51	83.91
S4	208.86	50.85	158.01
S5	149.74	53.94	95.81
S6	212.58	43.95	168.63
S7	161.01	80.72	80.28
S8	170.45	123.77	46.68
S9	180.71	60.56	120.15
S10	187.61	122.49	65.12
S11	168.99	96.88	72.11
S12	194.15	105.51	88.64
S13	205.22	131.66	73.56
S14	215.67	54.03	161.64
S15	193.33	147.19	46.14
S16	146.56	154.46	-7.91
S17	180.25	119.87	60.38
S18	180.79	114.78	66.01
S19	181.25	114.15	67.1
S20	174.71	117.42	57.29
S21	146.83	148.56	-1.73
S22	197.87	99.97	97.9
S23	182.07	110.78	71.28
S24	170.81	108.88	61.93
S25	97.16	158.46	-61.31
S26	136.66	200.41	-63.75
S27	193.15	106.97	86.18
S28	182.79	105.97	76.82
S29	50.848	39.044	11.804
S30	146.832	148.562	-1.73

2.3.2 Linguistic Tasks

There were two linguistic tasks in the current study. The first task consisted of narrating scenes from the picture book *Frog, where are you?* (Mayer, 1969) and the second task consisted of narrating scenes from a 3D, colorful animation clip created from some episodes of the *Gazoon* series (Villemaine & Trouvé, 2007). Each of these tasks are described in the following sections.

2.3.2.1 Picture Book Narration (Task 1)

Following the various researchers showcased in Berman & Slobin (1994) as well as more recent studies (Feist, Rojo, & Cifuentes, 2007; Ibarretxe-Antuñano, 2004; Lindsey, 2011; Naigles, 1998; Ozcaliskan & Slobin, 2000; Papafragou, Massey, & Gleitman, 2006; Papafragou & Selimis, 2010; Sakurai, 2014; Slobin, 2004, 2006; Volynsky, 2013), scenes from the word-less picture book Frog, where are you? (Mayer, 1969) were utilized to elicit the first set of MANNER of motion data. The main reason to utilize this book is because it has become a widely-used form of stimulus, allowing results to be compared with other studies. Berman & Slobin (1994) is a prime example of the breadth of the Frog story corpus and, as they point out, the tool has been used by more than 150 researchers and with about 50 languages worldwide (and continues to be used). The two languages relevant to the current study, Spanish and English are (not surprisingly) some of the most widely studied, since Talmy's (1985, 1991, 2000) typology

seems to fit these two languages well. The 24 images of the book were available to download online from the CHILDES (Child Language Data Exchange System manuals) database at the time the stimulus was created for the first linguistic task (MacWhinney, 2000).

An innovation in the current study was the creation of an automated electronic book (e-book, henceforth) to elicit the narrations. The main reason to do this was to be able to control for narration time, so that each subject had the exact same amount of time to look at the stimulus and narrate the story. This type of more restricted stimulus allows for controlling variances in personal narration styles that could potentially affect the data. That is, if certain subjects took much longer time than others to narrate the story, they could potentially have more time to notice many more details in the illustrations as well. Additionally, this modified stimulus had the benefit of having the look of a real book (in comparison to simply showing each of the illustrations separately, one after the other to the subjects; which creates a more *static* type of stimulus).

In order to create the e-book, a pilot study was conducted with 10 L1-Spanish speakers to assess the average time they took in narrating the entire frog story. The results showed that speakers took 2 minutes on average to narrate the entire story (M = 2.02, SD = 0.52). Thus, the automated e-book takes 2 minutes to display the stimulus. The e-book turns the pages automatically; so once the process starts, the subjects do not have to do anything besides paying attention to the pictures on the screen. The story has a total of 24 scenes, which yielded 14 double-sided pages in the e-book format; some contained one scene spread over two pages and others two separate

scenes (one on each page). The time per scene ranged from 2.34 seconds to 11.13 seconds (depending on the complexity of the illustrations). Appendix B shows a full description of the process involved in creating the e-book.

During this task, the same protocol as previous studies was followed: the stimulus was first presented once to the subjects so that they would get a sense of the basic storyline, and on the second round, they were told to narrate the story to the researcher as the scenes appeared on the screen. The linguistic data collected from the L1S/L2E and L1E groups during this task were transcribed for later analyses. Table 2.4 describes the scenes and locations that are contained within Mayer's (1969) book and Figure 2.5 shows three sample scenes from the story, as they were displayed in the e-book.

Table 2.4 Description of illustrations/scenes from *Frog where are you?* (Mayer, 1969).

Scene	Description	Location
1	A boy and a dog look at a frog that is sitting in a jar	Bedroom
2	The frog climbs out of the jar while the boy and the dog are asleep in a bed	Bedroom
3	The boy wakes up and looks at the empty jar	Bedroom
4	The boy looks inside a boot; the dog looks in the empty jar and gets its head stuck	Bedroom
5	The boy looks out the window and calls for the frog; the dog looks out, head still stuck in the jar	At window
6	The dog falls out of the window; the boy looks on	From/at window

Table 2.4 Continued.

7	The boy joins the dog outside; the dog is in the boy's arms; the jar is shattered	Outside window
8	The boy and the dog walk through the woods; the boy calls for the frog	Forest
9	The boy looks in a hole; the dog barks at a beehive	Forest
10	A gopher pops out of the hole; the dog continues to bark at the beehive	Forest
11	The boy looks in a hole in a tree; the beehive falls to the ground	Forest; at tree
12	The bees chase the dog; an owl comes out of the hole in the tree; the boy falls out of the tree	Forest; at/down tree
13	The boy sees a rock; the owl flies away/chases boy	At rock
14	The boy climbs on the rock; the boy calls for the frog; the dog approaches; the owl watches from a tree	On rock
15	The boy falls on a deer; the boy rests between the antlers; the owl watches from tree	Behind rock
16	The deer carries the boy away; the dog follows	Forest
17	The deer stops at the edge of a cliff; the boy and the dog fall over the edge	At cliff edge
18	The boy and dog fall into a pond	In pond
19	The boy and the dog notice a log laying on ground	Near log
20	The boy motions for dog to be quiet	At log
21	The boy and the dog peer over the log	At log
22	The boy and the dog find the frog with its mate	Behind log
23	The boy and the dog see a number of little frogs/ a family of frogs	Behind log
24	The boy carries one of the frogs and waves goodbye to the others	Leaving pond

Figure 2.5 Sample scenes from *Frog where are you?* (Mayer, 1969) as they were displayed on the e-book created for task 1 in the present study.

2.3.2.2 Animated Clip Narration (Task 2)

The stimulus for task 2 was exclusively created for this study. Even though the *frog story corpus* is an extensive one, that presents the opportunity for valuable cross-linguistic comparisons; it is also a rather static, 2D, colorless picture book. The question arises if this is an ideal type of stimulus to elicit data about motion events. Pourcel (2009. p. 375-376) notes that there is a lack of studies that use realistic motion stimuli, that is, stimuli that resembles typical motion occurrences that are readily observed in

day-to-day life. The author gives several examples of studies that gather data based on some type of imaginary motion/entity not found in a realistic setting, e.g. an artificially constructed two-dimensional figure called 'Tomatoman', who fails to be representative of the type of motion typically conceptualized by human subjects. She states that it is not clear how one may relate the conceptualization of the motion of a virtual tomato to that of human or any other naturally occurring three-dimensional motion.

Taking the above into consideration, it was important to add a realistic stimulus containing characters (FIGURES) which would be easily recognizable by the subjects utilized in the current study. This is how the series *Gazoon* (Villemaine & Trouvé, 2007) was chosen. The episodes in the series are ideal in that they contain no language and the characters involved are well-known animals that are familiar to everyone. Several of the episodes are available in the children's YouTube channel HooplaKidz TV (HooplaKidzTV).

In order to create the stimulus for this task, an animated clip (4:12 in length) was produced combining certain scenes from two *Gazoon* episodes: *Highly perched* (HooplaKidzTV, 2012a) and *Out of breath* (HooplaKidzTV, 2012b). These two episodes where chosen because they contain primarily only two characters: a snake and a bird; and the theme of the story is primarily the same: the snake is chasing or trying to eat the bird. Therefore, the subjects only had to focus on two FIGURES instead of having to pay attention to several animals and motion events happening at the same time (which is the case in several other *Gazoon e*pisodes). After various motion events were selected, they were combined into one clip using the video editing software Camtasia

Studio v8.2 (TechSmith, 2015). With the intention of avoiding making any of the motions more salient, the animation was shown without sound. It was observed that, for example, the scene where the snake is bouncing like a spring contained audio that highlighted the manner or motion with a corresponding bouncing spring. This could potentially increase the level of attention that a subject dedicates to it. As Feist et al. (2007) showed, it is possible to manipulate the degree of manner salience in certain contexts and consequently increase L1-Spanish speakers acceptability of MANNER verbs, even in boundary-crossing events, so the additional sensory component (sound) was removed from the stimulus. The data collected from this task were transcribed for later analyses. Table 2.5 shows all of the resulting scenes in the stimulus for this task. Figure 2.6 contains snapshots of six sample stimulus scenes.

Table. 2.5 Scenes from animated stimuli, produced by editing two episodes from *Gazoon* (Villemaine & Trouvé, 2007).

Scene	Description	Location
1	An elephant sleeps with a bird on top of its head	
2	The bird wakes up and pecks and jumps on the elephant to wake him up	
3	The elephant blows the bird away as he snores	
4	A snake pops out from the grass, sees the bird and chases it; the bird flies away	
5	The bird flies into a bamboo forest; the snake continues to chase and wraps itself around bamboo stalks	
6	The bird lands on a rock and watches the snake; the snake tries to eat the bird but cannot reach it because it is wrapped around the bamboo	
7	The snake gets launched into a tree and lands all coiled up, like in a spiral/coin	
8	The snake falls out of the tree in its coiled state and seems unconscious; the bird flies back to take a closer look at the snake	
9	The snake suddenly jumps at the bird; the bird flies away; the snake chases the bird bouncing like a spring	

Table 2.5 Continued.

10	The bird flies onto a tree in between two giraffes; a giraffe lowers its head to eat grass	Savanna
11	The snake keeps bouncing and ends up on the head of the giraffe who lifts its head, throwing the snake onto the tree where the bird is	
12	The bird flies away into a cloud and perches on the cloud	
13	The bird flies up toward the sky and the snake follows, jumping from cloud to cloud, chasing the bird	
14	The snake gets tired and stops to rest on a cloud; the snake looks down and realizes he can't rest on a cloud and falls to the ground	
15	The bird flies into his birdhouse/toward his birdhouse and goes inside	
16	The grass moves and the snake pops out; it sneaks/slithers toward the birdhouse through leaves/grass	
17	The snake coils around the pole of the birdhouse; the bird comes out of the house, looks down at the snake, goes back inside	
18	The birdhouse collapses, crushing the snake back into a coil; the birdhouse goes back to its original position	
19	The snake sneaks toward the birdhouse while being coiled up; it uncoils itself all the way up and it stands straight like a pole; then it loses its balance and falls down	
20	The snake inhales some helium and floats up into the air like a balloon	
21	The snake uses its tail as a propeller to fly toward the birdhouse	
22	The bird comes out of the house; the snake opens its mouth, releasing the helium and flying away like a deflating balloon	
23	The snake lands on the branch of a tree; body flat like a deflated balloon	
24	The snake grabs some bamboo with its tail and bends it to form a catapult; the bird comes out of the house	
25	The snake launches itself like a catapult onto the birdhouse	
26	The bird flies away and the snake lands inside the birdhouse, getting stuck inside; its head pops out from the window of the birdhouse and it looks around for the bird	
27	The bird is on the ground and lights a wick; the birdhouse launches into space like a rocket	
28	The bird steps on the ground and the earth opens up and a new birdhouse comes out; the bird looks up into the sky	
29	The snake is on a rocket headed towards the moon	Space

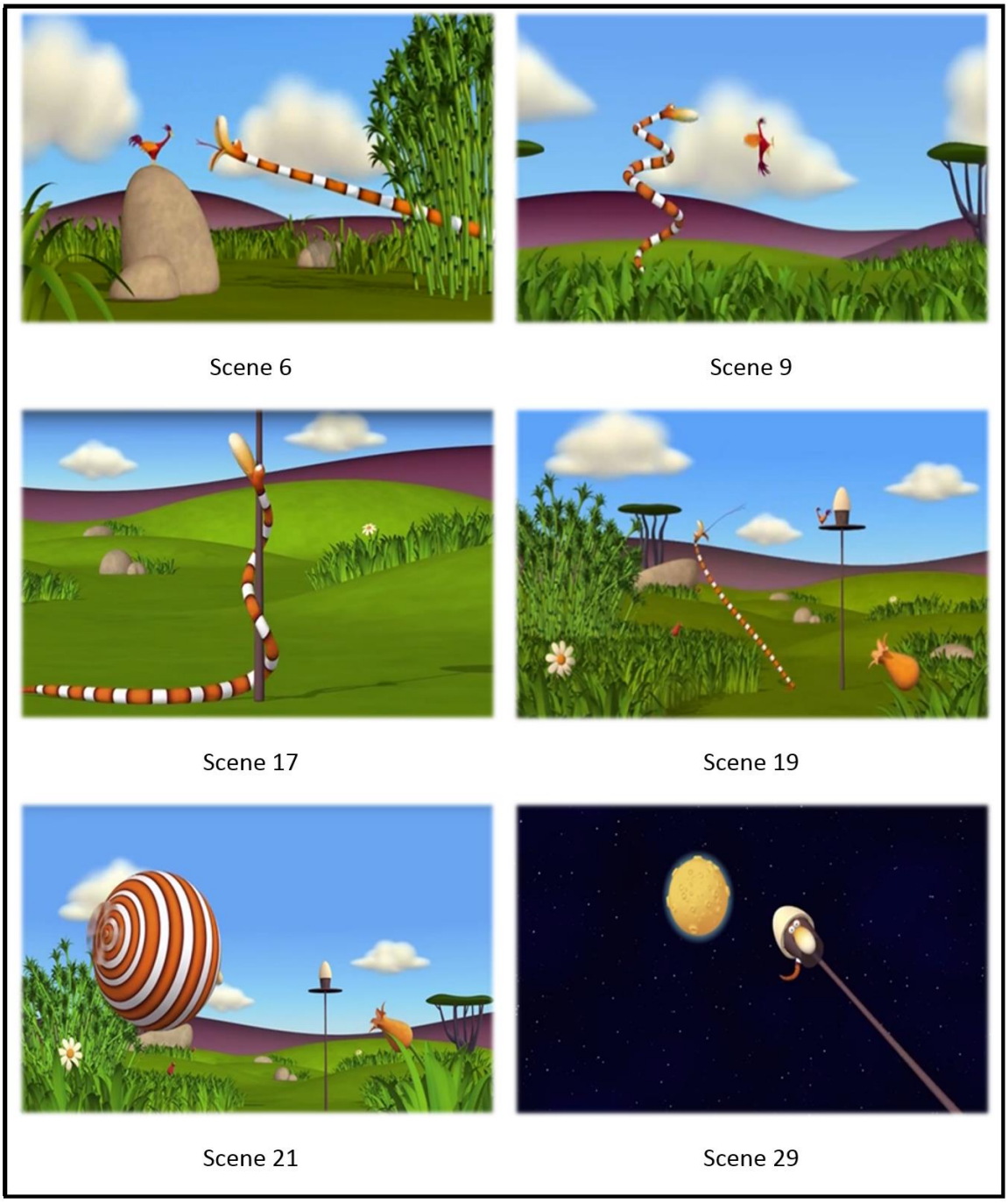

Figure 2.6 Sample scenes from animated stimuli, produced by editing two episodes from the *Gazoon* (Villemaine & Trouvé, 2007) animated series.

2.3.3 Non-Linguistic Tasks

There were two non-linguistic tasks in the current study. The importance of having non-linguistic tasks in synergy with linguistic tasks when attempting to assess the potential cognitive effects that language may have in human cognition has been duly noted in the literature (Everett, 2013; Murahata, Murahata, & Cook, 2016). Murahata et al. (2016) note that the ideal SLA research (what they call *multi-competence research*) sees languages as one of many complex systems in the mind, one which is interacting with several cognitive systems (e.g. memory systems, conceptual structures). They suggest that research design for investigating bilingual cognition should take three elements into consideration: language, thought and reality. It should assume that the language (words) we use to describe things (reality) corresponds to different ways of looking at aspects of that reality (thought). They emphasize that researchers ought to aim for the cognitive tasks to be as language-free as possible, in order to better assess the effects of the language-particular domain on non-language areas. They state that a true test of the linguistic relativity hypothesis involves the effect of language on non-language tasks rather than on language-related-areas (p. 19). These ideas seem sensible and this why task 3 and 4, the two non-linguistic tasks, were incorporated into the current study.

As was already mentioned, the stimuli and procedures for the two non-linguistic tasks were adopted from Sakurai (2014), with the generous consent of the author. Before describing the tasks per se, it is important to describe the similarities and the

changes that were made, as they compare with Sakurai's original study. In the 2014 study, there were two tasks: a MANNER/PATH categorical task and a MANNER/PATH similarity judgment task. The way to elicit the data was to present the subjects with a triad of images or a pair of images (respectively) which contained a contrast between MANNER and PATH. This aspect of the experiment was replicated in its entirety in the current study: the exact same triads and pairs were shown to the subjects, with the same general instructions, and in the identical order. However, the initial pilot study of the stimuli revealed some concerning matters which triggered modifications to some aspects of both the stimuli images as well as the procedures for administering the experiment, as explained below. Figure 2.7 shows examples of the triads and pairs as they were shown in Sakurai's experiment.

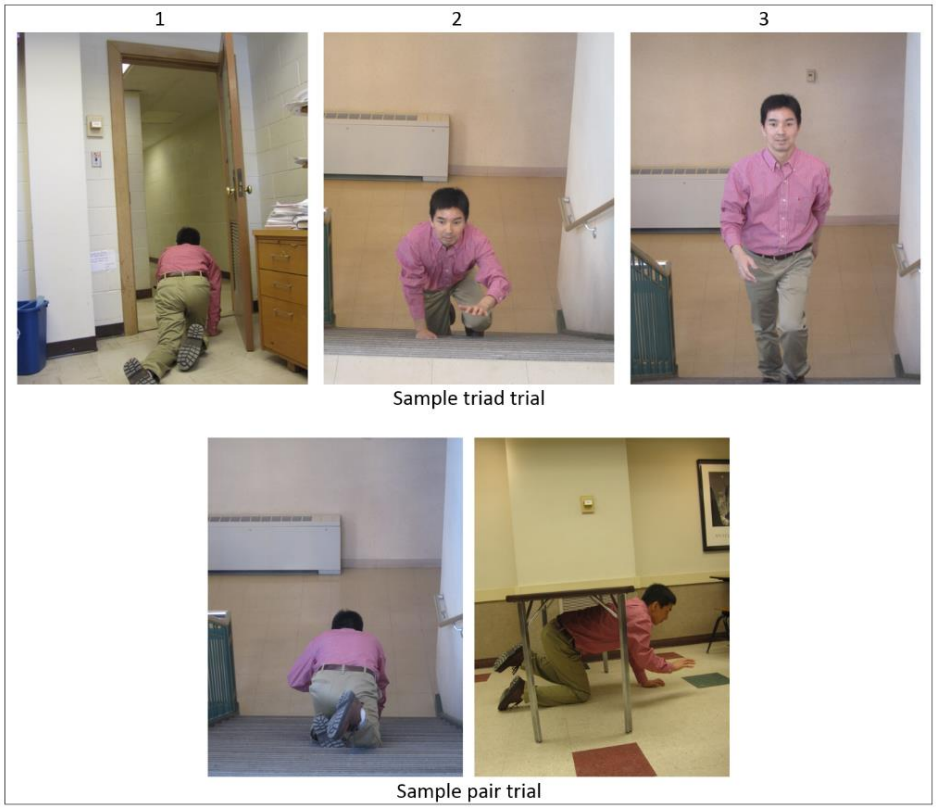

Figure 2.7 Sample stimuli from Sakurai's 2014 study.

When these two tasks were administered to the pilot-study subjects, there were two aspects that proved to be problematic with Sakurai's original design: the color appearance parameters in some of the images (i.e. hue, lightness, brightness, chroma, colorfulness and saturation) and the procedure to show the images to the subjects. It is important to note that the instructions given at the beginning of these tasks had to be as general as possible (to avoid directing the subjects' attention to the motion components in question), so the instructions would be along the lines of "among the three pictures, choose the two that are most similar to you" or "please indicate (on a given scale) how similar or different the two pictures are". Knowing that the instructions were general, the subjects of the pilot study were asked how they came to their decisions after they had completed the tasks (in order to make sure they were interpreting the instructions as intended). The addition of this question helped identified the first problematic aspect of the stimuli:

In the original experiment, the pictures were shown to the subjects in color on a computer screen (similar to this study) and Sakurai assured that the person in the images was dressed with the same clothes in all instances. In spite of this precaution, some of the images ended up appearing slightly darker than others. The results of the pilot study revealed that some subjects were basing their answer choices on these (irrelevant) color appearance parameters instead of by paying attention to what motion the FIGURE was performing in the scene. As surprising as it may seem that these slight differences would be perceived as significant by some, there were two subjects from the pilot study who reported things like "the color of the shirt was different in some

pictures" or "the man had darker skin color in some pictures", or "the room was darker". It is presumed that only a minority of the subjects would interpret the task in this manner if the experiment is replicated; nevertheless, some steps were taken in order to diminish such color appearance parameters differences: all of the images were manipulated so that the resulting pictures were monochrome images in the shades of blue and the brightness level was adjusted when needed to make them more uniform (see Figure 2.8 for an example). In addition, a question was formally added to the end of the task to make sure that the subjects were basing their choices in terms of what the FIGURE in the picture was doing. There were three subjects belonging to the L1E group who were eliminated from the study because they reported basing their choices on similar irrelevant factors (e.g. pixels, resolution, the distance of the FIGURE the top of the picture). As mentioned in section 2.2, supplemental information was collected for the non-linguistic task. This problem persisted and resulted in an even higher percentage of subjects getting eliminated: 9 L1-Spanish subjects and 30 L1-English subjects were removed. The final chapter will further discuss this issue and provide some recommendations for future research.

The other concern was with the procedure utilized to show the images to the subjects. In Sakurai's (2014) study, the images were added to a PowerPoint presentation and "to minimize linguistic influence as in the MANNER/PATH similarity judgment task, the images on the computer screen were quickly changed one after another" (Sakurai, 2014, p. 101) as the subjects wrote their choices on a separate paper answer sheet. Perhaps this method worked well with the different population in Sakurai's study

(second and fifth graders); however during the pilot study it was observed that, at least with adults, this procedure was prone to producing errors in the subjects' answers. For instance, they would still be looking down at the paper to write their answer when the next stimulus was presented, forcing them to look up and consequently (sometimes) forgetting their previous choice, or they would mark a choice where it didn't correspond (since the answer sheet had the list of all trials in it). More importantly, this process fails to elicit valuable information that is usually collected in in non-linguistic tasks (e.g. response time), so the researcher in the current study decided to use a different medium to administer these two tasks, as described in the following two sections.

2.3.3.1 MANNER/PATH Categorical (Task 3)

As Sakurai (2014) describes, the aim of this task was to investigate which aspect of motion appears more salient to the subjects (MANNER or PATH). The stimuli consists of 18 pictures portraying the same person performing various MANNER/PATH combinations which (in most cases) depict everyday human actions. Table 2.6 shows the various MANNER/PATH combinations yielded by combining the stimuli.

Table 2.6 Picture combinations used in task 3, MANNER/PATH categorical task. Adapted from Sakurai (2014, p. 100).

Manner/Path Categorical Tasks		**PATH**					
		Entering a room	Exiting a room	Getting over a box	Descending steps	Ascending steps	Getting under a table
MANNER	Walking	into	out	over	down	up	-
	Running	into	out	-	down	up	-
	Jumping	into	out	over	-	-	-
	Crawling	into	out	over	down	up	under

The procedure to administer the two non-linguistic tasks was modified to involve an automated, computerized experiment where the subjects had full control of the tasks (i.e. they controlled the flow of the trials appearing on the screen and they selected their answer choices in the same screen). After reviewing various experimental software, it was decided to utilize Qualtrics software, V062015, Copyright © 2015 Qualtrics (Qualtrics, 2015). Even though the software is traditionally used for surveys, their advance building options allow for the addition of images to a question as well as further control over how the survey (in this case the stimuli) flows. In the current experiment, a *single answer-multiple choice, auto advance code* was used so that a new trial of stimulus would automatically appear after the subjects had chosen their answer. The JavaScript code used to enable the auto-advanced option was the following:

```
var that = this;
        this.questionclick =
    function(event,element){
            if (element.type == 'radio')  {
                that.clickNextButton();
            }
}
```

Since this task involved a forced-choice answer (i.e. they had to decide which two of the three images was perceived as more similar), each trial could easily be built into the software as a multiple-choice question, with one of the only three possibilities being the answer choices. The resulting text in the trials read as follows: “Look at the images below. Which two images seem more similar to you?” and the possible answer

choices where "*a* and *b* are more similar", "*a* and *c* are more similar", or "*b* and *c* are more similar". Figure 2.7 shows a screen shot of one of the trials in the MANNER/PATH categorical experiment.

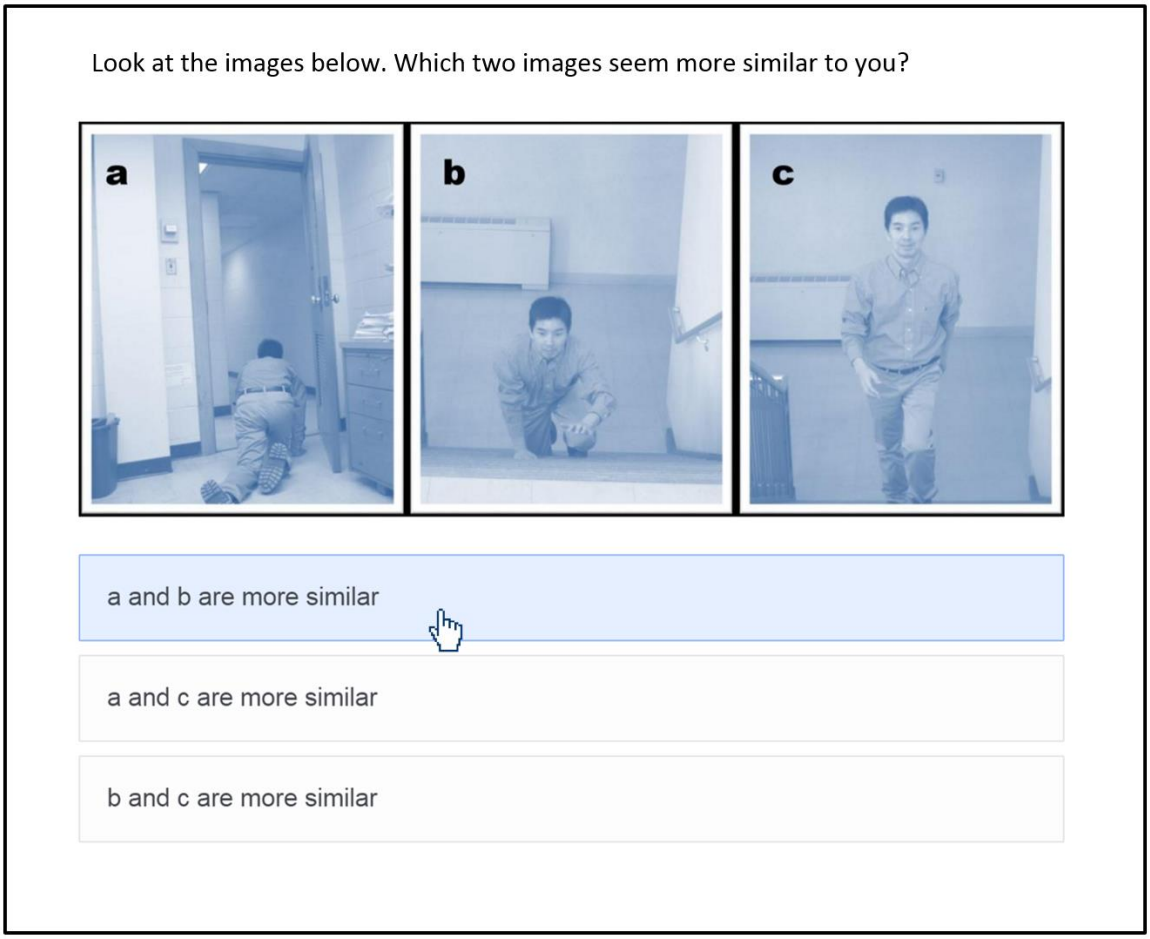

Figure 2.8 Screen shot of computerized version of Sakurai's (2014) MANNER/PATH categorical task as conducted in the current study (taken from a L1E trial).

Since the procedure for both of the non-linguistic tasks was exactly the same, it will be explained once in this section. All of the instructions for task 3 and 4 were displayed on the computer screen at the beginning of each experiment. For the L1S/LSE group, all of the text was in Spanish, and for the L1E group, all of the text was in English.

The experimenter's role was to set up the experiment and tell the subjects that she would be available in case there were any questions. The welcome screen showed the general instructions in order to prepare the subjects for the types of tasks they were about to complete and the second screen asked for some basic information (which was coded later and used to match to the linguistic data). Then, more specific instructions for task 3 appeared and the subjects had three *test trials* to get used to the task. After the test trials, a warning screen appeared telling the subjects that the *real* experiment was about to begin and to please let the researcher know if there were any questions before continuing (see Appendix C for a full set of instructions). As can be seen in Figure 2.8, when the subject hovered the mouse pointer over an answer choice (illustrated by a small hand icon), that option would change color to indicate that it was the selected choice. When the subject clicked on an option, a new trial automatically appeared on the screen and the process would continue until part 1 was over. The subjects were not able to go back once a selection had been made (which was explained at the beginning) and they could not advance to the next trial unless a choice had been selected.

As stated in the introduction to this section, there are various advantages of creating an automated-computerized experiment. By using this mechanism, the subjects had more control over the experiment and were able to select their choices more easily: right on the computer screen and without the interference of any other possible trial answers (in contrast to having to look away to write an answer on list with various choices). In addition, the software provides all the necessary analytics for further

analyses of data if the need arises (e.g. response time, data sheets and reports that can be easily exported in various formats).

All the trials in task 3 were similar in nature, there was a pair of pictures with the same MANNER of motion and a pair with the same PATH. As can be seen in Figure 2.8 above, there were two pictures (*a* and *b*) with the same MANNER combination (crawling) and two pictures (*b* and *c*) with the same PATH combination (going up the stairs). The trials were presented in the exact same order as the Sakurai's 2014 experiment. Note that it was also possible for a subject to select a choice that would not indicate a preference for either MANNER or PATH (e.g. a subject choosing option "a and c" in figure 2.8, which corresponds to a pair of images illustrating different MANNER and PATH).

2.3.3.2 MANNER/PATH Similarity Judgment (Task 4)

This task automatically followed task 3 in the computer experiment. A warning screen appeared once the subjects finished (what was labeled) *part 1* of the computer experiment and the new set of instructions for (what was labeled) *part 2* was displayed. The aim of this task was to further investigate the degree of salience of both MANNER and PATH by asking the subjects to look at a pair of pictures from the stimuli and rate them in terms of how similar or how different they seemed, on a rating scale from 1 (not at all similar/they look completely different to me) to 10 (extremely similar/they

look almost the same to me). See Table 2.7 for all pair combinations used and figure 2.9 for a sample trial for this task.

Table 2.7 MANNER/PATH similarity judgement pairs. The word in bold represents the particle in the expression that encodes the related motion characteristic. Adapted from Sakurai (2014, p. 97).

PATH		
No.	Picture A	Picture B
1	jump **into**	walk **into**
2	run **into**	crawl **into**
3	walk **out**	run **out**
4	crawl **out**	jump **out**
5	walk **over**	crawl **over**
6	jump **over**	crawl **over**
7	run **down**	walk **down**
8	walk **down**	crawl **down**
9	crawl **up**	walk **up**
10	crawl **up**	run **up**
MANNER		
No.	Picture A	Picture B
11	**walk** out	**walk** into
12	**walk** over	**walk** down
13	**walk** down	**walk** up
14	**run** up	**run** into
15	**run** out	**run** down
16	**jump** into	**jump** over
17	**jump** over	**jump** out
18	**crawl** under	**crawl** up
19	**crawl** down	**crawl** under
20	**crawl** up	**crawl** out

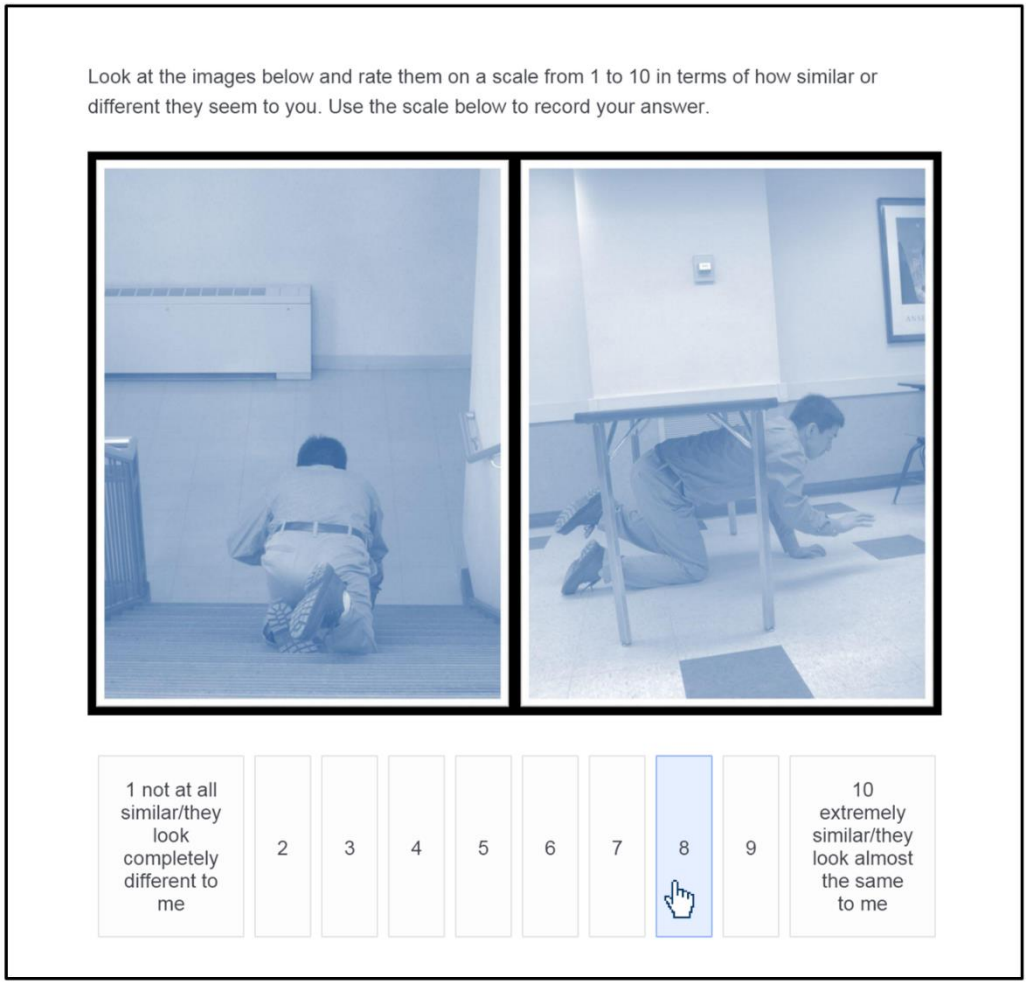

Figure 2.9 Sample trial for task 4, MANNER/PATH similarity judgement.

2.4 Analyses

The software used to perform the statistical analyses on the resulting data was SPSS V23. Microsoft Excel was used to manage the data and perform simple calculations such as means and standard deviations. Note that some of the Excel spreadsheets were direct downloads from the Qualtrics (Qualtrics, 2015) database since the results for tasks 3 and 4 were collected and stored on their server. Depending on the specific

analysis needed, the following tests were conducted: a one factor ANOVA or a Pearson product-moment correlation coefficient analysis. Since the data came from unequal group sizes, a Welch's *t*-test was used to test for the robustness of the equality of means. The significance level (alpha) for the analyses was set at 5%. Results with a calculated probability (*P-value*) smaller than 0.05 ($p < 0.05$) were considered statistically significant and results with a *P-value* smaller than 0.001 ($p < 0.001$) were considered statistically highly significant. The strength and direction of the linear relationships in the correlation analyses (r) ranges from -1 (perfect negative relationship) to 1 (perfect positive relationship). To interpret the effect size, Cohen's (1988) conventions were followed: $r = 0.1$ = small; $r = 0.3$ = moderate; $r = 0.5$ = large.

2.4.1 Analyses of the Linguistic Tasks (Tasks 1 and 2)

In order to examine the hypotheses presented in the previous chapter, approximately 350 minutes of linguistic data were transcribed. The first step was to identify the motion events contained in the data, which were the main unit of analysis. The verbs (or complex expressions) describing a motion event were divided by MANNER and PATH. Then, following Slobin (1996b), the MANNER tokens were further divided by T1-MANNER and T2-MANNER. As suggested in Chapter 1, if L2 transfer is likely to be observed, it would probably involve the more expressive T2-MANNER. The total number of MANNER expressions by subject was calculated to get the T1 and T2 MANNER proportions (i.e., percent of T1-MANNER and percent of T2-MANNER from total

MANNER produced). Intra-rater reliability was measured for 15% of the data for each group (L1S/L2E and L1E) and reached 97.5% consistency. Additionally, since a vast amount of *frog story* data is available from CHILDES in both Spanish and English (CHILDES; MacWhinney, 2000), thirty sample adult narrations in each language were coded by the researcher and by two other raters independently to test inter-rater agreement. The intraclass correlation coefficient (ICC) results yielded an alpha of 0.92 and 0.90 respectively.

The analyses were conducted from broader to more specific: the first analyses involved both MANNER and PATH and more fine-tuned analyses involved only MANNER (i.e. T1-MANNER vs. T2-MANNER). It is important to note that, in order to keep the MANNER domain as "uncontaminated" as possible, verbs which have MANNER and PATH conflated (e.g. *chase*, *escape*), were coded as PATH, not MANNER. The only exceptions were instances with additional MANNER elements encoded for the same event that would make it a T2-MANNER expression (e.g. *escaped flapping around*, *chased the bird bouncing like a spring*). In addition, since the unit of analysis was the motion event itself, if a speaker added three MANNER particles (e.g. an adverb, an adjective and an additional verb) to express more detailed MANNER in the same event, this counted as one (1) T2-MANNER token, not as three (3) T2-MANNER tokens. Table 4.3 in the last chapter presents some examples of T2-MANNER expressions produced by the L1S/L2E subjects in this study.

To start, a single factor ANOVA was used to compare the overall results, with language (L1S/L2E vs. L1E) as a between-subject factor and proportions of motion

domain (MANNER or PATH) as a within-subject factor. The proportions of MANNER and PATH were calculated from the overall motion-event productions each subject formulated in the narrations. After that, the results for the motion domain were broken into stimulus type to analyze between-subject variances for overall MANNER and PATH by stimuli (picture book vs. animation). As explained above, a more detailed analysis of MANNER was conducted to compare the proportions of T1-MANNER and T2-MANNER in the data. An ANOVA was conducted to compare language (L1S/L2E vs. L1E) and type of MANNER (T1 vs. T2) by stimulus type (picture book vs. animation). To end, a Pearson product-moment correlation coefficient was computed to assess the relationship (if any) between the BLP English dominance scores and the results of the L1S/L2E group in the linguistic tasks. If between-group statistically significant differences were found, further comparisons were conducted among those with higher BLP English dominance scores and the L1E control group.

It is important to explain why the L2-dominance scores were used instead of the (overall) global dominance scores presented in section 2.3.1. As noted by one of the BLP developers, Birdsong (2015), dominance is a matter of relativity between bilingual individuals, that is to say two equally resulting global dominance scores, for example a score of 10, could have been attained by subtracting the raw language dominance scores of 30 and 20 in one case, and 90 and 80 in another. Thus, even though the global dominance score is the same, it corresponds to very different types of speakers. In other words, when simply using the global dominance scores to compare data, inter-individual differences in the degree of dominance get lost. As a consequence, it would be a poorly

designed statistical test to split subjects in the current study to some arbitrary category, say *balanced bilinguals*, by deciding on some arbitrary cut-off in the overall dominance scores, for example, those in the range from -30 to 30 (closest to zero). If one of the research questions is to see if (perceived) dominance in the L2 is correlated with the mean number of MANNER tokens and types produced in the linguistic data or in the way they respond to the non-linguistic tasks; then the absolute scores for that language (English in this case) should be used in the analyses. It is important to keep in mind that a high degree of dominance does not imply monolingual native-like proficiency (Birdsong, 2015: 92). In spite of this limitation, calculating a correlation coefficient is relevant in order to assess if any differences are found within the L1S/L2E group (i.e., if some of the results are dependent on the BLP English dominance score). If this test showed a relationship between L2-dominance scores and any of the results, the L1S/L2E group was further divided to compare those above the median (the half with the highest dominance scores) to the control L1E group as needed. Figure 2.10 shows the BLP English dominance scores for all L1S/L2E subjects arranged from lowest to highest.

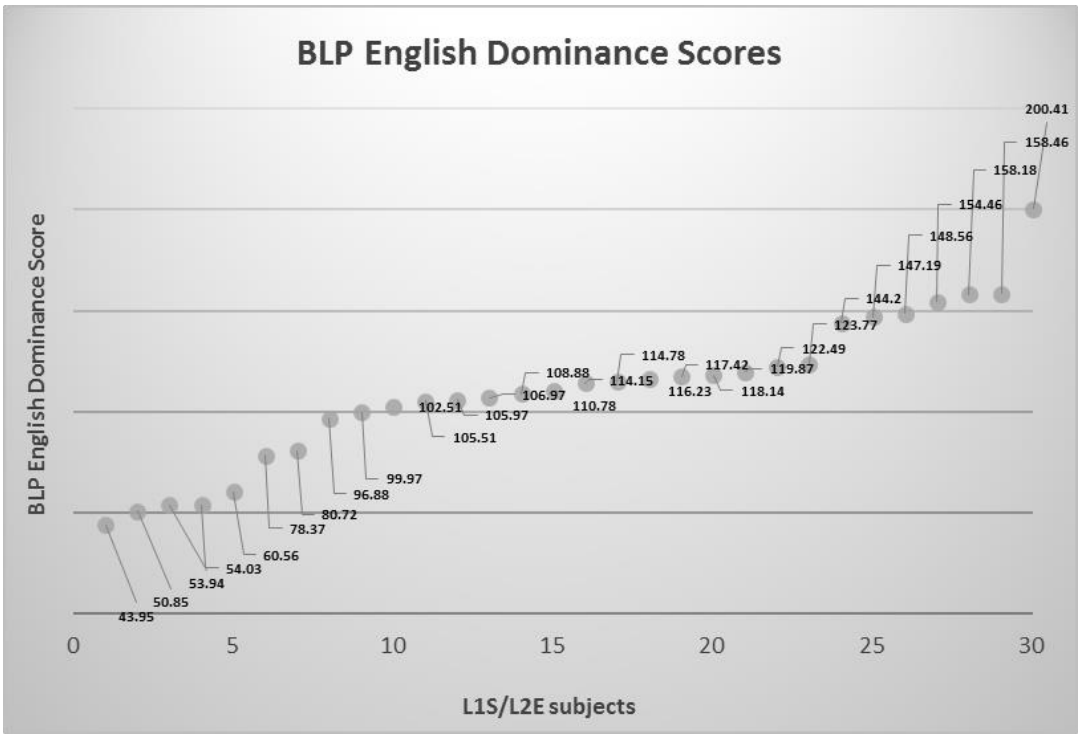

Figure 2.10 BLP English dominance scores from lowest (43.95) to highest (200.41).

2.4.2 Analyses of the Non-Linguistic Tasks (Tasks 3 and 4)

The first analyses for the non-linguistic tasks consisted in comparing the results of the experimental and control group to the results of the supplemental groups. A one-factor ANOVA was conducted to compare the data of all the subjects within their language groups (L1-Spanish or L2-English) for tasks 3 and 4. After the comparison with the larger group was made and the groups were determined to be statistically equivalent; the same analyses were conducted among the L1S/L2E and the L1E groups. The analysis for task 3 involved comparing the proportions of preference for either MANNER, PATH or NEITHER (i.e., what percentage of the time they chose one over the other from the total amount of trials). The analysis for task 4 involved comparing the

average rating for MANNER and PATH (i.e., the means of all MANNER ratings from all MANNER pairs and the means of all PATH ratings from all PATH pairs). Finally, a Pearson product-moment correlation coefficient was computed to assess the relationship (if any) between the BLP English dominance scores and the results for the non-linguistic tasks. If any correlations were found, further analyses took place to compare those with higher BLP English scores to the L1E control group.

2.5 Conclusion to Chapter 2

This chapter described the overall methodology for the current study including the experimental design, the subjects, and the different tools used to elicit relevant data. In section 2.3.1, information about the global BLP dominance scores of the L1S/L2E group was presented mainly to see the trend among the bilingual subjects, rather than to categorize them into a nominal dominance group (e.g. L1-dominant, L2-dominant, or balanced bilingual). Each of the tasks was explained in detail as well as the modifications that were made to Sakurai's (2014) stimuli and procedures. The last section of the chapter discussed the statistical tests conducted to analyze the results for both the linguistic and the non-linguistic tasks. The next chapter presents the results of those analyses.

CHAPTER 3. RESULTS

3.1 Introduction

The results of the various analyses conducted in this study are presented in this chapter. Before the results are presented, the hypotheses previously proposed in this work are reiterated below:

H1: In the first linguistic task (picture book storytelling), the L1S/L2E subjects with high Bilingual Language Profile (BLP) English dominance scores will produce a higher number of tokens and types of MANNER expressions, behaving closer to the L1E group.

H2: In the second linguistic task (narration of an animation), all L1S/L2E subjects will produce more MANNER tokens and types as compared to the first task, but those with higher BLP English dominance scores will behave more like the L1E group.

H3: In the non-linguistic tasks (pairs and triads contrasting MANNER and PATH) the L1S/L2E speakers with higher BLP English dominance scores will behave more like the L1E group.

3.2 Linguistic Tasks

3.2.1 Overall MANNER Results

The overall results by subject pools (L1S/L2E and L1E) for the linguistic tasks including the picture book and the animation are presented in Figure 3.1 below. As can be seen from the data, there was a statistically significant difference ($p < 0.05$) between groups as determined by a one-way ANOVA for MANNER, ($F(1,48) = 5.907$, $p = .019$). Additional Welch's *F* tests performed given the unequal group sizes also yielded significant values *Welch's F*(1, 29.489) = 4.986, $p = 0.033$. The numerical output is presented in Table 3.1.

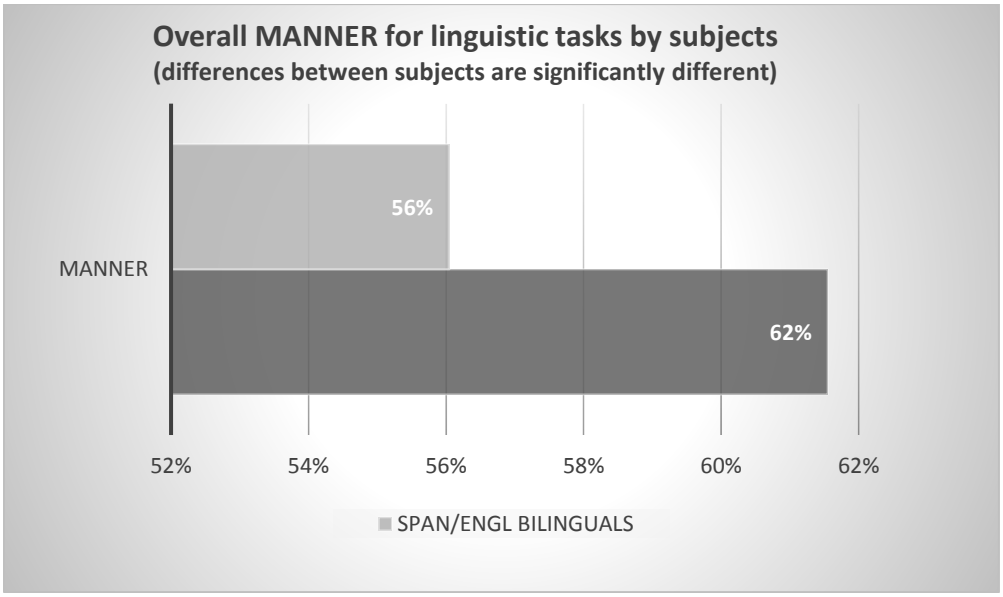

Figure 3.1. Overall MANNER results for the L1S/L2E bilinguals and the L1E control groups. The L1E group produced more MANNER than the L1S/L2E group. The variances among the groups are statistically significant ($p < 0.05$).

Table 3.1 Overall MANNER results by subject group for all of the linguistic tasks.

		Proportions of manner			
Subjects	*n*	*M*	*SD*		
L1E - Control	20	62%	0.09		
L1S/L2E - Experimental	30	56%	0.06		
ANOVA					
	df	*SS*	*MS*	*F*	*p*
Between Groups	1	0.03	0.03	5.91	0.02*
Within Groups	48	0.27	0.01		
Total	49	0.30			
Robust Tests of Equality of Means					
	Statistic [a]	*df1*	*df2*	*p*	
Welch	4.99	1	29.49	0.03*	

[a] Asymptotically F distributed.

*Significance at the $p < 0.05$ level.

The implications of the results presented above will be discussed further in the next chapter. For now it suffices to say that, at first sight, the results for the control group (L1E) seems to fit with previous research reporting that L1-English speakers encode significantly more MANNER than L1-Spanish speakers. However, when the results were analyzed by stimulus type (picture book and animation), there were no significant differences in the encoding of MANNER between groups. In other words, the encoding of MANNER in each of the two linguistic tasks can be considered equal among all subjects. As a reminder, the L1S/L2E subjects performed all of the tasks in Spanish, while the L1E performed them in English, which makes these results even more intriguing. This speaks to the importance of having more refined and controlled stimuli for motion-event experimentation. It also points out to the fact that this particular bilingual population differed in behavior from what has been reported for their L1 monolingual counterparts, even when completing the tasks in their L1 (Spanish). Figure

3.2 shows the overall results divided by stimulus type and subjects and Table 3.2 presents the relevant numerical output for the analyses of these data.

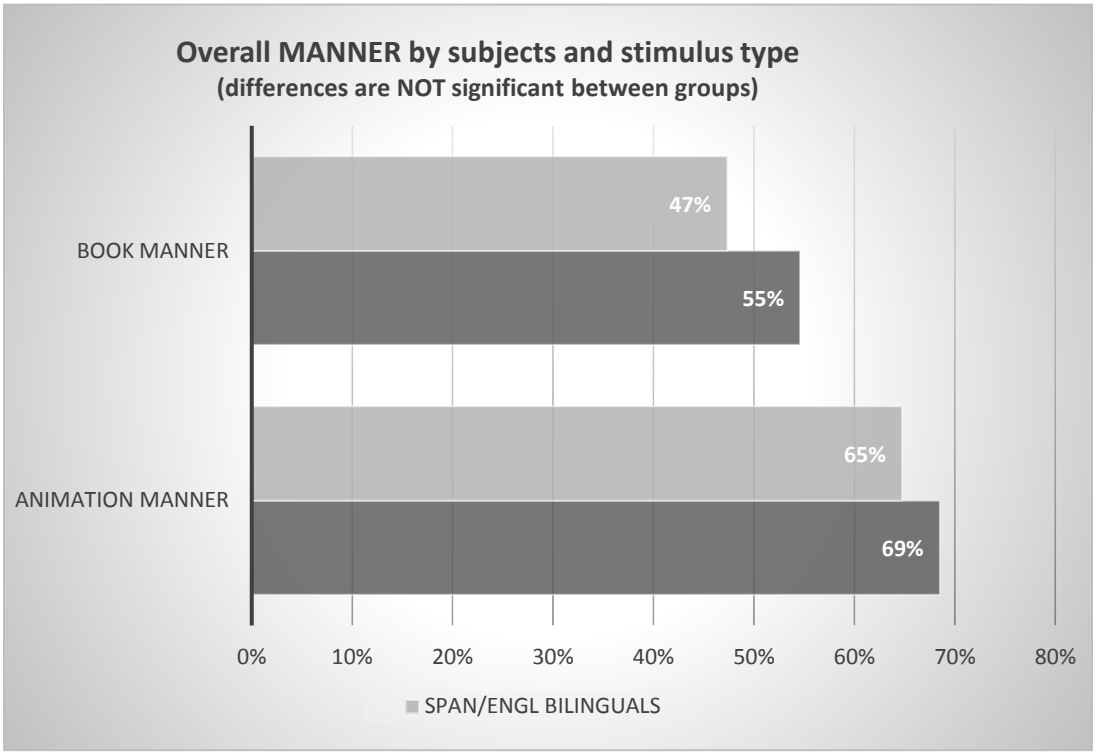

Figure 3.2 Overall results for MANNER, by stimuli and subjects. The analyses for mean variance found that the difference between the subject groups is not significant.

Table 3.2 Results for the data analyses comparing subjects and stimulus type for the linguistic tasks. No significant differences were found between the L1S/L2E and the L1E groups.

			Proportions of manner			
	Subjects	*n*	*M*	*SD*		
Book	L1E - Control	20	55%	0.16		
	L1S/L2E - Experimental	30	47%	0.10		
Animation	L1E - Control	20	69%	0.06		
	L1S/L2E - Experimental	30	65%	0.09		
ANOVA						
		df	*SS*	*MS*	*F*	*p*
Book	Between Groups	1	0.06	0.06	3.91	0.05
	Within Groups	48	0.77	0.02		
Animation						
	Between Groups	1	0.02	0.02	2.59	0.11
	Within Groups	48	0.32	0.01		
Robust Tests of Equality of Means						
		Statistic [a]	*df1*	*df2*	*p*	
Book	Welch	3.28	1	29.05	0.08	
Animation	Welch	3.02	1	47.98	0.09	

[a] Asymptotically F distributed.

A Pearson product-moment correlation coefficient was computed as a final analysis to assess the relationship (if any) between the BLP English dominance scores and the results of the L1S/L2E group. According to the results, there was no correlation between the BLP English dominance scores and the overall MANNER encoded in the linguistic tasks. Table 3.3 below shows the correlation analysis output. There are no significant correlations involving the BLP English dominance scores and overall MANNER.

Table 3.3 Results of correlation analysis between the BLP English dominance scores and the overall MANNER for the linguistic tasks by stimulus type. The analysis shows no correlation between the variables.

		BLP English dominance scores	Manner book	Manner animation
BLP English dominance scores	*r*	1		
	p			
	n	30		
Manner book	*r*	0.061	1	
	p	0.747		
	n	30	30	
Manner animation	*r*	0.138	-0.217	1
	p	0.467	0.248	
	n	30	30	30

3.2.2 T1 and T2 MANNER Results

This section presents more fine-tuned results for MANNER. As mentioned in the previous chapters, there is a need to refine the analyses conducted when looking at a domain such as this one. Thus, in order to better understand the similarities found among the L1S/L2E subjects and the L1E subjects, the MANNER tokens were further analyzed based of the type of MANNER: tier 1 (T1)-MANNER, which are the more general, widely used MANNER verbs such as *walk*, *run*, or *fly*; and tier 2 (T2)-MANNER, which are rarely used verbs like *swoop* or *scramble* or verbs that add another level of specificity to a *tier 1* verb, as well as other forms of added MANNER (as explained in the previous chapters). Of interest to the current study is T2-MANNER which is not readily

available in LMS-languages like Spanish. Figure 3.3 shows the results for the experimental group and the control group divided by T2-MANNER and stimulus type.

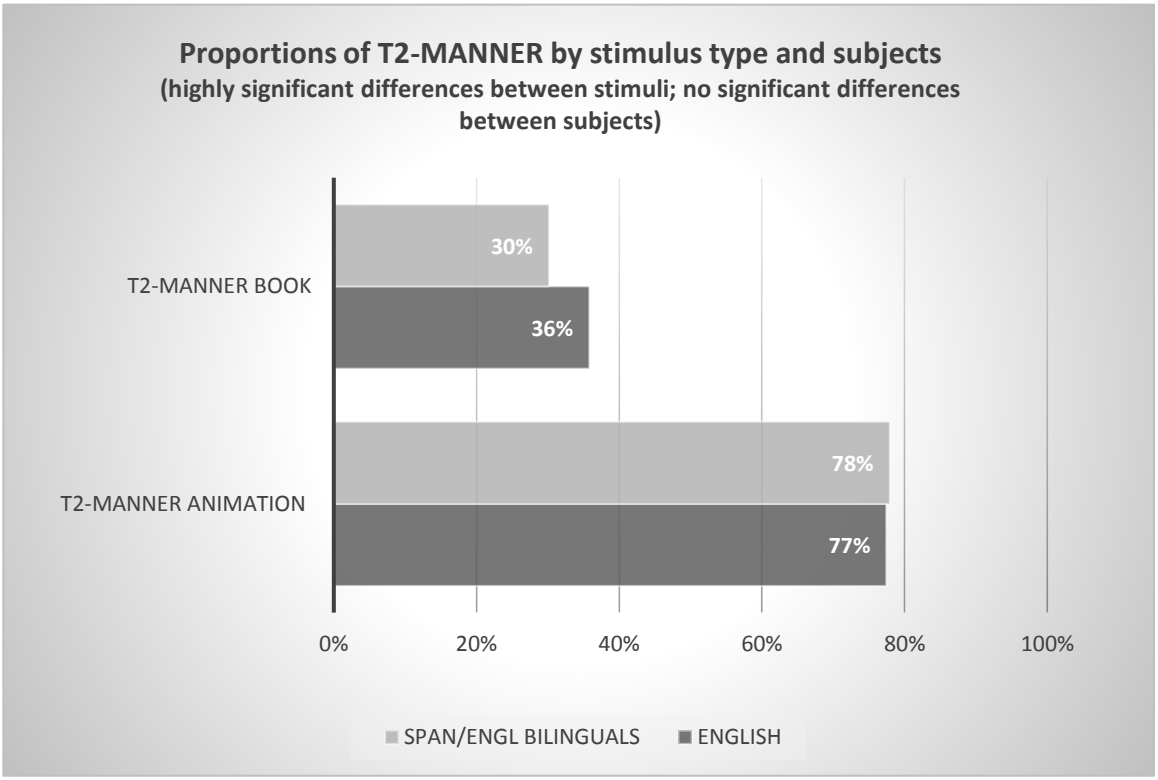

Figure 3.3 Results divided by stimuli and T2-MANNER. Results show that the encoding of T2-MANNER varied greatly by stimulus type ($p < 0.001$) with the animation yielding larger proportions of T2-MANNER. There were no significant differences between subject groups.

The analyses of the data portrayed in Figure 3.3 show that there were no significant differences between groups. This indicates that both the L1S/L2E and L1E groups performed the same in all linguistic tasks in terms of their encoding of T2-MANNER as evidenced by the results of the one-way ANOVA for *T2-MANNER-book,* ($F(1,48) = 1.139$, $p = 0.292$)*;* and for *T2-MANNER-animation* ($F(1,48) = 0.032$, $p = 0.859$). Welch's *F tests* also supported these results *Welch's* $F(1, 33.20) = 1.021$ $p = 0.320$ for *T2-*

MANNER-book; and *Welch's F*(1, 46.32) = 0.040 *p* = 0.843 for *T2-MANNER-animation*.

The analyses' results are presented in Table 3.4.

Table 3.4 Results for T2-MANNER proportions by subject group and stimulus type. There were no statistically significant differences found between groups.

			Proportions of T2-manner			
	Subjects	*n*	*M*	*SD*		
Book						
	L1E - Control	20	36%	0.21		
	L1S/L2E - Experimental	30	30%	0.16		
Animation						
	L1E - Control	20	77%	0.07		
	L1S/L2E - Experimental	30	78%	0.13		
ANOVA						
		df	*SS*	*MS*	*F*	*p*
Book	Between Groups	1	0.04	0.04	1.14	0.29
	Within Groups	48	1.64	0.03		
Animation	Between Groups	1	0.00	0.00	0.03	0.86
	Within Groups	48	0.62	0.01		
Robust Tests of Equality of Means						
		Statistic [a]	*df1*	*df2*	*p*	
Book	Welch	1.021	1	33.20	0.32	
Animation	Welch	0.040	1	46.32	0.84	

[a] Asymptotically F distributed.

As can be inferred from looking at the proportions in Figure 3.3 and Table 3.4, there was a large discrepancy among T2-MANNER depending on the stimulus type. All subjects produced a larger amount of T2-MANNER tokens when describing the animation. Not surprisingly, these differences are statistically highly significant ($p < 0.001$), which supports the idea that the type of stimulus plays an important role in motion-event experimentation.

Thus far, when looking at MANNER, the L1S/L2E group behaved very similar to the L1E control group and the major effect seems to be related to the stimulus type. A Pearson product-moment correlation coefficient was computed to assess the relationship (if any) between the BLP English dominance scores and the results for T2-MANNER. According to the results, there was a significant correlation ($p < 0.01$) between the BLP scores and T2-MANNER for the second linguistic task (the animation), [$r = -0.527$, $n = 30$, $p = 0.003$]. This correlation is visually presented in Figure 3.4. Table 3.5 below shows the numerical data with significant values bolded for ease of identification.

Table 3.5 Pearson correlation results showing a significant correlation (r = 0.527, $p < 0.01$) among BLP English dominance scores and T2-MANNER for the animation task.

		BLP English Dominance Scores	T2-manner book	T2-manner animation
BLP English dominance scores	*r*	1		
	p			
	n	30		
T2-manner book	*r*	-0.035	1	
	p	0.855		
	n	30	30	
T2-manner animation	*r*	**0.527****	0.082	1
	p	**0.003****	0.667	
	n	30	30	30

** Correlation is significant at the 0.01 level (2-tailed).

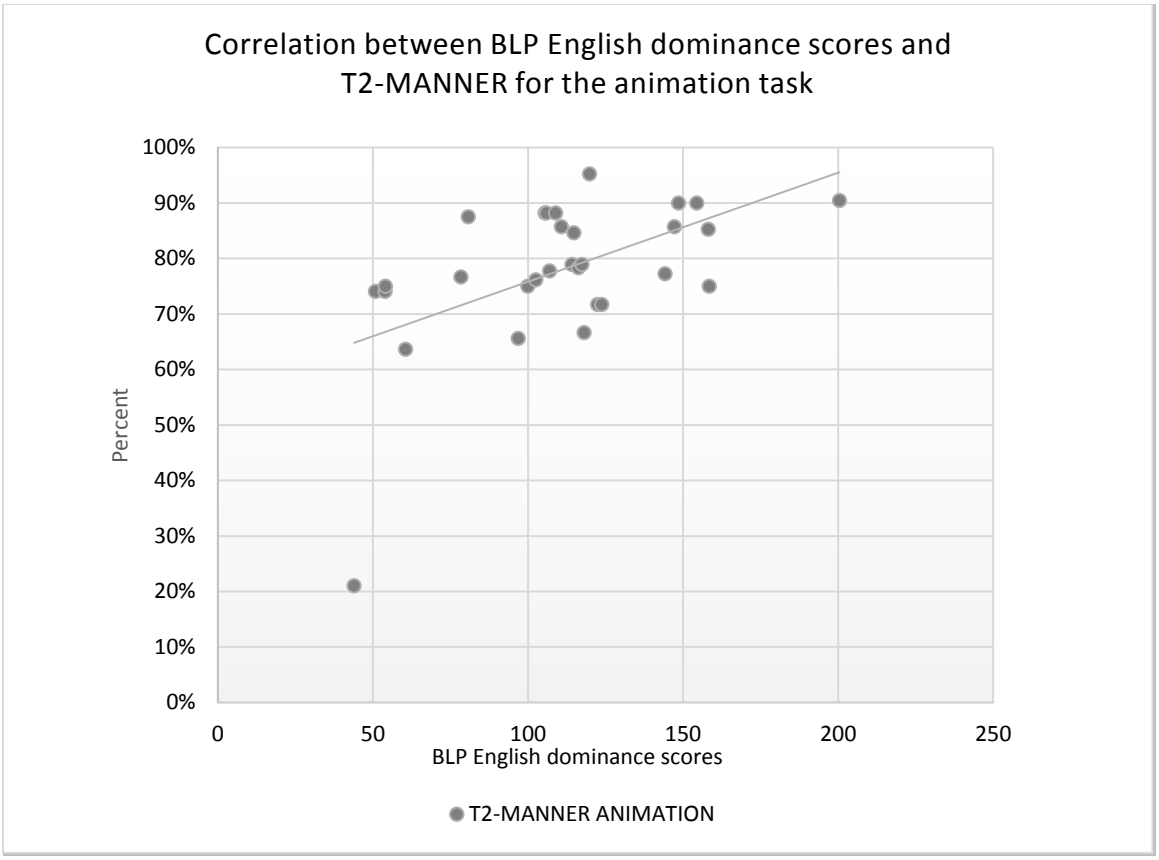

Figure 3.4 Correlation between BLP English dominance scores and T2-MANNER during the animation task. The higher the BLP English dominance score, the more occurrences of T2-MANNER were produced. This correlation is significant ($r = 0.527$, $p < 0.01$), even with outliers in the data.

The correlation results presented above in Table 3.5 are quite important for the current study since they suggest that there may be a relationship between language dominance and MANNER salience as will be discussed in the final chapter of this study. For now, taking all of the results into account, we can revisit the first two hypotheses, which relate to the two linguistic tasks:

H1: In the first linguistic task (picture book storytelling), the L1S/L2E subjects with high BLP English dominance scores will produce a higher number of tokens and types of MANNER expressions, behaving closer to the L1E group.

Hypothesis 1 is partially supported. It was found that the L1S/L2E subjects produced a higher number of MANNER tokens and types compared to what has been reported in the literature for LMS-language speakers and the group behaved statistically equivalent to the L1E group. However, there was no relationship between the BLP English dominance scores and MANNER in this particular task and the effect could be related to stimulus type; thus, hypothesis 1 is rejected.

H2: In the second linguistic task (narration of an animation), all L1S/L2E subjects will produce more MANNER tokens and types as compared to the first task, but those with higher BLP English dominance scores will behave more like the L1E group.

Hypothesis 2 is fully supported by the data. As reported above, significantly more MANNER overall was encoded during the animation in comparison to the picture book. In addition, a statistically significant correlation ($p < 0.01$) was found between BLP English dominance scores and T-2MANNER for the animation task. The implications of this finding will be discussed in detail in chapter 4. The next section of this chapter presents the results for the non-linguistic tasks.

3.3 Results for the Non-Linguistic Tasks

As mentioned in chapter 2, additional supplemental data were collected for the non-linguistic tasks. The results from the experimental group (L1S/L2E) and the control group (L1E) where compared with the results of the supplemental groups to ensure that the data collected were representative of a broader population. The combined results

for the four groups for the first non-linguistic task (MANNER/PATH categorical task) is presented in Figure 3.5 and the results for the second task (average MANNER and PATH rating) are presented in Figure 3.6.

Statistical analyses showed that there were no significant differences among the L1S/L2E group and the Spanish-supplemental group, or among the L1E group and the English-supplemental group. That is, all 65 L1-Spanish speakers performed the same on these tasks and all 60 L1-English speakers performed the same, which was verified by a one-way ANOVA conducted among each language group. The only significant *P-value* was found in the category "neither", which were instances in which a subject's choice would not reflect a preference for either MANNER or PATH. These percentages are extremely low and not relevant for the current study, so those numbers have been greyed out in the data. The results for both group comparisons are presented in Tables 3.6 and 3.7, respectively. After determining that the experimental and control results are comparable with the results of the supplemental groups, the remainder of the analyses were conducted.

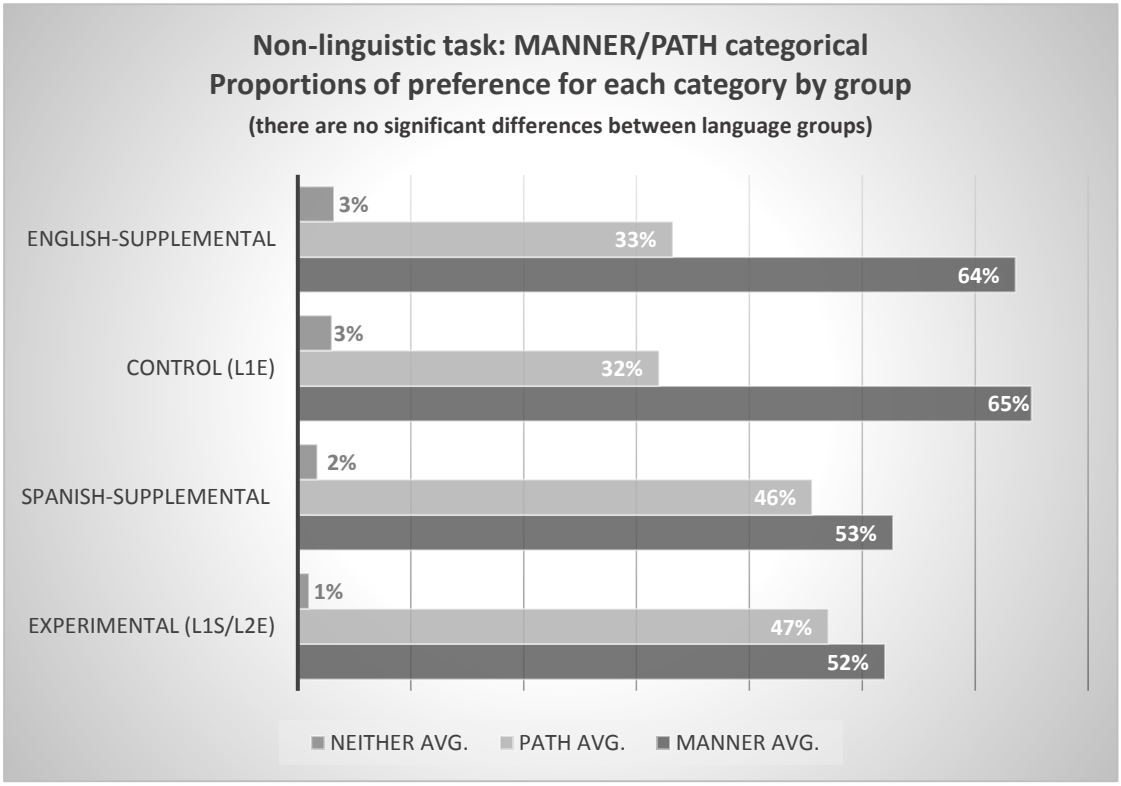

Figure 3.5 Overall results for the first non-linguistic tasks by group, experimental L1S/L2E (*n* = 30), Spanish supplemental (*n* = 35), control L1E (*n* = 20), and English supplemental (*n* = 40). There were no significant differences among language groups. All subjects preferred MANNER, but L1-English speakers tended to choose MANNER more than L1-Spanish speakers.

As can be seen in Figure 3.5, all subjects preferred MANNER to a higher degree than PATH, but L1-English speakers choose MANNER to a higher degree than L1-Spanish speakers. When looking at the average MANNER and PATH rating elicited in the pair-task (Figure 3.6), the results seem to show a more "expected" language pattern. A more in-depth discussion about the potential reasons behind these results will be presented in chapter 4.

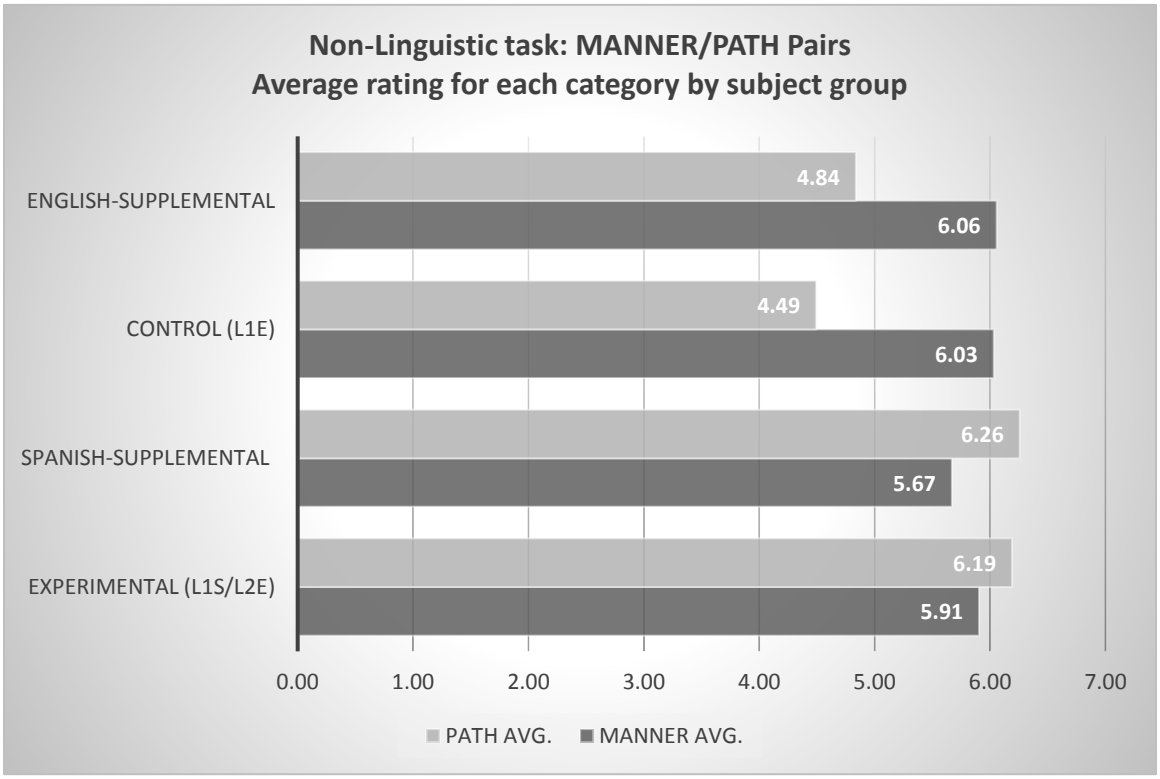

Figure 3.6 Results for the second non-linguistic task: average MANNER and PATH rating. For this task, L1-Spanish speakers tended to rate PATH higher than MANNER, and L1-English speakers tended to rate MANNER higher than PATH.

Table 3.6 Results comparing the experimental group (L1S/L2E) to the Spanish supplemental group. No significant differences were found among the two groups.

			Proportions of choice	
	Subjects	*n*	*M*	*SD*
Manner	L1S/L2E - experimental	30	52%	0.21
	Spanish - supplemental	35	53%	0.25
Path	L1S/L2E - experimental	30	47%	0.21
	Spanish - supplemental	35	46%	0.25
Neither	L1S/L2E - experimental	30	3%	0.03
	Spanish - supplemental	35	2%	0.02

Table 3.6 Continued.

			Average rating	
Manner pairs	L1S/L2E - experimental	30	5.91	1.99
	Spanish - supplemental	35	5.67	1.34
Path pairs	L1S/L2E - experimental	30	6.19	1.64
	Spanish - supplemental	35	6.26	1.46

ANOVA

		df	*SS*	*MS*	*F*	*p*
Manner	Between Groups	1	0.00	0.00	0.02	0.89
	Within Groups	63	3.49	0.06		
Path	Between Groups	1	0.00	0.00	0.04	0.85
	Within Groups	63	3.48	0.06		
Neither	Between Groups	1	0.00	0.00	3.65	0.06
	Within Groups	63	0.04	0.00		
	Total	64	0.04			
Manner pairs	Between Groups	1	0.91	0.91	0.33	0.57
	Within Groups	63	175.44	2.79		
Path pairs	Between Groups	1	0.07	0.07	0.03	0.86
	Within Groups	63	151.23	2.40		

Robust Tests of Equality of Means

		Statistic [a]	*df1*	*df2*	*p*
Manner	Welch	0.02	1	62.96	0.89
Path	Welch	0.04	1	63.00	0.85
Neither	Welch	3.57	1	57.83	0.06
Manner pairs	Welch	0.31	1	49.58	0.58
Path pairs	Welch	0.03	1	58.71	0.86

[a] Asymptotically F distributed.

Table 3.7 Results comparing the control group (L1E) to the English supplemental group. No significant differences were found among the two groups.

			Proportions of choice	
	Subjects	*n*	*M*	*SD*
Manner	L1E - control	20	65%	0.10
	English - supplemental	40	64%	0.21
Path	L1E - control	20	33%	0.11
	English - supplemental	40	33%	0.20
Neither	L1E - control	20	2%	0.02
	English - supplemental	40	3%	0.03
			Average rating	
	L1E - control	20	6.03	1.09
Manner pairs	English - supplemental	40	6.06	1.62
	L1E - control	20	4.49	1.26
Path pairs	English - supplemental	40	4.84	1.35

ANOVA

		df	*SS*	*MS*	*F*	*p*
Manner	Between Groups	1	0.00	0.00	0.13	0.72
	Within Groups	58	1.96	0.03		
Path	Between Groups	1	0.00	0.00	0.01	0.91
	Within Groups	58	1.78	0.03		
Neither	Between Groups	1	0.00	0.00	5.25	0.03
	Within Groups	58	0.03	0.00		
Manner pairs	Between Groups	1	0.01	0.01	0.00	0.95
	Within Groups	58	125.28	2.16		
Path pairs	Between Groups	1	1.57	1.57	0.91	0.35
	Within Groups	58	100.52	1.73		

Robust Tests of Equality of Means

		Statistic [a]	*df1*	*df2*	*p*
Manner	Welch	0.21	1	57.81	0.65
Path	Welch	0.02	1	57.64	0.89
Neither	Welch	6.35	1	48.99	0.02
Manner pairs	Welch	0.01	1	52.72	0.94
Path pairs	Welch	0.95	1	40.55	0.34

[a] Asymptotically F distributed.

After establishing that the experimental and control results compare to those of a larger subject pool, the analyses to compare the performance of the L1S/L2E and L1E groups in these tasks were conducted. The results for the non-linguistic tasks are reproduced below in Figure 3.7 and 3.8. The statistical analyses found significant differences ($p < 0.01$) for the proportion of MANNER and PATH preference in the categorical task. There was a highly significant difference ($p < 0.001$) for the average PATH rating in the pair-task. There were no significant differences between groups for the average MANNER rating in the pair-task ($p = 0.797$). The Welch *F test* supported the ANOVA results. Table 3.8 shows the numerical output with the significant values in bold.

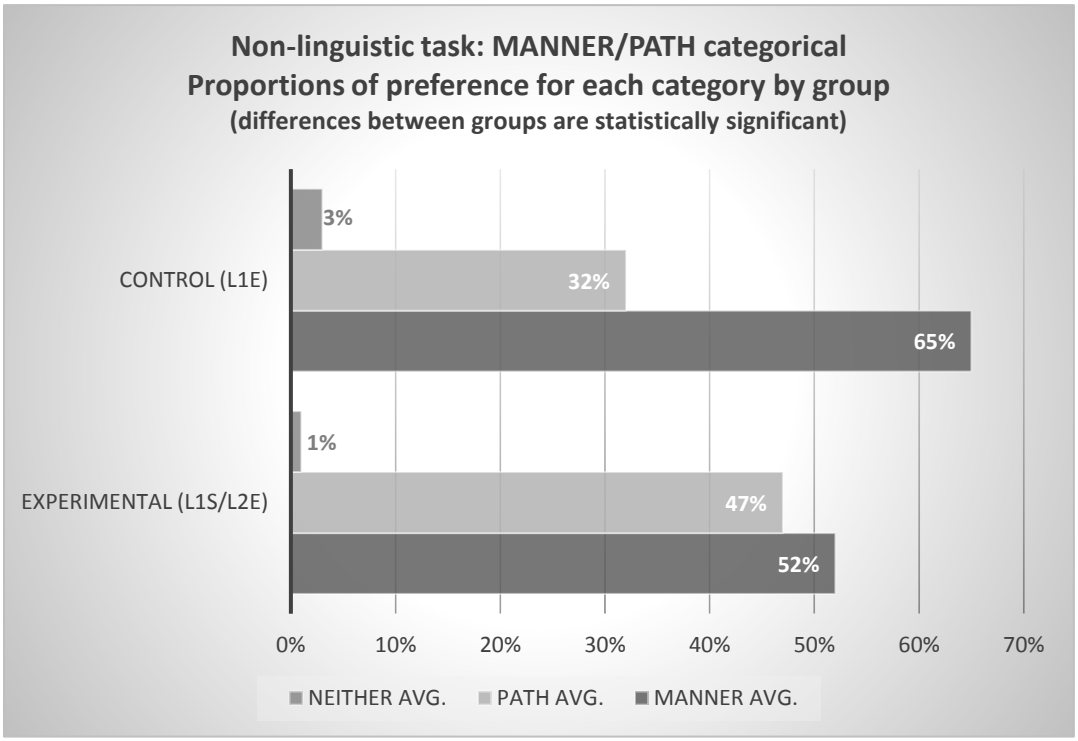

Figure 3.7 Results for the first non-linguistic task. MANNER and PATH preferences by group. These results are statistically significant ($p < 0.01$). The "neither" category is not relevant for the purposes of the current study.

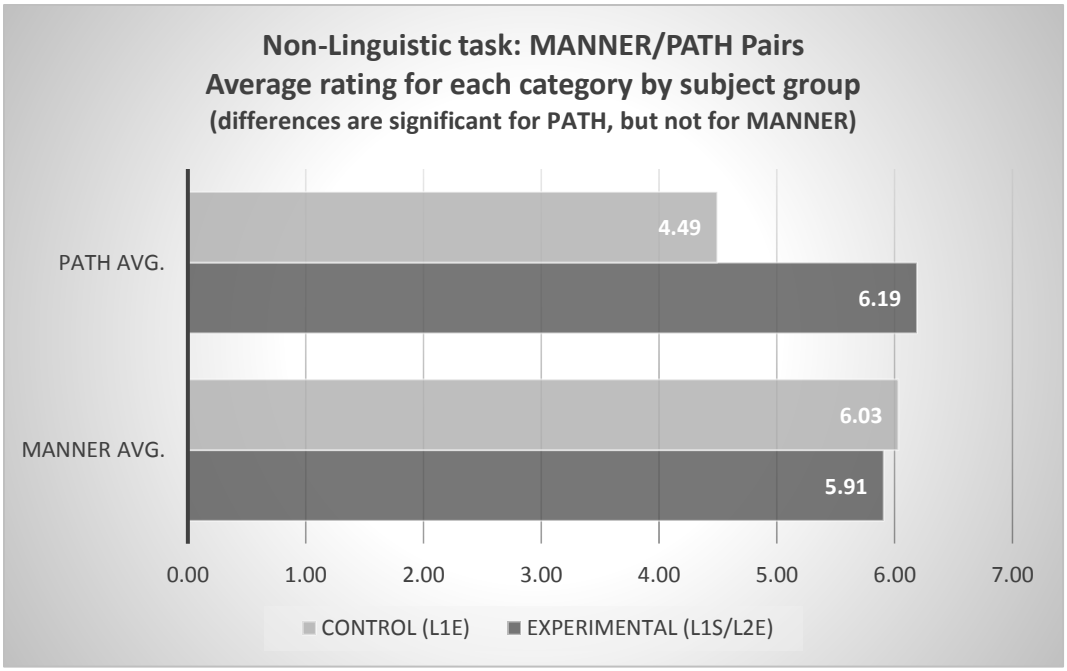

Figure 3.8 Results for the second non-linguistic task: MANNER and PATH average rating by group. The variances for PATH average rating are statistically highly significant ($p < 0.001$). There is no significant difference for MANNER average rating between the groups.

Table 3.8 Results for the non-linguistic tasks. A statistical significance between-group variance ($p < 0.01$) was found for the proportion of MANNER and PATH preference and a statistical highly significant difference ($p < 0.001$) was found for average PATH rating. The average rating for MANNER was not significantly different.

			Proportions of choice	
	Subjects	*n*	*M*	*SD*
Manner	L1E - Control	20	65%	0.10
	L1S/L2E - Experimental	30	52%	0.21
Path	L1E - Control	20	33%	0.11
	L1S/L2E - Experimental	30	47%	0.21
Neither	L1E- Control	20	2%	0.02
	L1S/L2E - Experimental	30	3%	0.03

Table 3.8 Continued.

			Average rating			
Manner pairs	L1E - Control	20	6.03	1.09		
	L1S/L2E -Experimental	30	5.91	1.99		
Path pairs	L1E - Control	20	4.49	1.26		
	L1S/L2E - Experimental	30	6.19	1.64		

ANOVA

		df	*SS*	*MS*	*F*	*p*
Manner	Between Groups	1	0.22	0.22	7.05	**0.011****
	Within Groups	48	1.48	0.03		
Path	Between Groups	1	0.24	0.24	7.32	**0.009****
	Within Groups	48	1.54	0.03		
Neither	Between Groups	1	0.00	0.00	2.91	0.095
	Within Groups	48	0.03	0.00		
Manner pairs	Between Groups	1	0.19	0.19	0.07	0.797
	Within Groups	48	137.17	2.86		
Path pairs	Between Groups	1	34.54	34.54	15.31	**0.000*****
	Within Groups	48	108.29	2.26		

Robust Tests of Equality of Means

		Statistic [a]	*df1*	*df2*	*p*
Manner	Welch	9.163	1	43.94	**0.004****
Path	Welch	9.349	1	45.21	**0.004****
Neither	Welch	3.323	1	47.73	0.075
Manner pairs	Welch	0.083	1	46.64	0.774
Path pairs	Welch	17.043	1	47.01	**0.000*****

[a] Asymptotically F distributed.

**Significant at the p < 0.01 level.

***Significance at the p < 0.001 level.

A Pearson product-moment correlation coefficient was computed to assess the relationship (if any) between the BLP English dominance scores and the results for the non-linguistic tasks. The test showed a significant positive correlation ($p < 0.05$) between the BLP English dominance scores and the average MANNER rating [r = 0.450,

n = 30, p = 0.013] and a significant negative correlation ($p < 0.05$) for average PATH rating [r = -0.433, n = 30, p = 0.017]. These correlations are visually presented in Figure 3.9 and the correlation results are contained in Table 3.9.

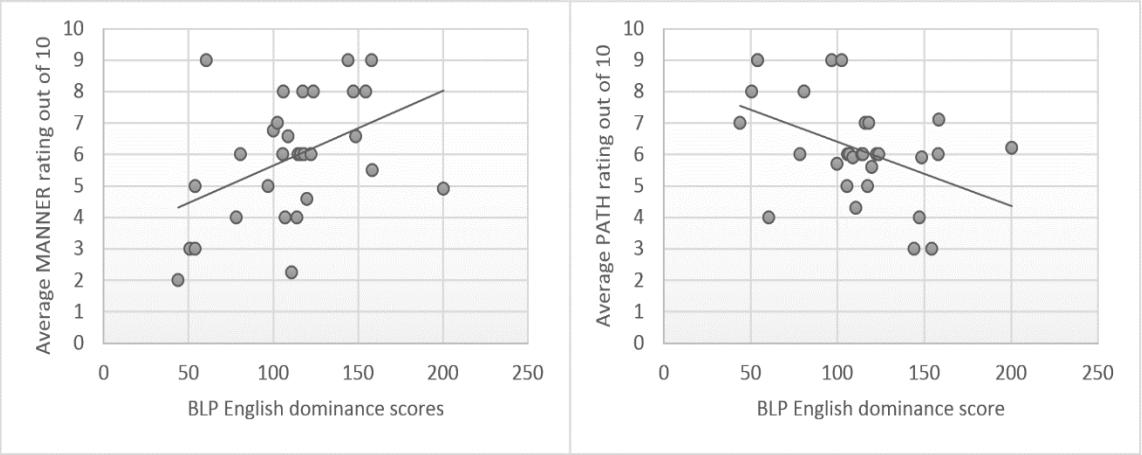

Figure 3.9 Significant correlation ($p < 0.05$) between BLP English dominance scores and average MANNER and PATH rating. The higher the BLP English dominance score, the higher the MANNER rating (and the lower the PATH rating, respectively).

Table 3.9 Correlations between the BLP English dominance scores and the non-linguistic tasks. Significant correlation ($p < 0.05$) were found between average MANNER and PATH ratings in the pair-task. Relevant values are shown in bold.

		BLP English dominance scores	Manner	Path	Neither	Manner pairs	Path pairs
BLP English dominance scores	*r*	1					
	p						
	n	30					
Manner	*r*	0.137	1				
	p	0.471					
	n	30	30				
Path	*r*	-0.154	-.996**	1			
	p	0.416	0				
	n	30	30	30			
Neither	*r*	-0.217	-0.048	0.058	1		
	p	0.249	0.801	0.760			
	n	30	30	30	30		
Manner pairs	*r*	**.433***	.546**	-.540**	0.052	1	
	p	**0.017**	0.002	0.002	0.784		
	n	30	30	30	30	30	
Path pairs	*r*	**-.450***	-0.351	.363*	0.004	-.450*	1
	p	**0.013**	0.057	0.049	0.984	0.013	
	n	30	30	30	30	30	30

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Given the results presented above, a final analysis was conducted to see if the results of those subjects with higher L2 dominance scores would be more similar to those of the L1E group for the tasks which had significant between-group differences (proportions of MANNER and PATH preference and average PATH rating). Note that this additional analysis was not necessary with the linguistic tasks since the results showed no significant differences in the encoding of MANNER between the groups. In order to divide the L1S/L2E group, the median for the 30 BLP English dominance scores was calculated and determined to be 112.47. Then, the subjects with BLP English dominance scores above the median were selected for further analysis. This division resulted in a group of 15 subjects: *N* = 4 females; *N* = 11 males; BLP English dominance scores ranging from 114.15 to 200.41 (*M* = 137.22; *SD* = 24.48).

The results showed that there were no significant differences among the subjects with higher BLP English scores and the L1E group for MANNER preference (p = 0.084) and PATH preference (p = 0.080). The average MANNER rating continued to be statistically equivalent (p = 0.190) between these groups. The average PATH rating remained statistically significantly different (p = 0.017), which is not surprising given that their L1 (Spanish) is a V-Language where PATH is salient. Note that the Welch's *F* tests performed given the unequal group sizes validated these results. Figures 3.10 and 3.11 show the new distribution when the higher BLP English dominance scores are taken into account. Table 3.10 presents the results of the statistical analyses for the L1S/L2E subjects with higher BLP English dominance scores as they compared to the L1E group.

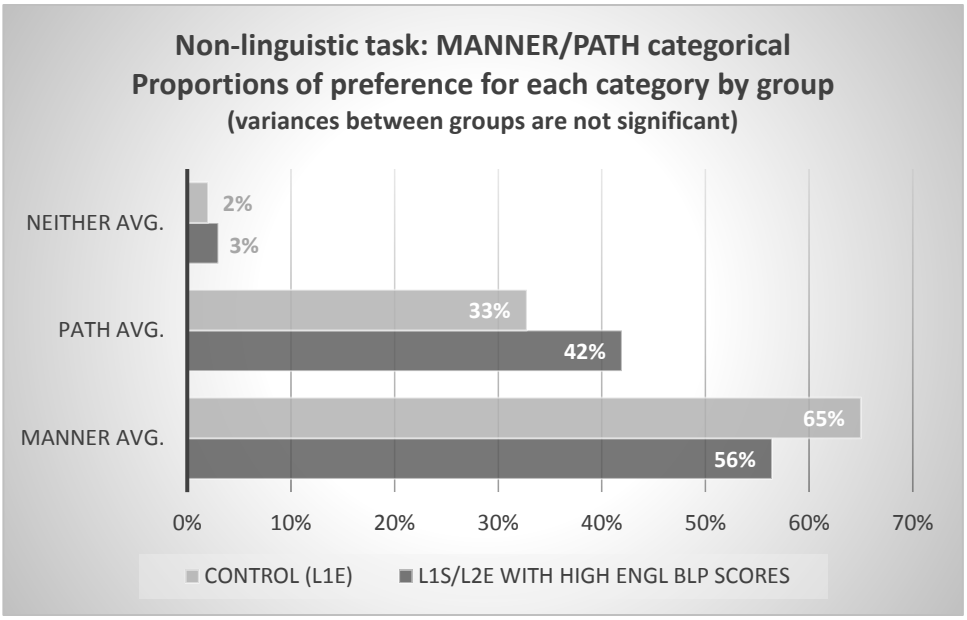

Figure 3.10 Results for the first non-linguistic task. There are no statistically significant differences between groups for the proportion of MANNER and PATH preferences.

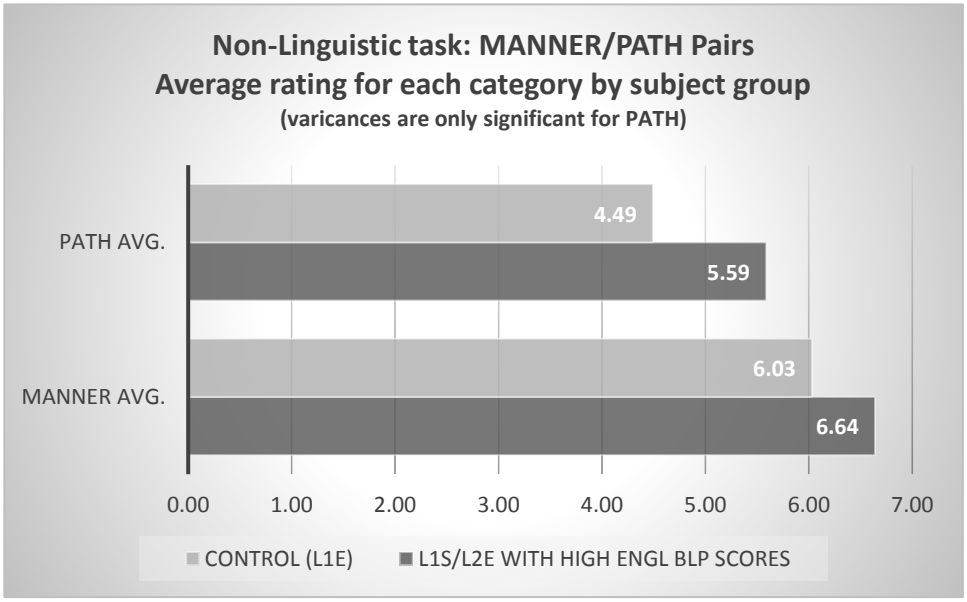

Figure 3.11 Results for the second non-linguistic task: average MANNER and PATH ratings. The average ratings for PATH continued to be significantly different ($p < 0.05$) between the L1S/L2E subjects with high BLP English dominance scores and the L1E group.

Table 3.10 Results for the L1S/L2E subjects with higher BLP English dominance scores as they compared to the L1E group. There were no significant differences among overall MANNER and PATH choices or for average MANNER rating between these groups.

			Proportions of choice	
	Subjects	*n*	*M*	*SD*
Manner	L1E - Control	20	65%	0.10
	L1S/L2E - High BLP ENG D	15	56%	0.20
Path	English - Control	20	33%	0.11
	L1S/L2E - High BLP ENG D	15	42%	0.19
Neither	L1E - Control	20	2%	0.02
	L1S/L2E - High BLP ENG D	15	3%	0.02

			Average rating	
		n	*M*	*SD*
Manner pairs	L1E - Control	20	6.03	1.09
	L1S/L2E - High BLP ENG D	15	6.64	1.60
Path pairs	L1E - Control	20	4.49	1.26

ANOVA

		df	*SS*	*MS*	*F*	*p*
Manner	Between Groups	1	0.07	0.07	3.17	0.08
	Within Groups	33	0.72	0.02		
Path	Between Groups	1	0.07	0.07	3.26	0.08
	Within Groups	33	0.73	0.02		
Neither	Between Groups	1	0.00	0.00	2.30	0.14
	Within Groups	33	0.02	0.00		
Manner pairs	Between Groups	1	3.16	3.16	1.79	0.19
	Within Groups	33	58.36	1.77		
Path pairs	Between Groups	1	10.24	10.24	6.28	**0.02***
	Within Groups	33	53.82	1.63		

Robust Tests of Equality of Means

		Statistic [a]	*df1*	*df2*	*p*
Manner	Welch	2.66	1	19.36	0.12
Path	Welch	2.79	1	20.51	0.11
Neither	Welch	2.14	1	25.67	0.16
Manner pairs	Welch	1.61	1	23.45	0.22
Path pairs	Welch	6.21	1	29.65	**0.02***

[a] Asymptotically F distributed.

*Significance at the $p < 0.05$ level.

The results presented above in Table 3.10 support the third hypothesis in this study:

H3: In the non-linguistic tasks (pairs and triads with pictures contrasting MANNER and PATH) bilingual speakers with higher BLP English dominance scores will behave more like the L1E group.

The analyses strongly suggest that there may be a movement toward encoding more MANNER, as bilingual subjects become more dominant in their L2 (English), even in non-linguistic-mediated tasks. Those subjects with higher BLP English dominance scores definitely behaved more like the L1E group. First, even though the proportions of MANNER and PATH preference varied between groups, a statistically significant correlation ($p < 0.05$) was found between BLP English dominance score and average MANNER and PATH rating when looking at the second non-linguistic task. This led to further analysis and where the L1S/L2E group was divided according to BLP English dominance scores. The final analyses showed no significant difference between these subjects and the L1E group in terms of the encoding of MANNER.

3.4 Conclusion to Chapter 3

The results of the various data analyses performed in the current study were presented in this chapter. The findings strongly support hypotheses 2 and 3, while hypothesis 1 was partially supported in terms of the MANNER produced, but no relationship to BLP English dominance scores was found. These results have profound

implications in the fields of cognitive linguistics, linguistic relativity, linguistic typology, second language acquisition, and motion-event experimentation. The final chapter will further discuss the relevance of these findings.

CHAPTER 4. DISCUSSION AND CONCLUSION

4.1 Introduction

This chapter discusses the interpretation of the results presented in Chapter 3, the limitations of this study, recommendations for future SLA and bilingual motion-event experimentation, and conclusions. It is important to note that given the small number of subjects who participated in this study, the use of modified/mixed stimuli, and the novel coding of MANNER, further investigation is needed in order to validate these findings. All of the conclusions presented in this chapter should be considered tentative in nature and in need of further replication/corroboration. Overall, the findings of the present study support the idea of L2 transfer for MANNER production and cognition. In addition, the results indicate that for similar studies: 1) It is crucial to use dynamic stimuli in motion-event experimentation; 2) there is value in dividing domains such as MANNER into different sub-categories; 3) it is worthwhile to assess L2-language dominance when studying bilingual populations; 4) it is imperative to fine-tune the statistical analyses to include more than only the overall results; and 5) it is necessary to revise the broad/general instructions sometimes given in non-linguistic tasks such as the ones conducted in the current study.

4.2 Interpretation of Results

4.2.1 Linguistic Tasks

The first discussion point related to the linguistic tasks refers to the type of statistical analyses conducted. In the current study, if only the overall/general analyses had been taken into account, one could have come to the following misleading conclusion: there is a statistically significant difference between the experimental and control groups. The L1E control group produced more MANNER than the L1S/L2E experimental group. This is consistent with Talmy's typology and there is no evidence of L2 transfer. However, further analyses after dividing the results by stimulus type revealed that, in fact, the performance of the experimental (L1S/L2E) group and the control (L1E) group were statistically equivalent. This speaks to the importance of point (4) mentioned in the introduction. For this type of study, it is beneficial to conduct more fine-tuned analyses that can provide a more accurate picture of the subjects' behavior. Further investigation with a larger number of subjects is needed to validate these results.

In this particular case, the fact that the bilingual L1S/L2E speakers' performance was equivalent to that of the L1E speakers in both linguistic tasks is pertinent. This means that the subjects did not conform to the lexicalization pattern preferred in their L1 (Spanish), even when the tasks were performed exclusively in Spanish. This contradicts some of the previously published research (Slobin 2006; Filipović, 2011)

reporting that bilingual subjects behave closer to their monolingual counterparts when performing tasks in each of the two languages (i.e. Spanish/English bilinguals behave more like L1-Spanish speakers when doing tasks in Spanish and behave more like L1-English speakers when performing tasks in English). As will be discussed later, one of the limitations of this study is the lack of a L1-Spanish monolingual group, so the intention here is not to claim that the current findings invalidate those studies. Rather, the observation is made that the data in this study reveals that the L1S/L2E group behaved more like the L1E group while performing the tasks in Spanish and this goes against the expected lexicalization pattern and other published work. Needless to say, it is necessary to collect more data in order to assess why the bilingual group in the current study did not conform to the previously reported bilingual patterns of behavior. One of the impediments for a true cross-study comparison is that there is not enough data to know if the various bilingual subject pools participating in other studies could be considered analogous to the pool in the current study. Not all studies test for either proficiency or language dominance and, sometimes, criteria such as the time living in a target country may be enough to label the subjects as “early” or “balanced” bilinguals. In addition, there are no other bilingual studies, to this researcher’s knowledge, that have utilized the Spanish-English Bilingual Language Profile (BLP) for motion-event experimentation. One aspect that became evident in this study was that even when the bilingual experimental group could be considered homogeneous (i.e., university students living in the United States), the L2 language dominance scores yielded some significant differences in terms of performance for some of the tasks (more on this

later). Thus, another recommendation for future SLA or bilingual studies is to take into consideration the L2-language dominance scores in order to conduct more robust analyses. Returning to the bilingual speakers who participated in this study, it is conceivable that this particular bilingual subject pool had higher L2 (English) dominance scores in comparison to the bilingual subjects who participated in other related studies. Therefore, in spite of performing the tasks in Spanish, their L2 dominance scores caused them to behave more like the L1E group.

In the two linguistic tasks, there was a highly significant difference ($p < 0.001$) among the stimuli: both groups encoded considerable more MANNER in the animation than in the picture book. Sakurai (2014) also used Mayer's (1969) *Frog where are you?* for the linguistic-mediated narration task in his study. In his analysis Sakurai noted that, even though the L1-English speaking group produced more MANNER verbs than the L1-Japanese group, PATH verbs were produced significantly more than MANNER verbs overall. This was also the case in the current study. Sakurai provides a few potential explanations for why PATH was more dominant than MANNER in this particular task: 1) PATH is more central than MANNER in a motion event and because of this the subjects focus more on PATH; 2) there may be developmental constraints causing children to give a preference to PATH, but some of the literature shows that adults narrating the same story would tend to use more MANNER than PATH; 3) the book itself might provide more opportunities for descriptions of PATH than for MANNER; 4) producing MANNER expressions involves a heavier processing load and speakers tend to choose a

lighter construction when given the chance; and 5) differences in personal narration styles.

In the current study, the same group of subjects performed two linguistic-mediated narration tasks: one with Mayer's book and one with the *Gazoon* animation. Since there were significant differences in performance depending on the stimulus type, this methodology eliminates several of Sakurai's (2014) proposals. In the current study; the way in which the subjects encoded motion in the picture book seemed to be related to the static nature of the stimulus. That is, if aspects like a heavier processing load were guiding the speakers to give preference to PATH over MANNER, we would expect to observe a consistent pattern among the speakers, regardless of the type of motion-event stimuli presented to them. As the data showed, with the dynamic stimulus (the animation) all of the subjects produced significantly more MANNER in their narrations. This is an important consideration for future experimentation involving the motion domain: ideally, the stimuli should contain *actual motion*. That way, the data are more likely to capture the preferred lexicalization patterns of the speakers.

Further support for having dynamic stimuli in motion-event experimentation came from the more fine-tuned analyses of MANNER. When this domain was divided into Tier 1 (T1)-MANNER and Tier 2 (T2)-MANNER as Slobin (1996b) and Slobin et al. (2014) proposed, there was also a highly significant variance ($p < 0.001$) among the two stimulus types: there was a significantly higher number of occurrences of the less expressive T1-MANNER in the picture book, and a significantly higher number of occurrences of the more expressive T2-MANNER in the animation. Thus, it is likely that

having a dynamic type of stimulus makes MANNER more salient and this makes the HMS-language speakers, like L1-English speakers or L2-English speakers with a high L2 dominance, produce the more expressive T2-MANNER. This behavior is consistent with the suggested lexicalization pattern for S-languages.

Another important consequence of dividing MANNER into two tiers became evident when computing the second Pearson product-moment correlation coefficient. When that analysis was conducted to evaluate if there was any relationship between the BLP English dominance scores and the overall results for the linguistic tasks no correlation was found. This result was the same even when looking at overall MANNER by stimulus type. However, when a further analysis took place, looking at T1-MANNER and T2-MANNER, a highly significant correlation ($r = 0.527$, $p = 0.003$) was found between the BLP English dominance scores and the number of T2-MANNER occurrences in the animation task. The fact that such an effect was found related to T2-MANNER is meaningful since this is the type of MANNER that is not readily encoded in LMS-languages, like Spanish. That is, the fact that the L1S/L2E speakers with higher BLP English dominance scores produced a significantly higher number of T2-MANNER strongly supports the idea that MANNER salience can be transferred. This type of MANNER is not the natural, default pattern in the subjects' L1 (Spanish) and this explains why the subjects with lower BLP English dominance scores did not produce as many number of occurrences of T2-MANNER when describing the animation. If MANNER had not been further divided into T1-MANNER and T2-MANNER, researchers could have come to the following misleading conclusion: the bilingual group behaved

equivalent to the L1-English group, but there is no correlation among English dominance score and MANNER, so the effect is more likely due to the dynamic nature of the stimulus type than to L2-transfer. Such a conclusion would be against the idea of a L2 effect on bilingual Spanish/English encoding of motion events. Nonetheless, the more detailed division of MANNER showed that L2-transfer of MANNER is indeed plausible for this domain. The correlation between the BLP English dominance scores and the encoding of T2-MANNER is the strongest piece of evidence in favor of L2 transfer for these tasks and it validates that the effect goes beyond stimulus type.

4.2.2 Non-Linguistic Tasks

The overall results for the two groups (experimental and control) matched the corresponding lexicalization patterns: The L1S/L2E experimental group encoded significantly more PATH than the L1E control group ($p < 0.001$); and the L1E group encoded significantly more MANNER than the L1S/L2E group ($p < 0.05$). However, the analyses for the average similarity rating for PATH and MANNER exposed a deviation from the expected lexicalization pattern. There was a highly significant difference ($p < 0.001$) between the average PATH rating from the L1S/L2E group (6.19) as compared to the average PATH rating from the L1E group (4.49). This result continued to conform to the assumed lexicalization pattern. Nevertheless, the average rating for MANNER, was statistically equivalent for both the L1S/L2E group and the L1E group (5.91 and 6.03, respectively). When a Pearson product-moment correlation coefficient was computed

to assess the relationship between the BLP English dominance scores and the results for the two non-linguistic tasks, a significant positive correlation was found between the BLP English dominance scores and the average MANNER rating (r = 0.433, *p* = 0.013). Conversely, a significant negative correlation was found between the BLP dominance scores and average PATH rating (r = 0.433, *p* = 0.017). This means that the similarities found in the data from the experimental and control group can be tied to the level of L2-dominance.

When the L1S/L2E group was further divided to select those with higher BLP English dominance score to compare their results with the L1E group, the significant differences seen in the first analyses disappeared for overall MANNER and overall PATH. This means that the L1S/L2E subjects with higher BLP dominance scores did in fact behave more like the L1E group while performing the non-linguistic tasks. The only result that remained significantly different was the average PATH rating (*p* = 0.017). This is not surprising given that the lexicalization pattern of the bilinguals' L1 (Spanish) is expected to cause the L1S/L2E group to show a higher rating for PATH in comparison to the ratings that the L1E group would display for that same domain. Similarly to the linguistic tasks, having a correlation between the BLP English dominance scores and the encoding of MANNER and PATH during these tasks provides further evidence of L2-transfer. Explicitly, these results can be explained beyond potential effects from the stimuli: those subjects with lower BLP English dominance scores behaved significantly different from the L1E group in all analyzed domains of the non-linguistic tasks, and are statistically equivalent to the L1-Spanish supplemental group. At the same time, those

with higher BLP English dominance scores behaved statistically equivalent to the L1E group in all but one domain. As explained above, the average PATH ratings remained significantly different as would be expected from those speakers who have a V-language as their L1.

Likewise, the results in the present study for the non-linguistic tasks are different from those obtained in Sakurai's (2014) study. In that study, all subjects regardless of language background (Japanese or English) preferred MANNER over PATH in the two non-linguistic tasks. Sakurai suggests that these results may be explained by the fact that differences in MANNER were visually "more salient" than differences in PATH. As noted in Chapter 3 in the current study, both groups tended to choose MANNER more than PATH, however the L1E group choose MANNER significantly more than the L1S/L2E group. This variance leveled out after taking the BLP English dominance scores into account. Thus, it seems that in the current study these tasks were able to capture some typological differences whereas in Sakurai's study they did not.

There may be a few reasons why this is the case. First, the subject pools were different: developing children versus adults. However, as Sakurai notes, Czechowska and Ewert (2011) found similar results (to those of the Sakurai study) with an adult population. It is important to note that those researchers were studying two S-languages (English and Polish) with varying degrees of MANNER salience, so the comparison is somewhat problematic. In any case, there may be other factors that go beyond variances in subjects or the assumption that MANNER is more salient that PATH in those particular tasks. As discussed in Chapter 2, when asked about the rationale

behind their choices, a notable percentage of the subjects who participated in this study stated basing them on aspects completely unrelated to the FIGURE performing the motion. This is extremely problematic since including that type of misleading data in the analyses could drastically change the results. For instance, the data from the group which had the highest percentage of eliminated subjects, the L1-English supplemental group, yielded the variances shown in Table 4.1.

Table 4.1 Variances in overall results for the L1-English supplemental group. 43% of the subjects completing the non-linguistic tasks reported focusing on irrelevant cues. There was an overall increase of 10% in MANNER choices when those subjects were eliminated and a 10% decrease in PATH choices, respectively. The results for the L1S/L2E experimental group and L1E control group are provided for comparison.

Subjects	*n*	Manner	Path	Neither
All L1-English supplemental	70	54%	43%	3%
L1-English subjects who focused on the task as expected	40	64%	33%	3%
L1S/L2E experimental	30	52%	47%	1%
L1E control	20	65%	32%	3%

As can be seen in Table 4.1, if the problematic subjects had not been eliminated the results for the L1-English supplemental group would have looked similar to the L1S/L2E group. But in reality, the *actual results* for this group are statistically equivalent to their L1 counterpart, the L1E group. Therefore, it is crucial to either revise the instructions for tasks such as this one, or include a question like the one added in the current study to capture the subjects' perception of how they chose their answers. A good example of more tailored instructions is provided by Slobin et al. (2014). In their experiment, the instructions contained sentences like "you will see a series of video clips of people moving" and "in each clip, it should be fairly obvious who the subject is that is

moving, but if there is some confusion, please use the text after the number (presented in **[bold bracketed type]**) to help you". An example of one of their bolded clues is "Man in green shirt" (Slobin et al. 2014, p. 709). This type of more explicit instructions is likely to diminish problems like the ones found in the current study. Alternatively, adding a question like the one added to this experiment's protocol not only helps to prevent the issue, but also provides additional data that can be examined if there is an interest in knowing how the subjects interpret the instructions for such tasks.

For the purposes of discussion, let us assume that there were no typological differences found in the data and no correlation between the BLP English dominance scores and the encoding of MANNER or PATH for the non-linguistic tasks. The overall results would have shown that both subject pools had a preference for MANNER, which is in tune with Sakurai's findings. As can be seen in Table 4.1 the resulting percentages for the L1S/L2E group were 52% MANNER and 47% PATH, and the percentages for the L1E group were 65% MANNER and 32% PATH. Assuming as well that all of the subjects in Sakurai's study focused on the FIGURE and the motion in the stimuli, are there any other factors that could have contributed to a higher number of MANNER occurrences in Sakurai's data as well as in the data from the current study?

A potential answer to this question is found in the results of Slobin et al. (2014). In that study, the researchers aimed to gain a better understanding of the way in which speakers from various languages (English, Polish, French, Spanish and Basque) encoded and described a wide range of manners of human gait. The stimuli consisted of various

video clips of people performing the related motions. The data yielded several semantic clusters, which are presented in Table 4.2.

Table 4.2 Resulting semantic clusters found in Slobin et al. (2014). The columns represent the different semantic categories under which the subjects allocated the various manners of gait with sample verbs of motion.

quadrupedal	**velocity dimension**		**non-canonical**		**other**
movement	**run**	**walk**	**bounce-and-recoil**	**syncopated**	
crawl	jog	crabwalk	hop	gallop	slither
	prance	limp	jump	prance	
	sprint	lumber	leap	skip	
		pace			
		plod			
		saunter			
		stomp			
		stride			
		stroll			
		strut			
		toddle			
		trudge			
		wander			

As can be seen in Table 4.2, the resulting semantic clusters make a clear distinction between crawling, running, walking, and jumping. These are the four types of MANNER depicted in Sakurai's stimuli. If Slobin et al. (2014) semantic clusters are accurate, this could explain why all of the subjects in Sakurai's study preferred MANNER over PATH. This could also explain the slight preference that all L1-Spanish subjects gave to MANNER during these same tasks in the current study. In addition, these four contrasting manners of motion belong to T1-MANNER and the equivalent verbs *gatear* 'crawl', *correr* 'run', *caminar* 'walk', and *saltar* 'jump' are also found and commonly used in Spanish (and other V-languages). Consequently, it is not odd for the speakers of LMS-languages to pay attention to these particular MANNER distinctions. The key finding in

the current study was that in spite of this preference for MANNER, the subjects with higher BLP English dominance scores preferred and rated MANNER to the same degree as the L1E group did.

The results of Slobin et al. (2014) show the importance of creating stimuli with a wider range of MANNER of motion. That study continues to assure that using dynamic stimuli in motion-event experimentation is more adequate than using static stimuli. The authors were able to gather a much richer set of data by creating video clips of human motion and expanding the range of MANNER portrayed in them. A recommendation for future studies of MANNER is to ensure that the contrasts in the stimuli go beyond the neutral, more general manners of motions (T1-MANNER) to include more expressive types of motion (T2-MANNER).

4.2.3 L2 Transfer and Implications for Linguistic Relativity

As explained in Chapter 1, the current study takes into account Pavlenko's (2000, 2005) and Jarvis and Pavlenko's (2008) proposals about the possible processes that may be involved when conceptual changes take place in the bilingual mind. To reiterate, the most likely process evidenced by these findings is *restructuring under the influence of the L2*. For the bilingual subjects with high L2-dominance scores, the encoding of MANNER in Spanish seems to be falling higher up in the *cline of manner salience*, matching what has been reported in the literature for L1-English speakers (Slobin 2004, 2006) and matching the performance of the L1E control group. It appears that this type

of conceptual transfer is happening as bilinguals become more dominant in their L2 (English). The higher their L2 dominance, the more fine-tuned attention they seem to be paying to MANNER. The subjects in this study did not only produce an equivalent amount of MANNER in the linguistics tasks in comparison the L1E control group, but also produced more sophisticated T2-MANNER expressions in Spanish and gave a higher rating to MANNER as their English dominance increased.

As mentioned earlier, these correlations are some of the best pieces of evidence supporting the idea that *manner salience* may transfer. It is conceivable that the animation promotes more MANNER encoding regardless of language background; for instance, it is possible that if L1-Spanish monolinguals were to narrate this task, they would also encode more MANNER than expected. In fact, this was observed with the bilingual subjects who had low levels of English dominance scores. It could also be argued that, in addition to the dynamic nature of the animation, the stimulus also provided more opportunities to encode MANNER than the picture book. Still, what is most relevant to the issue in question is not that all subjects tended to encode more MANNER overall with the animation, but rather that the type of MANNER encoded by those with high BLP English dominance scores belonged to the more expressive T2-MANNER, which does not readily exist in Spanish. Given this limitation of the Spanish language, there were several occasions where the speakers resorted to adding verbs, adjectival or adverbial phrases to elaborate on the MANNER depicted in a specific motion event. Table 4.3 below shows some examples of T2-MANNER productions that were collected in the current study. As explained in Chapter 2, the unit of analysis is the

motion event itself, so if a speaker added three MANNER particles (e.g. an adverb, an adjective, an additional verb) to express more detailed MANNER in the same event, this counted as one (1) T2-MANNER expression.

Table 4.3 Sample T2-Manner expressions made by L1S/L2E subjects when describing motion events during the animation task.

Animation Scene	T2-MANNER description of motion event	Gloss
1	un gallo saltaba picoteando	a rooster jumped (while) pecking
5	empieza a hacer zigzag entre medio enrollándose en el bambú	begins to zigzag wrapping itself in the bamboo
9	la serpiente salta y salta como un resorte persiguiéndola	the snakes jumps and jumps like a spring chasing it
16	se arrastra con el cuerpo despacio por el suelo	it drags itself slowly with its body on the floor
17	empieza a reptar sigilosa alrededor del poste	stealthy begins to slither around the pole
18	se baja todo como que fuera un acordeón	it goes down all the way as if it were an accordion
21	totalmente inflada como un globo va volando como un zepelín	totally inflated like a balloon goes flying like a zeppelin
21	inteligentemente con su cola la usa como un ventilador, como un propulsor, para llegar	intelligently, with its tail it uses it as a fan, as a propeller, to arrive
22	sale disparada como un globo desinflando perdiendo su aire	shoots out like a deflating balloon losing its air
23	cae pura alfombra en una rama	falls like a carpet on a branch
23	“pum” contra una rama como un globo desinflado colgado	"pum" against a branch like a deflated balloon
25	y con un salto de garrocha saltó	and with a "pole vaulting jump" it jumped
25	sale disparada como un hule	it shoots out like a rubber band
25	la serpiente inteligentemente intenta hacer el funcionamiento de un muelle para tirarse	the snake intelligently tries to device a mainspring to plunge itself
25	va la serpiente con toda su tenacidad y esfuerzo a lanzarse como una catapulta	goes the serpent, with all its effort and tenacity, to throw itself as a catapult
29	salió volando como una pólvora	it went out flying like a firework

As illustrated in the examples provided in Table 4.3, the subjects used various mechanisms available in their L1 (Spanish) to add more expressive MANNER when describing these motion events. Conversely, some of the subjects with lower BLP English dominance scores used much simpler expressions to describe the same events, for instance, ‘the snake chases the bird’ or ‘the snake gets to the birdhouse’. Such

expressions lack the more specific/detailed MANNER in which the snake performed those actions. Based on this contrast one could speculate that if data from L1-Spanish monolinguals were collected for the animation task, most of the produced MANNER would belong to T1-MANNER, which is readily available in Spanish. In other words, there would be less T2-MANNER (verb types and expressions) in comparison to the data yielded by the subjects with high BLP English dominance scores. Testing this idea is beyond the scope of this study, but it is something worth investigating in the future to better understand these findings.

Additional supporting evidence for the proposal of L2 transfer of *manner salience* was captured in some of the results from the non-linguistic tasks. As presented in Chapter 3, these results also yielded a significant correlation between the English dominance score and average MANNER rating. In addition, all the results involving MANNER were statistically equivalent among bilinguals with high BLP English dominance scores and the results of the L1E group. The fact that this patterns was found in non-linguistic-mediated tasks, not only strengthens and compliments the results found in the linguistic tasks, but it also provides some insights into the notions of Linguistic Relativity. The introductory chapter stated that one of the main goals of this study was to shed some light into the controversial question posed by Linguistic Relativity: *does the language we speak influence the way we think?* In addition, *what happens when we learn another language? Do we acquire the thought patterns of the speakers of that language?* (Bylund and Athanasopoulos 2015).

In terms of Linguistic Relativity, these findings represent an additional piece of information in the search for evidence to validate (or invalidate) its proposals. The data in the current study seems to support the idea that the language/s we speak influence/s thought and the way we view the world around us. More specifically, an L2 effect was seen in the way English makes MANNER more salient in Spanish, both in the linguistic and non-linguistic tasks. This tentative conclusion is sensible given that the data captured a correlation of L2 language dominance and the encoding of MANNER in the L1. Since these findings are preliminary, it seems appropriate to describe them as supporting the weaker version of Linguistic Relativity. This is in tune with a great number of recent research findings which show some type of effect or interplay of language and thought, but not a definitive proof that language *is* thought and/or that they are structurally parallel (see Wolff and Holmes 2010 for review of studies). Still, overall these findings provide some evidence in support of the idea that as we become more dominant in a second language, it may be possible to acquire the thought patterns of the speakers of that language.

The results for the linguistic tasks are in tune with Slobin's notion of *cline of manner salience* and also fit his Thinking-for-Speaking hypothesis. However, those results alone would not be enough to extend the encoding of MANNER and/or the L2 influence observed in the data to deeper cognitive mechanisms. This is why Sakurai´s non-linguistic tasks were adopted. These additional tasks make it possible to place the observed bilingual patterns beyond the linguistic domain into the cognitive domain. It is important to note that even if the findings seem to support the idea that language has

some influence on thought and that learning a second language may influence some cognitive processes in the bilingual mind, the exact nature of this mechanism is still difficult to assess.

In order to better explore the implications of these findings, a more detailed discussion of Linguistic Relativity is needed. Wolff and Holmes (2010) note that Linguistic Relativity can be best understood as a complex "family" of proposals with various "branches" representing diverging but related points of view. In their analysis, Wolff and Holmes reject the stronger branches which they call *language as language-of-thought* and *linguistic determinism*. However, they state that the lack of evidence for those "stronger versions" of Linguistic Relativity does not mean that language does not have an effect on thought. In the same article, the authors present various additional branches to illustrate the potential mechanisms that could affect the dynamic between language and thought.

Wolff and Holmes believe that thought is structurally separate from language, but there is interplay between them. The first possible mechanism is what they call *thinking before language*, which is basically Slobin's Thinking-for-Speaking hypothesis. This approach focuses on the thought processes associated with speech production. In terms of Linguistic Relativity, since languages differ in which aspects of reality their users pay attention to (e.g. MANNER or PATH), it is feasible that the thinking that occurs right before using language could cause differences in thought cross-linguistically. As mentioned in Chapter 1, motion-event experimentation has produced evidence for this effect, not only when researchers have looked at linguistic data, but also in studies that

look at aspects beyond language production (e.g. attention, perception, memory of motion events). The data in the current study provides additional evidence to support this idea.

The same authors present two additional processes: *thinking with language* and *thinking after language*. The first one involves co-activation of linguistic and non-linguistic processes. Here, language can act as a "meddler" (i.e. linguistic representations compete with non-linguistic ones) or as an "augmenter" (i.e. linguistic representations extend/enable nonlinguistic representations). In the second process language can act as a "spotlight" (i.e. making certain properties highly salient in non-linguistic thinking) or as an "inducer" (i.e. priming certain types of processing in non-linguistic thinking). Wolff and Holmes (2010) present evidence for all of these branches and state that they represent the various types of effects of language on thought, depending on the context. They conclude the following:

> First, we did not find empirical support for the view that language determines the basic categories of thought or that it 'closes doors'. Once people are able to make a particular conceptual distinction, this ability is retained, even if it is not explicitly encoded in one's language… There is evidence, however, that while language may not close doors, it may fling others wide open. For example, language makes certain distinctions difficult to avoid when it meddles in the process of color discrimination or renders one way of construing space more natural than another. Lastly, language can sometimes build new doors. For example, language may underlie our ability to represent exact numbers and entertain false beliefs. Thus, language may not replace, but instead may put in place, representational systems that make certain kinds of thinking possible. Although the mechanism differs from that which Whorf originally proposed, current research suggests that language can still have a powerful influence on thought. (p. 261)

The conclusions mentioned above are drawn while taking various research findings into account. Unfortunately, given that part of the stimuli and procedures were adapted from Sakurai's (2014) study and the main interest was to replicate/refine that study, there is no way to know for sure if any of these additional mechanisms were taking place as the subjects were performing the tasks. Even though other motion-event experimentation has found evidence for *thinking with language*, (see Wolff and Holmes, 2010, p. 256 for review of related studies), those experiments involved tracking the subjects attention to motion events with different sets of instructions, some in preparation to produce language and others without any specific instructions. This type of diverging tasks allows to better discern if there is a difference in the subject's attention/performance when verbal description is forthcoming. Other studies have looked at interference of language on performance/accuracy, but that was not the focus of the current research. In this study, the main goal was to elicit data with very general instructions and the linguistic and non-linguistic tasks were independent of each other. The experiments were designed to complement each other and provide a more robust data set, not to see the effect of one task on the other. This is why it is not possible to speculate with certainty in which specific way language affected cognition in these particular tasks. It is possible to say, however, that a language effect was definitely observed in terms of the encoding of MANNER as well as a modification in the degree of its saliency which correlated with L2 dominance. This is in tune with the weaker versions of Linguistic Relativity that propose that language influences thought.

4.3 Limitations of the current study

Even though the overall results for this study supported two of the proposed hypotheses and evidence was found for L2-transfer of MANNER salience, there are always limitations and room for improvement. The first limitation, as with any other linguistic study, is the sample size. Even though the experimental and control groups had an average number of subjects in comparison to related studies, a larger subject pool would have been beneficial. Especially since the current study incorporated a novel tool to measure L2 dominance, the Bilingual Language Profile (BLP) and the mixed designed which used both linguistic-mediated and non-linguistic-mediated tasks.

Another limitation of the current study is that the subjects of the experimental group were all residing in the United States. Perhaps a different outcome would have been found with a similar group of bilingual subjects living in a Spanish-speaking country. It would have been pertinent to compare if those having higher BLP English dominance scores living abroad would also behave more like L1-English speakers.

A shared limitation with Sakurai's (2014) study, is the lack of Spanish monolingual subjects. Part of this is because the main focus of the experiment was to see how the bilingual subjects with varying degrees of English dominance scores compared to the L1-English speakers. In addition, the motion domain of interest, MANNER, and more specifically the more expressive T2-MANNER is readily encoded in English, not in Spanish. At the same time, the fact that a correlation between BLP English dominance scores and the bilinguals' performance was found for both the linguistic and the non-

linguistic tasks, provided sensible evidence of L2-transfer. This was independent of a comparison to a monolingual Spanish group of speakers. Still, it could have been valuable to gather some monolingual L1-Spanish data to compare how they would perform in the same four tasks. As explained in the previous section, this could further validate the current findings if the type of MANNER the L1-Spanish monolinguals encoded belonged to T1-MANNER rather than T2-MANNER (or invalidate it if the results showed a different, unexpected pattern).

In addition, this study is limited to the well-studied Spanish-English language pair, which are languages that are prime examples of a V-language and a S-language, respectively. Perhaps the effects found in the current study were significant given that these two languages are located at opposing sides of the spectrum in relation to MANNER. It would be interesting to conduct similar studies with bilinguals who speak other languages. The BLP is available in several additional language pairs: English-French, English-Catalán, English-Gallego, Spanish-Basque, English-Arabic, English-Russian, English-Portuguese, French-Portuguese, Greek-French, and English-Japanese.

Lastly, as stated in the previous section, it would have been advantageous to use more dynamic stimuli and include contrasts between T1 and T2-MANNER in the non-linguistic tasks. This study adapted Sakurai's stimuli, mainly to have a comparison of the data across studies. By the time Slobin et al. (2014) study was published, several of the data had already been collected. After seeing the results of that study it seems sensible to design stimuli that takes the different semantic clusters for MANNER into account. As several of the more recent motion-event studies illustrate, the technology to create

stimuli with a broader variety of *dynamic* MANNER of motion is now available to us, so there is no reason not to incorporate this type of stimulus in the future.

4.4 Recommendations for Future SLA and Bilingual Motion-Event Experimentation

This section summarizes the recommendations previously noted and provides additional recommendations for future SLA and bilingual motion-event experimentation. The first recommendations are related to the nature of the stimuli and the methodology:

1) Include dynamic stimuli with relatable human or animal motions for both linguistic-mediated and non-linguistic tasks.
2) If stimuli such as an illustration book must be used, then it is best to control for the time the stimuli is presented to the subjects to diminish the effects of personal narration styles.
3) If studying the specific motion domain of MANNER, it is important to divide the manners of motion between less expressive and more impressive forms of MANNER (at a minimum). Slobin et al. (2014) provide even more detailed categories: attitude of actor, rate, effort, posture, and motor patterns of legs and feet. Making a distinction among different types of MANNER captures nuances that may not be evident when combining all MANNER into one general category.

4) Conducting mixed studies like Sakurai's (2014) or the current study where both linguistic-mediated and non-linguistic mediated tasks are performed by the same subjects is beneficial to gain a better understanding of the effect of lexicalization patterns in cognition.
5) It is crucial to ensure that the instructions for the non-linguistic tasks are clear to the subjects so that they focus on the tasks as expected (see Slobin et al. 2014 for an example). Including a question at the end of the experiment to elicit information about how they made their choices may also be valuable.
6) When conducting studies involving bilingual populations and SLA learners, it is beneficial to assess their L2 language dominance. The Bilingual Language Profile (Birdsong et al. 2012) has proven to be an accurate tool to assess L2 dominance and is freely accessible to researchers worldwide.
7) As noted by Birdsong (2015), if a tool like the Bilingual Language Profile is utilized, the overall (global) dominance score is not an appropriate value to use when assessing the effects of one of the languages in a particular domain. A better measure is the individual scores for each of the languages. In addition, linear correlation analyses, like the Pearson product-moment correlation coefficient, can identify if there is a correlation between the language dominance scores and the variables in the study.

8) Studies investigating complex cognitive domains such as this one, can benefit from conducting numerous statistical analyses that look at the data from various angles to avoid misleading conclusions.

As Emerson (2013) points out, the cognitive mechanisms behind the effects found in bilingual research of the motion events still need to be studied. That author suggests that the effects may be explained by memory and attention; however, this is not necessarily the case. In the current study, there were effects found for the non-linguistic tasks which required no memory load. And, as explained earlier, the fact that there was a correlation between the BLP English dominance score and the performance on these tasks rules out that the effect was merely because of attention. Still, as Emerson duly noted, one thing is clear: future designs should incorporate better manipulations of the assumed underlying cognitive mechanisms as well as better measures of individual differences.

Sakurai (2014) suggest that a future direction in the field could be to conduct longitudinal studies that could shed some light in the developmental process that SLA speakers go through when acquiring a different system of motion encoding. This would require beginning to collect data at the early stages of acquisition and throughout various years. The advantage would be that the data would reflect the same bilingual mind over time; the disadvantage is that it would take much longer than collecting data from subjects having a diverse range of L2 dominance/proficiency. Stam (2015) provided data for such a longitudinal study. The author studied a L1-Spanish/L2-English bilingual

female subject over 14 years collecting data at the beginning, after 9 years, and after 5 years. Stam wanted to investigate how learning a S-Language (English) could affect the subject's expression and gesticulation of motion in her L1 (Spanish). The results showed changes in the subject's gestural expression of PATH in both languages, and the gestural expression of MANNER changed only in English. The author noted that it took 14 years of L2-development to observe a change in the gestural expression of MANNER and wondered if some aspects are more resistant to transfer than others (i.e., native-like gestures encoding motion domains may take longer to be acquired). This example speaks to the complexity involved in acquiring a different frame of reference for encoding motion events. Thus, more than recommending longitudinal studies which may not be feasible, the crucial thing is to increase the sample size and assess the level of L2 dominance of the bilingual subject pools to see if we can capture some of the developmental variances.

The future of this field looks promising and full of potential. Perhaps it is time to spend less amount of time investigating these lexicalization patterns cross-linguistically (unless the studies are focusing on some of the less-known languages) and start conducting more experiments involving bilingual subjects that are acquiring diverging lexicalization patterns. Such a set of speakers would provide a unique opportunity for assessing, not only changes in the linguistic encoding of motion events, but also the potential effects in cognition. In this researcher's opinion, the increasing number of bilingual and multilingual human beings on the planet makes this an ideal and easily accessible population to study.

4.5 Conclusion

This study set out to investigate if there could be L2 transfer of the motion domain of MANNER in L1-Spanish/L2-English bilinguals. The findings contribute to expand the field of SLA and bilingual cognition in general, and motion-event experimentation in particular. It also builds on Sakurai's (2014) study, incorporating refined stimuli which allowed to capture more fine-tuned variances and significant effects in the data. It provides some ideas of why aspects such as stimuli design or methodological constrains may be causing misleading results in related studies. And most importantly, it provides evidence of L2 transfer in this domain.

Overall, an L2 effect was observed in both the linguistic-mediated tasks and the non-linguistic-mediated tasks. The evidence involved significant correlations between the BLP English dominance score and the encoding of the more expressive T2-MANNER in the animation task and the overall MANNER, PATH, and average MANNER rating in the non-linguistic tasks. Since the results were directly related to the domain in question, MANNER, there is strong support for the hypothesis that MANNER salience, a particular lexicalization pattern (with varying degrees) in S-languages, may be transferred to speakers of V-languages once they achieve a high L2 dominance.

These findings have profound implications in the fields of cognitive linguistics, linguistic relativity, linguistic typology, second language acquisition, and motion-event experimentation. The linguistic relativity idea that the language we speak may have an effect in the way we encode the input from the outside world is extended here to L2 acquisition. The combined results of the linguistic and non-linguistic task support the idea that the cross-linguistic variances in lexicalization patterns have consequences in the speakers' underlying representations of motion events. The outcome also fully supports Talmy's (1986) S-languages and V-languages lexicalization patterns, Slobin's (2004, 2006) observations on MANNER, and Slobin et al. (2014) proposal to expand the understanding and definition of this domain. The different types of stimuli used in this study illustrate that carefully designed experiments can elicit valuable data for motion-event experimentation. In addition, knowing that aspects such as MANNER salience may transfer from learning a second language can help to better understand the complex L2 learner and inform teaching methodologies in SLA.

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APPENDICES

Appendix A: BLP Items in Spanish

Información biográfica

- Nombre
- Edad
- Sexo
- Lugar de residencia actual
- Nivel más alto de formación académica

Módulo 1: Historial lingüístico Escala: de 0 to 20+

- ¿A qué edad empezó a aprender las siguientes lenguas? ESPAÑOL/INGLÉS
- ¿A qué edad empezó a sentirse cómodo usando las siguientes lenguas? ESPAÑOL/INGLÉS
- ¿Cuántos años de clases (gramática, historia, matemáticas, etc.) ha tenido en las siguientes lenguas (desde la primaria a la universidad)? ESPAÑOL/INGLÉS
- ¿Cuántos años ha pasado en un país/región donde se hablan las siguinetes lenguas? ESPAÑOL/INGLÉS
- ¿Cuántos años ha pasado en familia hablando las siguientes lenguas? ESPAÑOL/INGLÉS
- ¿Cuántos años ha pasado en un ambiente de trabajo donde se hablan las siguientes lenguas? ESPAÑOL/INGLÉS

Módulo 2: Uso de lenguas Escala: porcentajes del 0% al 100%

- En una semana normal, ¿qué porcentaje del tiempo usa las siguienres lenguas con sus amigos? ESPAÑOL/INGLÉS/OTRAS LENGUAS
- En una semana normal, ¿qué porcentaje del tiempo usa las siguientes lenguas con su familia? ESPAÑOL/INGLÉS/OTRAS LENGUAS
- En una semana normal, ¿qué porcentaje del tiempo usa las siguientes lenguas en la escuela/el trabajo? ESPAÑOL/INGLÉS/OTRAS LENGUAS
- Cuando se habla a usted mismo, ¿con qué frecuencia se habla a sí mismo en las siguientes lenguas? ESPAÑOL/INGLÉS/OTRAS LENGUAS
- Cuando hace cálculos, ¿con qué frecuencia cuenta en las siguientes lenguas? ESPAÑOL/INGLÉS/OTRAS LENGUAS

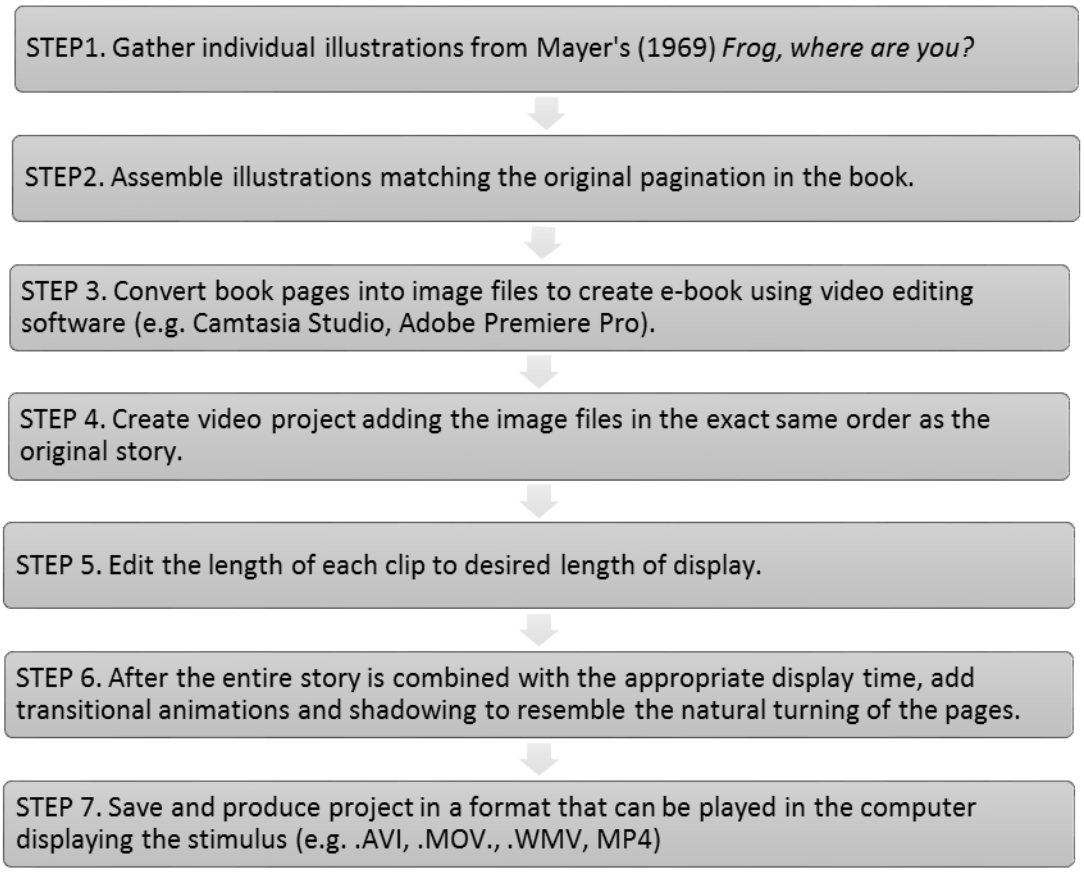
Módulo 3: Competencia Escala: 0 = no muy bien; 6 = muy bien

- ¿Cómo habla en ESPAÑOL/INGLÉS?
- ¿Cómo entiende en ESPAÑOL/INGLÉS?
- ¿Cómo lee en ESPAÑOL/INGLÉS?
- ¿Cómo escribe en ESPAÑOL/INGLÉS?

Módule 4: Actitudes Escala: 0 = no estoy de acuerdo; 6 = estoy de acuerdo

- Me siento "yo mismo" cuando hablo en ESPAÑOL/INGLÉS.
- Me identifico con una cultura Hispanohablante/Anglohablante.
- Es importante para mi usar (o llegar a usar) ESPAÑOL/INGLÉS como un hablante nativo.
- Quiero que los demás piensen que soy un hablante nativo del ESPAÑOL/INGLÉS.

Appendix B: Steps for e-Book Creation



Appendix C: Instructions for the Non-Linguistic Tasks

Spanish Instructions	**English Instructions**
¡Gracias por participar en este estudio! Este experimento consiste en dos partes: En la primera parte, se le mostrarán varios grupos de tres imágenes. Usted tendrá que decidir rápidamente cuáles dos imágenes son más similares entre sí. En la segunda parte, se le mostrarán varios grupos con pares de imágenes. Usted tendrá que dar una puntuación, del 1 al 10 indicando qué tan similares o diferentes encuentra estas imágenes. No hay respuestas correctas o incorrectas para este experimento; solamente estamos interesados en saber qué tan similares o diferentes le parecen las imágenes.	Thank you for participating in this study! This experiment consists of two parts: In the first part, you will be presented with a series of trials containing three images. Your task is to quickly decide which two images are most similar. In the second part, you will be presented with a series of trials containing a pair of images. Your task will be to rate how similar or different the two images are on a scale from 1 to 10. There are no correct or incorrect answers for this experiment; we are only interested in knowing how similar or different the pictures seem to you.
PARTE 1	**PART 1**
Usted verá varios grupos de tres imágenes etiquetadas **a**, **b** y **c**. Su tarea consiste en decidir rápidamente cuáles dos imágenes son más similares entre sí y elegir la opción que mejor refleje su opinión, por ejemplo: “a y c son más similares" o "b y c son más similares". No hay límite de tiempo para hacer su elección; sin embargo, le recomendamos que decida lo más pronto posible: déjese llevar por su primera impresión. Tendrá la oportunidad de hacer tres *pruebas* antes de iniciar el experimento real.  Nota: después de hacer su selección, verá un nuevo conjunto de imágenes y no podrá regresar al grupo anterior o cambiar su respuesta.	You will be presented with a series of three images labeled **a**, **b** and **c**. Your task is to quickly decide which two images are most similar by choosing the option that best reflects your opinion, for example: “a and c are more similar” or “b and c are more similar”. There is no time limit for making your choice; however we encourage you to decide as quickly as possible: go with your first impression. You will have three *test trials* before you start the actual experiment.  Note: once you make a selection, you will see a new set of images and you will not be able to change your answer or go back to the previous set.

PARTE 2	**PART 2**
Usted verá varios grupos de dos imágenes. Su tarea consiste en evaluar rápidamente qué tan similares o diferentes son estas imágenes en una escala del 1 al 10, donde 1 es "nada similares/me parecen completamente diferentes" y 10 es "extremadamente similares/me parecen casi iguales".	You will be presented with a pair of images. Your task is to quickly rate how similar or different these images are on a scale from 1 to 10, where 1 is “not at all similar/they look completely different to me” and 10 is “extremely similar/they look almost the same to me”.
No hay límite de tiempo para hacer su elección; sin embargo, le recomendamos que decida lo más pronto posible: déjese llevar por su primera impresión.	There is no time limit for making your choice; however we encourage you to decide as quickly as possible: go with your first impression.
Tendrá la oportunidad de hacer tres *pruebas* antes de iniciar el experimento real.	You will have three *test trials* before you start the actual experiment.
 Nota: después de hacer su selección, verá un nuevo conjunto de imágenes y no podrá regresar al grupo anterior o cambiar su respuesta.	 Note: once you make a selection, you will see a new set of images and you will not be able to change your answer or go back to the previous set.

VITA

VITA

HEIDI E. PARKER

EDUCATION

Ph.D. in Cognitive Linguistics, Purdue University, 2016
Dissertation Title: L2 Effect on Bilingual Spanish/English Descriptions of Motion Events: Does Manner Salience Transfer?
Committee: Robert M. Hammond (chair), Lori Czerwionka, Elaine Francis, Daniel J. Olson.

M.A. in Spanish Linguistics, Purdue University, 2008
Thesis Title: Variations in Salvadorian /s/: An acoustic analysis of [s] and [theta]
Committee: Robert M. Hammond (chair), Elena Benedicto, John Sundquist
Related area of interest: Applied Linguistics and Second Language Acquisition

B.S. in Management, Purdue University, 2002
Minor: Hospitality and Tourism Management
Internship Abroad: Jingling Hotel, Nanjing, China, June-November 2001

APPOINTMENTS

Instructional Developer, Center for Instructional Excellence, Purdue University, 2014-present
Graduate Assistant, Instructional Development and Global Learning Faculty Development Program, Center for Instructional Excellence, Purdue University, 2010-2014
Teaching Assistant, School of Languages and Cultures, Purdue University, 2006-2012
Research Assistant, College of Engineering, Vertically Integrated Projects, Purdue University, 2008-2009
Teaching Instructor, College of Engineering, School of Engineering Education, Purdue University, Summer-2009
General Manager, Sodexho Inc., 2003-2005

RESEARCH AND TEACHING INTERESTS _____

Spanish language and content courses
Instructional development courses
Bilingualism, language contact and sociolinguistics
Cognitive linguistics and neurolinguistics
Global learning and intercultural development
Scholarship of Teaching and Learning (SoTL)

TEACHING AND RESEARCH_____

Purdue University, Center for Instructional Excellence, 2010-2014

Teaching Assistant of Instructional Development and Global Learning Faculty Development Program

- Facilitated various instructional development seminars.
- Created and re-designed workshop content.
- Co-facilitated yearly Graduate Student Teaching Assistant campus-wide orientation.

Graduate course:

- EDCI 589: College Teaching Workshop Series I
  - This course is an introduction to the instructional, pedagogical, and curricular knowledge domains of teaching and provides instructors with an opportunity to: analyze various instructional strategies used when delivering post-secondary instruction; choose pedagogically sound tactics to enhance student learning and engagement; and use reflective teaching practices to discuss instructional choices/challenges and propose solutions to apply in future teaching experiences.

Purdue University, School of Languages and Cultures, 2006-2012

Teaching Assistant of Spanish and Linguistics

- Taught various undergraduate Spanish and Linguistics courses as instructor of record.
- Created syllabi, course content, reading packets, rubrics, activities, assessments, and homework.

Undergraduate Courses:

- FLL 261: Introduction to the Linguistic Study of Foreign Languages
- SPAN 101: Spanish I
- SPAN 102: Spanish II
- SPAN 201: Spanish III
- SPAN 202: Spanish IV
- SPAN 402: Spanish VI

Purdue University, School of Engineering Education, 2009

Instructor of Spanish for Engineering Recruiters

- Created a specialized Spanish summer course for Purdue's engineering recruiters.
- Designed syllabi, reading packets, grading rubrics, activities, assessments, and homework.
- Developed a professional presentation in Spanish to be used while recruiting abroad.
- Revised an English-Spanish manual with engineering technical terms.

Purdue University, College of Engineering, Vertically Integrated Projects 2008-2009

Research Assistant for the Online Spanish Tutor (OST) Project

- Created stimuli for the project.
- Performed acoustic labeling for speech signal analysis.
- Conducted software calibration and evaluation.
- Maintained OST website.

PEDAGOGICAL MATERIALS AND INSTRUCTIONAL DESIGN _____

Purdue University, The Language Teacher's Toolbox, 2011

- Assisted in creating audio and video materials for several online modules designed for learners of Spanish as a second language.

Purdue University, School of Languages and Cultures, 2006-2011

- Created several instructional activities and online tools for various Spanish courses; the materials continue to be distributed among teaching assistants in the department.

- Re-designed the cour*se Introduction to the Linguistic Study of Foreign Languages* (FLL 261)
  - Utilized backwards design and created syllabus, course schedule, activities and assessment criteria to incorporate student-centered teaching methods like active learning and cooperative learning. The course continues to be taught in this format.
  - The course format and materials were shared with an Assistant Professor of Language and Culture at Purchase College State University of New York (per his request) and they are currently being used in his courses.

Global Learning Faculty Development Program, 2012-2014

Online faculty toolkit: Intercultural Learning 101: Study Abroad

- Assisted in the creation of faculty activities using various interactive programs.
- Managed course webpages and content.
- Designed and produced an interactive video to promote the Intercultural Learning 101 toolkit, which can be used as a resource for the Study Abroad office, International Programs and faculty conducting study abroad projects.

Digital Badge program: Purdue University's Passport to Intercultural Learning (PUPIL)

- Managed program's website and content.
- Designed and produced two TV commercials to promote the PUPIL program, which can also be used as an in-class activity to promote intercultural learning.

Digital Badge program: Civic Engagement: Global Citizenship/Social Responsibility

- Designed and created digital badges.
- Managed program's website and content.

Digital Badge program: Purdue's Multinational Integration Xchange (MIX)

- Designed and created digital badges.

Intercultural Development Inventory (IDI)

IDI Qualified Administrator, 2015-present

- Conducted IDI coaching and debriefs to Purdue faculty, students, staff, and exchange students from Colombia.

Purdue, University, College of Engineering, Vertically Integrated Projects, Online

Spanish Tutor (OST) Project

- Co-developer of an online tool to assist second language Spanish learners with pronunciation.

FACULTY AND INSTRUCTIONAL DEVELOPMENT
Purdue University, Center for Instructional Excellence, 2010-present

FACULTY DEVELOPMENT

Instruction Matters: Purdue Academic Course Transformation (IMPACT)

- Lead IMPACT teams and provide support for faculty during the Faculty Learning Communities (2014 – present).
- Reviewed IMPACTS support team's training program and provided a comprehensive plan for improvement.
- Produced various Scholarship of Teaching and Learning (SoTL) outputs.

Small Group Instructional Diagnosis (SGID)

- Facilitate SGID sessions and faculty debriefs.
- Provide faculty with suggestions and resources based on SGID results.
- Sample classes: AAE 333, AAE 334, MET 334, MET 382, MGMT 175.

Faculty consultations and support

- Recent and ongoing consultations:
  - AGEC 327 (Principles of Food and Agribusiness Marketing).
  - BCHM 307 (Biochemistry).
  - BCM 215 (Mechanical Construction).
  - EAPS309 (Computer-aided analysis for Geosciences).
  - ECET 380 (Global Professional Issues in Electrical Engineering Technology).
  - FNR 488 (Global Environmental Issues Materials & Processes II).
  - GS100 (American Language and Culture for International Students).
  - LA 227/321/325 (Landscape Architecture).
  - MCMP 204/ MCMP 205 (Organic Chemistry).
  - MET 245/MFET 344/MFET 300 (Manufacturing systems).
  - NUPH 494/495 (Nuclear Pharmacy).

- Sample consultation deliverable:

    - Provided intercultural development resources and designed a class session for an International Marketing class in Krannert School of Management.
    - Secured international guest speaker for the session: Head Product Developer in Global Marketing for Maybelline, New York.
    - This class session won Krannert's *Culture Fest Global Classroom Contest* (Spring 2013).

GRADUATE TEACHER DEVELOPMENT

Graduate Teacher Certificates, 2010-2013

- Managed all certificate programs; reviewed and approved all applications.
- Led program outreach efforts in various Purdue departments.
- Mentored applicants and provided resources.
- Assisted Advanced Graduate Teacher Certificate (AGTC) applicants in developing specialized teaching and learning seminars.
- Redesigned program to increase participation and enhance the professional development process.

Additional consultations and support, 2010-present

- Provide graduate students with various resources and suggestions to promote best practices in teaching and learning.
- Recommend sample assignments, classroom activities and assessment tools.
- Facilitate *Micro-Teaching* workshop and playback sessions to provide constructive feedback and suggestions to graduate instructors.

INSTRUCTIONAL DEVELOPMENT

Center for Instructional Excellence Workshops and Programs

Facilitated:

- Advanced Teaching Portfolio Techniques: E-Portfolio and Website Design.
- Clever Ways to Get Feedback to Improve you're Teaching.
- Creating Teaching Portfolios and Philosophies.
- Creating the Engaged Classroom: Discussion Techniques.
- Designing a Course from Scratch.
- Fostering Academic Integrity & Responsibility.
- Instructional Presentation Techniques that Engage Students.
- Micro-Teaching: Practice your Teaching.

- Objective Assessment: Tools & Techniques.
- Student-Teacher Relationships: Building Rapport with Your Student.
- Subjective Assessment, Rubrics, and Assigning Grades.
- Teaching In the American Classroom.
- The Nuts and Bolts of Setting Rules for Your Course.

Created:

- Advanced Teaching Portfolio Techniques: E-Portfolio and Website Design.
- Basics of Creating an E-Portfolio.

Re-designed:

- Creating the Engaged Classroom: Discussion Techniques.
- Graduate Teacher Certificate programs.
- Objective Assessment: Tools & Techniques.
- Teaching In the American Classroom.

Other Center for Instructional Excellence online instructional materials:

- Managed online teaching tips content, videos and resources.
- Produced various digital presentations and TV commercials to promote the center's programs.

INTERNATIONAL FACULTY DEVELOPMENT AND COLLABORATIONS_____

Colombia, 2015-present

UNIVERSIDAD EAFIT, MEDELLÍN

- Developed materials and co-facilitated workshops during the conference "Roadmap towards a student-centered education. The Purdue Experience" (April, 2015).
- Provided feedback regarding institutional end-of-semester evaluations to EAFIT's Director of Faculty.
- Arranged semester-long sabbatical experience at Purdue for one of EAFIT's engineering faculty members:
  - Served as an International Students and Scholars (ISS) liaison.
  - Organized J-1 visa paperwork, travel and accommodations for the scholar.
  - Currently providing weekly faculty development consultations for his re-designed course: numerical analysis (Spring 2016).

- Assisted a delegation from *Proyecto 50* (EAFIT's faculty development and teaching technologies center) with planning a week-long visit to Purdue (November, 2015):
  - Provided individual consultations.
  - Secured networking meetings with various faculty members on campus.
  - Assisted with travel arrangements.
- Ongoing consultation with director and assessment team of *Universidad de los niños* (the children's university). The goal is to revise the program's assessment methods.

UNIVERSIDAD JORGE TADEO LOZANO, BOGOTÁ

- Ongoing consultation with the Director of Innovation and Head of Faculty Development:
  - Provided feedback on institutional end of semester evaluations.
  - Shared insights and expertise on newly created faculty development program and course re-design program.
  - Provided mentoring and coaching to Faculty Development Office as needed.
  - Developed materials and facilitated workshops during the "Week of Pedagogical Innovation" (January 18-22, 2016).

PONTIFICIA UNIVERSIDAD JAVERIANA

- Planned a faculty development conference with the theme "Cognitive Engagement and its Implication on Motivation and Active Learning" as part of the institution's Center for Teaching, Learning, and Assessment initiatives (June, 2016).

MULTI-INSTITUTIONAL COLLABORATION

- Leading a collaborative project to validate the Spanish version of the student learning and motivation assessment scales that are utilized for evaluating *Instruction Matters: Purdue Academic Course Transformation* (IMPACT) courses. After the validation is complete, it is expected that this scale will become the standard assessment tool for similar studies in all of the Spanish-speaking world. Partners involved in this project:
  - Universidad EAFIT
  - Universidad de los Andes
  - Universidad del Norte
  - Pontificia Universidad Javeriana
  - Universidad Jorge Tadeo Lozano
  - Universidad Nacional de Colombia (Bogotá)

MANAGEMENT_____

Sodexho Inc., 2003-2005

General Manager

- Administered budget and increased revenue.
- Conducted intervention in struggling unit: reduced departmental deficit by half during the first year and achieved the break-even point during the second year of operation.
- Created strategic plan and negotiated contracts.
- Developed five new programs, branding and marketing plans.
- Established positive relationships with key business partners.
- Improved customer satisfaction and retention for all accounts.
- Increased customer participation in all programs.
- Led, trained and developed a team of 30 employees.
- Opened a new account, reorganized the unit and recruited new staff.

CONFERENCE PRESENTATIONS AND INVITED PRESENTATIONS _____

Parker H.E. (2015). Using Digital Badges to Document Transformative Learning. Transformative Learning Conference. Oklahoma, OK.

Parker, H.E. and Calahan, C.A. (2014, October). Using Digital Badges to Assess Civic Engagement: Global Citizenship/Social Responsibility. Poster session at the Assessment Institute, Indianapolis, IN.

Calahan, C.A. and Parker, H.E. (2014). Assessing Affective Constructs in Intercultural Learning Using Digital Badges, Assessment Institute, Indianapolis, IN.

Calahan, C.A. and Parker, H.E. (2014). Digital Badges to assess Global Learning using Bloom's Affective Domain. Professional and Organizational Development Conference, Dallas, TX.

Richards, K.A., Levesque-Bristol, Parker, H.E. (2014). Promoting Faculty Role Balance: Implications for Faculty Developers. Professional and Organizational Development Conference, Dallas, TX.

Parker H. E., Carrillo-Munoz A., Calahan C. (2013). Purdue University's Passport to Intercultural Learning (PUPIL) as an Intercultural Skills Assessment Tool. Poster presented at the 2013 Assessment Institute in Indianapolis. Office of Planning and Institutional Improvement Indiana University-Purdue University Indianapolis. Indianapolis, IN.

Parker H. E. (2013). Useful Tips When Learning English as a Second Language. Presented at Purdue Extension's Learning Network of Clinton County. Frankfort, IN.

Parker H. E. (2012). Implementing Technology in SPAN 400-Level Classes. Presented at Purdue University, SPAN 400-Level Orientation. Invited by Cecilia Tenorio.

Parker H. E. (2010, 2011, 2012). Creating Teaching Philosophies. Guest Lecture. Physics 605,

Pedagogical Methods for Physics Graduate Students. Invited by Christo Deligkaris and Jordan Heim.

PUBLICATIONS AND WORK IN PROGRESS

Parker H. E. (2015). Assessment in Practice. Digital Badges as Effective Assessment Tools. National Institute for Learning Outcomes and Assessment (NILOA) Newsletter. Available at: https://illinois.edu/emailer/newsletter/71057.html

Parker, H. E. (2015). "Digital Badges to Assess Bloom's Affective Domain." The National Teaching & Learning Forum 24(4): 9-11. Available at: http://onlinelibrary.wiley.com/doi/10.1002/ntlf.2015.24.issue-4/issuetoc

Parker H. E. (in preparation). Variations in Salvadorian /s/: An acoustic analysis of [s] and [ɵ].

Parker H. E. (in preparation). Linear Predictive Coding (LPC) as a tool to analyze Spanish fricatives.

Parker H. E. (in preparation). Sociolinguistic aspects of Salvadorian and Andalusian [ɵ].

Parker H. E. (in preparation). On the other side of Service-learning: Exploring the Experiences of a Target Community.

SERVICE

Purdue University

- Volunteer, Purdue Service-Learning project *LARA Thrill of Thrift Fashion Show*, Spring 2014.
- Episode panelist, *The Chuck & Margaret Show*, Spring 2014.
- Graduate Committee - School of Languages and Cultures, webmaster, 2011-2012.
- Lingua Franca Newsletter Committee, School of Languages and Cultures, editor, writer and designer, 2010-2012.
- School of Languages and Cultures, teaching assistant mentor, 2008-2012.
- Sexual Harassment Advisors Network Orientation, School of Languages and Cultures Graduate student liaison, 2009-present.
- Purdue Linguistics Association Symposium, collaborator, 2010-2011.
- Art of Living at Purdue, founder and president, 1999-2001.

Community

- International Association for Human Values, instructor, 2002-present.
- Latino Center of Tippecanoe County (LCTC), volunteer instructor, 2003.
- Tree Lafayette, volunteer, 2008-present.
- YWCA – Lafayette, instructor and translator, 2000-2002.

HONORS, CERTIFICATIONS AND AFFILIATIONS

Purdue University

- Graduate Teaching Certificate, Center for Instructional Excellence, 2010.
- Outstanding Teaching Award, Teaching Academy, Purdue Graduate School 2009.
- Excellence in Teaching Award, Foreign Languages and Literatures, 2007-2008.
- Graduate Committee - School of Languages and Cultures, member, 2010-present.
- Purdue Linguistics Association, member, 2007-present.
- Art of Living at Purdue, member, volunteer and instructor 2001-2010.
- Dean's List/Semester Honors, 1999, 2001, 2002.

Other

- Linguistic Society of America (LSA), 2010-present.
- National Association of Collegiate Scholars (NSCS), member, 2000-present.
- International Association for Human Values, member, 1997-present.
- Society of Hispanic Professional Engineers, SHPE, member, 2000-2002.
- Graduated with First Class Honors, *Escuela Bilingue Maquilishuat*, 1997.

LANGUAGES

Spanish – native proficiency
English – near-native proficiency
German – basic proficiency
Mandarin Chinese – basic proficiency
Portuguese – advanced reading and listening comprehension
Purdue University

COMPUTER SKILLS

Adobe Creative Suite (Acrobat XI Pro, Photoshop CC, Illustrator CC, Dreamweaver CC, Audition CC)
ELAN (multimedia linguistic annotation tool)
EndNote (software tool for publishing and managing bibliographies, citations and references)
Hannon Hill Cascade Server, CMS (content management system)
Microsoft Office (Word, Excel, PowerPoint, Publisher)
Respondus StudyMate (tool for creating online learning activities, self-assessments, and games)
SAS (Statistical Analysis System)
Sparkol VideoScribe (tool for creating interactive videos)
SPSS (Statistical Package for Social Sciences)

TechSmith Camtasia Studio (screen recording and video editing tool)
Web 2.0 technologies (use of blogging, social network sites, podcasts, etc. for pedagogic purposes)
Web development (HTML, CSS, and PHP)