

Linguistic relativity in motion events in  
Spanish and English: a study on monolingual and  
bilingual children and adults

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## **Abstract**

The research investigates the relation between language and cognition, focusing specifically on dynamic motion events (MEs) of path, manner and causation. This dissertation studies differences in lexicalization patterns of MEs in monolingual and bilingual adults, children, and adolescents, speakers of English and Spanish, and the possible effect of language patterns of MEs on cognition (i.e. the linguistic relativity hypothesis). The study additionally seeks to determine developmental aspects of MEs in language and cognition and to measure the impact of speaking an additional language on linguistic and cognitive processing. Participants' linguistics patterns and cognitive performances are assessed with two experiments: i) a verbal description task of videos and ii) a similarity judgment task that measured categorization preferences. In total, participants are 124 adults and 221 children and adolescents. The research reveals that adults' performance is different from that of children in both tasks. It also confirms that MEs are conveyed differently in monolingual and bilingual speakers of English and Spanish. Most importantly it shows that categorization of MEs is constrained by the language-specific patterns in adults in the adult population. Additionally, the knowledge of a second language in adults influences language performance: A bidirectional cross-linguistic influence from L2 to L1 and L1 to L2 is observed. The study of lexicalization patterns in children reveals developmental changes that suggest that learning motion events patterns in one's language takes longer than previously reported. The performance of monolingual and bilingual children and adolescents does not yield effect of language on the categorization of MEs.

This research is a contribution to the studies of linguistic relativity. It helps to explain the contradictory results in the area. It reveals that language seems to affect other non-linguistic cognitive processes and support the hypothesis that language may be interconnected to other cognitive functions in monolinguals' and bilinguals' brain. Furthermore, it contributed to the studies of language acquisition in L1 and L2 by assessing bilingual adults and children in their encoding of motion events and its relation to cognition.

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## **List of abbreviations**

LR – Linguistic Relativity

T-F-S- Thinking-for-speaking

S-E – Spanish-English

AG- Age group

V - Verb

OV – Other verbs

RM- Related to motion event

N-RM – Non-related to motion events

NV – Neutral verb

PP-Prepositional phrase



## Chapter 1. Introduction

The present cross-linguistic study investigates the first and second acquisition of motion event patterns in Spanish and English, and the effect of language patterns in cognition (the linguistic relativity hypothesis). For this, we study three different populations from a psycholinguistic experimental perspective. To investigate the linguistic relativity hypothesis (i.e. whether language influence non-linguistic cognition) and the lexicalization patterns in the domain of motion events, the study uses two main experimental designs: a linguistic task and a non-linguistic categorization task. The experiments were run in three different linguistic populations: English monolingual, Spanish monolinguals, and native Spanish speakers with knowledge of English. Specifically, we focus on the components of path, manner and causation of motion events. Participants are both adults and children. We test a total of 124 adult participants (44 English monolinguals, 42 Spanish monolinguals, and 38 native Spanish speakers with knowledge of English) and a total of 221 children and adolescent participants (88 English monolinguals, 94 Spanish monolinguals, and 39 native Spanish speakers learning English at school) with an age range from 5 to 17 years old. In the child study, we aim to investigate the same aspects exposed above in relation to the adult population but from a cross-sectional perspective.

The studies performed in this thesis bring together the fields of cognitive linguistic, bilingualism, language acquisition and childhood bilingualism. The originality and innovative nature of this thesis is shown in the experimental data since it includes a wide linguistic population (speakers acquiring their first language, speakers learning a second language and monolingual adult speakers) with a wide age range ( from 5 to 50 years old). Additionally, it contributes to the studies of linguistic relativity in the domain of motion events, whose previous research has been focused on the process of lexicalization patterns of motion events rather than on the effect of language patterns in non-linguistic cognition.

Chapter 2 introduces the linguistic relativity (LR) hypothesis. It briefly describes the origins of the famous Whorf hypothesis and how it has developed until recent days. In this chapter we also discuss studies that support the LR in monolinguals and children. Additionally, a section is dedicated to the studies of LR and bilingualism.

Chapter 3 presents a literature review of studies to date regarding the lexicalization patterns of motion events. We emphasize particularly in the discussion of the Talmy's (1985) linguistic typology of motion events, and explain the studies that investigated motion events in language in adults, children, monolinguals, and bilinguals.

Chapter 4 presents a second literature review summarizing findings to date regarding the LR hypothesis and motion events. Due to the lengthy amount of studies in the area of LR we focus exclusively in motion events.

Chapter 5 presents the methodology that we followed to carry out the studies performed in this thesis. We first present our aims, followed by our hypothesis, and then we continue with the description of the experimental tasks. We present how the linguistic and non-linguistic tasks were designed, the materials, the selection of participants and the procedures followed to collect the data.

Chapter 6 presents the main results from the adult data. Results are presented in two main sections that describe and discuss the results from the linguistic task and the non-linguistic task. There are two subsections in each task: one exposes the results on the condition of path vs. manner, and the other one presents the results from the path vs. causation condition. The results from the monolingual speakers are presented first, followed by the bilingual speakers.

Chapter 7 has the same organization presented in chapter 6, but it describes the results from the child population. Despite participants (adults and children) performed the non-linguistic task followed by the linguistic task, we decided to describe the results in the reverse order (i.e. first we described the linguistic task, secondly, the non-linguistic task). In this way the reader can obtain a

picture of how speakers perform linguistically before reading about their cognitive behaviour.

Chapter 8 discusses extensively the results from each task in adults and in children. The theoretical ramifications of the investigation as a whole are discussed.

Finally, chapter 9 presents the conclusions.

## Chapter 2. The linguistic relativity hypothesis

### 2.1. Chapter overview

This chapter presents a summary of the origins of the linguistic relativity hypothesis (LRH). It describes the first linguistic and anthropological conceptions of the hypothesis and its evolution to what we know today. We also dedicate a section to explain the classical definition of the hypothesis, its premises, variations, and critics.

Section 2.1 describes new approaches to the LRH. This segment summarizes new versions of the hypothesis as a result of recent research, and shows how linguistic relativity has evolved in recent times. Section 2.2 presents an overview of the studies in linguistic relativity and bilingualism; section 2.3 describes the major questions in relation to linguistic relativity and language development. Finally, section 2.4 offers a summary of the discussion of the chapter.

### 2.2 The linguistic relativity hypothesis

#### 2.2.1 *The origins of the hypothesis*

The question of whether the language we speak affects our ways of thinking, today referred as the *linguistic relativity hypothesis*, has been a recurrent question for centuries which nowadays seems more active and controversial than ever. The original idea has its basis in the discussion between romanticist and enlightenment figures. Of special importance to the discussion are Johann Georg Hammann (1730-1788), Wilhelm von Humboldt (1767-1835) and especially Gottfried Herder (1744-1803) in the late eighteenth century and nineteenth century in Germany (see Swoyer 2011, p. 26-27). Romanticists, with their wide knowledge of languages, detect differences between them and start to suggest their influence in perceiving and thinking about the speakers' world (Swoyer 2011).



The question is firstly detailed by Francis Boas (e.g. 1911/1966), further developed by Edward Sapir (e.g. 1924, 1929, 1949a, 1949b, 1954, 1985)) and formally formulated by Benjamin Whorf (1956) towards the middle of the last century (Lucy 1992a, 1997; Swoyer 2011).

Lucy (1992a), in his book dedicated to linguistic relativity, describes in detail how the conceptions of language, culture and thought evolved in the works of the scholars Boas and Sapir, and explains how their conceptions were further developed by Whorf, who posits the linguistic relativity principle. Boas accepts the idea that thought and culture could influence language, but only scarcely, as for him language mirrored thought and culture. Sapir, on the other hand, recognizes that language could be a powerful tool that not only could shape the interpretation of experience, but also build it.

Sapir (1929, 1949b) already mentions that humans understand their world through the scope of language because this is the medium of communication; the reality is adjusted by the language:

“Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but are very much at the mercy of the particular language which has become the medium of expression for their society. It is quite an illusion to imagine that one adjusts to reality essentially without the use of language and that language is merely an incidental means of solving specific problems of communication or reflection” (Sapir 1929, p. 209).

And:

“The fact of the matter is that the ‘real world’ is to a large extent unconsciously built up on the language habits of the group. No two languages are ever sufficiently similar to be considered as representing the same social reality. The worlds in which different societies live are distinct worlds, not merely the same worlds with different labels attached”. (Sapir 1929, p. 209)

In Sapir's view, the reality that could be influenced by language reaches cognitive functions such as perception:

“Even comparatively simple acts of perception are very much more at the mercy of the social patterns called words than we might suppose... We see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation” (Sapir 1929, p. 209).

Boas and Sapir brought the foundation to the conception that each language embodies different “classification of experience”. The difference between the two anthropologists is that Boas considers the influence of language on thought and culture to be very small, and even on the contrary, thought and culture influence language, while Sapir considers that such language influence on thought exists (Lucy 1992a, p. 24).

Sapir may have coined the term *relativity* in his works, but it was Whorf (1956) who further develops the idea, formulated the hypothesis, and describes empirical investigations in order to demonstrate his thesis (Lucy 1992a, 1996).

Benjamin Whorf (1956) was an engineer interested in linguistic problems observed in his field of work. By 1931, he joined Sapir and his group of students as a hobby and started to produce his ideas, which have since become famous. With Whorf, the question of whether language influences thought acquires the statement of a hypothesis, i.e. the principle of linguistic relativity or the linguistic relativity hypothesis, as it is nowadays known (Cook 2011, Gumperz & Levinson 1996, Lucy 1992a, 1996; Swoyer 2011). Whorf's “principle of relativity” refers to the idea that the conceptual system in humans is *relative* due to their dependency of language. The following citation captures Whorf's own words.

“We are thus introduced to a new principle of relativity, which holds that all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar. Or can in some way be calibrated ... The relativity of all conceptual systems,

ours included, and their dependence upon language stand revealed” (Whorf 1956, p. 214).

This happens in languages that are markedly different from each other. If they were similar, speakers would share the same conceptual systems:

“We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds- and this means largely by the linguistic systems in our minds... no individual is free to describe nature with absolute impartiality but is constrained to certain modes of interpretation even while he thinks himself most free” (Whorf 1956b, pp. 213-214).

It seems that at the time Whorf’s grammatical and semantic conceptions evolved, his principle appeared as more specific:

“Users of markedly different grammars are pointed by their grammars toward different types of observations and different evaluations of externally similar acts of observation, and hence are not equivalent as observers but must arrive at somewhat different views of the world” (1956c, p.221)

Whorf would bring specific examples of investigations to probe his principle. His main concerns were around whether the concepts of time, space, and matter were the same for all speakers, or whether they differ according to their language. Additionally, he wanted to detect similarities between language patterns and cultural and behavioural patterns. Thus, Whorf was interested in finding empirical evidence for his principle and this led him to analyse particular structures of languages, such as simply lexical items encoding situations, but also he analysed “large-scale linguistic patterns” of grammatical categories that included tense, gender, number, animacy, etc., "and the matter of whether a given experience is denoted by a unit morpheme, an inflected word, or a

syntactical combination” (Whorf 1956, p 137). However, as Lucy (1992a) explains, Whorf thought that a more powerful effect of language on thought would be found in broader patterns between languages that go beyond grammar. He referred to “fashion of speaking”. This conception is reflected in his work on modern Nahuatl (Aztec) and Hopi languages where he analysed the grammar and descriptions of reality between these languages, finding significant linguistic differences. However, he never measured cognitive aspects, therefore, conclusions about language effect on thought was definitely not proven. (Lucy 1992a, pp. 25-39):

“Actually, thinking is most mysterious, and by far the greatest light upon it that we have is thrown by the study of language. This study shows that the forms of a person's thoughts are controlled by inexorable laws of pattern of which he is unconscious. These patterns are the unperceived intricate systematizations of his own language - shown readily enough by a candid comparison and contrast with other languages, especially those of a different linguistic family. His thinking itself is in a language - in English, in Sanskrit, in Chinese. And every language is a vast pattern-system, different from others, in which are culturally ordained the forms and categories by which the personality not only communicates, but also analyses nature, notices or neglects types of relationship and phenomena, channels his reasoning, and builds the house of his consciousness” (Whorf 1956, p. 252).

In his writings, Whorf led the basis for the ways to study the linguistic relativity, which is the comparison between languages with rather different systems. If language affects thought, comparing speakers with different system should show different thinking. Despite the important changes and variations to the original hypothesis, this is still the main methodology of analysis.

One of the most important criticisms of Whorf's work is that he never actually studied cognition. But in order to understand both Sapir's and Whorf's ideas we must firstly understand that cognition was conceived differently, as language and thinking concepts. Also, the same conception of “concept” varied greatly to

how it is considered today thanks to advances in modern cognitive science (Gumperz & Levinson 1996).

During the first half of the century the Whorf hypothesis became popular among American anthropologists and some behaviourists whose basic hypotheses of behaviour and conditioning learning were not in opposition with the linguistic relativity principle. However, difficulties in studying cognition and mind (remember the black box in Skinner's terms) made the studies to be forgotten (Gumperz & Levinson 1996).

Lucy (1992a, 1996) classifies the post-Whorf studies into two big categories: the studies by anthropological linguists, and comparative studies from psycholinguists. The first category explores the links between grammatical structures and cultural patterns. For example, Beals & Hoijer (1953) study categories concerning motion in the Navajo verb, and try to establish correlations with the motion of motif in Navajo myth and nomadic history. However, the study does not show correlations. Studies by comparative psychologists mostly focus on small sets of lexical items, and rarely on grammatical aspects of language. Additionally, a great deal of studies is done in only one language, usually English. Lucy (1996) divides these studies into those focus on lexicon and those focus on grammar. Among the first group, there are the famous studies in colour perception that brought a great impulse to the theory.

Brown & Lenneberg (1954) offer pioneering work by showing a correlation between lexical coding and memory in the domain of colour. However, soon studies such as Berlin & Kay (1969), and Heider (1972), reveal that the hypothesis was not valid. Brown & Lenneberg's study establishes an important precedent to methods for the studies of linguistic relativity. However, subsequent studies result in the linguistic relativity hypothesis being neglected for a long period of time.

The hypothesis was better tested by memory task in experimental conditions that allowed researchers to improve control over the variables; but as Lucy pointed out, this research also shifted "emphasis away from Whorf's concern

with *habitual* thought and behaviour and towards a concern with *potential* thought and behaviour” (1996, p. 47).

In the area of grammar, these psychological studies analyse the cognitive meaning of some grammatical patterns in two languages. However, results in this area are inconsistent and widely criticized through counter evidence. For example, Carroll & Casagrande (1958) find counter evidence to their same study of categorization of objects in Navajo-speaking and English-speaking children. The difference found in categorizing objects between Navajo and English children and adjudicated to the language differences is also found between the same English-speaking children from two different communities. Lucy (1996) points out that the basic weakness of these studies is that despite the presentation of data from different language groups, the analysis of a grammatical category was never compared between languages. It was never described beyond the scope of the given language.

These examples, and other studies with inconclusive results or unclear methodologies led to the hypothesis being left aside (see in Lucy 1992a, for example, the discussion of the accuracy of the Chinese translation of the English construction in Bloom’s, 1981, study about counterfactual markers in Chinese and English). At the same time, universalists’ views and the rise of generative grammar completely shift the interest in linguistics and psycholinguistics. Even behaviourism is set aside when Noam Chomsky refutes most of its basic premises and the hypothesis proposed by Skinner in his infamous *Verbal Behaviour*. Chomsky (1972) primarily believes that all languages are generated from a set of finite rules, and that even semantics is built on grammar and not the other way around<sup>1</sup>. Thus, the main goal among the researchers influenced by these ideas is to obtain the set of principles and parameters that prove that languages are the same. The language differences, which is one of the basic premises of linguistic relativity, do not exist but on the surface level which should not be the main interest in linguistics. Soon, linguistic

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<sup>1</sup> Our aim in these lines is to present the facts as they were at the time all these theories were originated. We know that Chomsky’s ideas, generative and innate grammar have greatly been modified in the last decades.

relativity is widely criticized and is even seen as ridiculous, and not properly understood for a long period (Cook 2011).

Cook (2011) explains that Whorf's ideas create a lot of confusion, in part, because every person seems to have their own interpretation of what Whorf wanted to say. The debate has been even oversimplified by those who do not consider the hypothesis possible. For example, see Pinker's (1994) quotes about Jerry Fodor in his book *The Language Instinct* about linguistic relativity:

“The thing is: I *hate* relativism. I hate relativism more than I hate anything else, excepting, maybe, fiberglass powerboats. More to the point, I think that relativism is very probably false. What it overlooks, to put it briefly and crudely, is the fixed structure of human nature...”  
(1994, p. 405)

Lucy (1992a) explains, and he is supported by others such as Cook (2011), Gumperz & Levinson (1996), and Swoyer (2011), that the relativist problem has been “caricaturized” to a very simple form. On one side it is suggested that the LR hypothesis implies that the structure of language *determines* thought and that variations are not possible. On the other side, the argument is that some language structures *influence* thought, “...in the sense that there may be some identifiable cognitive correlates ... associated with using a particular language...” (1992, p. 3). The first argument is difficult to sustain, while the second one will be easy to accept. Therefore, as Lucy points out, there is no point in investigating either argument because one seems false and the other one true. Swoyer (2011) also considers this point of view. These two versions are the so-called strong version and the weak version, which according to this author, once the first one is on attack; the only resource for the researcher seems to be to consider the weak version. Another obstacle for the advance of the studies on LR seems to be that the discussion finishes in an “all-or-none” approach. There is no middle ground; either everything is relative or it is not. Additionally, Lucy (1992a) indicates that one of the major obstacles for the study of LR lies in the conception among psychologists that cultural, social, and linguistic transmission is not important. The study of LR, Lucy (1992a) suggested, must include a wide range of knowledge of how language and

speakers conceptualize the world, considering the speaker as an individual part of a cultural system.

Gumperz & Levinson (1996) additionally consider that Whorf never intended the idea that language would limit thoughts. As they point out:

“...the phrase "linguistic determinism" should be understood to imply that there is *at least some* causal influence from language categories to non-verbal cognition; it was not intended to denote an exclusive causal vector in one direction ...” (1996, p.23)

Despite the LR hypothesis seeming “adventurous,” some researchers find results in their studies that apparently support it (Lee 1991; Lucy 1992a, 1992b; Steiner 1975, are some of the authors named by Gumperz & Levinson). The reality is that the LR has undergone a sudden, abrupt change in the last two decades as a result of new findings in those aspects considered by Lucy (1992): language and cognition (i.e. thought, in Lucy’s term by the time of his 1992 book).

### **2.2.2 The revival of the linguistic relativity hypothesis**

Gumperz & Levinson (1996) recognize that there has recently been a change of attitude toward the hypothesis. The new theories and conceptions in psychology, linguistics, and anthropology have made it possible to consider an intermediate position. Within linguistic and psycholinguistic universal aspects, the importance of socio-cultural context, meaning, and discourse has contributed to the acceptance of the linguistic relativity as a plausible hypothesis. Additionally, we believe that the evidence showing the role of input and context, frequency of use and associations in constructing language (see Emergentism models such as McWhinney 2005, Usage-based models such as Tomasello 2001, 2003; Kemmer & Barlow 2000; Bybee 2010; and Connectionist models such as Elman, Karmiloff-Smith, Bates, Johnson, Parisi, & Plunkett 1996) contribute to making the LR an interesting plausible cognitive and socio-cultural hypothesis.



Nowadays, the principle is known as the Linguistic Relativity Hypothesis and although it has many versions, Lucy (1997), one of the most influential researchers in the study of the hypothesis, explains that three elements are key to the original proposal: language, thought, and reality. Thoughts about reality are influenced by certain characteristics of languages. Thought can be considered any activity that involves perception, attention, and any system of categorization, memory, inference and judgment. Language would serve as a guide to cognitive activities facilitated by its work of interpreting messages (Lucy 1997, p. 294-295).

Two premises, therefore, must be considered. First, languages differ not only lexically and morpho-syntactically, but also semantically. If this premise is not accepted, there is no point in considering the LRH. The second premise is that of linguistic determinism. This implies that the language organization should “implicitly” or “explicitly” influences aspects such as non-linguistic categorization, memory, perception, and thinking (Gumperz & Levinson 1996). Swoyer (2011) additionally adds: attention, inference, social cognition, and decision-making.

The LR hypothesis proposes that “aspects of individual thinking” (this implies that not all our reasoning process and perception have to be modified) could differ between communities, if their languages differs in terms of these aspects. This assumption is crucial for understanding the hypothesis, and to obviate the trivial discussion of whether there is a strong or a weak version of linguistic relativity (Gumperz & Levinson 1996, Lucy 1992). As Gumperz & Levinson point out, what is important is to determine the level of language differences and the interconnection between semantic categories and cognitive categories.

This conception of the hypothesis, therefore, is not contradictory with other ways of conceiving language and cognition. It is not contradictory with universalist and continuity hypothesis. For example, this is Carey’s conclusion

after analysing aspects of noun semantics in children. The continuity<sup>2</sup> thesis is valid for some grammaticized notions and LR is valid for others (2001, p. 187). Following Gumperz & Levinson's lines of explanation of the LR hypothesis, we can consider a relativity syllogism that implies that:

(1) "Different languages utilize different semantic representation systems Which are informationally non-equivalent (at least in the sense that they employ different lexical concepts)"

(2) "Semantic representations determine aspects of conceptual representations"; *therefore*

(3) "Users of different languages utilize different conceptual representations" (1996, p. 25)

In the same way, there is an anti-Whorfian syllogism with followers (Jackendoff 1992, Papafragou, Massey, & Gleitman, 2006, Pinker 1994, among others) that consider that speakers of different languages share the same semantic and conceptual systems.

By the time Lucy (1992b, 1996, 1997) reviews the studies in linguistic relativity, the author points out the necessity to develop more appropriate empirical studies that could test real predictions of the hypothesis. He criticizes some of the methodologies applied in studies, such as the lack of contrastive studies in which two languages were cross-linguistically analysed in major linguistic differences. Many of the studies, he argues, are based on the analysis of speakers of one language. Additionally, and most importantly, these studies rarely investigate non-linguistic cognitive processes. Lucy tries to follow these research parameters and produces some seminal investigations to the studies of linguistic relativity. In the following lines, we summarize some of his studies.

Lucy (1992a) carries out one of the classical empirical studies that marked a new period for linguistic relativity research by analysing differences in grammatical structures between speakers of different languages and comparing

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<sup>2</sup> The continuity hypothesis is "the thesis that cognitive architecture does not change throughout development, that the infant's prelinguistic representations of the world are couched in the same vocabulary as later linguistic representations" (Carey 2001, p. 186)

their cognitions. Specifically, he studies the difference between speakers of American English and speakers of Yucatec Maya in marking number in their grammars and how this difference affected non-linguistic classification and memory tasks.

These two languages differ in how they mark plurality on the noun. English speakers mark plural for animate entities and objects (e.g. the dog – the dogs) but not for mass nouns such as substances and materials (e.g. sugar - \*the sugars) which need a unitizer in order to be quantified (e.g. two cups of sugar). Lucy (1992a) shows that Yucatec speakers mark plural for animate entities in some occasions but rarely mark it for any other type of noun. Thus, inanimate entities are quantified in Yucatec like mass nouns in English, that is, through a form called *numeral classifier* (e.g. *un-tz.ít kib* , one **long thin** wax, meaning ‘one candle’<sup>3</sup>). This means that inanimate entities in Yucatec are semantically unspecified in relation to individuation, like mass nouns in English. Lucy designs an experiment in which participants saw pictures of everyday village life in which different numbers of referents in different shapes were present, and participants had to perform a memory task and a categorization task. Lucy’s prediction is that, given the fact that English is a language in which plural is obligatory on individuated nouns, their speakers should pay more attention to the shape of objects because this constitutes the most salient perceptual characteristic of an individual entity. Yucatec speakers, on the other hand, should pay more attention to the material property of the referents because most of their nouns are individually unspecified.

The categorization task is of note because most subsequent studies analysing categorization would follow this pattern of design. The task required from participants to judge the similarity between objects arranged in triads. One first object had a particular shape and made from a certain material; then a second object with the same shape of the first one, but made from a different material was presented. The third object was made from the same material as the first object, but its shape was different. The speaker had to respond which of the alternate objects was more similar to the standard one. Lucy’s result confirms his predictions. English speakers pay more attention to shape of the objects,

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<sup>3</sup> Examples taken from Lucy (1997, p. 298).

while Yucatec speakers pay more attention to the material of the object. With this experiment, the author demonstrates that language can affect cognition. Later, Lucy's results were replicated by: i) Imai & Mazuka (2003) in a study of monolingual speakers of Japanese, a language that employs numeral classifiers like Yucatec, and English monolingual speakers; and ii) Athanasopoulos & Kasai (2008), who also compares monolingual speakers of English and Japanese and Japanese-English bilinguals<sup>4</sup>.

Along the same lines, Lucy & Gaskins 2001 carry out a second study comparing Yucatec and English-speaking children finding results that explain the development of the relation between language and cognition. This study is further described below in the section dedicated to developmental studies in LR. However, we want to stress the importance of Lucy's research for future studies on LR.

Lucy (1996) discusses the urgency to an account for the linguistic relativity hypothesis and describes how the research should be pointed to this aspect. This account should determine the "properties" in language that allow the "diversity" in any cultural community. "These properties and their consequences will form the cornerstone of any theory about the processes (or mechanisms) underlying the language-thought linkage and indicate exactly where diversity should have effects" (1996, p. 37). Also, an account of linguistic relativity should revise whether cultural patterns of use facilitate the influence of language on cognition. Finally, he argues for an account that could explain the mechanism underlying these relations (1996, pp.37-38).

We conclude in the present dissertation, after reading the available literature and analysing the results and conclusions from our research, that the prospect of a widely accepted, unifying linguistic relativity account is still far from being attained. Although much progress has been made in the last decades, and the findings in some studies seem to be recurrent in pointing towards some directions, the variety of approaches still does not bring a clear view about what the precise linguistic properties are that allow diversity in languages (e.g. there seems to be a great deal of them) and secondly, the research on the

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<sup>4</sup> The aspects related to the study of bilingual speakers are discussed in section 2.2 of the present chapter.

relationship between language and cognition seems to continuously generate new approaches. As we detail in the following section, the linguistic relativity hypothesis seems to be dividing into even more versions.

### ***2.2.3. New approaches to the linguistic relativity hypothesis***

The earliest research on the LR hypothesis was characterized by cross-linguistic studies that focused on linguistic differences between languages, but did not look into the study of non-linguistic cognitive processes. New methodologies and technological advances have resulted in a new wave of studies on linguistic relativity that have been able to test non-linguistic cognition. As a consequence, the hypothesis has evolved and diversified into more sophisticated and detailed proposals. This specialization has enriched our knowledge of language and our understanding of the complex relationship between language and other cognitive functions. At the same time, this development has brought new questions, which means that the topic of LR is far from closed.

Recent research has focused on the study of concrete domains such as colour, object categorization, numbers, and on abstract domains such as space, time and motion (e.g. Athanasopoulos 2009, in press; Boroditsky 2001; Boroditsky, Ham, Ramscar, 2002; Bylund, 2008, 2009; ; Bylund & Jarvis 2011; Carrol & von Stutterheim 2003; Choi & Bowerman 2001; Gennari et al 2002; Hickmann & Hendriks 2010; Papafragou, Hulbert, & Trueswell 2008; Papafragou & Selimis 2010; Schmiedtova, Carrol, & Stutterheim 2007; Schmiedtova & Flecken 2008; Slobin 1996, Slobin 2006; Sebastián & Slobin 1994; Slobin & Hoiting 1994; among many others). Some of these studies analyse non-linguistic cognition while others restrict their studies to the domain of language. Additionally, some of them find support the hypothesis, others do not.

Despite the positive results, the LRH is not without its critics and the discussion of whether language can affect thought or conceptual structures is still going on. Some researchers have denied the idea that language can affect thought, while others have proposed different views closer to the original LRH. For example, Gleitman (1990), Jackendoff (1986, 1990), Papafragou, Massey & Gleitman

(2002), and Pinker (1994), argue that languages would map differently universal conceptual structures. Concepts are the same across languages, and speakers have the same types of perceptions about the world but these perceptions can be expressed differently across languages. Some research supporting this view comes, for example, from studies in the area of object categorization such as Papafragou, Massey and Gleitman (2002), Papafragou & Selimis (2010) and Malt, Sloman, Gennari, Shi, & Wang (1999), and also from the area of motion events. Other points of views accept that language can have an effect on thought but only under certain circumstances. Gennari, Sloman, Malt, and Fitch (2002) deny that there is an effect of language on thought as it has been expressed in the LRH. However some effects can be observed, but only: i) in some cognitive tasks that involve reasoning and categorization; ii) under certain conditions; iii) and more importantly, this effect would be transitory. In this case, language is used as a strategy to resolve a task otherwise difficult to solve. Gennari et al. (2002) find support for this hypothesis in a study on motion events in Spanish and English speakers (see detailed description of this study in Chapter 4, section 3.3). Only participants that have verbally described videos previously to the execution of a categorization task show a language effect on thought. In cases like this, these authors explain that language could intervene in the process of performing this type of task. Due to their language constraints, in the descriptive task, participants pay more attention to some elements of motion events than others, and this directly affects their decisions in the second task, the similarity judgment task. This effect, then, would be temporary and only influenced by the previous naming task. Other studies supporting this proposal are Papafragou, Hulbert and Trueswell (2008), and Papafragou & Selimis (2010) (see detail of these studies in Chapter 4).

A different but related hypothesis to the LRH is the *thinking-for-speaking* hypothesis proposed by Slobin (1987, 1996, 2003, 2005, 2006). This hypothesis, not a version of the LRH, suggests that when speakers are expressing their thoughts they think in a special form determined by the characteristics (lexical and grammatical) of their languages. Each language has its own set of grammatical options for encoding any message and speakers are “forced” to express their messages according to this set of options. “*Thinking for speaking* involves picking those characteristics that (a) fit some

conceptualization of the event, and (b) are readily encodable in the language” (Slobin 1987, p. 435); it is “a special thought that is mobilized for communication” (Slobin 1996, p. 76). Slobin and colleagues have a great deal of studies that supported this hypothesis in speakers of different languages (Spanish, English, Turkish, Russian, among others) and from different ages (from early childhood to adulthood). They analyse narratives elicited by speakers, translations and rhetorical styles in novels. Slobin and colleagues have dedicated a great deal of research to the study of language acquisition and they suggest that their results support the traditional linguistic relativity principle, but their studies are based on pure linguistic analysis. Several of these studies are described in chapter 4.

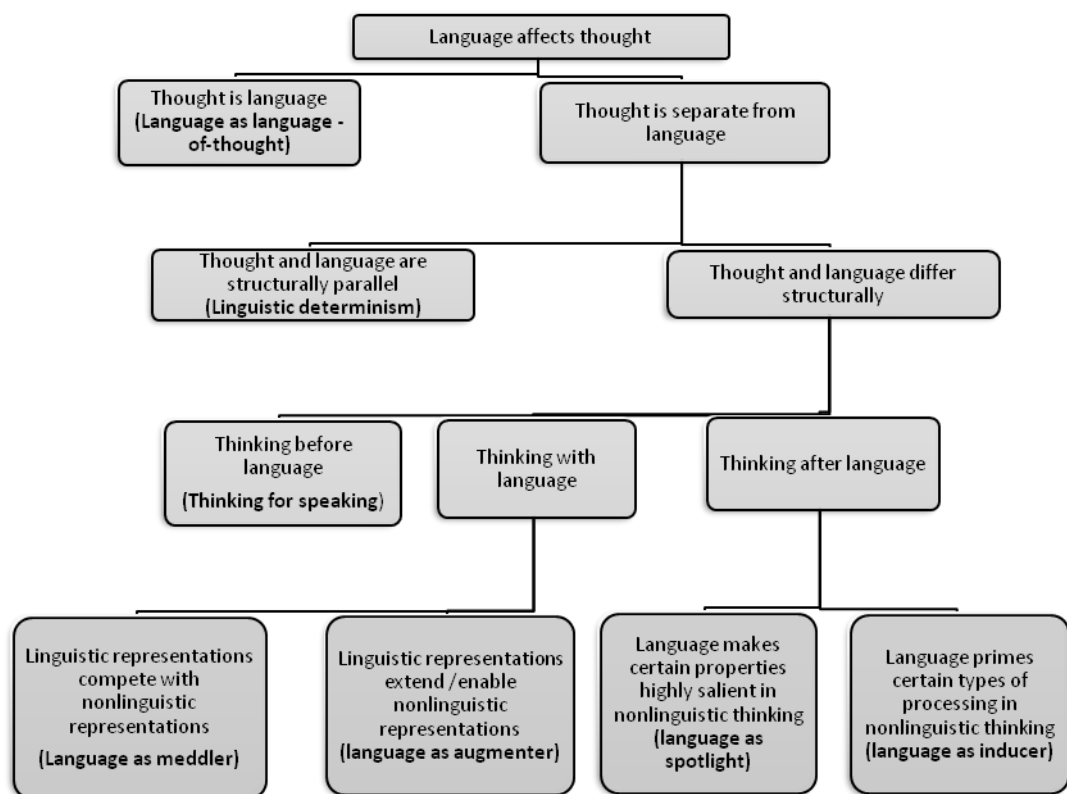
Wolff & Holmes (2010), in a recent comprehensive study, explain that findings from studies on LRH and related hypotheses suggest that the connection between language and non-linguistic cognition is far more complex than previously thought. To explain everything in terms of strong vs. weak hypothesis is pointless, and obviates important processes that could help us to understand the way cognition and language systems work. The array of studies suggests several possible hypotheses.

Wolff & Holmes (2010) describe the different hypothesis and sub-hypothesis through a diagram that we reproduce in figure 2.1. In it, based on previous studies they identify five main hypotheses that explain how language affects non-linguistic cognition. The authors start by pointed out that the empirical evidence and theories reject the hypotheses of language as *language-of-thought* and *linguistic determinism*.

The proposal that language is equivalent to thought is not sustained nowadays. However, philologists like Max Müller in the nineteenth century, and behaviourists like Watson, explain Wolff & Holmes, assumed it was. Thanks to our knowledge of language, we are now aware that this assumption is not possible. Repeating Pinker’s (1994) argument, if we would think in words we would not be able to encode new words because there would not be room for imagining new meanings. Linguistic determinism assumes that language

determines or causes different thinking (Wolff & Holmes 2010). This hypothesis has been widely unaccepted (see Lucy's explanations above).

Wolff & Holmes (2010) consider that three of the five main proposals compete and have supporters: *thinking-for-speaking*, *thinking with language*, and *thinking after language* (see Figure 2.1.) In each of these three main proposals, language can have an effect on thought, but thought differs structurally from language. This effect on thought could be before language is processed, when language and thinking are being processed simultaneously, after language is processed, and finally, after language is processed but when it is no longer in use.



**Figure 2.1:** Hypothesis of how language can influence thought<sup>5</sup>

*Thinking before language* refers to thinking before producing language. The best example under this category is *thinking-for-speaking*, formulated by Slobin (1996, 2003, 2005, 2006) and explained above.

<sup>5</sup> This figure is taken from Wolff and Holmes (2010).



The hypothesis of *Thinking with language*: non-linguistic processes and language processes would be triggered simultaneously. Under this category the authors refer to two different classes. In one, language acts as a *meddler*, meaning that language representations and non-linguistic representations take part together in decision making and this decision will be facilitated when the linguistic codes and the non-linguistic codes involved are alike. However, the decision can be made either based on the non-linguistic code or on the linguistic code. Findings in Papafragou, Hulbert & Trueswell 2008 would support this view. Papafragou et al. (2008, described in Chapter 4) study eye-movements in English and Greek speakers when observing animations of motion events. Speakers' attention during the animation does not differ between language groups, but differences are observed at the end of the animation when the scene froze. According to the authors, this result is explained by a spontaneous use of language during the task.

The second type of effect is the *language as augments*. Language codes become crucial along with non-linguistic representations to make possible for speakers to solve a particular task. In this case, both language and cognitive activities happen together and only in this way the task would be completed. This is, for example, the approach of Gennari, Sloman, Malt, & Fitch (2002) after studying motion events in Spanish and English monolingual speakers. They find that only when speakers perform a verbal description task on motion event scenes, speakers responded to non-linguistic categorization task following the pattern of their languages. That is to say, English speakers pay more attention to manner than Spanish speakers when asked to select scenes in terms of their similarity. This cross-linguistic difference in the non-linguistic categorization task is not observed when participants do not perform the verbal description task first. Gennari et al. conclude that language is used as a tool for solving difficult tasks. This would correspond to the *language as augments* in Wolff & Holmes's (2010) terminology.

This thesis seems to be supported by several studies. Papafragou & Selimis (2010) also suggest a similar hypothesis for explaining their results on two experiments in the domain of motion events in English and Greek speakers: a categorization task and a recognition task. Finkbeiner, Nicol, Greth, &

Nakamura (2002) for example, conclude that language is used in non-linguistic cognitive tasks where working memory is required, like in categorization tasks. They base this assumption on studies which show that people improve their memory processes when using language (Bower, Karlin, & Dueck, 1975, Zelinsky & Murphy, 2000). Finkbeiner et al (2002), and Papafragou and Selimis (2010) are described in detail in chapter 4. Finally, in the domains of numbers, and false belief, the use of language seems to facilitate the process of thinking (Wolff & Holmes 2010).

*Thinking after Language.* The frequent use of a particular linguistic feature may guide attention towards particular properties of the world, even in non-linguistic contexts. One class of *thinking after language* is what Wolff & Holmes (2010) has called the *language as spotlight*: language makes some aspects of the world to look more prominent in non-linguistic thinking. This is, in our view, the hypothesis most connected to the original Whorf's hypothesis. This hypothesis seems to be supported by results from several studies on motion events, the domain under investigation in the present dissertation (Fausey & Boroditsky, 2011; Hohenstein, 2005; Kersten, Meissner, Lechuga, Schwarts, Albrechtsen, & Iglesias, 2010; Pourcel, 2009, among others). Furthermore, it is supported by results on grammatical gender (Boroditsky, Schmidt & Phillips, 2003) and on object categorization (Athanasopoulos 2007; Athanasopoulos & Kasai, 2008; Lucy 1992a, among others).

The hypothesis of *language as inducer*, language leads some type of processing that remains even after language is no longer in use. This would imply language would influence thought in a more general way. Wolff & Holmes (2010) find this effect in a study in which realistic static images appear challenging the effect of gravity (e.g. in a picture, a pedestal that sustains a flower vase is not present, thus the object appears floating) and verbal descriptions of the static images. The authors conclude that their study suggests that language can *induce* speakers to conceptualize experience in a schematic fashion.

The possible mechanism in which language influences non-language cognition is far from clear. There seems to be a number of different explanations.

## 2.3 Linguistic relativity and bilingualism

This section aims to examine the relationship between cognition and bilingualism. Specifically, we describe the research that has examined the LR hypothesis in bilingual speakers, the main research questions in the area, and the findings on how learning or speaking a new language affects cognition and whether it differs from monolingual speakers.

Following the extensive collection of articles in Cook & Bassetti (2011) on language and cognition in the bilingual speaker, we consider necessary to define what a bilingual is, given the number of definitions that are proposed in the literature. According to Bassetti & Cook (2011) there are two principal, extreme definitions of bilingualism. On the one hand, the term refers to speakers that master two languages equally well, that is to say, they are highly fluent in the languages they speak. On the other hand, there is the assumption that speakers with any level of proficiency of two languages are already bilinguals. We assume this last definition due to the large evidence showing that speaking a second language, even at low levels of proficiency, already changes speakers' way of thinking. Additionally, speakers of two languages do not seem to have the same knowledge their languages as a monolingual native speaker of any of the two languages (Cook 2003); and as Grosjean (1998) points out, the bilingual is not two monolinguals (Bassetti & Cook, 2011 p.144). Although these are two extreme definitions, most of the research on bilingualism seems to accept the second assumption: a bilingual is a speaker with the knowledge of a native language (L1) and at least some knowledge of a second language (L2). This definition of the bilingual speaker is the one that is assumed in the present dissertation. We will refer to a bilingual any speaker that could be considered: balanced bilingual, bilingual with low/intermediate/high level of proficiency, instructed bilinguals, early bilingual, late bilingual, etc.).

In relation to the investigation of linguistic relativity and bilingualism, some research questions seem to be constant in the studies. First, does the learning or speaking of a second language restructure thoughts in bilinguals? Secondly, if thoughts are restructured, is the outcome similar to either of the languages

spoken by the bilingual, or is it different from both languages? Is there variation on the outcome depending on the type of linguistic system under consideration or on extra-linguistic variables associated to the relation between the bilingual and the languages they speak (i.e. frequency of use, language proficiency, age of acquisition, etc.). How much L2 exposure is necessary in order to observe conceptual change?

In their review of studies on bilingualism and cognition, Bassetti & Cook (2011) explain that it is not until six decades after Whorf, that researchers started to seriously study bilingual cognition. The authors explain that different factors changed the situation, and an important one is connected to evidence that being bilingual is an advantage rather than a disadvantage. However, some studies in the in the 60s, 70s, and 80s already conclude that cognition in bilinguals is different from monolinguals (e.g. Ervin 1961). Bilingualism studies and linguistic relativity start to reach importance in the 90s, with significant works from Hunt and Agnoli (1991), Cook (1992, 2002, 2003), Green (1998), and Pavlenko (1999).

Cook (1992, 2002, 2003) offers an important contribution to the studies on bilingualism by defining the bilingual speaker as an independent speaker whose knowledge of L1 and L2 is not like that of a native speaker of either of those languages, and whose mind is different also from a monolingual speaker. The bilingual should not be considered an imperfect version of a native monolingual speaker, as it is considered in many previous studies.

For example, Hunt & Agnoli (1991), who provide theoretical discussion and experimental evidence for the so-called weak version of the Whorfian hypothesis, address the question of whether bilinguals with different lexicons structure the same experience in different ways. They suggest that it was possible that bilinguals would have unique representations of the world as a result of using different language structures. Also, they support the hypothesis that bilinguals can transfer concepts from L1 to L2 and from L2 to L1, and that their mental representations depend on the language in which they are tested in study conditions.

Green (1998) offers one of the first comprehensive discussions on the relationship between language and thought in bilingual speakers. The aim of this work is to propose a theoretical account in accordance with actual models of language production and comprehension that could explain language effect on thought. Green assumes the hypothesis that bilingual speakers should have two different worlds, depending on the languages they speak.

Green develops this idea further and tries to explain how language can affect thought by reinterpreting Levelt's (1989) model of language production. His analysis, starting from the assumptions of how the verbal message is built based on lexical concepts and how these lexical concepts are accessed, drive him to the conclusion that conceptualization (the process that selects information from the world to later verbalize a message in Levelt's model) must be lexically-specific. This has implications for bilingual speakers, who should have different lexical concepts for each language. Green suggests that if conceptualization is language-specific, bilinguals must conceptually represent the intention to speak when they decide to speak in one language and not in the other one. However, processes of competition are also expected because it is assumed that the mental lexica are interconnected. This idea is similar in some ways to Slobin's *thinking-for-speaking* hypothesis. Interestingly, Green also considers that bilingual speakers' behaviour would also depend on the characteristics of the bilingual speakers: those who have different language skills in different domains use their languages in different occasions and with different purposes. Additionally, thinking is "not of the same nature". Cognitive subsystems are not equally autonomous to language processing. The author gives the example of numerical cognition and social cognition. The former is quite independent from language processing, but the latter is not.

Green focuses on issues related to general and language-specific cognitive effects in bilinguals. He provides evidence that being bilingual does not increase general cognitive processes such as metalinguistic awareness and selective attention, and did not facilitate different types of reasoning. Since Green's publication of this article in 1998, there has been a wealth of empirical findings that in fact show just such effects of bilingualism on general cognitive processes such as selective attention (i.e. Bialystok, 2009).

In relation to language-specific effects on cognition, Green starts by analysing Hunt & Agnoli ideas, and suggests that one of their plausible hypotheses is that speakers will be more efficient in thinking about topics that are encoded in the language than in those that are not. Thus, he provides evidence of this effect in the studies of colour perception between languages that differ in their basic colour terms.

Green suggests that in order to really understand language-specific effects on cognition, attention must be studied. The general claim is that language directs attention. Therefore, it is necessary to study this relation. In conclusion the author addresses the importance of socio-cultural knowledge for bilinguals. Selecting language when speaking will depend not only on bilinguals' vocabulary knowledge but also on what they know is "mutually mentally represented".

Finally, it is concluded that bilingual speakers are not identical to monolinguals, and that their ways of thinking must differ in each language. There are many remaining questions that need to be addressed. For example, is the effect of language post-perceptual? In relation to this point, Green describes studies by Levinson (1996) about spatial descriptions and by Slobin (1996) about encoding events.

Pavlenko (1999) constitutes another seminal study about bilingualism and cognition. The article tackles the main problems affecting theoretical models and methodologies in the study of the bilingual lexicon. Pavlenko considers that part of the problem of the models is the lack of knowledge about the interaction between conceptual systems and language in the mind. Due, in part, to the fact that the bilingual is not considered a person, with a history, but a "depository" or "processing container", the research's interest is put on language processing, but not on language, culture and thought. Additionally, in relation to the language process itself, levels of semantic and conceptual representation should be considered different.

Another problem Pavlenko raises is that many studies on bilingual lexicon are carried out with decontextualized words; therefore, the richness of words in

context is lost. This, we believe, is not exclusive to studies on bilingualism. There are some researchers in the study of linguistic relativity which suggest that there would be more progress on LR hypothesis only when language and cognition are studied in real-life contexts. The usual experimental designs are not the best conditions for observing the relationship between language and cognition (see Pourcel, 2009).

Concepts are not isolated items, and they can only be understood in relation to other concepts. They should be studied under a dynamic perspective. From a methodological point of view, this new conception demands from the researcher to attend aspects such as context of acquisition, degree of biculturalism and patterns of language use.

Pavlenko (1999) points out those models of bilingual memory can be helped enormously if lexicalized and grammaticized concepts are considered both language and culture-specific. According to her, one possible way to study conceptual representations in bilinguals is by combining the notion of concept comparability (comparable vs. language specific concepts) and concept encoding (lexicalized vs. grammaticized concepts). She provides a long list of studies that apply this methodology successfully.

The author also discusses the ways in which concepts might interact with each other in bilinguals. In this process, bilinguals could experience conceptual transfer (i.e. conceptual representation from L2 that affects L1); conceptual change (i.e. effect of L1 on L2), convergence (i.e. structural similarities in two languages product of mutual or unidirectional influence), cognitive restructuring (i.e. self-reorganization of linguistic categories that happens when a second language is learnt) and attrition (i.e. partial or total loss of a first, second or third language by a speaker). Additionally, she explains that some possible constraints on bilinguals' conceptual representation are the bilinguals' language learning history, language dominance and/or proficiency, degree of biculturalism and/or acculturation, context of language interaction, and type of encoding and concept comparability (see also Athanasopoulos & Avelo, 2012 for a discussion on linguistic relativity and bilingualism).

The evidence shows that bilingualism has consequences for cognition. Bilinguals restructure their concepts and non-linguistic cognition as a consequence of using two languages. The following lines describe evidence that support this conclusion.

Bilinguals seem to follow two types of cognitive patterns:

1. Bilinguals could show cognitive patterns from their L1 or the L2.
2. Cognitive patterns in bilinguals are unique, in-between monolingual speakers of either language.

According to Athanasopoulos & Avedo (2012), the last pattern seems to be the most frequent one. Some studies in colour perception support the hypothesis that bilingual speakers changed their native colour categories influenced by the categories of their second language (Andrews 1994). Wolff and Ventura (2009) also find that their bilingual speakers perform like monolingual speakers from their L2 in a study on the domain of causality. However, Athanasopoulos (2009) and Athanasopoulos, Damjanovic, Krajcivova & Sasaki (2011), in the same colour perception domain, find that bilingual speakers behave in between their two languages. They also find that the time living in a L2-speaking country and the frequency of language use are also predictors for the shift in the perception of colour.

Cook et al. (2006), for example, report similar results to those from Athanasopoulos and colleagues in a study in the domain of grammatical number marking and object classification (i.e. shape or material). Their bilingual participants behave in between monolinguals (monolinguals' results are reported by a previous study by Imai & Gentner, 1997). Additionally, they find the time living in the L2-speaking country as a predictor of cognitive changes.

In a study in the domain of aspect with early bilingual speakers, Flecken (2011) also finds cognitive patterns in attention to agent vs. action in event in bilinguals that are different from monolingual speakers of their L1 and L2 languages. Additionally, the cognitive changes depend on the frequency of use of linguistic structures.



Other variables that seem to affect non-linguistic cognition processes in bilinguals are age of acquisition, and proficiency level in L2. Jarvis and Pavlenko (2008), Athanasopoulos & Kasai (2008), Bylund & Jarvis (2011), and Kersten et al. (2010) are some examples of research that proves these hypotheses.

In conclusion, the studies on bilingualism and linguistic relativity show evidence that learning a new language restructures our mental representations of reality and the world. Bilinguals seem to have a unique perspective of the world that is different from monolingual speakers, although some studies show that bilinguals can perform similarly to L1- or to L2-speakers on linguistic conceptualization and non-linguistic cognitive processes. Both hypotheses are probably true, but more research is needed in different domains to reach more conclusive results.

We have described an overview of the main theoretical accounts and hypothesis studied in relation to the bilingual speaker and the effects on his/her languages on cognition. We have not detailed the vast amount of studies available in different domains. However, Chapter 4 describes the studies in the domain of motion event and linguistic relativity, our interest for this project. One of its sections is dedicated to the studies related to the bilingual speakers.

#### *What mechanisms allow language to affect cognition?*

There are still no clear answers to the question of the specific mechanisms that allow language to affect cognition. It seems that explanations depend greatly on the certain theoretical assumptions that still do not have enough support. Thus, for example, authors such as Gennari et al. (2002), Papafragou and colleagues (2008, 2010) suggest that language is used in categorization and memory tasks as a tool to solve these specific tasks that are difficult to solve. In Wolff & Holmes (2010) language would act as a *meddler* or as an *augmenter*. Filipovic (2011) explains the connection between language and working memory in more detail. The author does not rule out the possibility that speakers may be doing their *thinking-for-speaking* process on non-explicit linguistic tasks such as recognition memory. They based this assumption in studies such as Schrauf,

Pavlenko, & Dewaele (2003) that show that the role of language is much more active in on-line processing of memory than previously thought (Filipovic, 2011, p 15).

We do not believe that this approach contradicts the assumption that language affects cognition, by associative learning, as Casasanto (2008) suggests. Athanasopoulos et al. (2010) in a ERP study on the domain of colour perception in bilinguals further described Casasanto's hypothesis by explaining that when speakers learn their language, connections between words and referents from the real world are strengthening, and when a speaker is involved in learning a second language, such connections or associations are readjusted by the effect of acquiring new linguistic and cultural knowledge. This is a connectionist approach that assumes that cognition in general is formed by neuronal networks which are formed by contact with the input and, in which, mechanisms such as frequency and analogy forms strengthen such networks (Elman, Bates, Johnson, Karmiloff-Smith, Parisi, and Plunkett 1996).

This hypothesis would suggest that language acts as a spotlight, in terms of Wolff & Holmes (2010). Under Casasanto's assumption, we may also expect the possibility that some cognitive processes could influence others; this is not necessarily an exclusive effect of language, although language is a powerful reasoning result. Examples of the effect of language on other cognitive functions beyond categorization and memory are given, for example, by Bialystok (2011) who shows evidence that being bilingual affects the executive control system. Nisbett, Peng, Choi, & Norenzayan's (2008) study evidences that as a result of cultural differences East Asians and Westerners have developed different systems of thought (holistic vs. analytic) respectively.

We think that both types of hypotheses could be valid and are not mutually exclusive. However, more research is needed. An interesting idea would be to test participants with left hemisphere dominance vs. right hemisphere dominance in order to observe whether language is used identically in tasks such as categorization and recognition memory. It could be possible that some speakers are more prone to use left hemisphere functions (e.g. language) while others are not.

## 2.4. Linguistic relativity and language development

There is very little research analysing the linguistic relativity hypothesis and language development. However, concern about cognitive development and linguistic development has led some authors to revise the hypothesis. First language acquisition has confronted the relationship between language and cognition despite not directly addressing the LRH. Since Piaget (1926), issues such as when language concepts are acquired and what is first, cognition or language has been central. According to Piaget, cognition develops independently of language. Actually, children must achieve certain stages (e.g. pre-operational stage) in order to be able to acquire language. Around the 70's there was a special interest in establishing correlation between Piaget's stages and operations and language acquisition (Bowerman & Levinson, 2001). See for example the ample work done by Sinclair (1978) with healthy children, children and adolescent with severe cognitive impairment, and adults with senile dementia in which she studied whether cognitive transformations lead to language transformations. The issue of whether general cognitive development was involved in language acquisition keeps the attention of some researcher since some linguistics and psycholinguistics observe disassociation between language and general cognition (for example, individuals with severe cognitive impairment, but language capacity intact). Furthermore, after the proposal of the theory of modularity from Fodor (1983) (i.e. mind was designed with different devices, each specialised in different processing and innate) and Chomsky's innate generative grammar, some linguists in the 70's and 80' centre their studies in discovering which aspects of language are modular and encapsulated , consequently, isolated from general cognition (see also Piattelli-Palmarini, 1980). Classical researchers working in this area in language acquisition are among other, Cromer (1983, 1994, ), who examines up to what extent general cognitive interfere in language acquisition; the very extended works from Alison Gopnik , Sonjia Choi, Annette Karmiloff-Smith, Lila Gleitman (see Gleitman, Gleitman, & Shirley 1972; Gopnik, Choi & Baumberger, 1996; Karmiloff-Smith, A. 1988).

As Bowerman & Levinson explain, soon theories of modularity and generative grammar contribute to the focalization of language studies in internal linguistic processes. Thus, investigations on cognitive development take two ways: one addressing non-linguistic cognitive development, and a second way focusing in sole linguistic development (2001, p. 6).

Today the evidence, of course, shows that children understand their physical and social world before understanding and producing language. However there is also evidence that the interaction between language and cognition during child development is closer than previously thought. For example, see the quotes from Tomasello (1999).

“Recent research suggest that this hypothesis [the linguistic relativity hypothesis] is almost certainly true in one form or another, be it the “strong” form in which particular languages influence non-linguistic cognition in particular ways (e.g. Lucy 1992a; Levinson 1983) or the “weak” form in which learning and using a particular language draw attention to certain aspects of situations as opposed to others- so-called thinking for speaking (Slobin 1991). However, there is an even more fundamental question, and that is the role of linguistic communication – using any natural language versus not using one at all – in cognitive development in general.” (Tomasello 1999, p. 164)

He later added the following quote that exposes the importance of language, which helps to structure cognition in general and in children:

“...children engage in certain very special processes of categorization and conceptual perspective-taking. Language does not create these fundamental cognitive abilities, of course, as many animal species create different conceptual categories for various instrumental purposes, and children can take the perspective of others without language. But language adds another set of conceptual categories and perspective to the human repertoire/categories and perspective constructed for purposes of linguistic communication”. (Tomasello 1999, p. 16)

Furthermore, researchers such as Gopnik (2001) show evidence that language restructure cognition in a way that it is congruent with cognitive development science.

The main question concerning the LRH is whether linguistic categories in children will affect their way of thinking and when is this observable. Does the child need enough linguistic exposure in order to reach a threshold that would affect non-linguistic cognitive processes? Or does the effect of language on thought go along with the acquisition and development of linguistic structures?

In a summary of the studies in LRH and language development, three lines of approaches offer evidence. We describe first the *thinking-for-speaking* hypothesis, already explained above. This hypothesis has been largely tested cross-linguistically in children by Slobin and colleagues in a different number of languages. Regarding motion events, languages can be typologically divided in how they tend to encode path and manner of motions (this is largely explained in the following chapter). Verb-languages, such as Spanish, Turkish and Greek prefer to encode path (trajectory of an object) in the main verb, while Satellite-languages, such as English, highly encode manner of motion in the main verb. According to Slobin, this difference should make speakers of typologically different languages pay attention to manner or path for the process of preparing to speak. Slobin and colleagues observe that children from 5 years of age start to pay attention and describe motion event scenes according to the characteristics of their languages; however, the entire process of achieving adult-like structure is done in a piecemeal fashion during years.

Other studies suggest that language is a medium of thought. Gentner and Loewenstein (2002, 2005) also find that language seems to help children in analogical reasoning (i.e. when they have to establish certain relational similarities that are difficult for children).

Another evidence of this hypothesis would be the role of language in autobiographical memory. According to some studies, children can start remembering part of their life after 4;05 years because it is at that age that they can create representations of personal experience through language (Simcook

& Hyne, 2002). These studies would imply that language affects these cognitive processes because it is used in there. As Hoff (2009) suggests, this evidence supports Vygotsky's assumptions that "language is a tool that alters the inner world" (2008, p. 284), and that effect would be available from when the child starts using language.

In a study of motion events in English-speaking and Greek-speaking adults and children, Papafragou & Selimis (2010) find that 5 year-olds pay attention to aspects related to lexicalization patterns in some non-linguistic cognitive tasks, while adults do not. They suggest that the unexpected result is explained by the possibility that children could have used language for organizing and remembering the experimental scene, and responding to the tasks. This means that children are already using language as a strategy to solve difficult tasks from an early age.

The hypothesis that language characteristics could affect situations that do not overtly require language is also supported in some studies in children in different domains (Bowerman & Choi 2001, Choi & Bowerman 1991, Hohenstein 2005, Imai & Gentner 1997). However, a basic drawback in most of these studies is that they make conclusions about their ways of thinking through the analysis of children's language. This is the case in studies such as Imai and Gentner (1997), who investigate developmental differences in linguistically marking novel objects in the domain of object categorization. Bowerman & Choi (2001) and Choi & Bowerman (1991) study spatial relations in English-speaking children and Korean-speaking children (these studies are further described in chapter 3).

Lucy & Gaskins (2001) is probably the first study to directly address the linguistic relativity hypothesis in children. Following on from Lucy's study on Yucatec and English-speaking adults, the Yucatec-speaking and English-speaking children's ways of classifying shape over material are analysed. The authors find differences in children from both language groups by the age of 8, but do not in children under 7. The differences correspond to the speakers' linguistic patterns. This study seems to provide evidence that children take time to show language effects on cognition. However, Hohenstein explained that

Lucy & Gaskins' (2001) study fails to show how children develop their linguistic patterns in a way that would lead to cognitive differences. Nothing can be concluded about when cognition is affected by linguistic characteristics in children without this analysis.

Hohenstein (2005) studies motion event conceptualization and categorization in children speakers of English and Spanish (this study is described in detail in chapters 3 and 4). Results are partially similar to Lucy & Gaskins (2001) as the author finds correlations between lexical patterns and categorization in children older than 8 years of age. However, Hohenstein notices that the correlation is starting to show in only in the older age group of speakers. This means that children, even at around 7 to 8 years of age, are not necessarily performing cognitively and linguistically like adults. These aspects are further developed in the domain of motion events in the following chapters.

Finally, Gopnik (2001) suggests another related hypothesis called the "Theory theory". By making an analogy to the way in which scientists build their scientific formulation, Gopnik posits that children develop cognition by interacting with the world, learning new aspects of it and revising the new information. The relation between language and cognition is present from very early on and they are specific to the type of relation, conceptual development and semantic development rather than general relations (Gopnik 2001; Gopnik & Melzoff 1986).

In conclusion, further research is still needed in order to confirm the hypotheses that surround the LRH and child development. However, as Carey (2001) explains, if we accept conceptual changes in the child, we must accept the Whorf-hypothesis. What we need to further investigate is how deep in cognition the effect of language goes, or if it is only tied to certain cognitive processes.

## **2.5 Summary of the chapter**

This chapter presents a summary of the studies in linguistic relativity. It starts by presenting an overview of the origins of the Whorf's hypothesis and explaining the reasons that led the linguistic and psycholinguistic community to adverse

the hypothesis. Thanks to new methodologies and technologies in psychology and psycholinguistics, the LR hypothesis has revived.

The section 2.1.3 of the chapter shows how new evidence of LR emerges by studying non-linguistic cognition. As a consequence, new proposals have been posited and they are nicely schematized by Wolff & Holmes (2010). We explain each of one of these proposals. Finally, we provide with an overview of the studies on LR and bilingualism (section 2.2), and LR and development (2.3.). Finally, the most important questions that researchers investigate in relation with these domains are exposed.



## Chapter 3. Motion Events

### 3.1. Chapter overview

Motion events and generally spatial relations are a fundamental part of speakers' world experience across cultures such that these conceptual notions and how they are related and expressed in languages has captured much attention among linguists from different theoretical tendencies. Consequently, there are plenty of studies dedicated to spatial relations and motion events in languages since decades ago. Among the most important pioneering works in the area are Aske, (1989); Bloom (1996b); Choi & Bowerman (1991); Jackendoff (1992); Jackendoff & Landau (1991); Levin & Rappaport Hovav, 1991; Lyons (1977); McNeill (1997); Miller, (1972); Miller & Johnson-Laird (1976); Pinon (1993); Slobin (1997, 1998); Svorou (1994) and Talmy (1985, 1991, 2000).

Probably linguists would agree that Talmy's work is one of the most influential in these areas, especially in relation to motion events, the central topic of the present investigation. In his study, Talmy provides an in-depth analysis and discussion into the relationship between motion event notions and semantic, syntax and lexical components. One of Talmy's most influential findings is that a language has a distinguishing pattern of mapping motion event concepts into syntactic structures. His comparisons between the relations of concepts and linguistic structures in a diversity of languages, allow him to propose a very detailed typology that classifies languages according to how motion events are encoded.

His work is not exempt of criticism. In the following years of his proposal, other linguists (e.g. Slobin and colleagues, Bowerman, and Choi 1991 among others) have made changes and further developed his typology. Despite these changes, Talmy's typology in general remains intact, and it is currently used for different type of studies related to linguistics, psycholinguistics, discourse analysis, and even psychology. Today, thanks to new methodological advances and the continued research based on his proposal, we have a better

understanding of how languages express motion events. At the same time, this knowledge has allowed us to go further and trespass the boundaries of language and be able to connect language and other cognitive activities.

Roughly, by motion event Talmy (1985) means any “translatory” situation in which several elements can participate (motion, figure, path, ground, cause, manner, among the main elements). Motion refers to the movement itself; the figure is the entity that moves; path is the trajectory taken by the figure in relation to the ground; ground means the reference object; it refers to any location and stationary point; manner refers to the way the figure moves; and cause refers to an agent that makes the figure to move. The concept of motion event in the linguistic system includes static and dynamic events, as well as spontaneous or caused situations (Choi 2009; Talmy 1985). These concepts of motion, figure, path, manner, etc. are universals but inside the linguistic systems they are expressed in different ways depending on the language. Therefore, Talmy’s main contributions are to recognize how the different conceptual elements of motion events are combined and expressed in the languages. Additionally, he has discovered the restrictions and possibilities observed in languages; and finally, this author offers a very precise typology that divides languages according to their pattern of lexicalization of motion events. This typology is the one that has caught the attention in studies on the Whorf’s hypothesis. Specifically, those studies focused on the relation between elements such as path, manner and cause with thought, the main interest of the present dissertation.

The aim of this chapter is to describe Talmy’s typology (1985, 1991) and studies that contribute to the characterization of motion events in languages. Furthermore, the chapter reports research findings about how a motion component is acquired by first language and second language learners. The focus will be placed on Spanish and English, the languages analysed in the present study. Accordingly, this chapter is organized as follows: i. It presents Talmy’s typology in the area of dynamic motion events: spontaneous and caused, and also describes other authors’ studies that go in more detail into the typology; ii. It explains how motion events are expressed in Spanish and English; iii. It presents studies about the process of acquisition of motion event

expressions in children, monolingual speakers of English, and monolingual speakers of Spanish; v. Finally, it describes studies that explain how second language learners (mainly speakers of English and Spanish) acquire motion event expressions.

### **3.2. Motion Events**

Talmy's typology of motion events in language is part of a larger theory whose beginnings starts between 1972 and 1985, when this author was highly interested in *lexicalization patterns* (i.e. the recurrent/regular relation established between a meaning and a morpheme (Talmy 1985). His work has gone beyond this scope and today he proposes a theory that explains the conceptual structure in human cognition (Talmy 2000).

Talmy realizes that meanings are not always expressed in the same ways within language and across languages. Meaning can be isolated from lexical and syntactic elements (surface elements in Talmy's words, 1985) and there are several possible associations. That is, some semantic elements can be encoded in one type of surface element or more than one, and the opposite relation is possible as well: one semantic entity can be expressed by a single or by multiple surface elements. The representation of meaning on surface entities is called by the author "conflation", a term highly used today in studies of motion events and semantic-lexical relations. Therefore, one of the author's first aim is to establish common and uncommon patterns of combinations between meanings and "surface expression" (i.e. linguistics encodings, conflation), and to compare these patterns across languages in order to check their universality.

Although for the purpose of the present study, a full description of Talmy's entire theory about conceptual structure in human cognition is not needed, it seems important to explain some fundamental concepts from it to fully understand his typology on motion events.

Talmy classifies any *conceptualized event*<sup>6</sup> as part of a *macro-event*<sup>7</sup>. A *conceptualized event* is a type of entity related to human experience that could include some “portion” of time, space or any other “qualitative” domain. *Events* can be simplex, complex or coordinated. A *simplex* event would be an event that expresses the conceptual experience in a single clause, while a *complex event* would encode the experience in a complex sentence such as one formed by a main clause and a subordinated clause. Both types of clauses are considered simplex events. A *coordinated event* implied two equally important events related in a way. In some language they could be encoded by coordinate sentences (Talmy 1991, p 481).

A *macro-event* is formed by a *framing event* + a *supporting event* (or co-event). A *framing event* is a main *conceptualized event* that encircles a type of “*schematic-structure*” in a specific conceptual domain (it could be a temporal, a spatial, or an aspectual domain). The *framing event* also determines the argument structures of the *macro-event*. This relation is called by the author *domain-schematizing event* and according to him, there are 5 types of them: motion or location in space events; aspectual events; change or constancy events; correlation among action events; and, confirmation event in the domain of realization. Each *domain-schematizing event* is characterized by presenting certain structural features: i. a figural entity; ii. ground elements; iii. a relation between the figure with respect to the ground that could either be a stationary relation (i.e. the figure remains static in relation to the ground elements) or dynamic (i.e. the figure moves with respect to the ground elements), and this relation is called *activating process* (it is the motion itself); and iv. a functional relation that associates the figure with ground elements. It is this functional relation what Talmy considers the *schematic core* of a *framing event*, i.e. *the core schema* which is nothing less than the *path* (1991, pp 432-433).

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<sup>6</sup> Initially, some terms will be italicized just for the purpose of familiarizing the reader with Talmy’s terminology. Once they are defined they won’t subsequently appear highlighted.

<sup>7</sup> In 1985 Talmy proposed a first typology based on whether the verb conjointly expresses motion + another motion event element. He found three main groups: 1. Manner/cause type languages (manner and cause are expressed with motion in a single verb); 2. Path type languages (path and motion are expressed in a single verb); 3. Figure type languages (motion and the figure are expressed in a single verb). The bases for this typology would change in his 1991 work, where he proposed a more detailed and wide typology. I decided to start discussing Talmy’s work based on this 1991 study because it is the typology assumed in most studies. However, aspects from 1985 are considered.

Additionally to the *framing event*, a *macro-event* has a section called *supporting events* (or *co-events*). Such co-events work on supporting the macro-event in relation to the framing. There are several possible relations such as purpose, enablement, deixis but the most frequent are *cause* and *manner*. For the purpose of the present study, the crucial *supporting relations* are mainly *manner* and *cause*. Manner is considered a subordinate action or state manifested by the figure. In simpler ways, it refers to the way a figure moves or remains in a stationary position when the framing event happens (i.e. motion + core schema (i.e. path) is taking place). Cause is also considered a subordinate action and it refers to the framing event being caused by an agent. According to Talmy (1985, 1991), languages that encode manner of motion in verbs also encode cause in the same grammatical category, and frequently have a list of common verbs that conflate motion and either cause or manner like in English (see example 1).

(1) The girl kicked<sub>[CAUSE-MANNER verb]</sub> the ball out of the gym.

In example 1, an agentive clause, the agent that caused the motion is present (i.e. the girl); the verb “kicked” refers to the figure “ball” being moved but that movement was caused by an agent. Therefore, according to Talmy, kicked encodes *manner + cause*.

Direction or deixis is another supporting element frequently observed in motion event descriptions. It expresses whether the figure moves away or toward the speaker. The concept can be found in isolated words in relation to other elements in the sentence like in the adverbial phrase: *‘lejos de mí’*/far away from me; or it could be present in verb roots such as in the highly frequent verbs *go* and *come*. Some languages even incorporate deictic main verbs in their motion event clauses by using “come” or “go”. This is the case of Japanese and Korean. See (2) a Korean example taken from Slobin & Hoiting (1994, p 500).

(2) *Otoko wa ie ni hasitte haitte kita*

Man TOPIC house DAT running entering came

Following Talmy (1991), the structural features of a conceptual structure of a *macro-event* in the *domain-schematizing of motion event* are sketched as follows: first, there is an entity which can be an *object* or *animated figure*; then the ground elements which are the locations; thirdly, the activating process which refers to the motion itself executed by the entity; and finally, the relating function between the entity and the location propelled by the motion, which refers to the *path*.

The *path*<sup>8</sup>, sole or with ground elements, constitutes the *core schema* of the motion event. The *path* is the trajectory that the object or animated figure takes in relation to the ground elements. The ground elements can indicate the source, the via and/or the goal.

Consequently, what characterizes dynamic motion events in space is the “translator” action of a figure in relation to the ground elements following a path. Thus, in dynamic motion events the main four elements are the *figure*, *the ground*, *the motion itself*, and *the path*. Additionally, elements such as *manner*, *cause*, *deixis*, among others, act as *supporting relations*.

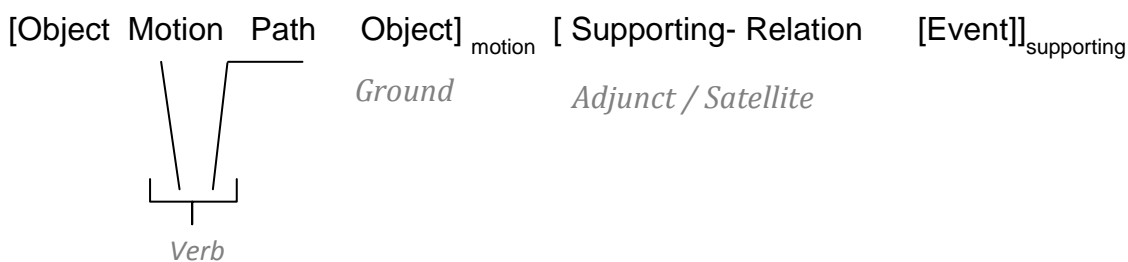
These concepts are encoded in language by different elements such as verbs, subjects, adjuncts, etc. Talmy (1972, 1985) realizes that languages vary in how they encode these conceptual elements; however, he finds that languages follow mainly two types of patterns: a typological universal dichotomy<sup>9</sup> that is guided by the surface element that conflates the path of motion. There are languages that conflate the *core schema* (i.e. path) in the verb category; while other languages conflate the *core schema* in satellite elements such as adjuncts (i.e. prepositions), gerunds, subordinate clauses, which function in the macro-

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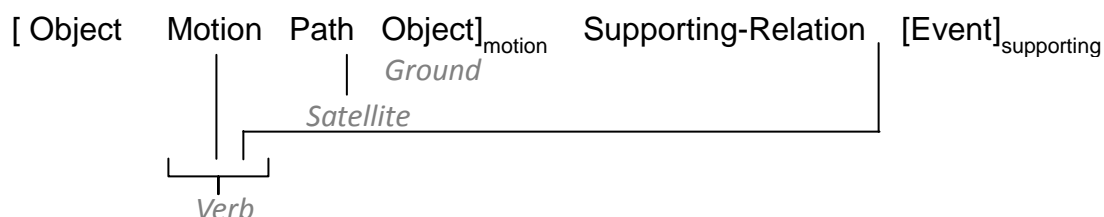
<sup>8</sup> In the motion event literature it is not uncommon to find the terms “directional path” and “directional element” as synonyms of “path verbs” and “path elements”. In the present study Talmy’s terminology is assumed, therefore, direction is synonym of *deixis* while path and trajectory could be considered synonyms. In this research the term used is path verbs. But, for example, Slobin refers to path verbs as directional verbs because he considers path a more complex situation that not only refers to the trajectory followed by a figure, but the whole process that involves the figure and its relation with the ground elements (Slobin & Hoiting 1996a, 1996b).

<sup>9</sup> Talmy proposes that most languages express motion events following mainly these two types of patterns. For him, the concept of typology implies that languages follow certain patterns in speech with high frequency; these patterns must be colloquial in style rather than literary; and they are persuasive instead of limited (1985).

event as supporting relations. The first type of pattern in the typology is referred to as *verb-framed languages* while the second one is referred to as *satellite-framed languages*. In the following figures Talmy's (1991), the relationship between conceptual structures on motion events and verb-framed languages and satellite-framed languages is schematized.



**Figure 3.1: Syntactic structure of a motion event conceptualization in a verb-framed language.**



**Figure 3.2: Syntactic structure of a motion event conceptualization in a satellite-framed language.**

Verb-framed languages, like Spanish (see example 3), are characterized mainly by expressing the path in the verb, which constitute part of the framing event. If supporting events such as manner are expressed in V-framed languages, the language would place them outside the main verb, and it will tend to be encoded by a satellite such as a gerund. Thus, in example 3, the path *cruzó* 'crossed' indicates motion and trajectory with respect to the ground (i.e. *la calle* 'the street'). Additionally to these elements, the sentence expresses that the *crossing* is done in a certain *manner*, *cojeando* 'limping', and it is encoded by a gerund. Example 3, therefore, follows the patterns depicted in figure 1.

(3) El perro [*cruzó*]<sub>path</sub> la calle cojeando ( 'the dog crossed the street limping).

(4) The kangaroo jumped [*out*]<sub>path</sub> of the box.

Example (4) describes an archetypical satellite-framed language structure. English, a satellite-framed language, follows very straightforwardly the pattern depicted in figure 3.3. What defines example 4 as a clause from a satellite-frame language is the fact that the path is expressed by a satellite; in this case it is expressed by a preposition associated with the verb. The verb, on the other hand, not only conflates motion but also the manner, a supporting element of the macro-event.

Talmy's typology seems straightforward and he provides an exhaustive analysis of all the possible relations between concepts and lexical and syntactic elements<sup>10</sup>. Probably the only term that has been most controversial is that of *satellite*, which seems difficult to grasp. Actually, this concept has been redefined by the same Talmy. The definition of *satellite* used in this dissertation is the one defined by Talmy in his 1991's study. It refers to elements in the clause that are immediate and in close relation to the verb. In his words "the satellite ... is the grammatical category of any constituent other than a nominal complement that is in a sister relation to the verb root" (1991: 486). The satellite can be separable or inseparable affixes or free words, always in relation to the verb (see examples 5a-b). In example 5a, the Spanish *gateando* 'crawling' is a gerund and it functions as the satellite of this event. In the Russian example 5b, the satellite is a prefix bound to the verb (*v*'in'). Talmy (1985) explains that it would be better not to consider the satellite a grammatical category on its own, but "as a new kind of grammatical relation". In the present dissertation this affirmation would be assumed due to all the possible satellites that languages

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<sup>10</sup> Talmy, in his work on lexicalization patterns (1985), analysed all possible confluations of motion events within languages and across languages. Although for the purpose of the study of linguistic relativity (the topic of this dissertation) the main focus is put in the dichotomy between verb-framed languages and satellite framed languages, it has to be explained that Talmy looked also into all possible confluations in each domain-schematizing events. For example, within motion events, this author found a 3<sup>rd</sup> major typology pattern in which a verb expressed motion and figure (1985, 1991). He realized that a pattern that conflates manner/cause/path/figure would be exhaustive, thus apparently it does not occur in languages. Additionally, ground does not seem to conflate motion. Talmy proposes that the different types of conflation can be seen as hierarchy concepts in which conflation of path is the most 'prevalent', followed by manner/cause, and by figure.

In the same way, this author investigated all the possible positions that concepts such as path, ground, manner, etc. can take in languages. In Talmy (1991) the author goes beyond motion events and spatial relations and analysed aspect, state change, condition change, among others to prove that they are allocated in the framing event in the same position of path and concluding that these types of domain schematizations belong to a single conceptual unity (1985, 1991, 2000).



can express. This aspect is addressed in more detail in the section dedicated to the characteristics of English, as a satellite-framed language, and Spanish, as a verb-framed language.

- (5) a. El niño pasa **gateando** por la mesa  
‘the boy passed **crawling** through the table’.  
The boy crawled through the table
- b. Ya **vbeial** (**v** dom)  
‘I **in** ran (**into** house (acc))’  
I ran **into** the house<sup>11</sup>

So far, it is known that satellite-framed languages are most Indo-European languages Germanic, Slavic, Celtic, Finno-Ugric, Chinese, Ojibwa, and Warlpiri, except romance languages. On the other hand, Romance, Greek, Turkic, Basque, Korean, Semitic, Japanese, Tamil, Polynesians, most Bantu, Mayan, Nez Perce, and Caddo languages are considered verb-framed languages.

The typology of both verb-framed languages (henceforth, V-language) and satellite-framed languages (henceforth, S-language) focused on the position of the path. Thus, it seems to be irrelevant where manner is encoded. However, due to later studies in which the dichotomous character of the typology was questioned, and the grammatical category of the verb acquired importance in terms of its saliency, the focus of attention has been changed from *the encoding of path* to *what the verb encodes*: manner or path. As a result, some studies are dedicated to manner languages, which refer to languages that encode manner in the verb category, and to path languages, which refer to languages that encode path in the verb category.

Furthering Talmy’s typology, Slobin and colleagues analyse lexicalization patterns of motion events cross-linguistically and study motion events not only from a lexical perspective but also from a grammatical, discourse, rhetorical and psycholinguistic point of view. Additionally, they investigate adult language, child language, and second language learners. As a result, these researchers

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<sup>11</sup> Example taken from Talmy (1985, p 105).

offer new insight about motion event expressions and have shown the complexity of the linguistic system of motion events. Apart from Slobin, of course, there are many researchers that continue studying the encoding of motion events and bringing new insights to this topic. The next lines summarize these studies and their findings.

Much of the first research done on motion events by Slobin and colleagues is focused on language development. Broadly speaking, their research on motion events (1994a, 1994b, 1996a, 1996b, 1997, 2000, 2003, 2004a, 2006, among others) shows an evolution that goes from proving that languages are divided according to Talmy's typology up to providing results that show that the lexicalization patterns of motion events have effects on other linguistic elements (i.e. in grammar, discourse, rhetoric) and psycholinguistic and cognitive aspects (mental imagery, attention, memory). All these findings allow Slobin and collaborators to posit their *thinking-for-speaking* hypothesis, a theory associated with linguistic relativity which was defined in the previous chapter.

Slobin and colleagues confirm Talmy's typology by looking mainly at narratives in different languages. Most of their research data are collected from children and adults' participants who elicit narratives from a 24-picture story book, *Frog, Where are you?* (Mayer 1969) already available in many languages. The story book depicts the story of a boy and a dog that look for a pet frog that escaped. The story shows different motion events and it is perfect for eliciting descriptions (e.g. - falling from a window, - climbing from a tree) (Slobin 1996b). Studies analyse different languages. This made possible cross-linguistic comparisons between different discourses, grammars, lexicons, etc. from different languages, genres and ages based on the same methodology (Berman & Slobin 1994). Although different domains are analysed, Slobin pays particular attention to motion events. The method (see Berman & Slobin 1999 for details) is to show participants the picture story book and then they are invited to tell the story to the researcher by looking at every picture again.

By analysing verbs in a good group of languages (e.g. English, Spanish, Turkish, Dutch, German, Russian, SLN "Sign Language of Netherland", among others), studies show a clear difference between speakers of these S-

languages and V-languages, thus confirming Talmy's typology. S-language speakers produce mainly manner verbs almost all of the time followed by path satellites, but the diversity is remarkable, as the author expressed in his study of English and Spanish (Slobin 1996a). V-language speakers produce more path verbs although some manner verbs are produced in their descriptions. Additionally, in V-languages, satellites are not always present (Slobin & Hoiting 1994, Slobin 1996b). S-language speakers apparently also have the characteristic of producing richer movement descriptions compared to V-language speakers by adding more grounds or locatives in their clauses (e.g. from English: *they fell [in the water]*<sup>12</sup>) while V-languages tend to produce bare verbs (e.g. from Spanish: *Se cayeron*/"they fell"<sup>13</sup>) and less ground elements or if they appear, they tend to be just one type of ground element which is likely to be a source, a goal or a via (Slobin 1996, p 203). The author points out that "This typological distinction between S- and V- languages is quite widespread, apparently independent of language family, geographical area, and culture" (2003, p 160).

These linguistic differences in the encoding of motion events make speakers of V-languages and speakers of S-languages to pay attention to different aspects of the motion event. S-languages focus on manner descriptions, and this predominance is due not only to the fact that manner is frequently mentioned but also because it occupies a salience position in the clause (i.e. the main verb). This last fact, in the words of Slobin, makes speakers of S-languages to make pervasive use of this element communicatively and cognitively compared to V-languages (2003). On the other hand, speakers of V-languages do not pay that much attention to manner and therefore they are less sensitive to this element than speakers of S-languages. They tend to pay attention to path, although Slobin (2000) and Sebastián & Slobin (1994) observe that speakers of this type of language show much more interest in describing the settings and the emotional circumstances of the people involved in a motion event in narrative constructions. S-language speakers pay attention to manner but also to path; that is, manner and path are present always in a compacted way. This

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<sup>12</sup> Example taken from Slobin (1996, p 200).

<sup>13</sup> Example taken from Slobin (1996, p 200).

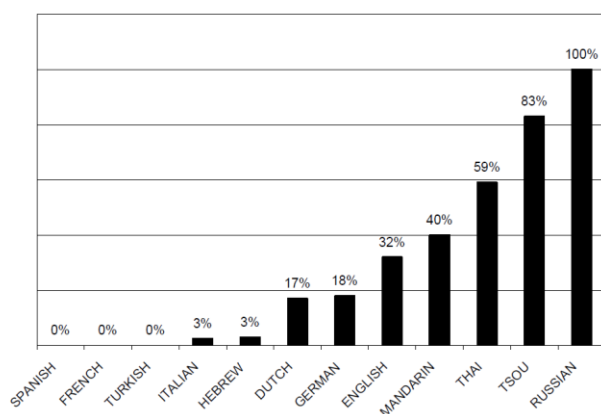
is suggesting that manner and path are part of a single conceptual event (Slobin 2000, p 132). However, the position of manner, encoded in the verb, makes this element highly salient. It is necessary to mention that English has some of the same path verbs observed in romance languages. Actually they entered the language through French influence (Online Etymology Dictionary) but with an infrequent use.

S-languages have developed a much larger manner lexicon than V-languages and this lexicon offers fine details of distinctions compared to the lexicon in the other language type. A good example is the one provided by the same author between French, a V-language, and English. In French, *bondir* can be translated in different manners of motion in English (i.e. *jump, leap, bound, spring, skip, gambol*). In Slobin's words "the semantic space of manner of motion is "highly saturated" in S-languages, in comparison with V-languages" (2003, p 161). A similar example is observed in our analysis between Spanish and English. In Spanish, the equivalent of 'jump' is *saltar*. Apart from *brincar* which is synonym of *saltar*, there are no more specific words for expressing 'jump' or types of jumps. However English speakers can differentiate the type of *jumps* with specific words: *jump, hop, and skip*. When directly talking to English-speaking participants about these different verbs, they were very conscious about the differences in meanings between them. They are not synonyms; on the contrary, each expresses particular ways of *jumping*. These differences do not exist in Spanish vocabulary. Furthermore, in a comparison between Turkish and English novels, Özçalışkan finds that for the verb *walk* only one verb is used in Turkish (a V-language) while in English 23 different verbs were used in the same context of *walk* (2002, p 58).

Slobin (2003) also proves the saliency of manner by asking English speakers and French speakers to produce as many manner verbs as they can in one minute. The result shows that English speakers produce many more manner verbs (by token and by type) than French speakers. Additionally, the verbs produced by English speakers are more "fine-grained" in detail, confirming the degree of saliency and specification of manner verbs in English. In another study reported in Slobin (2005), translations from speakers of different V- and S- languages of an English text (a chapter of Tolkien's *Hobbit*) are compared

and results show a much larger manner lexical diversity in languages such as English and Serbo-Croatian (S-languages) than in French and Turkish (V-languages).

Berman & Slobin (1994) conduct extensive research showing results from the study of oral narratives comparing different languages. They reveal that the mean percentage of manner verb use differ between V-language speakers and S-language speakers (i.e. 20% in Spanish, 25% in Turkish, and 30% in Hebrew, V-languages; while in S-languages: 45% in English, 62% in Mandarin, and 69% in Russian; these percentages include children and adults combined), (see Slobin 2003 for summary of the results, see Berman & Slobin 1994 for each detailed study). However, despite this difference between speakers of V-language and speakers of S-languages, Slobin discovers that the level of attention and therefore of expression of manner within S-languages could vary. This author (2000, 2006) presents results of hundreds of narratives in which an *owl emerges from a hole of a tree and flies away*. The percentages of people from different languages using manner verbs like “fly”, “jump” and “hop” for this particular event is presented in figure 3.3, a figure taken from Slobin (2006, p 66).



**Figure 3.3: Percentage of participants using manner verbs of motion when confronted to a picture showing an owl exiting a hole in a tree.**

What seems interesting from this result is that there is a continuum in the frequency of use of manner verbs in S-languages. The variation in the use of manner verbs appears to be associated to constraints on the morphosyntactic characteristics of the languages and in processing load. First, V-language

speakers behave very different from S-language speakers (from Spanish to Hebrew in Figure 3.3). But S-language speakers also perform differently among them. For example, Germanic languages (Dutch, German and English) show different preferences compared to Russian, a Slavic language also considered S-language (Slobin 2006). The author explains that the most salient event in the scene of the owl for Germanic speakers seems to be the emergence of the owl. Therefore, these speakers mainly used the form “come out”. The option of adding an additional manner verb “come out flying” is probably too heavy for processing. In the case of Russian, a grammatical restriction impedes the use of expression such as “come out” because these deictic elements are prefixes that do not appear as independent verbs. Consequently, Russian speakers need to use manner verbs.

In conclusion, this research demonstrates that some grammatical and lexical restrictions force the speakers of a language to encode certain concepts in certain ways. Thus, in this case we observe language characteristics affecting concepts and demonstrating that probably Talmy’s typology should be considered a continuum rather than a dichotomy (this is proposed by other authors such as Choi (2009), Ibarretxe (2008) and Slobin (2006)).

Slobin (2006) explains that there are certain linguistic factors in a language that facilitate the frequent encoding of a semantic domain. For example, a domain encoded through a finite verb will be easier to process than one encoded through a non-finite verb. If the domain is lexically expressed in a single morpheme, it will be also easier to process than if it is an inflected verb form. The domain of manner as expressed in S-languages has the syntactic characteristics that make this form easier to process compared to the domain of manner in V-languages. This explains Slobin’s (2006) suggestion that manner is more salient in S-languages.

Slobin also studies the preponderance of manner verbs in S-languages compared to V-languages in written narrative and translations. For example, a study of novels in English, German and Russian show overall a higher use in type and tokens of manner verbs over novels written in Spanish, French, Turkish, and Hebrew (Slobin 2003). In studies of novels’ translations,

interestingly it is observed that when the translation goes from English to Spanish, only 62% of the manner verbs are kept; while when the translation happens in the other direction, 95% of the manner verbs in Spanish are translated into English.

Another consequence of the manner saliency observed in S-languages is that manner verbs should be acquired earlier. Slobin offers in different studies support for this hypothesis (Berman & Slobin 1994, Sebastián & Slobin 1994). However, in this dissertation this is an important topic that will be treated in a separate section (see 3.4). Finally, Slobin (2006, p. 12) explains that other characteristics of the saliency of manner in S-languages will be the constant renovation of manner words, in which he includes metaphorical uses as well.

Slobin (1989) additional analyses the mental imagery, which is related to the mental representation of motion events previous to language production (conceptualization in Levelt's term, 1989). The author finds evidence that speakers of S-languages would be affected by the salient the manner pattern in their language. He reports an experiment conducted with his students in which speakers of English and speakers of Spanish read novels and later gave mental imagery of the narrated events. Texts are from Spanish novels (a language characterized by encoding basically static description and inner state of the protagonist while manner is left to be inferred. English speakers read a literal translation of the Spanish texts (see Slobin 2006, p.14 for examples). Results show that Spanish speakers did not produce manner descriptions. They tend to describe images of the stage, that is, they describe more "series of static images or still pictures (more like photographs)" (Slobin 2006, p 15). English speakers, on the other hand, report manner of motions of the protagonist using manner verbs but also describing manners with additional details (e.g. "he rocks from side to side) (Slobin 2006, p 14).

Another aspect analyzed by Slobin (2006) is the effect of manner saliency in memory for events and verbal accounts. These hypotheses are explained in more detail in the next chapter in which the linguistic system of motion events' expressions and other non-linguistic cognitive activities are described.

Finally, Slobin (2003) goes beyond the linguistic frame and suggests that probably the language-specific patterns in S-languages could affect the ways in which information is stored and evaluated. However, we still need cross-linguistic research to prove these hypotheses. In chapter 4 of this dissertation follow up studies that try to prove these connections, namely the LR hypothesis, are described.

Summarizing so far, it is understood that Talmy proposes a typology in which languages could be divided according to whether path is encoded in the main verb or as a satellite. The path is the core schema because without path there is no motion event (Slobin 2004). Slobin and colleagues' research provides empirical support to Talmy's typology but also finds that the saliency manner of motion in S-languages has cognitive consequences.

More recently, there is a tendency to consider English a language in which path of motion is equally salient than manner because this component is frequently encoded together with the manner verb as a satellite in English sentences. For example, Kersten et al. (1998) finds that English speakers focus more strongly on path than on manner of motion in a novel verb-learning task, suggesting that path was a more salient attribute of an event than was manner of motion for these participants. This hypothesis was tested in our study and results are analysed in the Discussion.

If S-languages have a salient component or components, do V-languages show any preference? According to Talmy (1985, 1991) they tend to encode path in the main verb. Therefore, we should expect a path saliency in these languages. Slobin (2000) finds that speakers of V-languages prefer to encode path over manner verbs in studies of narratives and conversations. But in these studies it is observed a tendency to describe static sceneries and leave path and manner to be inferred. When manner is encoded in the verb position the propensity is to appear alone without any ground element in the clause. Slobin (2004) presents a study in which intransitive verbs are analyzed in two hours of oral conversations in Turkish and Spanish. Results confirmed that speakers of both languages produced mainly path verbs (98% in Turkish, and 97% in Spanish).



In studies which aim to test the LR hypothesis, path vs. manner verb linguistic descriptions are analysed in the context of experiments (i.e. elicitation of description of pictures or videos) and the results support Talmy's typology when path differences are considered (e.g. Gennari et al. 2002; Hohenstein 2005; Papafragou, Massey, & Gleitman 2002). These studies will be presented in chapter 4.

The study of LR counts on a great deal research using different methodologies that support the manner vs. path preferences according to type of language (S-languages vs. V-languages). However, other studies have gone beyond this difference and have observed that V-languages patterns are not that clear cut.

In a study done on SLN (Sign language of the Netherland), considered a V-language, Slobin & Hoiting (1994) observe the frequent presence of two different types of path, each constructing a different figure to ground relationship. The authors call one case a linear path, because the figure just moves from one point to another one in which only a continuity movement happened. In the second type the path, the figure movement is not continuous in relation to the ground, in this case a boundary is crossed because the figure finishes in a different space (e.g. inside a house, out of a building, etc.). In SLN, this second type of path is marked with an arc symbol (1994, p 93).

Based on the analyses of SLN, the authors thus suggest the existence of two different types of path in V-languages. The one referred to as linear path and considered path-focused (it includes verbs such as approach, depart, ascend, descend). The second, the impeded path, includes verbs such as enter, exit, and across. "The endstate of motion is a 'configured' relation of figure to ground". (1994, pp 493- 494) Slobin & Hoiting (1994) posit that these two types of path are both present in V-languages and that they affect the type of motion element that the verb will express. They therefore use the terms boundary focus and path focus to differentiate these types of path.

Already Aske (1989) finds that Spanish speakers could use main manner verbs and main path verbs in their motion expression depending on the telicity of the event. A path verbs is required when the event is telic or resultative (i.e. the

figure reaches an endpoint); and if it is not resultative, speakers of this language can produce manner verbs instead. Slobin & Hoiting (1994) considered Aske's proposal, but after analyzing the SLN and other spoken languages, they suggested that telicity is not the aspect that triggers more descriptions with path verbs in V-languages, but the traversing of a boundary. Therefore, when a figure crosses a boundary (e.g. a figure moving from outside to the inside of a building) V-languages require a path verb. If no boundary is crossed, speakers will tend to encode manner verb, although path verbs will still be favored.

Other studies do not discard Aske's (1989) proposal. Naigles, Eisenberg, Kako, Highter & McGraw (1998)<sup>14</sup> test both Aske's and Slobin & Hoiting's hypotheses in Spanish and their results partially support both proposals. Therefore, telicity and crossing a boundary affect Spanish speakers' decision between path and manner verbs. Kita (1999), in a study of Japanese, a V-language, supports the boundary-crossing hypothesis. The author explains that manner of motion is not allowed in the verb position when the event is extended in time/space while crossing a boundary.

Slobin (1997) concludes that it is common to all V-languages that when a figure crosses a boundary a change of state is considered. These languages require an independent predicate headed by a path verb to express the change of state. In these constructions only one ground element is possible to encode. Additionally, if manner is expressed that will happen through a satellite or subordinate clause (see example 6). If no boundary is crossed the main verb allows more than one ground (see example 7) and manner verbs are allowed, although the preferred structured will be to use path verbs.

(6) La muchacha salió<sub>path verb</sub> [de la casa]<sub>ground</sub> saltando en un solo pie/

'The girl exited the house jumping on a single foot'

(7) El muchacho subió<sub>path verb</sub> sentado [las escaleras]<sub>ground</sub> [hasta la puerta]<sub>ground</sub>

'the boy ascended sat down the stairs towards the door'

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<sup>14</sup> These studies that analysed the difference in path verbs will be described in more detail in section 3.3, dedicated to the studies of motion events in English and Spanish.

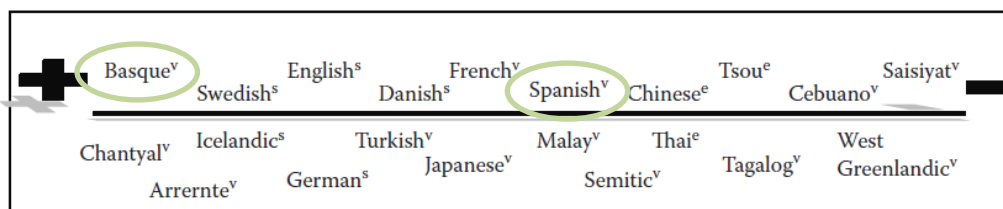
V-languages will generally be characterized by the occurrence of fewer ground elements per verb in comparison with texts in S-languages. These differences have been observed between languages such as English, German, Dutch and Russian and languages such as French, Spanish, Turkish and Japanese (Slobin 1997).

Subsequent studies show that in the same way that manner is not equally expressed in S-languages (see Figure 3.3, Slobin 2006) path expressions vary within V-languages as well. For instance, Ozcaliskan and Slobin (2000), in a study about path verbs in Spanish and Turkish, two V-languages, find that speakers of Turkish produce considerably more path verbs than Spanish speakers, for what Turkish could be considered a more prototypical V-language than Spanish in Talmy's terminology. In the same lines, Ibarretxe (2008) observes that there is intra-typological variation, and not all languages fit into the two typology types expressed by Talmy. This author analyses V- and S-languages and the third typology proposed by Slobin (2003), equipollently-framed languages<sup>15</sup>. She proposes a continuum that goes from high-path saliency to low path saliency. Data is collected from narrative elicitations from the Frog-Story picture book, and it comes from 14 V-languages, 6 S-languages and 4 equipollently-framed languages. The author analyses types of motion verbs, path complements, and event granularity (i.e. whether the sentence contains more than 3 grounds). Figure 3.4, taken from Ibarretxe (2008, p 410) shows the decline in the production of path elements in the sentence in different languages. The author finds that there is variation even between some of same typological group of languages. In figure 3.4 the symbol '+' means that path is more salient, while the symbol '-' expresses a less salient path. For instance, Spanish and Basque are both V-languages, but although studies seem to show that Spanish limits the description of path components outside the verb and can express bare verbs or just one ground element (e.g. *She descended*, a typical Spanish sentence), Basque generally offers a more detail description (e.g. *she descended from the cliff **down to the river***, a more typical Basque sentence). This is evidenced in figure 3.4, circled in green. Therefore, Basque is behaving more similarly to English than to a typical V-language. Ibarretxe suggests that it

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<sup>15</sup> Slobin 2004 proposes a third typology called equipollently-framed languages, which is more detailed described at the end of this section.

would be more appropriate to describe languages in a rank that expresses the cline of the saliency of the semantic path component (Ibarretxe 2008).



**Figure 3.4: Path salience cline. <sup>v</sup>: V-language, <sup>s</sup>: S-Language, <sup>e</sup>: equipollently-language.**

Therefore, as some authors such as Slobin, propose to talk about a continuum rather than a dichotomy in relation to manner expression, others also propose a continuum for path expression in V-languages (Choi 2008, Ibarretxe 2008).

These studies show that within each typology there are differences that seem to be guided by lexicalization patterns, for example the verb characteristics, or by morphological and syntactic constraints that allow speakers of some languages to express motion events in particular syntactic framings.

Other studies try to determine whether the lexicalization pattern of motion events affects other syntactic components of the clause when motion events are expressed. For instance, Muehleisen & Imai (1997) find a path verb preference in Japanese, a V-language. However, they observe that this language does not behave exactly as other V-languages, like Spanish. Japanese main path verbs can encode information about the ground. Therefore, two types of paths can be identified and their use seems to constrain the syntax of the clause. Firstly, there are *directional path verbs* which can be assumed as “pure” motion+path verbs. This type of path verb focuses on either a starting point or the goal of a motion event. Secondly, there are *ground path verbs* which encode information (the nature or the shape) about the ground. As a consequence, *directional path verbs* appear in intransitive constructions, whereas *ground path verbs* occur in transitive constructions. These semantic differences in these two types of paths have several consequences, apart from the transitivity vs. intransitivity issue. It affects the aspectual properties of the verbs, the semantic specificity of the verb (i.e. ground path verbs are more

semantic specific than directional path verbs. The later type appears with more types of subjects whereas the former type is used more exclusively with animate beings or vehicle subjects.

In addition, Choi (2009) examines whether there are systematic differences between S- and V- languages in the way they treat different types of paths. The author proposes that different types of paths will influence the syntactic frames particularly in V-languages. Choi proposes an alternative classification of types of path to Aske (1989) and Slobin & Hoiting (1994), that seems to better explain syntactic constrains observed in V-languages. One type of path, *endpoint path*, refers to punctual actions in which the goal is achieved quickly and in which the figure goes in or out of an enclosure. For this type of paths, V- and S- languages use intransitive constructions. In contrast, trajectory paths involve a barrier between the source and the goal location. For this type of path, V- languages use transitive constructions with the barrier (i.e. ground nominal) as the direct object of the motion verb. The difference is observed within V- languages and not in English because it is the lexicalization pattern of the V- languages that allows the distinction by expressing the core schema, path, in the main verb. This, according to the author, provides flexibility that guarantees that the nominal ground could take different syntactic and semantic roles. Choi's study consists of showing 28 videos to 80 participants who are speakers of English (a S- language), Korean, Spanish, and Japanese (V-languages). Speakers are asked to describe the scenes. Twenty-one scenes involve different types of paths in real motion events. The first result is that all languages follow the pattern expected in the verb according to their typology. However, the results also show that typological differences in lexicalization patterns lead to systematic differences in the syntactic treatments of these domains. English speakers use intransitive frames for all types of path (oblique objects). In contrast, the V- language speakers behave differently depending on the types of path. They use intransitive constructions when the path is an "endpoint path" (paths that express change of state, that have a punctual aspect in that the motion to the goal is achieved quickly<sup>16</sup>), but they use transitive frames when the path is a "trajectory path" (i.e. paths that involve a barrier to

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<sup>16</sup> Examples of endpoint paths are *in(to)*, *out (of)*, *up*.

reach the goal<sup>17</sup>). These findings suggest that path is not expressed syntactically in a uniform way. According to the author “it is the lexicalization patterns of the V-languages that allows differences in syntax for the two types of paths” (2009, p 191). It is proposed that the endpoint paths essentially express a change of state (in terms of the spatial relation between the Figure and the Ground element). For this type of paths, completion of the trajectory occurs rather punctually and quickly, as there is no salient barrier between source and goal. Choi (2009) concludes that the syntactic frame is determined by the type of path and ground element rather than the verb type.

Hohenstein Naigles & Eisenberg (2004), Naigles & Terrazas (1998) and Muehleisen & Imai (1997) suggest that differences in syntactic frame are governed by verb types. Slobin & Hoiting (1994) posit that it is the distinction between boundary-crossing and non-boundary-crossing that incites morphological and syntactic consequences. Choi (2009) partially supports this view. She find that in V-languages verbs such as “exit” and “enter” (i.e. endpoint path verbs) will be followed by intransitive frame, while verbs such as “ascend” and “descend” (i.e. trajectory path verbs) are used in both types of constructions. For Choi (2009), it is the lexicalization pattern of the V-Languages that causes different syntax patterns. Path is encoded in verb, thus ground can be expressed via an oblique or a direct object.

The crucial conclusion to all these studies about motion events and Talmy’s typology is that they show that our knowledge about how motion events are encoded in languages goes beyond the expression of concepts such as path or manner in certain syntactic positions. It is true that they all show that Talmy’s typology is still correct in the sense that generally speaking S-languages tend to encode more manners in the main verb and that V-languages tend to encode path in the main verb. But also they demonstrate that there are differences even inside a typology in how these concepts are conflated, and this would strongly depend not only on lexicalization patterns but also in the syntactic characteristics of the languages. This conclusion leads authors such as Choi (2009), Ibarretxe (2008) and Slobin (2003) to suggest a continuum in the expression of motion events rather than about a dichotomous typology.

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<sup>17</sup> Examples of trajectory paths are *over*, *across*.

By concluding this section of path vs. manner, it is essential to present Slobin’s (2006) work in which he suggests a third class of lexicalization pattern, called equipollently-framed, already mentioned in a study above but not described in detail. In this class of lexicalization, path and manner appear as main verbs, both with roughly similar morphosyntactic status. He includes here languages that in previous studies he considers serial-verb (explain what they do) languages such as Mandarin, bipartite verb languages (i.e. the verb contains 2 morphemes, one encoding path and the other manner, of equal status), and generic verb languages (i.e. languages with very few verbs that combines deictic verbs such as “come” and “go” with a satellite that expresses path and manner). Table 3.1, taken from Slobin (2006, p 65), summarizes his latest typology of motion events.

**Table 3.1: Typology of the linguistic system of motion events**

Language type	Preferred means of expression	Typical construction type	Examples
verb-framed	path expressed by finite verb, with subordinate manner expression	Verb PATH + subordinate verb MANNER	Romance, Semitic, Turkic, Basque, Japanese, Korean
satellite-framed	path expressed by non-verb element associated with verb	Verb MANNER + satellite PATH	Germanic, Slavic, Finno-Ugric
equipollently-framed	path and manner expressed by equivalent grammatical forms	<b>serial verb:</b> verb MANNER + verb PATH	Niger-Congo, Hmong-Mien, Sino-Tibetan, Tai-Kadai, Mon-Khmer, Austronesian
		<b>bipartite verb:</b> [manner + path] VERB	Algonquian, Athabaskan, Hokan, Klamath-Takelman
		<b>generic verb:</b> coverb MANNER + coverb PATH + verb GENERIC	Jaminjungan

### *Cause of motion*

The subject of semantic cause and its lexicalization is a complex topic that can be studied from different perspectives. Following Talmy (2000), cause in language must be differentiated from causation in the physical world. As this author points out, in the physical world we can establish causative relations that will not be considered like those observed in language. For example, in (8), we can assume that another physical event (i.e. condensation of water steam from

the clouds) provoked the event. But in language this sentence won't be considered caused, because there is no agent making the event to happen.

(8) It's raining

*Cause* refers to the presence of an agent causing the figure to move (Choi 2009). There is a second event that would not happen if a first one does not occur. This motion element could be studied from different perspectives because it can be expressed in several ways. For instance, the focus could be on the type of agent (e.g. the agents cause to themselves the event, or to another figure), or on how intentional or accidental is the event being caused by the agent; and finally the focus could be in the presence of cause in a particular grammatical category or in more than one sentence.

In this dissertation the interest is placed in cause being expressed in a single clause because there is a difference in how S-languages and V-languages encode this element when talking about motion events. In S-languages, cause, as manner, tends to be expressed with motion in the verb. As it was explained when exposing Talmy's lexicalization pattern study (1985), S-languages have a good number of verbs of common use that encode motion and cause. Some verbs also express cause and location but they are less in number (Talmy 1985, p 62; Choi 2009).

*Cause* can be: agentive (the figure that causes the motion is present, see example 9a); non-agentive (the figure that causes the motion is not present, see example 9b); or self-agentive (the figure causes the motion to itself, see example 9c).

- (9) a. I blew the ant off the table  
b. The napkin blew off the table  
c. She wore a green dress to the party<sup>18</sup>

V-languages, on the other hand, tend to express cause in satellites, usually gerunds or adverbial constituents, if cause is expressed at all. Cause or manner

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<sup>18</sup> The three examples are taken from Talmy (1985, p 63)



can be left outside the clause and be expressed in another section of the discourse or not be expressed at all (Talmy 1985). See example (10) in which the verb conflates path and the cause is mentioned in a second sentence. This would be the preferred Spanish option of expressing cause in its agentive form.

(10) El animal finalmente salió de la caja. Lo empujé con un palito para afuera.  
‘The animal finally went out of the box. I pushed it with a little stick outside  
(the box)’

Choi (2009), to my knowledge, conducts the first detailed investigation into the linguistic differences in the encoding of cause between V-languages and S-languages. The aim of this study is to investigate how cause of motion is highlighted by Spanish, English and two other path languages, Korean and Japanese. Her hypothesis is that because *cause* is encoded in the verb position, speakers of S-languages should be more sensitive to the cause of motion (this is related to Slobin’s hypothesis of saliency of a semantic element). Therefore if S-language speakers are asked to describe videos expressing different types of causes, they should tend to use more causative constructions than V-languages that do not encode cause in this important syntactic position.

For her study, Choi (2009) asks speakers of these two different typological languages to describe videos showing different type of cause: i. caused motion with an agent present (e.g. J throws keys into basket); ii. caused without an agent present (e.g. (j) throws keys into basket); iii. caused and spontaneous motion (e.g. J runs toward M kicking a ball), and iv. video of indirect causation (e.g. a fan blows and paper falls into a basket)<sup>19</sup>. These different types would present different degrees of causation. It is expected that speakers of S-languages highlight the causation more than speakers of V-languages by constructing transitive clause with an explicit agent (e.g. John is kicking a ball). V-languages are expected to highlight the figure motion by using intransitive constructions (e.g. John is running toward Mary).

Results reveal that there is a significant difference between the four types of causation degrees. In stimuli showing *cause with an agent*, speakers from all

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<sup>19</sup> All the examples were taken from Choi (2009, p 175).

four languages express causation in the main verb. However, when the stimuli show no-agent, more than 65% of English speakers produce a cause verb. In contrast, half of the Spanish speakers produce a cause verb, followed by Japanese speakers (40%) and Korean speakers (20%). Therefore, Korean speakers pay less attention to cause than the rest of V-languages speakers. In general V-languages have less preference for expressing cause verbs than S-languages when watching cause of motion. In videos showing a *caused and a spontaneous motion* stimulus almost the same proportions of caused constructions are produced by speakers. English speakers prefer cause verbs in a very high percentage (17 out of 20), followed by Spanish speakers, Japanese speakers and Korean speakers. In this case, the majority of the V-language speakers produce a path verb in the main clause, therefore attending more to path than to cause or manner. In relation to the video depicting an *indirect causation*, English speakers produce a transitive construction with a cause verb and a path preposition “into” 100% of the time; while the tendency among Japanese and Korean speakers is to produce expressions of trajectory, focusing more on path than in cause. Spanish speakers surprisingly perform in-between English speakers and the other V-language’s speakers as 50% of them produce cause verbs in transitive constructions, the rest produce periphrastic causative construction with the verb “make that” + intransitive clause (see example (15), taken from Choi 2008, p 188):

- (15) Está el abanico prendido y hace que el papel caiga sobre una canasta  
 Is the fan turned on and makes that the paper fall on a basket  
 ‘The fan is on, and it makes the paper fall on a basket’

English speakers highlight the causal aspect of the event by expressing causation in the verb in transitive clauses. In contrast, intransitive constructions are more frequent in V-language speakers. Specifically, these speakers prefer to focus on the trajectory of the figure and the causal element is expressed in another clause or not mentioned at all. The results also suggest that the differences between V- and S- languages are not clear-cut. Speakers Japanese and Korean seem to behave more like archetypical V-languages, whereas Spanish shows similarities with S-languages like English. Japanese speakers are not statically different from speakers of Spanish and Korean. But Korean

speakers are statistically different from speakers Spanish and English. Like Ibarretxe (2008), Choi (2009) also proposes a continuum in relation to path expression.

### 3.3. Motion events in Spanish and English

Following the typology presented in section 3.2, it is expected that English and Spanish speakers describe motion events as the typology indicates; additionally, many studies exposed in the previous section already mention characteristics and particularities of these two languages. But it is also clear that not all V-languages and S-languages express motion events in the same ways. Consequently, in this section more details about motion events in Spanish and English are presented. The aim is to understand what differences and similarities these two languages present in relation to the semantic, syntactic and lexical elements of motion events.

Looking at table 3.1, Spanish, a V-language, conflates path in the main verb while manner is encoded in a satellite position, if mentioned at all. In this language, manner concepts appear in the forms of gerunds, prepositional phrases, or adverbial phrases. English, a S-language, would then express manner and cause in the verb and path in a satellite. Satellites are usually prepositions that appear in a compacted fashion in relation to the verb in this language.

The consequence of this manner preference is that English has elaborate means of lexicalizing manner and caused verbs. This vocabulary more than doubles the Spanish one, if we consider all the possible combinations of verbs with prepositions in English (Berman & Slobin 1994, Slobin 1996a). Because this language places path in a satellite position, it allows stacking more than one path in the same sentence. Consider example (16), taken from Slobin (1996b, p 84), in which two paths are specified in English. The boy moved *down* (i.e. “descended”), while putting *in* (i.e. “introduce”) the frog inside the jar. Both paths are happening at the same time and English has the capability the express it.

(16) The boy put the frog *down into* a jar

Slobin concludes that English is a language filled with motion descriptions: manner is always present in the verb, path is constantly added in an almost formulaic way with manner (manner verb + path preposition); additionally, the fine-grained prepositions expressing locations allow this language to mention plenty of locatives compared to Spanish. Slobin studies this difference between both languages by counting the number of bare verbs, and verbs with satellites that appear in narrations of a scene of the Frog-Story book in which a downward trajectory is shown to participants. It is evidenced that English speakers display a much richer description of movements compared to Spanish speakers. Spanish speakers, on the other hand, produce more bare verbs and express less locatives. In this case, Spanish adults describe the scene with 36 bare verbs while English adults used 15 of these, proving Slobin's hypothesis (1996a, p 201).

Slobin (1996a) also conducts another analysis that produced similar results. In this case the author counts: i. bare verbs and verbs with satellites indicating path of movement (called minus-ground); and ii. verbs + satellites with additionally one or more prepositional phrases encoding sources and/or goals (called plus-grounds). Results reveal similar findings to the previous reported study. For minus-ground verbs, English adults produce 18 cases while Spanish counterparts produce 37 cases. However, in relation plus-ground (i.e. verbs expressing additional sources and goals), English speaking adults produce 82 against 63 cases in Spanish speaking adults (Slobin 1996a, p 2001).

Sebastian and Slobin (1994) compare a set of locative prepositions in Spanish and in English. The comparison shows that English have a great deal of more locative preposition. For expressing locations, Spanish speakers only have 3 markers *-a*, *-de*, and *-en* respectively. The directional preposition *-a* (e.g. *el niño fue a la tienda*/'the boy went **to** the shop') in Spanish has the equivalent of 4 preposition in English (e.g. *to*, *towards*, *into*, and *onto*). This shows the richness of English possible location's descriptions and the poorness of Spanish in this regard.

In Spanish manner seems to be optional, and frequently it is not encoded (Sebastián & Slobin 1994, Slobin 1996a). The set of verbs expressing paths is very limited as well as the manner vocabulary. As a consequence, Spanish is a language that has less elaborated dynamic path and manner discourse. Also, the fact that path is encoded in the verb makes it impossible for this language to stack more paths, as English does (see example 16). In the translated version of (16), example (17), the trajectories *down into*, perfectly expressed in (16), is not fully semantically expressed in the Spanish example. Only the path *meter/put in* is encoded. The second path from (16), *down*, has to be inferred in (17) by the static description in the final relative clause: *que había abajo* 'that was down'.

(17) El niño *metió* la rana en el frasco *que había abajo*  
The boy *put in* the frog in the jar that was down'

As mentioned, Spanish tends to express fewer locations in their sentences than English. Locative phrases have a tendency to appear in separate sentences from where the path is in narrations. This was shown above when we described results from a study of ground expressions in English and Spanish (Slobin 1996a, p 201).

English speakers would leave resultant locative states to be inferred in their narratives. The consistency of manner expression in the verb position, its frequency in speech, and the richness of the manner vocabulary should make English a language salient in manner in such a grade that their speakers should pay more attention to this aspect of motion event than speakers of Spanish. Spanish is a language in which path is expressed, while information about manner, cause and locations (grounds) tend to be left unattended. The change of state is expressed through a general path verb, but then, more descriptions of static sketches are given in a way that the speaker can infer the whole trajectory of the figure and its way of moving. Slobin and colleagues (1996b, 1997, 2004, 2006) would prove this hypothesis through the study of translations, written narratives, and mental images. Consequently, Slobin would propose his *thinking-for-speaking* hypothesis already described in Chapter 2.

In summary, Slobin and colleagues' studies show that English and Spanish are two languages that express motion events differently. This typological differences, explains Slobin (2004) constrain these languages lexically (there is a preference for manner or path verbs, for manner or path satellites, for expressing locations), grammatically (patterns associated to the expression of manner or path verbs, bare verbs, the presence of certain types of satellites, the possibilities of stacking path satellites, preference for simpler constructions and presence of relative clauses or passive clauses), at the discourse level (specific trajectories of narratives, preference for motion or static pictures); and, as this author points out in other studies, these differences should make speakers of English and Spanish to pay attention to different aspects of experience (Berman & Slobin, 1994, Slobin, 1996a, 1996b, 1997, 2004, 2006). In the following chapter, studies testing this particular hypothesis are described.

Other studies followed up Slobin's work by addressing the same questions but using different methodologies of analysis. These studies have also offered new insights into the topic that would have been difficult to observe in a context of narrative analysis. Naigles & Terrazas (1998) look into the expression of motion events in Spanish and English under an experimental perspective. These authors carry out an experimental design in which participants have to interpret novel verbs in manner or path syntactic frames in Spanish and English. The aim of this project is to test whether the cross-linguistic difference observed between English and Spanish is due to the characteristics of the verb or to the syntactic frame in which verbs are placed. The authors find that both specific syntactic frames and semantic properties of the verbs play a role in the differences observed between Spanish and English speakers in motion events.

Other studies whose main aim is to test the LR hypothesis analyse linguistic descriptions of motion events and provide interesting results about motion event descriptions in Spanish and English. In these studies speakers provide descriptions of pictures or videos in which all the motion event elements are controlled. Most of these studies support Talmy's typology. For example, Gennari et al. (2002) analyze motion events description from English and Spanish speakers. They show videos depicting spontaneous dynamic motion events in which path includes only culminating events (i.e. the figure reaches an

endpoint). English speakers produce a mean rate of 0.86 of manner verbs, and a similar mean in *manner verbs + a particle* of a prepositional phrase. Spanish speakers, on the other hand, a mean rate of 0.80 of path verbs. Additionally, the authors measure the percentage of manner expressions independently of where they are encoded in both languages. English speakers express manner more often than Spanish speakers (86.16% vs. 71.33% respectively) (2002, pp 65-68).

In conclusion, different studies focusing on English and Spanish and using different methodologies, provide evidence of the difference in motion event patterns encoded in these two languages. Additionally, some studies have gone beyond and have analyzed the connection between syntax and lexico-semantic patterns.

### 3.3.1. The type of path

Despite Spanish speakers' tendency to encode path in the main verb, Talmy (1985) already mention that this language also accepts manner verbs but it is not possible to pile them with path complements. In section 3.2 we mention some studies that suggest that V-languages express differently motion events depending on the type of path verbs. In Spanish, Aske (1989) seems to be the first author that studied in detail the conditions in which manner and path verbs are allowed in Spanish sentences. This author notices that in some conditions manner verbs can actually appear with path descriptions in the same sentence as in some English structures (see examples 18a in Spanish and English). Aske does a fine-grained work in which different grammatical elements (prepositions, verb types, adverbs, transitivity, and telicity) in English sentences and Spanish sentences are compared. A detailed characterization of the encoding of English paths is presented. But the main finding for the purpose of the present dissertation is that Spanish production of path expression on the main verb is constrained by the telicity of the clause. Spanish speakers must use path verbs when the event is telic or resultative (i.e. the figure reaches an endpoint, a culmination point, see example (18b)). If it is not resultative, speakers of this language can produce manner verbs instead (see example 18a). According to the author, this happens because in Spanish, a telic path predicate and a resultative secondary predicate are not allowed together (Aske 1989). In

English this is allowed (see example (19). In order to translate example (19) into Spanish you need two sentences, and still probably the translation is not completely accurate.

(18) a. La botella flotó hacia la cueva<sup>20</sup>

‘The bottle floated towards the cave’

b. El libro entró en la caja volando

‘The book entered in the box flying’

(19) She knocked the door down<sup>15</sup>

Spanish: ella golpeó la puerta y la echó abajo

‘she knocked the door and (she) made it lie down

Aske also explains that the pattern of preference (path in the verb, and manner at the end, like in example 18b) perfectly matches the pattern of information structure in Spanish in which new information goes at the end of the sentence. Manner, according to Aske (1989), tends to be new information, and that is likely why it is expressed at the final position of the sentence. If examples like 18a were the norm, they would go against the preferred information structure in Spanish. Aske suggests this as another factor that can intervene in the description of motion events in Spanish.

These comparisons show that the distribution of Spanish motion elements is not clear cut. Spanish speakers can encode manner verbs under some circumstances but not in others. Slobin & Hoiting (1994), on the other hand, suggested that it is not telicity per se that triggers more descriptions with path verbs, but the traversing of a boundary. These authors propose that when a figure crosses a boundary (e.g. a figure moving from outside to the inside of a building) Spanish requires a path verb (see section 3.2 for a detail description of this study). In example (18b) the figure “book” changed location: it crossed a boundary from outside to inside the box. Therefore, the expression of this motion event requires a path verb. If there is not traversing of a boundary, the speakers can encode a manner verb, although path verbs will be favored.

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<sup>20</sup> Examples taken from Aske (1989, pp 3, 6).



Kita (1999) supports the boundary crossing restriction. This author suggests that the conceptualization of manner of motion as an activity that is extended in time/space while crossing a boundary seems to be blocked. For example, it is difficult to say in Spanish something like 'the phone rang as I entered the house', because *entering* has no duration; it is an instantaneous change of state. Because boundary-crossing is a change of state, and manner verbs are generally activity verbs, most manner descriptions are excluded from boundary-crossing descriptions. The only manner verbs that can occur in boundary-crossing situations are those that are not readily conceived of as activities, but, rather, as "instantaneous" acts. Thus one can 'throw oneself into a room' but one generally cannot 'crawl into a room' in verb-framed languages (Kita 1999, p. 9).

In the same line, Naigles et al. (1998) test Aske's (1989) and Slobin & Hoiting's hypotheses (1994) suggesting that these studies are not free of flaws. Aske uses a traditional distributional analysis comparing English and Spanish sentences, while Slobin & Hoiting utilize static pictures where motion events have to be inferred. Also, because a picture story book is used, many non-controlled variables are involved and they could affect results. Additionally, the number of stimuli is low. Naigles et al. (1998) design two experiments by asking participants to describe single events. The authors study Aske's hypothesis (1989) by counting the number of non-resultative prepositions in Spanish: *a (to)*, *de (from)*, *para (for)* in relation to the number of path and manner verbs that appears with them. Slobin & Hoiting's hypothesis (1994) is examined by considering the number of path and manner verbs produced when the event shows a traversing of a boundary. Apart from these aspects, the authors also analyze the use of manner modifiers and bare verbs in both languages.

Two experiments are designed. In the first one, 12 native speakers of English and 12 native speakers of Spanish (with English knowledge) have to describe in one sentence *what is/are he/she/they doing?* (*¿Qué está pasando/haciendo?/What is happening?*). The stimuli are 10 black and white drawings depicting motion events. The results show that English speakers produce many more manner verbs than path verbs, while Spanish speakers produce equal numbers

of path and manner verbs. When the sentences are studied according to both Slobin & Hoiting's and Aske's predictions, both are positive, meaning that resultative events and boundary crossing events produce more path verbs than manner verbs in Spanish speakers' sentences.

However, in experiment 1 some important factors are not controlled: namely, the use of static pictures (a criticism that the same authors made to Slobin & Hoiting's 1994 study), the use of a small subset of stimuli; and additionally, I personally add the use of bilingual speakers who are considered monolinguals could have confounded their results. Naigles et al. (1998) do a second experiment in order to control these weaknesses. In the second experiments, Spanish speakers are monolinguals from Guatemala. Participants describe twelve dynamic videos in which 6 different paths are shown, each presented twice. The results show that English preferred manner verbs over path verbs. Spanish overall prefer path verbs (Mean=7.91 for path, 3.95 for manner, and 0.14 for others). Additionally, Spanish express more manner modifiers and bare verbs than English. Bare verbs in Spanish convey more manner than path. In relation to the type of path, the authors find that Spanish speakers produce more path verbs than manner verbs with resultative events (72% vs. 26%). However, only 54% of all the sentences have 1 of the 3 prepositions that according to the theory produces resultative sentences. This seems to mean that there are more than these 3 prepositions for generating resultative structures.

In relation to boundary crossing events, 65% of them appear with path verbs, proving also that Slobin & Hoiting's hypothesis is correct. However, these 65% of path verbs are not high considering that prediction determines that boundary-crossing events trigger path verbs. What happens with the other 35%? Analyzing these results the authors find that the encoding of path vs. manner verbs also depended on the plane in which the figure crosses the boundary. If the plane is horizontal, speakers highly prefer to encode path verbs (83%), but if the plane is vertical, manner verbs are favored. The authors reach this conclusion after analyzing two vertical stimuli in which a figure jumps and slips into a pool. They suggest several possible explanations. One is that probably the actions in vertical planes are not clearly perceived as crossing-boundary

events. Also, another possibility is that in these paths the actor's locus control is more considered. In the vertical stimuli participants mainly consider the initial exertion made by the figure.

Additionally, the authors ask why stimuli that show non-boundary and non-resultative events still produce so many path verbs. They suggest an interesting possibility which is that maybe certain path verbs are required due to their saliency in the vocabulary, being more accessible even when not required. However, there is not a clear answer to this (Naigles et al. 1998).

In a recent study, Feist, Rojo, & Cifuentes (2007) find that the notion of boundary-crossing does not explain entirely the encoding of path and manner verbs in Spanish. They find that Spanish speakers can actually pay more attention to manner than path and express it on the verb when manner is made salient. These authors confirm the hypothesis after conducting a couple of experiments in which the manners of the actions are made salient contextually and culturally. They explain that by using highly frequent manner of actions in a given culture (i.e. manner that as easily accessible for Spanish speaker such as *taconear*/*heel-tapping*) they become salient in relation to paths (2007, p. 144). Additionally, if different types of manners are shown but path is kept constant in a set of videos, manner becomes contextually more salient. However, more research has to be done to prove this hypothesis. But it is very interesting that more studies are given importance to the saliency aspects of an event. Talmy (1985, 1991) and Naigles et al. (1998) are already mentioning saliency as an explanatory aspect to some description of motion events.

In relation to cause of motion, in section 3.2 it was explained that according to Talmy's typology, English, a S-language, should encode cause in the verb. In some cases *manner+cause* are expressed in a single verb. Spanish, a V-language, encodes cause in satellites, as it happens with manner concepts. Choi (2009), up to my knowledge, is the first study that analyse in detail cause descriptions in V- and S- languages. This study is already described in section 3.2. But for the purpose of this dissertation it seems important to summarize the results from English and Spanish. We mention that Choi (2009) studied in English, Spanish, Japanese and Korean after making speakers to watch videos that show different degrees of cause saliency. She expects to see more

transitive constructions in English because the cause construction has the agent usually visible. Spanish should produce more intransitive constructions and prefer path in the main verb. Results exclusively for English and Spanish reveal that these languages defer significantly from each other and the predictions are validated. See data in Table 3.2. (taken from Choi 2009, p 184).

**Table 3.2: Number of causative constructions according to the type of cause.**

	Cause with agent visible	Cause without agent visible	Cause and spontaneous motions
English	20	13	17
Spanish	20	10	8

It is evident that English speakers prefer more causative constructions than Spanish speakers (see Table 3.2). Actually English speakers produce in total 65% of causative sentences while Spanish speakers produce 50%. When videos show an agent, both languages perform similar by describing the events with causative constructions. But when the saliency of the agent lower in the videos, the agent is not visible and cause is mixed with spontaneous events, English speakers produce more causative sentences than Spanish speakers.

The main finding of this study is that English prefer to encode cause in verbs and use transitive constructions while Spanish focus on the trajectory of the figure encoding path in verbs. When cause is mentioned it is located in a second clause, but in many cases it is not mentioned at all. As the author suggest this would mean that the mental images of motion events between these two languages are different, in Slobin´s terms.

Fausey & Boroditsky (2011) investigate cause of motion events in English and Spanish. Although the main aim of the authors is to test Whorf´s hypothesis, a section of their study is dedicated to the analysis of the encoding of cause. They base their study on the apparent difference that exists between accidental and intentional cause constructions in English and Spanish (see examples 20a-b). According to them and other cited authors (Dorfman, 2004; Filipović, 2007; Maldonado, 1992; Martinez, 2000; Slobin & Bocaz, 1988) in some languages

non-agentive expressions are more common when the event shows an accidental event.

- (20) a. He pushed the ball down the road (intentionally)  
b. He broke the glass (accidentally because the glass fell down, accidental cause)

With intentional cause events (like example 20a) both English and Spanish apparently use agentive constructions. They test this hypothesis by asking participants to describe 16 intentional and accidental videos to speakers. The videos show a man interacting with an object and in one version an intentional event is presented and in the other an accidentally event is shown. Results support the predictions: when events are intentional speakers of both languages describe with agentive constructions. On the other hand, when the event was accidental, English speakers prefer more than Spanish speakers to express the event with an agentive construction (74.55% mean in English, 59.61% mean in Spanish).

In summary, studies seem to support the hypothesis that English has a strong bias towards manner and cause by encoding frequently these elements in the main verb when describing motion events. Spanish, on the other hand, tends to conflate verb and path of motion but there are conditions in which manner can be expressed in this grammatical category. These typological differences, explains Slobin (1998, 2004), constrain languages lexically, grammatically, and at the discourse level. However, other studies seem to report that maybe the syntactic and discourse constrains could also affect the lexicalization pattern.

### **3.4 First language development of motion event construal**

Although the aim of the present section is to describe the steps that children undertake in order to develop the adult lexicalization pattern of motion events, it must be clarified that looking at steps and at learning strategies in the acquisition process not only tells us about motion events but about more general theories of first language acquisition. However, the scope of this research does not allow us to go into deep detail in this matter. The focus is

how motion event linguistic patterns affect thought. Thus the interest in this section is the description of motion events in children rather than exposing general linguistic theories of language acquisition. However, in the discussion, general aspects of language acquisition theories are addressed. Additionally, although in this dissertation children are tested from age 5, the researcher considers important to describe what the studies find about the development of motion events at earlier stages in order to have the whole picture from when children start to talk about motion events according to the patterns of their language.

The first question addressed in this section is when Spanish-speaking children and English-speaking children do acquire the motion event typology of their languages? This knowledge allows us to establish hypotheses about when the lexicalization patterns of their language could affect thought, the main aim of this study.

It seems well established that children from early stages (from 14 to 17 months) start to produce motion event sentences for English and Spanish (Choi & Bowerman 1991; Ozcaliskan & Slobin 1999). Actually, there is a series of studies carried out by Pulverman and colleagues that demonstrate that children in pre-verbal stages linguistically discriminate between path and manner of motion. This is essential for later verb learning and relational terms for producing motion events' descriptions. Pulverman, Sootsman, Golinkoff, & Hirsh-Pasek (2003) study a young children population from 14 to 17 month-old by using the methodology of habituation task with some cartoons depicting simple manner and path actions. The results revealed that children discriminate path and manner easily. In Pulverman & Golinkoff (2004), a similar study with habituation methodology, the authors study younger children (7 month-olds) before their word learning process starts. And as before, these children were able to discriminate between manner and path verbs. The authors conclude that infants are prepared from very early stages with the necessary cognitive tools for learning motion verbs.

Casasola, Hohenstein & Naigles (2003) also carried out a study similar to Pulverman and colleagues' study with 10 month-old children, following the

same methodology but changing the cartoon figures with videos showing more natural action. These authors obtain similar results (for a detailed description of studies on pre-verbal stages see Pulverman, Hirsh-Pasek, Pruden, & Golinkoff (2006). In conclusion these studies support Bowerman's well-known suggestion that:

“... children are prepared from the beginning to accept linguistic guidance as to which distinctions—from among the set of distinctions that are salient to them—they should rely on in organizing particular domains of meaning” (1985, p 1283).

One of the earliest studies that reports results about early acquisition of motion events in language is Choi & Bowerman (1991). Their aim is to look for answers about how children start to acquire the motion event linguistic system, whether non-linguistic concepts are understood by the child without linguistic interference from input or whether linguistic input and “non-linguistic spatial concept” play a role as Bowerman (1978) and Gopnik (1996) propose. Additionally, they test Gentner's (1982) and Slobin's (1985) hypotheses. The former suggests that specific patterns from the language are present from the first periods in child language, while the latter shows that these patterns emerge slowly, starting from a shared point and later diverging into each language pattern. Choi & Bowerman aim to determine non-linguistic spatial cognition from “the structure of the linguistic input” comparing Korean and English (Korean is a V-language). They observe how motion events are described in each language, and study linguistic expressions from one-word-utterance stage and early word combination. The analysed data come from two English-speaking children, recorded from 1 year-old, and four Korean-speaking children recorded from 12 to 28 month-olds.

At 14-16 months, Choi & Bowerman (1991) find that speakers from both language groups (English and Korean) start to produce words to encode motion concepts. These concepts are similar in both languages (i.e. to ask help to change location, to climb up on a chair, to sit down, etc.). However, the linguistic expressions to encode these concepts are different in both languages. First, English-speaking children produce path prepositions alone (i.e. up, down,

in, out, back, away, etc.)<sup>21</sup>. The first motion particles to appear are *up* and *down*. Children use them for expressing motions in their own bodies. Between 16 to 29 months, these particles are used in other contexts, such as in vertical motions, change of locations, climbing, falling (1991, p 100). At around 17 months, they combine these particles with general purpose verbs (e.g. *go*, *come*) and spontaneous manner verbs (e.g. *walk*, *jump*, *run*, etc.). But from 21-22 months, children increase considerably the number of manner verbs + satellite expressions for spontaneous and caused events (e.g. *push*, *pull*, *throw*, etc.).

Korean children act in a very different way. They prefer to encode caused motions in transitive constructions. Intransitive verbs appear much later than transitive motion verbs. English children differentiate transitive from intransitive sentences without mistakes. These Korean-speaking children acquire manner and caused verb in a much slower pace than English children, and they fail to combine them with path verbs initially. At 17-20 months, English speaking children differentiate manner/caused verbs from path particles.

Although details of Korean's children performance will not be described in this dissertation because the focus is on English and Spanish, it is interesting to show how these V-language speakers behave entirely different from English speakers despite both groups are talking about the same events. English start using path particles alone, in an idiosyncratic way and soon expand their use in combination with manner and caused verbs. Korean children start using cause constructions.

Choi & Bowerman (1991) conclude that the meanings of the first words related to spatial concepts are language specific. Children "are sensitive to the semantic structure of the input language virtually from the beginning" (1991: 117-118). They do not map directly words and non-linguistic spatial concepts, although, as the authors explain, "non-linguistic concepts" play a role; a finding that confirms this hypothesis is the fact that some spatial words appear before others, which means that some concepts are understood before others (e.g. *on*

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<sup>21</sup> These, as the authors explain, has been described in other studies such as Bloom (1973), Gopnick (1980), and Tomasello (1987).



and *in*, words that mark topological relationships are learned first than *in front of* and *behind*, which mark projective relationships).

Berman & Slobin (1994) study narratives in English speaking children from 3 to 9-year-olds elicited from the Frog Story Book. The youngest children, 3 year-olds, already have a quite differentiated vocabulary in motion events. At this age children use between 2 to 12 different verbs per text. These children use manner verbs like *climb*, *fall*, and general purpose verbs combined with particles to express movement (e.g. *get past*, *go away*, etc.). These manner verbs are frequently used with 1 or more satellite (verb particles). Some examples are *climb + down, on, out, over, up, in, up on, crawl + out, over, up, drop +down, off, fall +down, in, off, on, out, over float + off*, etc. (1994:158). When the manner verb production of 3 year-old English-speaking children and Spanish-speaking children is compared, 47 manner verbs in English narratives while there were only 27 in the Spanish one. Therefore, already the manner verb preponderance is clear in English.

With age, English-speaking children show an increment of the variety of motion verbs. They rely less in idiomatic and polysemous verb + particle combination (e.g. “to run away” instead of “to chase”; “to get out” instead of “to escape”). Furthermore, between 4 to 5 year-olds English-speaking children highly increase the production of manner of motion. And although they still use expressions of the type “*get out*”, “*come out*”, other motion elements start to appear in the sentence, like *sources*. By age 5, this element is already present in their expressions (e.g. *The frog got out of his bowl* (5;2), Slobin (1994, p 154). Already at 9 year-olds it is observed in combinations of causation plus manner in the same verb stem like in “*the deer bucked him off*” (1994, p 154).

In relation to cause of motion, English seems to have several ways to conflate it. In one case, different clauses can be produced and causation remains implicit (e.g. “*this owl comes out and the boy falls*”)<sup>22</sup>. Causative relation between separate clauses can be explicitly marked (e.g. “*The boy falls off the tree because the owl came out of the hollow*”). And also, causation and manner are encoded in the same stem verb (e.g. “*There’s an owl in there who bumps*”).

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<sup>22</sup> Examples taken from Berman & Slobin (1994, pp 154-155).

*him down the ground*”). These three forms appear in the data already. However, Berman & Slobin (1994) point out that it is frequent for young children to use periphrastic causatives with the auxiliary verbs *get* or *make* (e.g. “*the dog made the hive fall* (4;4)”). This type of construction is rare in children over 9 and adults, who tend to encode causation, or causation + manner in the verb and construct a transitive sentence (e.g. *he pushed the ball down*).

In relation to other elements of motion events, the authors observe that early children used particles as path prepositions. Also, they produce locatives like *standing on two toes*, *flew out of here*. Furthermore, some examples of bare verbs are already present in the language of 3 year-olds children.

Only two 3-years-old children from the study do not use prepositional phrases. Thus this syntactic element seems available to the youngest. As children develop their language, what seems to change in motion event description is the lexicon-semantic aspect rather than the syntactic one. According to the authors, preposition such as *across*, *towards* and *between* will not appear until the age of 9. Furthermore, the context in which prepositions are used changes with age. The youngest children use these prepositional phrases for building locative constructions, dynamic or static descriptions, while older children and adults use them for building oblique objects.

From 4 to 5 year-olds, some important changes happen. First, children start to produce sentences with double locative trajectories, encoding source or goal: VERB + PARTICLE + PREPOSITIONAL PHRASE (e.g. *he climbs back up +on the log* (4;7), 1994; p 161). Furthermore, from 5 years old, chains of prepositions are observed (e.g. “*coming from + behind the long*”, 1994, p 161).

In relation to the appearance of path, goal and source, the authors found 3 patterns. The youngest children seem to have more difficulties encoding source and goal in the same conceptual frame. As a consequence they do not produce them together, not even in two sentences sequentially. A period of change seems to occur at around 5, when half of the children use source and goal together. At 9 years of age children seem to use any pattern they prefer. The authors posit that where clause-internal conflation is beyond the online

processing capacities, younger narrators will do so by clause stacking (Berman & Slobin 1994).

Sebastián & Slobin (1994) carry out a similar study to that of Berman & Slobin (1994) with Spanish children from Spain and Latin-America. The main study reports that Spanish-speaking children present poor description of path and manner compared to English-speaking children. Furthermore, manner of motion is rarely encoded. However, with regards to path some developments are observed, and they suggest 3 phases:

1. During the first phase, children produce bare verbs or verbs with a locative expression (*Se ha subido/He has ascended (tree)*, 3;8, (1994, p 262). This pattern is followed by half of the children, and 9 year-olds and adults express motion events in this way. We already know from the discussion in section 3.3 that this characteristic is common in Spanish.
2. During phase 2, some children express more information by using directional locative adverbs. The authors suggest that this characteristic could be either: i) a U-shaped developmental curve in which some children will be motivated to provide more information about path than what it is generally available in the input. Children would use redundant adverbs reinforcing the meaning of the verb, “such uses suggest that these children feel a need to “reinforce” the directional meaning inherent in the verb of motion” (1994, p 264); or ii) the expression of locatives would be an earlier phase, observable only in some children.

Sebastián & Slobin explained that the U-shaped developmental curve hypothesis is more likely because between 4 to 5 years of age children go through an increment in the use of directional adverbs (such as *arriba/“upwards”, abajo/‘downward’, dentro/‘inwards’, encima/‘topwards’*). This is not observed in the language of 3 year-old children. The use of the directional adverbs substantially decreases in the older age groups studied (9 year-olds and adults). The author suggest that further research is necessary in this regard (1994, p 263).

3. During phase 3, the authors observe two major changes in children from 5 years of age. The first one is the increment of the production of directional adverbs already mentioned above. Secondly, there is an increment in the production of locatives specifying source or goal. This increment is not high, but compared to younger children it shows an important change. Additionally, in this phase it was observed that expressions of static locative descriptions increase, which makes motion event descriptions closer to adults.

As it is explained in section 3.3, Spanish speakers pay more attention to the setting of the stage. Path verbs indicate a general change of location, and these verbs, added to the description of the setting, will allow the speaker to infer the motion event involved. According to the authors, this narrative style is crucial for where speakers allocate attention when talking about motion events.

Ozcaliskan & Slobin (2000) carry out research in which English-speaking and Turkish-speaking children from 3 to 10 year-olds and adults are studied. They analyse the production of path, manner, satellite, neutral verbs (e.g. go, move, etc.) in three scenes from the *Frog Story book*. These scenes show a frog's scape, a bee's chase and a dog's scape.

The results indicate that there are changes among the different ages in both languages. First, the production of path verbs alone among English speakers is low, around 10%, in the groups of 3 to 4 year-olds (henceforth, 4-5) and in the group 5 to 6 year-olds (henceforth, 5-6), but it decreases in the 9 year-olds group. In the Turkish group the production of path verbs is much higher from the beginning. This group behaved like speakers of V-language (45% to 40% between age groups 3-4 and 5-6 respectively). This percentage decreases with age (30%). With regards to the production of manner alone, speakers of Turkish and English behave very similar. The percentage is very low (below 15% in both age groups 3-4 and 5-6) and it decreases even more with age. However, as expected, the production of manner verbs + satellites is very high in the first two age groups, although it decreases in 9 year-old children. The same happens to *neutral verbs + satellites*. This constitutes the second most frequent type of construction in children. All age groups produce then in around a 25%, but it decreases enormously in adults (below 10%). The big change was observed in

the use of verbs that conflated manner and path together, such as (*chase* and *escape*). This construction is used 18% of the time in age group 3-4, 24% in age group 5-6, 36% in age group 9-10, and 44% in adults.

Thus, in this analysis in which path events are salient, as children's vocabulary grows and gets more complex, they start to replace *manner + satellite* and neutral *verbs+satellite* for single verbs that can express manner and path together. The oldest group of children from both languages use *manner+satellite* and *manner/path* single verbs almost in the same frequency.

The main focus of Hohenstein's (2005) study is to test the linguistic relativity hypothesis in motion events in Spanish and English children. In one of their experiments they analyse children's lexical tendencies and whether these tendencies reflect the languages' typologies in a verb learning task. Children hear a novel verb inserted in manner frame or path frame sentences. Then, 2 videos appear; in one they show a path-match; and in the second one, they show the video with a manner-match. Children choose the video matching the novel verb.

Fifty participants perform experiment 2 (3;05 years old children and 7;00 years old children). Children's eye movements and their responses are recorded. Results reveal that 7 year-old children start to resemble adults as in Naigles & Terrazas (1998) study. That is, Spanish-speaking children at 7 follow the path interpretation with manner frames more than English-speaking children do, meaning that they follow the lexicalization patterns of their language. The lexical patterns of the language (path preference and manner preference) do not seem to affect the process of new verb learning for 3 years old children speakers of English and Spanish. They only use the sentence frame as a clue for matching the novel verb. Interestingly, 7 year-old English-speaking children do not prefer the manner interpretation in path frames more than Spanish-speaking children. This seems to suggest that this is the beginning of the effect found in adults by Naigles & Terrazas (1998). According to the authors, children have to learn first the language-specific syntax of their language and secondly, the language-specific verb-lexicalization pattern (2005, p 596).

Interestingly, in some studies reported by Hohenstein, Naigles, & Eisenberg (2004), Hohenstein & Naigles (1999, 2000) it is shown that early differences found in the use of motion verbs not necessary imply that the lexical semantic differences between Spanish and English are generalized. Apparently, the generalization emerges in their data at the age of 7 and only for Spanish speaking children, leaving the question of whether lexical semantic characteristic in English-speaking children appear much later. In conclusion, Spanish and English children differ from very early in their use of path and manner verb constructions.

Language-specific patterns can be established quite early, as shown in the work of Choi & Bowerman (1991) on very young children's differing spatial concepts in Korean and English. However the whole language pattern system of motion event does not seem to be fully developed before the age of 7 or 9 years old.

### **3.5. Motion events and bilingualism**

As it was explained in Chapter 1, in this research we are also studying second language users (L2-learners). Cadierno (2008) explains that there are not many studies that look into motion events in L2-learners compared to monolingual's studies. In Chapter 1 we already explained the importance of L2 acquisition for the Whorf hypothesis. Thus, in this section we wish to describe the main studies that analyzed motion event in speakers that know two languages. We expose research that show cross-linguistic influence from L1 and L2, and explain the characteristics of this influence. Due to the great numbers of studies, we describe mainly works done in English and Spanish, with the occasional reference to other languages as well.

Research on motion event expressions has shown that a L2 can be affected by the characteristics of the L1 in motion events. But also that L2 might influence L1. This would mean that the conceptualization of motion event could be more permeable, dynamic and less static than previously thought. For example, Navarro & Nicoladis (2005) study the free descriptions produced by 10 high proficient adults, native English speakers, learners of Spanish. Results showed that participants described motion events following the Spanish pattern (path

verb tendency), but inserted in an intransitive sentence with a post-verbal phrase which is more typical in English than in Spanish.

In another investigation, Cadierno & Ruiz (2006) compare motion event expressions selected from Spanish narratives elicited by 48 participants. The authors compare 3 groups: 1. native speakers of Danish (a manner language) learners of Spanish; 2. native speakers of Italian learning Spanish (two path languages); Spanish speakers with no knowledge of Danish. Bilinguals had high proficiency in Spanish. Therefore, authors hypothesized that Danish, a typologically different language from Spanish, would affect motion event expression in the L2, i.e. Spanish. Generalizing, the results show a partial effect of L1 in L2 only in Danish speakers. That effect is observed by the presence of high numbers of ground specifications and in the production of ungrammatical sentences, structures not present in the Italian-speaking group. The authors conclude that the effect of L1 on L2 in advanced learners is limited, and probably more evident in learners with lower proficiency levels.

In their study, Larrañaga, Treffers-Daller, Tidball, & Gil Ortega (2011) also analyze the effect of L1 on L2 acquisition, and how positive and negative evidence (the implicit or explicit information obtained by learners about the language being acquired) could affect the acquisition of motion events. According to the authors learning to express motion events is not an easy task. Despite the general rules about what type of verbs encode motion event concepts there are restrictions like the types of PPs, adverbs, gerunds, etc. that must accompany each lexical item. For instance, learners must learn the boundary crossing restrictions in Spanish. This difficulty for L2 learners is also suggested by (Slobin 2006b). Furthermore, Larrañaga et al. (2011), citing Morimoto (2001) explain that learning the constraints imposed by two different types of manner verbs in Spanish is another difficulty which speakers must confront. As far as we know, this is the only study that explains a difference between manner verbs in Spanish. The original study from Morimoto is in Spanish, and probably for that reason it hasn't yet been described in many studies. According to Morimoto (2001), Spanish has *internal manner* of motion verbs ("verbos de manera de moverse interna") in which the way of movement is autokinesthetic or reflexive (2011) (e.g. *patear*/to kick), *bailar*/ to dance).

These manner verbs apparently do not appear with grounds or trajectories. The second type of manner verbs is called *external manner* of motion verbs (“verbos de manera de moverse externa”) which includes verbs such as *correr*/to run, *caminar*/to walk, *volar*/to fly. These manner verbs can be followed by trajectory elements and paths PPs. Also, they “express an element of displacement”. According to Philips (2003) (cited by Larragaña et al. (2011)), you need negative evidence to learn this difference between manner verbs. Larrañaga et al. explain that according to her knowledge motion verbs are not a commonly studied subject in Spanish classes. This makes the task of acquiring motion events more difficult. The aim of Larrañaga et al. is to study whether the L1 of native English-speakers from the UK affects their acquisition of Spanish, i.e. their L2. They show a bank robber story to 68 students of Spanish with 3 different levels of proficiency in Spanish. Participants narrate the story they watched in Spanish with no time limitations. The study is focused on boundary crossing verbs. Results show similarities between students with proficiency levels 1 and 2 (36.8% and 42% of path verbs, 26.3% and 26.3% of manner verbs, and 31.6% and 26.3% of deictic verbs respectively). Some participants just describe static expressions, although the percentage is below 3% and it decreases with proficiency. The authors do not find a significant difference between the 3 levels of proficiency in relation to the use of path and manner verbs. All participants use more path verbs, although participants from proficiency level 3 used a little more. They explain that probably learning this lexicalization pattern for English speakers is easy because English already possess some similar Latin verbs in its vocabulary. Another finding is that participants from levels 1 and 2 instead of encoding manner in the satellite, as Spanish do, they place path and locative information in that sentence position, which seems a transfer from English patterns. Even some participants at level 3 still follow this pattern. Finally, many participants do not seem to know the boundary crossing restriction from Spanish, as they use some manner verbs instead of path. In some cases, they seem to literally translate from English. Larrañaga et al. (2011) explain that this contradicts Cardierno’s (2008) finding; however, they offer an explanation. Cardierno’s studies are focused on Danish as L1 which does not have Latin verbs as English. Latin verbs act against the learning process of motion events as well. Although it facilitates the acquisition of path verbs, it also makes learners to over-transfer due to the apparent



similarity between the two languages. The authors conclude that due to the lack of negative evidence, the acquisition of motion events even at higher levels of proficiency is not successful.

Other studies on motion events have also shown that L2 can affect L1. Hohenstein, Eisenberg & Naigles (2006) study bidirectional influence of L1 and L2 in bilingual Spanish-English adult (native speakers of English). Bilinguals are categorized as early bilinguals (before or from 5 years of age) and as late bilinguals (from 12 years of age). Participants describe previously watch videos. Path and manner elements in the whole sentence are studied. Results show that when performed in Spanish participants preferred path verbs over manner verbs. The opposite performance is obtained when participants perform in English. However, when both groups are compared to English- and Spanish-monolinguals<sup>23</sup>, it is observed that in Spanish, bilinguals produce more manner verbs than monolinguals; and likewise, in English, bilinguals produce less manner verbs than English monolinguals. Therefore, lexically, bidirectional effects of L1 on L2 and from L2 on L1 are observed. However, grammatically, the biggest differences are observed when bilinguals perform in English by producing sentences and elements typical from Spanish. Therefore, an effect of L1 on L2 is observed. When the effect of AoA is analysed, the authors only find a lexical effect of L2 on L1 in early bilinguals (i.e. Spanish sentences have less presence of path verbs). However, in late bilinguals, a bidirectional effect is observed, not only lexically but also grammatically.

Another study on Spanish-English bilinguals is carried out by Filipović (2011). The author studies how balanced bilinguals remember and describe complex motion events. Although by testing memory the study's main aim is to test the LR hypothesis, the author reports results from a description task in a section.

Filipović tests 30 monolingual speakers of English, 30 monolingual speakers of Spanish, and 20 Spanish-English balanced bilinguals. A total of 66% of the bilinguals are descendant of Latin-Americans and 34% are white Caucasians.

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<sup>23</sup> Hohenstein et al. (2006b) compared their results with results from Spanish- and English- monolinguals obtained by Naigles et al. (1998) in a similar study. Therefore, the comparisons with monolinguals described above come from this study.

They are all early bilinguals. Participants watch series of two videos, each showing a person performing 2 or 3 different manners. A group of participants are asked to describe the videos in English and in Spanish. The results show that when bilinguals describe videos in English they use more manner verbs (per type and tokens) than when performing in Spanish. Furthermore, bilinguals produce more manner verbs than their Spanish peers. When bilinguals describe videos in Spanish they mainly use path verbs. However, these bilingual speakers produce more expressions of manner than Spanish monolinguals but significantly less than English monolinguals. This is suggesting cross-linguistic transfer from Spanish to English. The author proposes that the Spanish preference could be explained by a predominance of the Spanish language in bilinguals, who speak that language at home and with family and friends.

Brown & Gullberg (2010) scrutinize all the possible expressions of path of motion in second language learners, focusing on the effect of L2 on L1. Adult native speakers of Japanese learning English (with intermediate proficiency level) are compared to monolingual speakers- of Japanese, and of English. Although the study also analyzes motion events in monolinguals' groups, we report results from bilingual speakers. Probably the most interesting finding is the effect of L2 on L1 even at intermediate proficiency of English. Second language learners use in their L1 a mixed strategy to path lexicalization: a presence of path verbs, typical in Japanese, but also a high use of path adverbial, more typical for English. Furthermore, they produce a high number of path expressions inside the clause, even more than any monolingual group. The authors conclude that not only L2 but also L1 seems to be restructured even at modest levels of proficiency.

The same authors publish another article (Brown & Gullberg (2011)) that looks into more detail at the cross-linguistic transferences between L1 Japanese learners of English, obtaining the same general result from 2010. They focus their study in the production of path of motion and its components: source, via, goal. The methodology is similar to that from the 2010 study: the proficiency level of second language learners is intermediate; and the data is collected from narrations elicited after looking at the Canary Row cartoon. The results show that in certain aspects Japanese learners behave differently from monolinguals

of their language, which makes the authors to conclude that the L1 is restructured as an effect of learning a second language at modest levels of proficiency, in the same way L2 speakers differ from the monolingual pattern of their second language.

Other research using different methodologies also seems to show the difficulty for even proficient second language learners to master the motion event system of the L2. Many of them find transfer from L1. Montrul (2001), in a study under a generativist approach, shows that Spanish and Turkish learners of English with intermediate level of proficiency find hard to produce the argument structure of the L2 when talking about motion events. Most of the studies describe in our thesis use elicited narration or sentences through videos, but Montrul's (2001) work use grammaticality judgment task and picture judgment task. However, this study also shows the difficulty for second language learners to express motion events as native speakers.

Other interesting studies that also show effects from L1 into L2 are those focused on language expressions and gestures. Both, language and gestures are analyzed as expressing a single meaning. Choi & Lantolf (2008) study English with advanced level of Korean and Korean-native speakers with advanced level of English. Speakers of both languages do present patterns from their L1 in their L2. Similar results are obtained by Negueruela, Lantolf, Rehn Jordan, & Gelabert (2004) in a study of advanced L2 speakers of English and Spanish.

### **3.6. Chapter summary**

The studies described above suggest the following with regards to motion events in languages:

- Sufficient evidence shows that languages can be divided according to how their speakers lexicalize motion event concept (Talmy's typology and Slobin's typology).
- Speakers of S-languages encode manner and cause in the main verb and allow the accumulation of paths in one sentence. This allows the

sentence to conflate different concepts of motions such as source, goal, etc., which makes the sentence more dynamic and full of motion.

- Speakers of V-languages tend to encode path in the main verb while manner is left in the satellite position. The fact that path must be expressed in the verb limits the sentence options of describing more path information. Therefore, speakers of this type of languages tend to provide static descriptions of the scenery in which the event occurs in a way that allows the interlocutor to infer motion information.
- Some studies have found evidence that V-languages have more restrictions when encoding motion events. They allow manner verb conflation but apparently only when the path has certain characteristics.
- Despite V-languages are considered one homogenous typological group, some researchers have found variation within it, concluding that V-languages are not as homogenous as previously thought.
- Spanish is a typical V-language; however, it allows manner verb conflation in some circumstances, according to the following constraints: 1. The boundary crossing constraint; 2. The telicity constraint; 3. The endpoint/trajectory constraint.
- English speakers behave like speakers of prototypical S-language. However, Slobin finds that inside the group of S-languages the frequency of manner verb selection can vary and it seems that syntax imposes some restrictions.
- In relation to causation, speakers of V-language tend to express path while causation is encoded in satellites or expressed it in different sentences.
- In conclusion, some authors suggest that in terms of manner or path description in languages it would be more appropriate to talk about a continuum instead of a dichotomy.
- In relation to language acquisition, it seems clear that children differentiate path and manner concepts from very early stages, in pre-verbal periods. According to studies, children apparently learn first the syntax of their language and later the verb-lexicalization pattern of their language. When the verbal period starts, English and Spanish children differ in the amount of production of manner and path verbs.

- English and Spanish children seem to follow quickly the pattern of their languages, although some concepts are acquired earlier than others. Initially, it is observed that many idiosyncratic structures are used. Little by little the child starts to encode more motion elements in his/her language, particularly English speakers, whose language encode more locatives and directional elements than Spanish.
- Studies reveal that there is an important change at around 5 year-olds in both languages.
- And later, at 9 year-olds, another important jump towards the adult system happens.
- In relation to second language acquisition, what seems clear is that the acquisition of motion events of typologically different languages presents some difficulties to learners. This happens independently of their age of acquisition and proficiency. Many studies show evidence of transfer from L1 on L2, and others present bidirectional effects.

## **Chapter 4. Studies on linguistic relativity and motion events**

### **4.1. Chapter overview**

This chapter provides an overview of recent cross-linguistic investigations of linguistic relativity and motion events (specifically, about manner, path and causation components) in monolingual and bilingual speaking- adults and children. We focus on studies on English and Spanish because these are the languages under investigation in this thesis, although we refer to studies involving other languages as well when necessary.

The chapter is divided in two main sections. One section describes studies investigating motion events and linguistic relativity in adult and child monolingual speakers. The second section describes studies about the same topic but in bilingual speakers. Finally, a chapter summary is offered.

### **4.2. Studies on linguistic relativity of motion events in adult and child speakers**

#### ***4.2.1. Linguistic relativity in adult monolinguals***

Despite the fact that differences between S-languages and V-languages in dynamic motion events constitute an excellent case for analysing the linguistic relativity hypothesis, the few studies that are available present contradictory results.

Some of the first attempts to measure the effect of language on cognition show the disadvantage of measuring this effect through the analysis of linguistic performance. In these studies, non-linguistic cognition is not really separated from language, and conclusions could be misleading (see, for example, Slobin's studies on language mental images in the previous chapter).

More recently, researchers have been tackling this aspect and producing studies with more appropriate and testable predictions of the linguistic relativity hypothesis by specifically analysing non-linguistic cognitive processes such as perception, categorization, and memory (Cook & Bassetti (2011); Hohenstein (2005); Pourcel (2009)).

One of the first studies that tests language influence on cognition in motion events is Gennari, Sloman, Malt & Fitch (2002). In this study, the authors explore the effect of language on non-linguistic cognitive functions by analysing the language encoding of motion events in speakers of English (S-language) and speakers of Spanish (V-language), and by studying predictions proposed by four different theoretical approaches (universal approach and language-based approach: strong language-based approach, the weak language-based approach, language-as-strategy view). The universal approach, based on the work of Jackendoff (1986, 1990) and the studies of language typologies (Greenberg 1966 and Comrie 1981), proposes that conceptual structures are universal across languages. Therefore, speakers of different languages should not differ in terms of concept, only in linguistic terms. The language-based approach, based on proposals from Whorf (1956) and neo-Whorfian's researchers, claims that language can "be part of speakers' conceptualizations of experience" (Gennari et al. 2002, p 50). Within this approach, two different sub-hypotheses are proposed. The strong language-based hypothesis, which refers to the LR hypothesis (Levinson 1996a, 1997; Lucy 1992b, 1997), would predict that language specificities shape thought, that is to say, they shape how the world is viewed and processed. The weak language-based hypothesis refers to Slobin's *thinking-for-speaking hypothesis* (explained in Chapter 2). Finally, the language-as-strategy hypothesis claims that language would affect individuals' process of thinking in certain tasks that require this tool (i.e. language) in order to be solved. In the study, cognition is assessed with a recognition memory task and a similarity judgment task, each measuring memory and categorization respectively.

Participants perform two non-linguistic tasks: a recognition memory and a categorization task in three different conditions, and different groups of subjects

participated in each condition. In the first condition, a group verbally describes the stimuli prior to the recognition memory and categorization task; in the second condition, a second group only see the stimuli without describing them; and in the third condition, another group see the stimuli while repeating nonsense syllables (i.e. researchers tried to avoid the use of language while watching the videos). After finishing this section, participants do a memory recognition task (i.e. whether they see or not the video) and later a similarity judgement task, in which they watch triads of videos and have to make similarity judgements based on shared path or manner attributes of scenes they have just seen.

According to the strong hypothesis, the memory task and the similarity judgment task should replicate the characteristics of the language specificities. Spanish speakers should pay less attention to manner than English speakers.

Weak Language-based hypothesis predicts that language would affect perception and conceptualization only after linguistic encoding of motion events videos. This hypothesis would be confirmed if English speakers do not differ between task performances (i.e. recognition and similarity judgement) in the verbal and the non-verbal conditions because both manner and path are encoded in the language; while Spanish speakers should differ in task performances in both conditions (verbal and non-verbal) because they pay less attention to manner. Spanish speakers would not differ in their preference for path or manner in the recognition memory task. They may display a language effect in the similarity judgement task after linguistic encoding, but not after non-linguistic conditions.

Fifteen native speakers of English and 15 native speakers of Spanish with knowledge of English perform a pre-test in which they have to perform a similarity judgement task of the experimental videos in order to measure whether speakers of these two different languages differ in their categorization preferences. This test is used as a baseline for the study, and its results reveal that English and Spanish speakers do not differ in their preference for path or manner. English speakers actually find path component more relevant (mean proportion, 0.61) than Spanish speakers (mean proportion, 0.51).



For the main study, 47 monolingual Spanish speakers and 46 monolingual English speakers are tested. Results from the non-linguistic tasks showed that English and Spanish speakers do not differ in their performance, except for the group that do the naming task first, i.e. first condition. In this condition, English and Spanish speakers behave significantly different in the similarity judgement task. That is, Spanish speakers pay significantly more attention to path than English speakers. According to the authors, their study supports the *Language-as-Strategy hypothesis*, which they define as the use of language as a strategy to facilitate the resolution of more difficult tasks. The fact that speakers previously describe motion events using their language constrains facilitates the task of solving a more difficult task, the judgment about similarities. Additionally, the fact that the similarity judgement task, and not the recognition task, shows effect from language suggests that the former is strongly influenced by the previous encoding and the linguistic differences.

This study is not exempt of critics. Filipović (2011) argues that Gennari et al. (2002), do not properly elicit motion verbs. The stimuli used in their experiment do not show a difference in how the figure moved only making path of motion salient. “For example, in the videos of a man dragging vs. a man carrying a log out of the room, the movement of the agent (the man) is always the same (walking) but what changes is how the inanimate object is handled, which is not relevant for the manner of motion of the agent” (2011, p 4). This could explain the high attention to path over manner among these speakers. Kersten et al. (2010) also point out that the non-effect result obtained in Gennari et al.’s study could be explained by the fact that English speakers had to decide between manner and path in the similarity judgment task, and both motion events components are important for this language. English encodes mainly *manner verb + path preposition*; thus, path is always present. As we detail in the subsequent lines, Kersten et al. try to avoid this components’ competition in their experiments.

Despite this criticism, Finkbeiner, Nicol, Greth & Nakamura (2002) find similar results, concluding that language is used in non-linguistic cognitive tasks where working memory is required, such as in similarity judgment tasks. The authors

carry out a study in which the cross-linguistic differences between speakers on motion event are studied in a similarity judgment task with novel events. In the first experiment, 23 Spanish speakers recruited at a university in the United States (we assume that they have at least some knowledge of English), 21 English monolingual speakers, and 17 Japanese-English bilingual speakers observe a target animation in 3D followed by two variants (one variant changes the path, but preserves the same manner from the target and the other variant presents the opposite pattern). The animations perform motions that are not easy to label in the participants language. This would avoid speakers using language during the task. Results from the non-linguistic task are similar to the language specific patterns. However, authors suggest that it is possible that participants are using language in order to better remember the scene. They base this assumption on studies that show that people improve their memory processes when using language (Bower, Karlin, & Dueck 1975, Zelinsky & Murphy 2000).

Subsequently, the authors perform a second experiment in which language is suppressed. In this way there is no working memory active that could lead to the use of language. Twenty-four monolingual speakers of English participate in the non-memory task, and 39 perform the task in the memory version. For the first task, stimuli from experiments 1 are used but target and variants are presented simultaneously, while in the memory task the target was presented first, followed by the two variants. Participants who perform the memory version choose manner frames more than 80% of the time. On the other hand, in the non-working memory task, manner frame selection is close to 50%. This second experiment requires close perceptual analyses of the stimuli from participants and results reveal that the selection of manner frames is much higher when memory is involved in the experiment than when it is not. The authors suggest that the observed effect in the similarity judgement task is the use of language, which is required in working memory for performing the task. Thus, these tasks are probably not language-free.

Pourcel (2009) makes two main criticisms to this study that could question the findings. First, Finkbeiner et al.'s (2002) stimuli are based in non-human motions - just virtual, imaginary motion with imaginary figures. Therefore, the

attention could be different in stimuli of this kind. Secondly, the second experiment in which language is suppressed is only performed by English speakers. Although participants perform two tasks (a memory and non-memory task) in order to established comparisons, both are carried out in speakers of the same language (i.e. English). Thus, there is not a cross-linguistic comparison. Under the condition of this experiment, we do not know how Spanish and Japanese speakers would have performed.

Similar hypotheses are proposed by Papafragou and colleagues, who have dedicated a great deal of research on linguistic relativity and motion events between English and Greek, a V-language like Spanish. Papafragou, Massey, & Gleitman (2002) study whether linguistic representations and processes affect non-linguistic cognitive functions, such as memory and categorization.

A new assumption proposes by Papafragou et al. (2002) is the possibility that English, which is usually associated with a manner salient language, could pay more attention to path. This proposal makes authors to consider two hypotheses: 1) what makes speakers of English and Greek to pay attention to different aspects of motion events lies in the privilege of encoding path (i.e. in Greek) or manner (i.e. English) in the verb position, considered by the authors as the “informationally privileged element”; 2) but on the contrary, if the *Attention hypothesis* formulated by Talmy (1985) and his concepts of foregrounded and backgrounded are considered, English speakers could pay attention to path more than manner, because this path is always mentioned independently in sentences, and its meaning is not amalgamated in the verb. Therefore, S-languages might also be sensitive to path. If a significant difference is found in Greek and English in the cognitive tasks in either direction it can be assumed that language affects non-linguistic cognition.

Papafragou et al. (2002) tackle the following questions: 1) Do English speakers and Greek speakers talk differently?; 2) If both languages encode path and manner differently, does it affect memorization and categorization of motion events in speakers? The linguistic-relativity prediction will be accepted if the differences observed in English and Greek languages are systematically observed in how people attend and process path vs. manner in these non-

linguistic tasks. If no difference is found, linguistic relativity is rejected; 3) Are non-linguistic cognitive functions affected by the time of exposure to a language? Do children differ from adults? The authors hypothesize that because children need to pass through a process of enough exposure to lexical patterns and to learn the typical contexts of use, the authors expect to observe more clear differences between path vs. manner between adults than between children; 4) Because of the same process of learning, children should differ progressively over age. This study is therefore innovative because not only it investigates conceptualization of events in adults, and additionally it seeks for answers about when such language influence on thought appears in children, and when it starts to develop.

The stimuli of the study are 6 static pictures in black and white representing actions. Two of them do not yield motion events and were discarded by the authors. Two different types of experiments are run. English speakers and Greek speakers are divided in three different age groups: young children (mean age around 5;8); older children (mean age around 12;0); adults (mean age around 26). In Experiment 1, subjects have to perform two tasks: i) subjects describe pictures of motion scenes before participating in the experiment. ii) Two days later, they answer whether the pictures are the same that they have seen before or not (recognition task).

Results from the first task (linguistic description) show a significant difference between language groups, but there is no difference between age groups. That is, younger children speakers of Greek do not differ from older children and adults, speakers of the same language. The same is observed among English participants. Greek speakers describe scenes with more path verbs while English speakers prefer to encode manner verbs. For the recognition task participants are 22 Greek-speaking (range 7;2–9;2 years old) and 14 English-speaking (age range 7;5–10;00) children. The second group is formed by 21 Greek-speaking adults and 20 English-speaking adults. The same subjects participate in both experiments. Results do not show significant differences between English and Greek speakers. Additionally, there are no differences among ages.

The first experiment shows some limitations, i.e. the number of stimuli. Thus the authors run a second experiment, a categorization task, in which stimuli are increased from 6 to 8 items, and the pictures are changed to colour photographs. Subjects see a target picture, and two variants in which path and manner are changed with respect to the target (similar to the similarity judgment task performed in Gennari et al 2002). Participants judge the similarity of the photographs to the target picture. After this task is over, they describe each scene verbally. In this task, the age groups are reduced to two: older children and adults. Results show that Greek- and English- speakers linguistically express differently manner information. Additionally, this difference increases with age. However, categorization of the visual stimuli does not differ across language or across age group.

The analysis of the verbal task shows that English speakers use much more manner verbs compared to Greek speakers. Adults use more manner verbs when describing the sample photographs than children do. The authors suggest that the age effect is due to English speaking children, who increase their preference for manner verbs across age. And this can be explained by the limited size of lexical path verbs in these children's vocabulary. There is already a predominance of path verbs in Greek children.

The authors conclude that results are against the strong Whorf interpretation of language. When the tasks are linguistics, the speakers of different languages show more differences in their performance. However, these differences disappear when the language is left aside in the experimental tasks. They conclude that there is independence between non-linguistic and linguistic representations.

Papafragou et al. (2002) have been largely criticized for several methodological issues that could have affected results. First and most importantly, in all the experimental tasks the authors measure motion events with static pictures. It is plausible to consider that motion events in fact are not measured (Hohenstein 2005, Kersten et al. 2010, Pourcel, 2009). Secondly, Hohenstein (2005) indicates that in Papafragou et al.'s investigation, participants do not have a

time constraint for looking at and responding to the task, which could have distracted participants from the main objective.

Acknowledging the critics done to Papafragou's et al. 2002, Papafragou & Selimis 2010 replicate the same study but re-designed their stimuli using dynamic motion events. Thus, the investigation likewise studies the effect of language on memory and categorization in English and Greek, and tests the same hypotheses.

Three experiments are run in English- and Greek-speaking adults and children. The first one is a similarity judgment task similar to the one designed by Gennari et al. (2002) and Papafragou et al. (2002). Child participants are 10 native English-speaking children (aged 4;5 and 5;7) and 10 native Greek-speaking children (aged 4;5 and 5;10). Adult participants are 10 native speakers of English and 12 native speakers of Greek. Participants watch animated motion clips showing everyday actions that involved change-of-state (resultative or telic) events. They first watch a target video and they hear a sentence saying: "Look! The turtle is doing something!", and its equivalent in Greek, and then the two variants. At the end of the task, subjects watch the videos again and verbally described them.

The linguistic task reveals that speakers perform according to their language patterns. There is a difference between language and age. That difference is observed among the English speakers. While Greek adults and children select manner verbs in same proportions, English children produce less manner verbs than English adults.

In the similarity judgment task, the authors find that English speakers prefer same-manner choices much more than Greek speakers. The results seem to support the linguistic relativity hypothesis. However, the authors suggest that the observed effect could be the result of a "transient effects" product of the verbal instructions and the descriptive task during the experiment instead of a language effect on cognition. Consequently, they design two other similarity judgment tasks in which the linguistic instructions are changed. In both tasks

the linguistic instruction is merely: Look!, in Greek: Kita!. The same videos from experiment 1 are used and participants do not perform the linguistic task.

The third experiment is similar to the second one. It only varies in that the triads of videos are presented simultaneously. They test 20 children. Ten are Greek speakers and the other half are English speakers. Additionally they test 20 adult (10 Greek speakers and 10 English speakers). The test ages are similar to previous experiments. Subjects do not perform the linguistic task. The results do not show any effect from language.

The authors find that conceptual categorization is not affected by language particularities. Their results are inconsistent with the linguistic relativity hypothesis. The attention to path or manner is task dependent. Linguistic labels are used by participants to solve the categorization task. The use of language is, therefore, a temporary strategy that participants can implement to solve non-linguistic tasks, and is not a reorganisation of cognitive representation of motion due to language characteristics.

Papafragou, Hulbert, & Trueswell (2008) test the LR hypothesis and the *thinking-for-speaking* hypothesis (they also called it “a modest influence from language on thought”) by using an online task (i.e. monitoring eye-movements to event elements) in Greek speakers and English speakers. According to these authors, the study of the linguistic relativity hypothesis has shown to be difficult to demonstrate, and controversial. Secondly, most of the studies have been based on offline experiments. Therefore, there is no evidence of what happens actually when a speaker perceives motion events, and whether this online event is connected with language characteristics for encoding motion events. The authors test: i) whether English speakers are more likely to focus on manner of motion earlier and more consistently than Greek speakers in linguistic and non-linguistic tasks; ii) whether event perception is independent of language or not.

The authors perform an experiment in which speakers’ eye-movements are recorded while preparing to describe dynamic motion events in one condition, and preparing to perform a memory task, in the second condition. For the experiment, 17 native English speakers and 17 native Greek speakers watch 12

three-second videos of an unfolding event, which freeze on the last frame of the video. Speakers then have to either describe the event or inspect the image for the memory task. It is necessary to draw attention to two aspects: 1) Greek speakers are students recruited in a US university, which seems to imply that they should have at least some knowledge of English, and therefore are not monolingual speakers; and 2) the test stimuli involve instrumental motions (e.g., skating, sailing, skiing) in order to make the eye-movement analysis easier. However, the instrument is a new element involved in the motion event, and we do not know up to what point speakers are attending to manner of motion or the instruments.

Results show that Greek speakers and English speakers perform differently during the observation of events in the linguistic task by allocating attention to the areas in accordance with their language. Interestingly, this happens only when the languages differ in relation to the information encoded in the verb. That is, in the case of boundary-crossing events. In the non-linguistic task, during the observation of the events, previous to the frozen image, the language groups do not differ in their allocation of attention. The authors point out that “This overall preference for inspecting path endpoints could reveal a principled asymmetry in event apprehension; endpoints and other stable reference objects are necessary for defining a motion event...” (2008, p169). However, later in the memory task differences emerge between both language groups. In this case, Greek speakers do not show a particular preference for attending manner or path regions while English speakers focus on the path-endpoint (the reference endpoint in the image that was analysed as path). The authors conclude that motion events do seem to be perceived differently depending on observer’s goal. If they are preparing for speech, their attention focuses on the elements necessary for encoding the information in their language, otherwise, language does not interfere. Kersten et al. (2010) suggest that there is a problem with the procedure of the task, because speakers make their decision by inspecting a static picture, when the images are frozen. In our opinion, this type of experimental task is questionable because path and manner are difficult to measure independently. Papafragou et al. measure path by speakers’ attention to an endpoint. They assume, by results taken from a pilot study, that when observing paths, participants pay attention to beginnings and endpoints of



motion events. However, this investigation is not reported in their study, and any reference is given. Thus, we suggest that this assumption requires much further investigation; it is possible that speakers are observing manner and path at the time these components are happening as well, and not only at the beginning and at the end (see for example Athanasopoulos & Bylund (2013) who find cross-linguistic differences when they examine focus on ongoingness vs. focus on endpoints in English and Swedish speakers). We think the eye-tracking equipment is not differentiating manner from path because they happened conjointly in most of the same zone. It is our opinion that this type of methodology for measuring motion events, at least in the way it was done by these authors, does not seem to be the most suitable.

Kersten, Meissner, Lechuga, Schwartz, Albrechtsen, & Iglesias (2010) assume that what makes the difference between English and Spanish descriptions of motion events is the frequency of use of manner while path is equally present in both languages. English speakers tend to encode manner and path in their motion event descriptions, while Spanish speakers tend to describe the path and omit the manner. The authors' prediction is that English speakers should pay more attention to manner than Spanish speakers as a result of frequently attending to this motion element for encoding the correct verb form.

In contrast to previous studies, the authors use a different task to measure the effect of language on cognition: a supervised classification task. The assumption is that both English and Spanish languages encode path in their sentences. Therefore, in a situation in which both manner and path components are present and competing in a motion event, speakers of either language could pay more attention to path than manner. This, according to the authors, explains the lack of differences found in Gennari et al. (2002) in which both language groups equally pay more attention to manner. Assuming this, the authors design a category discrimination task in which one of the components, path or manner, is imposed to participants for categorization, and they have to discover what it was. In this task, participants have to categorize four novel objects and events. The experimental design is done in a way that half of the participants rule out the manner of motion as crucial for the task, and therefore, focus on path. In the same way, the other half of the participants rule out the

path of motion as crucial to solve the task, and pay attention to manner. Linguistic labels are used in the first experiment, but number labels are used in the second experiment to avoid linguistic prompt. Three experiments are run. The third one differs from the rest in that participants are bilingual speakers. This last experiment will be explained in this study in the section dedicated to the studies on bilingual speakers. In the first experiment, researchers aim to study attention to novel manners of motion and speakers' capability to generalize in a category-learning task. Participants are 120 native English speakers and 120 native Spanish speakers living in Florida, USA. Participants watch an insect-like creature performing 4 different motion events and they have to decide to which category the event belonged. In a training session, participants receive information about whether the chosen category is correct or not. They choose among 4 buttons, each linguistically labelled with a nonsense word. Once this session finishes, they recognize the category, but on this occasion, the only difference between the 4 movements is the manner of motion. Half of the participants have to select among 4 nonsense verb-like label words, "a verb learning strategy"; while the other half selects among 4 novel nouns. The hypothesis is that English speakers' capability to generalize motion events should go beyond the verb-learning context.

English speakers are faster than Spanish speakers learning novel manner of motion categories. This learning process is observed in the verb learning session and in the noun learning session. This shows that generalization goes beyond the verb category.

The second experiment is similar to experiment 1 in its methodology, but in this case, there are no linguistic labels. Participants are told that their task was to distinguish 4 different creatures based on their characteristics, and buttons are changed by numbers. Path is the characteristic to discriminate in half of the participants, while manner of motion is the characteristic to discriminate in the other half. Any differences in performance between English and Spanish speakers in the manner discrimination task would provide evidence for an influence of native language on non-linguistic cognition, consistent with the linguistic relativity theory. Only monolingual speakers participate in this task: 60 English speakers and 60 Spanish speakers.

Results show that English learn to categorize according to manner more quickly than Spanish speakers. Therefore, this study finds effect of language on thought. Interestingly, speakers of both language groups perform similarly in the condition where path of motion is made salient, suggesting that both language groups pay equally attention to path when manner is suppressed.

Pourcel (2009) presents evidence for the linguistic relativity hypothesis of a study on motion events in native English-speaking adults and native French-speaking adults. But additionally, she examines in detail methodological aspects from different studies in order to seek explanations for the diversity of results in the field of linguistic relativity and motion events. Among the conclusions, the author suggests that there has been a lack of information of how the domain of motion events works. Additionally, motion events have not been consistently studied.

Based on a previous research that examine motion event conceptualization in French (a V-Language) and English (Pourcel 2005), the author points out the necessity to acknowledge that the cognitive saliency of motion dimensions also depends on variables such as figure animacy, path telicity, manner force dynamic, and motion causality, and that they can affect greatly results in an investigation (Pourcel 2009, p 372). Considering these aspects, Pourcel (2009) offers a new study testing the linguistic relativity hypothesis in motion events with a better controlled methodology and better understanding of this domain.

The study seeks to determine whether French and English speakers conceptualise motion events differently according the linguistic patterns of each language; whether they recall differently the events; and whether these speakers make inferences in different ways. Twenty-two English speaking adults and 25 French speaking adults watch the Charlie Chaplin's film *City Lights* and perform a free prose recall. Twenty-four hours later, participants perform a recall condition in which they answered 31 questions related to details of the scenes. Memory and inferences are analysed, and their linguistic answers are compared.

Results reveal a difference in the production of manner. English speakers produce more motion events with this component than the French-speaking group. The percentage of error rates in the speakers' manner or path statements in the recall task verifies that French speakers were worse at manner errors, while English speakers performed better. English speakers are better at recalling manner components while French speakers are better at recalling path components. This study supports the linguistic relativity hypothesis. It shows that French speakers and English speakers memorize in different ways, and that the patterns of their languages affect this process of memorization. Also importantly, it brings evidence that show that differences in the methodology of analysis could trigger different responses in the area of motion events.

Fausey & Boroditsky (2011) is, to the best of our knowledge, the first study that tests effects of lexicalization patterns of causation in motion events on non-linguistic cognition. As we explain in the previous chapter (see Chapter 3), Talmy (1985), in his study of language typology, also observes that Satellite languages differ from Verb languages in the way in which they tend to encode causation of motion events. Satellite languages, like English, encode manner or causation in the main verb, while V-languages tend to focus on path. Fausey & Boroditsky (2011) find an interesting way to confirm linguistic differences between both language types and to study whether these linguistic differences affect non-linguistic cognition by analysing memory. The study is based on the assumption that English differs from Spanish in its preference for agentive sentences, depending on whether it refers to accidental or intentional actions. Spanish, is a language that would use more non-agentive sentences and this characteristic (agentivity vs non-agentivity) is used for distinguishing accidental vs. intentional actions, that is to say, an action in which an agent performs an activity without looking for it and an action in which the agent performs an activity on purpose, respectively.

Two studies are carried out by the authors. One seeks to determine whether English speakers and Spanish speakers verbalize agentive/non-agentive expression differently. A second one investigates whether the specific patterns in encoding agentivity in each language affects speakers' attention and

memorization. For the first study, 68 English adult speakers and 29 Spanish speakers are recruited. By the characteristics of the participant's recruitment, it is understood that although Spanish speakers mainly use their native language on a daily basis, they are also able to speak English. These participants watch 8 videos showing an accidental event (e.g. a man is writing and meanwhile the pencil breaks in half and the man shows a surprise face) and 8 videos showing an intentional event (e.g. a man intentionally breaks a pencil). Then, participants describe the scene.

For the second experiment, 113 English-speaking adults and 109 Spanish-speaking adults participate with same characteristics from participants in experiment 1. Speakers perform two non-linguistic tasks: an "object-orientation memory task" and then "the agent memory task". The first task aim to measure general memory performance independently of language, and answers should not and do not vary across language groups. The second task is designed to test for differences in non-linguistic memory (memory for the agents of events) between English and Spanish speakers. For the agent memory task, participants watch the same events seen in the encoding experiment, but with a different agent. Then, participants watch photographs showing two actors from the encoding experiment and are asked, "Who did it the first time?" and the Spanish version. In experiment 1, English speakers produce an important number of agentive structures independently of the intentional or accidental nature of the stimuli. Spanish speakers, on the other hand, produce more agentive structures with intentional events than with accidental events. Furthermore, English speakers remember significantly more accidental agents than Spanish speakers. In relation to intentional agents, both language groups are equally good. In conclusion, the language patterns match those of the memory performance.

#### ***4.2.2 Linguistic relativity in child populations***

It is not until recently that the development of conceptualisation and categorisation preferences in childhood has been considered within the framework of linguistic relativity. According to the hypothesis, speakers of V- and S- languages will encode, memorise, and categorise motion events differently, but little is known about how and when such effects are observable

in the process of L1 development. Presumably, children must have first acquired their motion event conceptualization and lexicalization patterns for any such effects to occur (Hohenstein 2005, Papafragou et al. 2008), or at least have substantial exposure and input of the typological characteristics of the ambient language. Another possibility suggested by some authors is that the process should be simultaneous (Gopnik 2001).

The development of the lexicalization patterns in motion event is described in the previous chapter in detail. We already know that the process starts from early stages (from 14 to 17 months) and it is still development in 9;00 year old children. Knowing that the motion event language pattern takes a relatively long time to develop, the question arises as to when cross-linguistic differences in non-linguistic cognition, if any, are observable. As far as we know, very few studies have tried to assess these hypotheses developmentally. Papafragou et al.'s (2002) find no significant differences between English and Greek children, leading the authors to reject the LR hypothesis. In Papafragou & Selimis (2010), results from Greek and English-speaking children of around 5 years of age show the expected language pattern differences (English children produced much more manner verbs than Greek children), and a difference in nonverbal similarity judgments only when the instructions contain linguistic cues to help the children make a decision. The authors conclude that in children, as in adults, language particularities do not shape non-verbal cognitive categorization. The observed effect is a transient effect, product of the verbalization task and language instructions.

Hohenstein (2005) carefully studies the same questions of motion events conceptualization and categorization in Spanish-speaking and English-speaking children, finding support for the LR hypothesis. The aim of her study is to analyse how children, from typologically different languages (English and Spanish), develop the observed differences found in adults, in the attention to manner and path elements in motion events. Hohenstein begins by considering that Satellite-framed languages tend to express the manner of a motion event in the main verb. Because the verb is crucial in categorizing, it should, more than any other element in the sentence, influence non-linguistic cognition. If English

tends to express manner in the main verb, speakers of this language should pay more attention to this component than to path (Hohenstein 2005, p 18).

In relation to the developmental issue, English and Spanish speakers should differ in their attention to manner vs. path only after children have acquired the linguistic patterns of their languages for encoding motion events. Spanish-speaking children, as expressed by the author, should not necessarily focus on path, but definitely, should not pay attention to manner as much as English-speaking children do<sup>24</sup>. Additionally, based on other authors' findings (see Bowerman 1994; Sera, Berge, & Pintado 1994), Hohenstein alleges that children from different languages should perform cognitively similarly before acquiring the linguistic feature that should affect cognition.

The non-linguistic cognitive acquisition should be linked to the linguistic acquisition. This is supported by Lucy & Gaskins (2001) who note that English-speaking and Yucatec-speaking children show a developmental pattern in their similarity judgments of objects based on shape or material, but they do not provide analysis of this in relation to specific language developments.

Hohenstein (2005) designs two experiments, in this order: a non-linguistic similarity judgment task followed by two novel verb learning tasks. The similarity judgment task is similar to the tasks done by Papafragou et al. (2002) but the experiment is done on a larger population. Forty-seven children are classified in two age groups: younger children (averaged 3,5 years of age) and older children (averaged 7 years of age). They watch a target video. Then, simultaneously, they watch a manner-altered version and a path-altered version. The child is asked to point to the video that looks more similar to the target one. Children are video recorded and their eye movement fixations are coded. The videos are not labelled linguistically to avoid the linguistic effect reported in Papafragou & Selimis (2010) and in Gennari et al. (2002). Additionally, the non-linguistic task is performed before the linguistic tasks.

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<sup>24</sup> This comment is based on previous studies, in which results do not show a clear preference for path in Spanish-speaking adults. According to Hohenstein and Naigles (1999), this is due to the relatively high use of manner verbs in Spanish in vertical motion scenes (2005, p 19).

Results show that older English-speaking children pay more attention to manner than any other age group or language group. Spanish-speaking children do not show any preference. Additionally, the study reveals that speakers do not respond equally to all types of stimuli.

The second experiment, a learning novel verb task, is aimed to test whether children encode new words according to their language specific lexical typology pattern. Novel verbs are presented in either manner frame condition or path frame condition. Children are presented with both frame conditions and have to identify the referent of the novel verb. Initially, children watch a video three times in which an action (for example, a woman skips toward a tree) is paired with a novel verb they hear (e.g. Look, she's *kradding* the tree). Then, the action is changed to a manner-match (the action shows the same manner but a different path) and a path match (the action shows the same path but a different manner). Children are advised to notice that the videos are different. In total 50 children participate. Only older Spanish-speaking children prefer to match novel verbs according to the lexical tendencies of their language in the manner frame condition.

A particular procedure in this study is that participants perform firstly the similarity judgment task and secondly, the verbal task. Hohenstein (2005) argues in favour of the linguistic relativity hypothesis and discards the hypothesis of interference from language in the non-linguistic task. On one hand, in the similarity judgment task the author uses non-linguistic labels to identify videos in order to avoid in speakers the interference from language during their performance of the task. Furthermore, because the verbal encoding task is done after the similarity judgement task, the author rules out the possible language facilitation effect in responses (Gennari et al. 2002; Papafragou et al. 2002; Papafragou & Selimis 2010). The study also shows that influence from language on categorization begins at around 7;00 years of age, and does not equally affect speakers from both languages. Additionally, results show that only older children begin to prefer to match novel verbs according to the lexical tendencies of their language in the manner frame condition. That is, older Spanish speakers prefer the path interpretation in manner frames more that



older English speakers, but the opposite pattern is not observed in English speakers in path frames.

### **4.2.3 Linguistic relativity and bilingualism**

It is our interest to study monolingual and bilingual speakers. The study of bilinguals who speak languages with different grammatical properties is offering new insight to the investigation of the language affects non-linguistic cognition. How will bilinguals conceptualise if they speak two languages that differ in grammatical properties, properties that would affect cognition differently? Can the acquisition of a second language restructure cognitive processes already influenced by the first language? If so, is this restructuring similar to L2, or different from L1 and L2. Is it a transient or a reorganization of cognition due to the effect of language? Is this observable indistinctively in all domains (e.g. colour perception, time perception, object categorization, motion events, etc.) or are some domains more easily affected, if at all, than others by second language acquisition?

So far research is suggesting that learning a second language might alter individual's cognitive representations and the outcome is variable: in some occasions bilinguals' cognitive behaviour is similar to that of monolingual speakers of their L1; in other cases it is similar to that of monolingual speakers of the L2, but most times it is somewhere in-between (Athanasopoulos 2007, Athanasopoulos et al. 2011). For example, in a study about cognitive dispositions towards different types of entities in Japanese-English bilinguals, Athanasopoulos (2006) finds that advanced bilinguals think in their L2, thus resembling thinking from monolingual speakers of their L2. However, other studies show that bilinguals merge elements from both languages ending up thinking in a unique way, different from their L1 but also from their L2. Studies like Ameel, Storms, Malt, & Sloman (2005) and Cook, Bassetti, Kasai, Sasaki, & Takahashi (2006), among others, support this last hypothesis. However, changes in cognitive processes haven't been observed in all bilingual studies. The extend of the cognitive changes seems to correlate with the acquisition of specific grammatical features and other factors, such as proficiency level (Athanasopoulos, 2006; Athanasopoulos & Kasai, 2008; Boroditsky, Schmidt & Phillips, 2003; Dewaele, 2004, 2007; Kersten et al., 2010), the age of L2

acquisition (Boroditsky, 2001; Boroditsky et al., 2003), length of cultural immersion in the second language (L2) speaking country (Athanasopoulos, 2009; Cook et al., 2006;) and length of language use (Boroditsky et al., 2003, see also Bassetti, 2007), and even the language used for task instructions (Boroditsky, Ham, & Ramscar, 2002; Kersten et al., 2010; Kousta, Vinson, & Vigliocco, 2008).

In the domain of motion events, most of the studies have focused on determining the ways speakers of path languages and manner languages encode motion elements (see in the previous chapter for example, Cadierno & Ruiz, 2006; Navarro & Nicoladis, 2005; Hohenstein, Eisenberg & Naigles, 2006, and Brown & Gullberg, 2010, 2011). However, very little has been done on language effects on non-linguistic cognition.

Recently, Kersten et al. (2010) run 3 experiments (see Kersten et al. 2010 in the present chapter, section 4.2.1) in which one involved the study of bilingual speakers of Spanish and English. The details of the methodology are mentioned in section 4.2.1 in this chapter. In this third experiment, 60 native speakers of English and 240 native speakers of Spanish from different regions participate, all of them are students at US universities. Bilingual speakers, as well as the monolingual speakers from the study, perform the same category discrimination task. Bilinguals are divided in two groups: early bilinguals, participants exposed to their L2 (English) before the age of 6, and late bilinguals, participants exposed to English after the age of 6. Half of the participants performs the task in an English language context, meaning that consent forms, instructions, language used on computers are in English. The other half performs the task in a Spanish language context. Therefore, they measure the effect of language context and language acquisition in the categorization of motion events in bilingual speakers of Spanish and English. Results show a general language effect on categorization, specifically in the manner discrimination task. In other words, bilinguals tested in Spanish context perform worse in the manner discrimination task compared to both English monolinguals and bilinguals tested in English. Interestingly, variables such as context of instructions and AoA play a role in the manner discrimination task. Early bilinguals have better performance than late bilinguals. Additionally, in an

English context, those who acquired English before age 6 behave very similarly to monolingual English speakers in the manner discrimination task. When the language context is Spanish, only early bilinguals differ from monolingual English speakers.

Filipović (2011) also examines the linguistic relativity hypothesis on motion events in English- and Spanish-speaking monolinguals and English-Spanish bilinguals. The methodology used in this study differs from that used in Kersten et al. (2010) but both investigations found similar results. Filipović assumes that if speakers of English and speakers of Spanish are presented with simple motion events, speakers from both languages can perform equally well in expressing and memorizing manner because in both languages a single manner can be expressed: English speakers will encode manner in the verb, whereas Spanish speakers will encode it as a gerund or a phrase. However, if the task requires from the speaker to express and remember complex motion events “the more economical packaging of English and the availability of single lexical items for each manner are expected to facilitate both expression and later recognition for these speakers” (Filipović 2011, p 4). The author expects that by increasing the complexity of manner components the memory load will increase, consequently increasing the changes of effect on language characteristics in monolingual and bilingual speakers. Filipović tests whether bilinguals process and memorise both languages independently of the other, or conversely, whether there is interdependency between processing and memory in this type of speakers. Filipović’s hypothesis is that bilinguals’ performance will depend on the relevant pattern in the language used: it will be like English, when verbalization takes place in English; and it will look like Spanish when the task is done in Spanish. Balanced English–Spanish bilinguals should behave like monolinguals when using each of their two languages. Thus, the author designs an experiment in which 30 participants, monolingual speakers of English, 30 monolingual speakers of Spanish and 30 Spanish–English balanced bilinguals participate. Participants perform a linguistic task, and a non-linguistic task (i.e. recognition task) designed in the following fashion.

Participants watch sets of two video clips: one target and one variant. The target contains what the author called a *complex motion event*; that is to say,

three manners of motion in the same scene (e.g. limping, staggering and marching), in the variant option, only one of the three manners changed. The variant and the target share the rest of the elements (surrounding, figures, paths, etc.). The sets are presented in two blocks. During the first block, some participants describe the videos (i.e. verbalization condition), and other participants only observe them (non-verbalization condition). In the second block participants describe the observed videos and indicate if they watched them in the first block (the recognition task).

Bilingual speakers are divided in three groups: the first group perform the description task in English in the first block and in Spanish in the second block; the second group do the same but in a reverse order; the third group do not describe videos but receive instructions in one of the two languages for each block. The rationale of the experiment is that keeping this design will maintains a balance of both languages in bilinguals (use of one of the language in a block). Additionally, they expect bilinguals to perform the recognition task in bilingual mode (i.e. both languages active at the time of the task, Grosjean 2001).

The results confirm that monolinguals group differed. English speakers describe and memorize manner of motion better than Spanish speakers. According to the authors, this confirms the hypothesis that the expected language-specific effect is going to be more salient when memory load is increased. Additionally, although bilinguals produce more manner expression than Spanish monolinguals, their performance is not significantly different from their Spanish peers while significantly differ from English monolinguals. This difference is also obtained in the recognition task independently of the language used in the experiment.

The bilingual group perform differently from both monolingual groups: “this is exactly the pattern of lexicalization that can work in both languages” (2011, p 15). Additionally, the fact that using English during the first block do not help the first group of bilinguals to focus and better memorize manner is evidence for interdependence, and for a single storage system in bilingual processing and memory.

Finally, Filipović explains that one factor that could have affected results in bilinguals is the fact that the predominant language for these speakers is Spanish. That could explain the skewed results toward the Spanish pattern.

### **4.3 Summary of the methodology and the design**

As we can conclude from this chapter, the main methodologies applied in studies of linguistic relativity and motion events have changed as cognitive science has advanced and the LR studies have refined. In what follow I summarize the main methodologies and explain why we choose ours.

Initially investigation is based on the analysis of thought through language. For example, here we can include studies that collect data from free descriptions, elicited narratives from picture-story books (e.g. Slobin and colleagues research). This methodology is still in use for analysis of language patterns. However, an important change has been observed in the use of videos that allows the use of dynamic motion events instead of static pictures. For example, here we can include the studies of Brown and Gullberg (2010) and Pourcel (2009) which used a Chaplin's film and the Canary Row cartoon respectively.

In order to control variables more precisely and be able to compare language outcomes with cognitive outcomes short videos showing motion events are more frequently used nowadays (e.g. Choi). This brings us to the type of stimuli used in these studies. Research has used pictures, picture-story books, cartoons, 3D animations, real dynamic motion events, motion events culturally salient. Static images have been largely criticized because they do not show the most important aspect in motion events, the motion itself. Therefore, current investigations use dynamic motion events. In some studies cartoon and 3D animations are used (e.g. Papafragou and Selimis 2010, Finkbeiner et al 2002), while others use real dynamic motion events (e.g. Hohenstein 2005, Pourcel 2009). Cartoons and 3D animations have been criticized by some researchers because of their unnatural characteristics (Pourcel 2009). However, some

studies with 3D animations as (Finkbeiner et al. 2002, Kersten et al. 2010) allow to control variables in a more precise fashion.

The studies on LR currently focus on the study of non-linguistics cognition functions that could be affected by language. Two are mostly investigated: memory and categorization. The variation in the methodologies is mainly in how these functions are studied.

The analysis of memory is usually done by recognition tasks. Usually participants watch motion events clips and 24 hour later they perform a recall task (e.g. Gennari et al. 2002). Categorization is mainly analysed by similarity judgment tasks that consists in the reorganization of information according to ,for example, motion events components (see next chapter for a thorough explanation). Thus, the most common task involves showing triads of clips in which path and manner are contrasted and participants must decide in terms of similarity. For example, a triad usually consists of a target clip showing a figure moving in a path X in a manner X; the second clip shows a variant of target by showing the figure moving in a path X but in a different manner; the last variant shows the same figure following manner X but with a different path. Thus, participants have to decide which variant is more similar to the target. Most studies contrast path vs. manner (Gennari et al 2002, Hohenstein 2005, Papagrafou and Selimis 2010, etc.). However, Kersten et al (2010) manage to separate attention in the contrast manner and path. Thus, participants compare path and manner components with motion elements.

In relation to the procedures, the most important aspect is that researchers try to control variables that could affect participants' responses. Probably the most important one is that after the work of Papafragou et al. (2002) and Gennari et al. (2002), is well established that if language is used previously to a categorization task, the former can affect the latter. Therefore, in many research in the area this is controlled by presenting the non-cognitive task first (e.g. Gennari et al. 2002, Hohenstein, 2005). Also, verbal interference has been used. This consists in asking participants to repeat nonsense syllables while performing a categorization task (Gennari et al. 2002). We think that this method is not the most appropriate for children, as we cannot control if the child is performing well the non-cognitive task because of confusion. Most recently,

event eye-movement has been monitored for the study of cognition (Hohenstein 2005 and Papafragou et al. 2008).

Studies on bilingual population follow the same methodology expose above. In this case, attention is put in the characteristics of the participants because they can affect the study results. So, for example, studies determine whether the bilingual is an early or a late bilingual, age of acquisition of the second language, time spent in the second language country, etc. (Cadierno and Ruiz 2006, Filipovic 2011, Kersten et al 2010). Not less important is the language use in instructions during the experiments (Athanasopoulos 2006, 2009; Athanasopoulos et al. 2011, Cook et al. 2006, just for naming few).

For the present study we choose to do a categorization task and a linguistic description task. The first one measures the non-linguistic cognition while the second one analyses the characteristics of the motion events patterns in the languages under study. We analyse an ample range of speakers that includes children. For them we need to come with a design of experiments that do not take very long due to children's attention. Therefore, we decide not to include further tasks, like a recognition task and focused on the mentioned two. Additionally, we decided to perform the similarity judgment task and not the memory task because very little studies have obtained results in motion events with recognition tasks.

For avoiding any interference from language in the non-cognitive task, participants did first the similarity judgment task. Also, instructions were reduced to the minimal, while we increased the number of examples shown previously to the experimental task. For the similarity judgement task we choose the design of the triads in which path vs manner, and path vs causation were contrasted because is the most frequent one, and it was the one that could allow us comparisons between studies and ours. We analysed 8 stimuli per condition. This number could be considered small, however, we must take into account that the task could not take more than 30 minutes in order to keep children's attention. Additionally, we think that 8 stimuli per condition plus a large number of participants can produce reliable statistic results.

The triad is in some studies presented simultaneously, in others sequentially. For our study we decided to present the triads sequentially. First we present the

target, and then the variants, one after the other. We thought this was a neater design, very appropriate for testing children.

Our speakers were monolingual and bilingual. We make sure that monolinguals did not have any knowledge of the other language. Bilinguals were carefully selected and characterised according to the mentioned variables (see next chapter)

#### **4.4 Chapter summary**

In this chapter, we have summarized studies on linguistic relativity in motion events, specifically in English and Spanish languages. In general, there are not many studies testing linguistic relativity in motion events, most of them focus on the difference between manner components vs. path components. The studies available offer different findings. We observe four tendencies: some studies show an influence from language in categorization but not in memory tasks (e.g. Gennari et al. 2002; Finkbeiner et al. 2002). Other studies find a correlation between language and memory (Fausey & Boroditsky 2011; Filipović 2011). Some research show effects on categorization task only when language seems to facilitate the task (i.e. by previous verbal description of the same stimuli, or but using language in instructions) (e.g. Gennari et al. 2002, Papafragou & Selimis 2010). A fourth group of studies finds influence from language-specific patterns in categorization task (Hohenstein 2005; Kersten et al. 2010; Pourcel 2005)

Interestingly, Pourcel (2009) explains these high differences in results by the fact that studies diverged greatly in their methodologies, and that there has been little knowledge about how motion events work in languages. For example, we can notice that some studies diverge in their assumptions. For some, the cross-linguistic differences between both languages are that English pay more attention to manner and Spanish to path because these are the concepts encoded in the main verb: The most conceptually salient category in the predicate (e.g. Gennari et al. 2002; Hohenstein 2005). In other studies it is suggested that English speakers could pay equally attention to manner and



path concepts because they both are frequently encoded in the sentence. Therefore, the difference between Spanish and English monolingual speakers is based on the frequency of encoding of manner (Kersten et al. 2010; Papafragou et al. 2002). Additionally, we observe differences in the type of material and procedure used to measure categorization and memory. In some studies stimuli are static pictures (e.g. Papafragou & Selimis 2010); in other studies stimuli are 3D non-human animations and , in others, human-like video clips (Finkbeiner et al. 2002). Another aspect that is worth noticing is the variety of participants. Recent studies show how speaking a second language could affect non-linguistic cognition and conceptualization in bilingual speakers. But despite these findings, in some studies we still observe the use of participants with knowledge of a second language being categorized as monolingual speakers. The decisive factor is that the second language of these participants tends to be the language that linguistically differs in the encoding of motion events to their first language. It is already established that bilinguals' cognition could differ from monolinguals' cognition (Bialystok 2011). Therefore, to analyse the predominant language in bilingual speakers assuming that the performance would be similar like to that of monolingual speakers of that language could be misleading.

We also summarize studies that investigate children who are still acquiring their first language to scrutinize when language influence, if any, could start affecting non-linguistic cognition. The question also could contribute to studies of language acquisition and cognitive development. Only a couple of studies are reported, and they show opposite findings . Therefore we conclude that this is still an undeveloped area of research.

Studies on bilingualism are few but promising, as they particularly focus on testing the LR hypothesis. Furthermore, their findings demonstrate that language could affect cognition.. Additionally they are contributing to the understanding of the bilingual cognitive system. The studies on bilinguals reported here offer some contradictory results. One finds variables such as context of language, age of acquisition and variables affecting speakers' linguistic and non-linguistic behaviours whereas the other one did not. However, their methodologies differed greatly not only in terms of the type of participants

involved, but also in the type of material and procedure used in the experiments. This could explain the differences in the findings.

Finally, one of our concerns in the present research is the study of childhood bilingualism, that is, the effect of language on cognition in children acquiring early two languages. We have not found studies in this domain of linguistic relativity on motion events in English and Spanish speakers. Thus we think that information in this domain an area of research will be an important contribution to the studies of linguistic relativity. Only one study (Fausey & Boroditsky 2011) tests path vs. causation in S- and V- language, and this study finds language influence on non-linguistic tasks.

## Chapter 5. Method

### 5.1. Chapter Overview

The present study has several aims. First, it investigates whether language affect thought. Specifically, the research studies whether the differences in lexicalization patterns for expressing motion events between two typological different languages, English and Spanish, influence non-linguistic cognition in monolingual adults and monolingual children. Additionally, this investigation aims to analyze how speakers of English and Spanish lexicalize motion events in an experimental condition after watching videos specifically designed for the task. The objective is to study whether these speakers performed according to what other studies have found. Additionally, we tests children in order to answer to question in the developmental area. How do children lexicalize motion events? Are there changes in their linguistic development? Do children show an influence from language on non-linguistic cognition? Finally, we test a population of bilingual speakers, children and adults, in order to study how acquiring a second language can affect the process of lexicalization of motion event and the non-linguistic cognition. Bilingual speakers are native speakers of Spanish, learners of English (henceforth, S-E bilinguals<sup>25</sup>).

This chapter is concerned with the methodology applied to the study. The hypothesis and predictions of the study are presented, followed by the rationale and methodology of the tasks. Next, it explains the pilot study and the main study. In the section dedicated to the main study aspects of the research, design and methodological issues such as participants, materials, procedures, as well as coding are presented. Because the study used basically the same methodology for a set of four different types of populations (i.e. samples from

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<sup>25</sup> The terms S-E bilinguals and bilinguals will be treated as synonyms in this article. The same case applies to the terms: monolingual English/Spanish-speaking children, English/Spanish monolinguals, and English/Spanish group.

two adult populations and from two children populations), participants are described in the last subsection before the coding section.

## **5.2. Hypotheses**

Based previous results on motion events and cognition, the main hypotheses tested in this research are the following:

### **5.2.1. Hypotheses related to lexicalization patterns of motion events**

#### **A. Monolingual-speaking adults**

A.1 English speakers show a stronger bias towards manner, by encoding this element in the main verb when describing spontaneous motion events.

A.2. Spanish speakers tend to encode path in main verbs.

A.3. When the event shows a boundary crossing path, Spanish speakers tend to encode path on the main verb; manner, if mentioned, tends to be expressed in satellites mainly through gerunds.

A.4 When the event shows a trajectory path, Spanish speakers tend to encode manner on the main verb.

A.5 Spanish speakers should produce more sentences with bare verbs, and these bare verbs should tend to encode manner rather than path.

A.6 When confronted with cause events, English speakers should encode more agentive sentences with causative verbs than Spanish speakers.

#### **B. Bilingual-speaking adults**

B.1 When describing videos showing motion events in English, bilingual adults show the same pattern observed in monolingual-speaking adults of their L2 but some transference from L1 (i.e. Spanish) is observed affecting the codification of path, manner and causation.

B.2 When speaking in Spanish, their L1, bilinguals produce the same pattern observed in monolingual Spanish speakers.

B.3 Proficiency, age of acquisition, and time leaving in an English speaking country affect bilinguals' lexicalization patterns.

B.4 Bilingual speakers can produce transfer from L1 to L2 and effect from L2 to L1.

B.5 When describing videos showing motion events in English, bilingual adults show the same pattern observed in monolingual-speaking adults of their L2 (i.e. a preference for causation over path when describing events in English).

### ***C. Monolingual-speaking children and adolescents (from age 5;00 to 17;00)***

C.1 Spanish-speaking children and adolescents (henceforth, children) show an increase in the use of path verbs and a decrease in the use of “neutral verb” in the early ages.

C.2 English-speaking children tend to decrease the production of path and neutral verbs and increase the use of manner and cause verbs with age.

C.3 Older children produce the adult pattern of lexicalization of motion events from their languages.

C.4 When the event shows a boundary crossing path, Spanish speaking children tend to encode path on the main verb; manner, if mentioned, tends to be expressed in satellites mainly through gerunds. When the event shows a trajectory path, they tend to encode manner on the main verb.

C.5 When confronted with cause events, English-speaking children should encode more agentive sentences with causative verbs than Spanish-speaking children.

### ***5.2.2 Hypotheses related to non-linguistic cognition of motion events***

#### ***Monolingual-speaking adults and children***

D.1. In the non-linguistic cognitive task, English speakers prefer to pay attention to the manner aspect of the motion while the Spanish group does not show preferences.

D.2 Spanish speaking adults do not display a particular tendency in boundary crossing paths and trajectory paths shown in the videos.

D.3 Speakers of English pay more attention to the cause of the event than to the path.

D.4 Because Spanish does not show a clear tendency, Spanish speakers can pay attention to either path or cause.

D.5 Motion events patterns in children affect non-linguistic cognitive task after the language-specific patterns of their languages are fully acquired.

D.6 Children, older than 9;00 years of age, show a language effect on the categorization task until later in age.

### ***Bilingual-speaking adults and children***

E.1 Bilingual-speaking adults change their patterns of categorization (path vs. manner and causation vs. path) of motion events. We can observe different tendencies and the exact ones are unknown.

E.2 Variables, such as Proficiency, AoA, time leaving in UK, diverge bilingual-speaking adults' performance from the L1 pattern.

E.3 Bilingual-speaking adults differ from Spanish-speaking monolinguals in their categorization of path vs. manner of motion events that show trajectory and boundary-crossing paths.

E.4 Bilingual children perform as monolingual speakers of their L1. However, their exact behavior is unknown.

### ***5.2.5 Exploratory studies***

To the researcher's knowledge the present study is the only cross-sectional study assessing different groups of children from 5 to 17 years old, thus showing the development of motion events in language and cognition from childhood through to adulthood. Therefore, although two hypotheses have been formulated, the study with this population is essentially exploratory. The intention is to explore: i) at what age cross-linguistic differences between groups begins to emerge; ii) whether linguistic differences emerge between age groups in a language; and iii) the linguistic preferences in S-E learners, and whether their L1 verbalization patterns have been influenced by their L2<sup>26</sup>.

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<sup>26</sup> S-E learners of English did the linguistic task only in Spanish, therefore, in this case, we will measure any influence from the L2 on the L1.

Therefore, the study explores the semantic characteristics of the type of motion main verbs (manner verb, path verb, or other verb) produced in sentences by children when they watch motion events' videos. Additionally, we investigate the Spanish and S-E bilinguals' cognitive preferences for manner or path verbs when they watch different types of paths (boundary-crossing paths and trajectory paths).

### **5.3. Experimental tasks and rationale**

Following previous research on motion events (Athanasopoulos & Bylund, 2013; Hohenstein, 2005; Papafragou & Selimis, 2010) two different tasks were designed: a verbal encoding (linguistic) task and a similarity judgment (non-linguistic) task.

Both tasks included the design of stimuli for the purpose of analysing two experimental conditions: path vs. manner differences and cause vs. path differences.

The verbal encoding task was designed to explore encoding differences between English and Spanish speakers. Participants were asked to describe videos showing motion events in order to elicit short descriptions of what speakers see on videos. The task has the advantage, in relation to other methodologies that collect linguistic information, that first, it shows realistic dynamic motion events; secondly, it is possible to control the type of answers from speakers (i.e. they would tend to focus either on path or on manner in the path vs. manner condition; and on path or on causation in the cause vs. path condition) because of the given instructions (i.e. they were instructed to respond in few words and to describe what they first saw). According to the LR hypothesis, when looking at motion events, speakers of manner languages prefer to pay attention to manner over path, and to cause over path; while speakers of path languages like Spanish, that tend to encode path components but that accept manner verbs as well, may not show a specific pattern (path vs. manner, cause vs. path).

A similarity judgment task was designed to test effects of language on categorization. It was built is on a triad task. Participants watched a target video showing a motion event in which both a path component and a manner component were compounded (or a path and cause, in the case of the videos measuring path vs. cause condition). Immediately after, participants were presented with two variants of the target video. In one, the manner was changed in relation to the target video, while on the other, the path was altered in relation to the target video. The same logic applied to the videos testing path vs. cause condition. After watching the triad, participants had to decide which of the two variants was more similar to the target video. In this task, where language is not involved, participants were forced to choose between path or manner, and path or causation when looking at the motion events.

The aim of a similarity judgment task was to make participants evaluate how similar or dissimilar two events were in relation to a third one. It is a categorization task that makes participants to form categories (i.e. equivalent classes made of different entities) and “treat them as members of an equivalent class” (Sloutsky, 2003; p. 247). This ability to categorize is recently more connected to attention and perceptual mechanisms that make possible to detect many similarities in behavior. If speakers find the path variant or the manner variant more similar to the target, and according to the lexicalization pattern of their languages, it can be assumed that speakers are categorizing these concepts according to the language characteristics, therefore, it can be said that language affects cognition. However, this task is not exempt from criticisms. Goldstone (1994a) reports the main disadvantages of basing categorization on similarity (e.g. too flexible, too context-dependent, among others). Gennari and collaborators, along the lines of the hypotheses of study, mention that this type of task is very sensitive to factors such as linguistic markers or category labels, direction of the comparison (i.e. if video A is shown after B and vice versa), and the weight of the features in comparison (Gennari et al 2002; p. 56). However, there seems to be good evidence that this type of task, in which similarity is involved, was a good measure tool of categorization processes (Goldstone 1994a, Sloutsky 2003). In the present study, negative factors described by Gennari and colleagues were controlled in the design of the task.



## **5.4. The study**

### **5.4.1. A pilot study**

Previously to run our experiments with our population we performed a small pilot study with the aim to test whether the similarity judgment task could show some results. In contrast to Hohenstein (2005), Kersten et al. (2010), and Finkbeiner (2002), studies from Papafragou et al. (2002), Papafragou and Selimis (2010), and Gennari et al. (2002) do not find effect from language on non-linguistic cognition when non-linguistic categorization was done previously to a linguistic task. Therefore, we were risking the entire study if we could not find results because the investigation of LR depended only in the categorization task. This explains the aim of this pilot study. Therefore, we checked the design, the stimuli, and procedures of the experiments. A similarity judgment task was performed with 24 triads of videos. Video clips showed path vs. manner condition and path vs. causation condition. This task was performed by 15 monolingual speakers of Spanish from Venezuela, and 10 monolingual speakers of English from the UK. The study showed the expected tendency, that is, a preference for manner among English speakers, and a reduced preference for manner among the Spanish speakers. However, the study served the function of adjusting and discarding stimuli, and creating new ones more appropriate for the purpose of the research. Specifically, 3 of our stimuli measuring path vs. manner were not contrasting correctly these components. In relation to the condition path vs. causation, some orders in the target-variants videos were done in order to control the number of stimuli showing and not showing an agent.

The linguistic description task clearly showed the language patterns typical in Spanish and in English.

### **5.4.2 Main study**

#### ***Materials***

The materials consisted of 16 sets of three silent video clips of 6 seconds each showing spontaneous and cause dynamic motion events and caused dynamic

motion events. Eight sets of clips were specially designed to test the path vs. manner condition; while the other 8 were intended to test the path vs. causation condition. Additionally, 5 more sets were designed as fillers.

**Experiment 1. The similarity judgment task.**

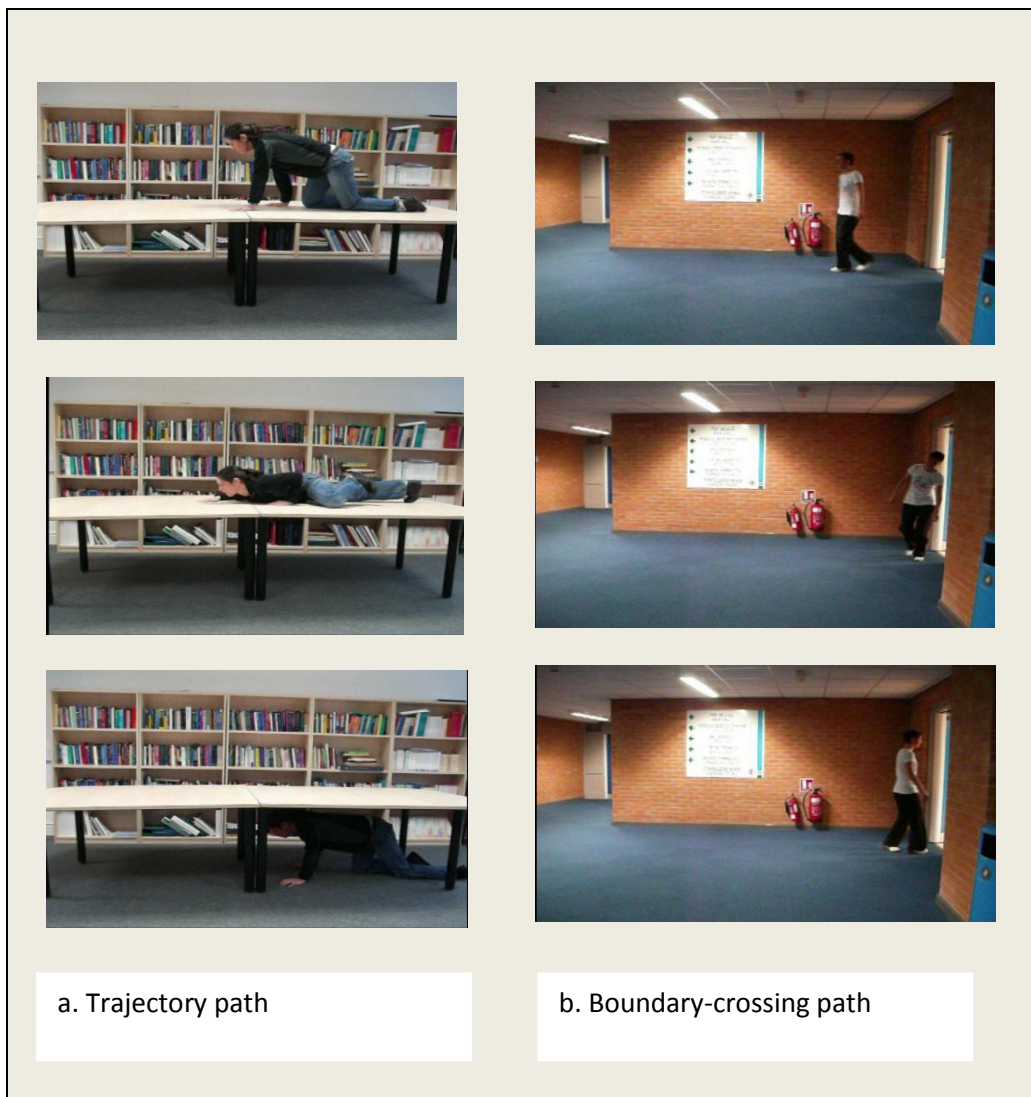
*Video clips for the path vs. manner condition*

For the path vs. manner condition, the set of clips consisted of a target video in which a human figure moves in a path X and in a manner X and in a particular ground. Then, two variants were created. In variant 1, the figure followed the same path from the target, and a different manner, i.e. manner change variant. In variant 2, the figure followed the same manner from the target but a different path, i.e. path change variant (See Table 5.1 and figure 5.1).

**Table 5.1: Structure of path and manner in triads for the path vs. manner condition**

<b>Target video</b>	<b>FIGURE → PATH X IN MANNER X</b>
Variant 1. Manner change	FIGURE → PATH X IN MANNER Y
Variant 2. Path change	FIGURE → PATH Y IN MANNER X

In each set, the figure and the ground were kept constant. In fact, videos were recorded with a Canon PowerShot S90 (set at 7 megapixels). The camera was placed on a tripod, which helped to keep the same background in the exact same size in the three videos. Only the manner and the path of the motion changed. In this way, it was more difficult for participants to diverge from other components rather than path, manner or cause. The video clips were edited to 6 second clips and converted to the *wmv* format through the software Window Video Maker from Window Vista. The sound was discarded. An example of triad of videos is shown in figure 5.1.



**Figure 5.1:** Two sets of stimuli (a trajectory path and a boundary-crossing path). Upper photos shows the targets. Central photo shows the manner change variant. Lower photo shows the path change variant.

For clarity on the task, videos were labeled with simple letters. The target video was always X, the second video was A, and the third one was B. It is assumed that this kind of labeling should not bias participants' responses (cf. Athanasopoulos and Bylund, 2013).

Paths involved different spatial relations (i.e. in, out, across, over, down, up, zigzagging, following a straight line, following a square path pattern). Following Slobin and Hoiting's (1994) methodology, stimuli were grouped into two different types of paths: 5 triads showed boundary-crossing paths and 3 triads

showed trajectory paths<sup>27</sup>. Manners involved different ways in which the figures move forward (jump, dance, skip, crawl, twirl, etc.). Further description about path-manner structure of each video can be found at Table 5.2.

**Table 5.2: Path-manner structure of video clips for the path vs. manner condition**

Target video	same path variant	same manner variant	type of event
1. a woman is dancing into a room	...jumping into of the room	...dancing out of a room	boundary-crossing
2. a woman is hoping into a building	...is walking into a building	... is hoping out of the building	boundary-crossing
3. a woman is twirling into a gym	...is waddling into a gym	...is twirling out of a gym	boundary-crossing
4. a man is walking out of a room	... is crawling out of a room	... is walking in the room	boundary-crossing
5. a woman is jogging into a room	... is walking into a room	...is jogging out of a room	boundary-crossing
6. a woman is crawling over a table	a dragging oneself over a table	crawling under a table	Trajectory
7. A man dragging himself up sat in his bottom	... is crawling up the stairs	...is dragging himself down the stairs	Trajectory
8. a man is jumping following a square pattern	straight...is twirling following a square pattern	is jumping following a straight line pattern	Trajectory

In the selection of paths and manners we included, some motion components that were unfamiliar. For example, in video 8 (see Table 5.2), the figure follows a square path pattern that cannot be named neither in Spanish nor in English. Also in video 7 (see Table 5.2), the figure moves backwards up the stairs on his bottom, being difficult to name the manner in one word. It has been advised by researchers<sup>28</sup> that the more distant these motion components are from having a word that names them, the more we will be able to disconnect language from non-linguistic tasks such as memory, recognition, and similarity judgments. However, it was difficult to design all of these clips with non-familiar paths and manners, because the clips were real life scenes with real human figures in motion. Additionally, Spanish boundary-crossing paths are very few and already lexicalized.

<sup>27</sup> While the division of stimuli seems unbalanced, and the number of trajectory path videos seems low, several studies have reported similar designs with low numbers of stimuli due to practical considerations in the creation of stimuli. (e.g. Naigles et al.,1998; Choi, 2009).

<sup>28</sup> Prof. Ginny Gathercole in personal communication, November 2010.

Stimuli in Table 5.2 were design to test the following hypotheses

1. Stimuli 1 to 8 tested condition path vs. manner, specifically, hypotheses D.1, D.5, D.6, E.1, E.2, and E.4 (see section 5.2.2)
2. Stimuli 1 to 5 tested boundary-crossing preferences in path vs. manner condition, specifically, hypotheses D.2, and E.3 (see section 5.2.2)
3. Stimuli 6, 7, and 8 tested trajectory-path preferences in path vs. manner condition, specifically, hypotheses D.2, and E.3 (see section 5.2.2).

*ii. Video clips in the path vs. cause condition*

The same rationale described above applied in the path vs. cause condition. In this case, the triads of clips were structured in two ways. On the first one, four clip triads presented the following structure: a target in which an agent (a human figure) moves or propels an inanimate figure following a path X. Then, in variant 1 of this structure, the path is changed and the agent causes the figure to move in a different path (Path Y). In variant 2, the cause is changed and the same inanimate figure from the target moves alone following the same path X from the target without the agent being present (see Table 5.3). The second way consisted on another set of four videos presented with the following structure: a target in which an inanimate figure moves alone in a path X without an agent. Then in variant 1, the cause is changed and an agent (human figure) moves or propels the same inanimate figure from the target video following the same path X. In variant 2 the change is made for path and the inanimate figure moves alone following a different path from the target (path Y). Manner was always kept constant in all set of videos. The rationale of presenting an agentive target video and a non-agentive target video was to control the possible speaker' preference for one option, given that the target had a specific form (see criticisms to the similarity judgment task in Gennari et al (2002; p. 56). For example, the fact that the target had an agent could bias speakers to choose the option that showed an agent. More details about these clips structure can be found at Table 5.3.

**Table 5.3: Structures of the sets of video for the path vs. causation condition**

<b>Structure 1</b>	<b>Target video</b>	<b>Agent CAUSING a figure → PATH X</b>
	Variant 1 . Causation change	FIGURE → PATH X
	Variant 2. Path change	Agent CAUSING a figure → PATH Y
<b>Structure 2</b>	<b>Target video</b>	<b>FIGURE → PATH X</b>
	Variant 1 . Causation change	Agent CAUSING a figure → PATH X
	Variant 2. Path change	FIGURE → PATH Y

Path components also involved trajectory and boundary-crossing paths. The list of paths used in the videos is described in Table 5.4. In relation to cause, three different types of causation were introduced with variations of the agent’s saliency among videos. The first type consisted on three videos showing a whole body agent continuously causing the figure to move (e.g. pushing a car or rolling a ball constantly during the clip, see figure 5.2-2a). On the second type, three videos showed the whole body of an agent only initiating the causation (e.g. propelling or pushing the figure, the agent stays steady after causing the motion, and only the figure moves in the scene, see figure 5.2-2b). And finally, two videos showed a body part of an agent continuously causing the figure to move (e.g. a hand continuously pushes a toy turtle down a ramp, see figure 5.2-2c). As explained, the saliency of the agent varied between these three types of causations. In the videos in which the whole agent was causing the figure to move continuously (figure 5.2-2a.), the agent is highly salient. The agent was always moving himself/herself along with the figure, therefore both were in focus. This was not so obvious in the clips where the agent only initiated the motion. These clips focused mainly in the figure while it was moving along a path and, therefore, they were less salient than the first type of causation. The saliency in the clips showing only body parts as agents were probably the lowest of all the three type of causations. In these clips the figure became the focus of the clip because one cannot see a whole agent but a hand moving the object. We expected these different specifications of causation to influence participants’ answers differently.

**Table 5.4: Path and cause composition of video clips for the path vs. causation condition**

Target video	same path variant	same cause variant	type of cause	Type of path
1. A spider goes up in a fridge	A hand pushes a spider up...	A spider goes down ...	Body part agent Continuous cause	Up/down Bound.-cross
2. A hand pushes the turtle down a ramp...	the turtle goes down...	A hand pushes the turtle up...	Body part agent Continuous cause	Up/down Bound.-cross
3. A guy rolls a ball into a shed	The ball goes into ...	The boy rolls the ball out of ...	Whole agent Continuous cause	Out/in Bound.-cross
4. A boy moves a toy car in a straight line in a field	Toy car moves in a straight line...	A boy moves a toy car across...	Whole agent Continuous cause	Crossing/straight trajectory
5. A man rolls a ball in a straight line in a gym court...	A ball rolls in a straight line...	A man rolls a ball across...	Whole agent Continuous cause	Zigzagging/ straight trajectory
6. A woman launches a ball up a high ramp	A woman throws a ball down ...	A ball moves down ...	Whole Agent Initiating cause	Down/up Bound.-cross
7. Toy car moves into a box	A man pushes a car into a box	Toy car moves out of ...	Whole Agent Initiating cause	Out/in Bound.-cross
8. A toy car moves down a street	A man drops a toy car down	A toy car moves up the hill	Whole Agent Initiating cause	Down/up Trajectory
	...			

The videos were filmed in different settings. After being recorded with the camera, they were edited utilizing Windows Movie Maker program.



**Figure 5.2: Examples of causations. 2a. Whole body agent continuously causing motion. 2b. Whole body agent initiating causation. 2c. Body part agent continuously causing motion**

Stimuli in Table 5.4 were design to test the following hypotheses:

1. All the stimuli were designed to test the path vs. causation condition, specifically hypotheses, D.3, D.4, E.1, E.2, and E.4 in section 5.2.2. The division of stimuli according to saliency of agent and the type of path were variables controlled in the clips.

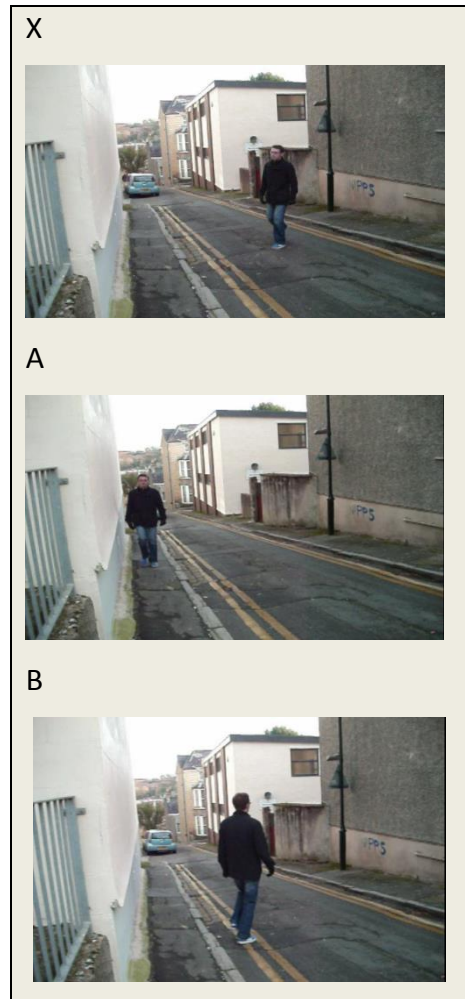
iii. *Filler video clips*

Five sets of video clips were designed as fillers (see Table 5.5. The reason for the low number of fillers was to avoid making the task too time-consuming, as it is known that children’s attention in this type of task does not last much more than 30 minutes. The task was designed to last around 30 minutes. Additionally to this time, participants were spending more time for performing the other



experimental task and the questionnaires. Given also the high number of participants to be tested in this study, we had to restrain the number of clips in order to make the testing task more feasible.

The filler triads of clips were designed similarly to the experimental stimuli, but other motion elements were contrasted: 1. path vs. deixis; 2. manner vs. deixis, and 3. cause vs. manner. Figure 5.3 shows an example of a filler contrasting path vs. deixis. In the target video (X) the figure is crossing the street walking towards the camera. In variant A, directionality is kept constant but the path is changed (i.e. the figure is walking along the sidewalk towards the camera). In video B, path is kept constant in relation to the target but directionality changes with respect to the target clip (i.e. the figure is crossing the street walking away from the camera). Manner, on the other hand, was kept constant along the three videos. This strategy was used in all the filler videos in a way that only the contrasting elements were changed in the variant clips.



**Figure 5.3: Example of a filler triad. 2a. A man crossed the street walking toward the camera. 2b. A man walked along the sidewalk towards the camera. 2c. A man is crossing the street walking away from the camera**

**Table 5.5: Composition of video clips used as fillers**

<b>Fillers contrasting path vs. direction</b>		
<b>Target video</b>	<b>same path variant</b>	<b>same direction variant</b>
1. A man crosses a street toward a camera	A man comes toward a camera following a straight line	A man crosses a street away the camera ...
2. A man is zigzagging away from the camera	A man follows a circle pattern coming towards ...	A man is zigzagging away from the camera
<b>Fillers contrasting manner vs. direction</b>		
<b>Target video</b>	<b>same manner variant</b>	<b>same direction variant</b>
3. A woman runs away from camera	A woman runs toward...	A woman walks away from ...
4. A boy jumps away from camera in a room	A boy jumps towards ...	A boy skips away from ...
<b>Fillers contrasting causation vs. manner</b>		
<b>Target video</b>	<b>Same causation variant</b>	<b>Same manner variant</b>
5. A boy bounces a big ball	A boy rolls a big ball	The ball bounces alone

## **Experiment 2. The verbal encoding task**

The material for this experiment consisted of the 22 video clips of 6 seconds each from Experiment 1 and an extra one. For this experiment, 8 target clips assessing path vs. manner, 8 target clips assessing path vs. causation, and 5 target fillers clips from the similarity judgment task were chosen. The extra clip assessed path vs. causation and it showed a man throwing ball in a straight line (see figure 5.4).

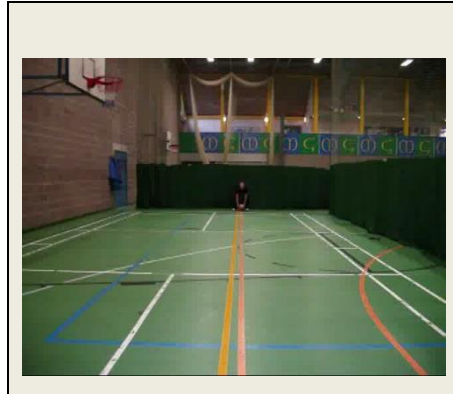
Target clip-stimuli in Table 5.2 (see first column) were used in experiment 1 and they tested the following hypotheses

1. Stimuli 1 to 8 tested path vs. manner condition, specifically, hypotheses A.1, A.2, A.5, B.1-B.4, and C.1-C.3 (see section 5.2.1)
2. Stimuli 1 to 5 tested boundary-crossing preferences in path vs. manner condition, specifically, hypotheses A.3, A.4, and C.4 (see section 5.2.1)
3. Stimuli 6, 7, and 8 tested trajectory-path preferences in path vs. manner condition, specifically, hypotheses A.3, A.4, and C.4 (see section 5.2.1).

Target clip-stimuli in Table 5.4 were design to test the following hypothesis:

1. All the stimuli in table 5.4 , and the extra one (see figure 5.4),were designed to test the path vs. causation condition, specifically hypotheses, A.6, B.3, B.4, B.5, C.3,and C.5 in section 5.2.2. The division of stimuli according to saliency of agent and the type of path were variables controlled in the clips.

One of the research questions is how speakers of English and Spanish and bilinguals would respond to videos depicting the most salient form of cause (i.e. the variants that show an agent). In order to respond this question, clips from Experiment 1 showing an agent are utilized for the linguistic experiment (i.e. target clips from structure 1 (see Table 5.3) and the variant videos showing an agent from structure 2). Finally, the additional video clip is depicted in figure 5.4.



**Figure 5.4: Example of the extra stimulus used in the verbal encoding task**

### ***Procedures***

The similarity judgment task is always presented first to avoid any language interference in the task. The 16 sets of videos and the additional 5 fillers were randomized in 15 different orders and displayed in a PowerPoint presentation. The target was always presented first, followed by the two variants. The variants were shown twice, in both orders (i.e. in half of the videos the targets were followed by the path-change variants; while in the other half, the targets were firstly followed by the manner change variants. The same structure was applied to videos measuring path vs. cause condition and the fillers. In total, a set of 42 video clips were presented to participants in a fully randomized order.

The clips from a set appeared automatically one after the other, with 0.5 seconds between expositions. The target video was named X on the top of the PowerPoint slide, and the variants were named A and B. The instruction given to participant was:

*“which video, (A or B), do you think is more similar to X?/ cuál video, (A o B), piensas que es mas similar a X”.*

Once the triad of videos was shown, the screen went white and the participant responded. Only by pressing the ENTER button, the following triad appeared. The answers were written on an answer sheet designed for this purpose; the

adults wrote their answers by themselves while the examiner wrote them for younger children. This first experimental task was designed to last no longer than 25-30 minutes.

All speakers were given the instructions in their native language and a set of example videos were presented. In the case of young children, the instructions were read out loud. Additionally, before starting the task they watched three examples that were not included in the stimuli or the filler items.

Immediately after finishing the first experiment, participants were presented with the instructions of the second experiment, the verbal encoding task. The instruction given was:

*“describe in few words, but in a whole sentence, what do you think has happened in the video”.*

The instruction in Spanish was:

*“describe en pocas palabras, pero en una oración completa, qué crees que sucedió en el video”<sup>29</sup>.*

Participants watched videos in a PowerPoint presentation. After the stimulus was shown, they were asked to describe verbally what has happened and responses were coded as explained on Experiment 1. Once they gave their answer, they were instructed to press the *enter* button on the computer, which led to the next video.

S-E bilingual children were asked to do the verbal encoding experiment only in Spanish. However, adult S-E bilinguals did this task in both languages (English and Spanish). Half of the adult participants did the experiment first in Spanish, and at least three weeks later, they repeated the experiment in English; while the other half performed the task first in English and secondly in Spanish. In this

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<sup>29</sup> Younger children do not understand what a sentence is. Therefore, the researcher used instead the word “idea” that produced the expected responses. The reason behind this instruction was to avoid children from responding with more than one main verb. The instructions produced the expected results, as less than 1.7% of the responses had more than 1 main verb.

way, we could control any effect from the language order of presentation in their answers. Instructions to adult bilingual participants were given by researcher according to the type of task (i.e. English instructions for English testing and Spanish instructions for Spanish task).

Some speakers did the test individually while others completed it in groups depending on testing circumstances. For example, in some cases, adult speakers were tested in groups in a classroom, while in other cases they were tested individually because participant and researcher agreed to meet on a specific day and time. Young-children speakers were tested individually and the researcher wrote their answers in an answer sheet. Older children performed the test in small groups and wrote their answers themselves on the answer sheet. Participants were instructed to make their decisions at their own pace and according to their own opinion. Additionally, they were allowed to watch the videos from both experiments again if they wanted to (being finally requested by less than 5% of the participants).

This second experimental task lasted between 10 to 15 minutes, depending on who was writing the answers and participants' age. In relation to children, it is worth noticing that only in one case the administrator of the task observes a bored and unmotivated child. Children generally enjoyed doing the tasks.

## ***Participants***

### ***Adults***

A total of 124 adult speakers participated on the experiment: 44 of them were native speakers of English (aged 19 to 58), 42 were native speakers of Spanish (aged 16 to 40) and 38 were L1 Spanish speakers, early and late L2 English learners, henceforth S-E bilinguals, (aged 20 to 47) (see table 5.5 for more details). They all shared the same socioeconomic level (middle class) and educational level (graduate and postgraduate).

The native English speakers were all born in the UK, and recruited in Bangor, Chester and Manchester. All participants, most of them undergraduate university students, filled in a questionnaire with general questions about their

language background. The questionnaire collected information such as age, sex, language at home, languages learnt at school and their proficiency level, time spent speaking those languages during a week, and time living in another country. With these questions, we made sure that they did not have knowledge of Spanish or of any other path language. Some participants had studied Spanish or French at school, but they self-rated this language knowledge at the lowest level in the questionnaire (see a questionnaire form, and the rest of materials such as consent form, information sheet, and information debrief in Appendix A).

Native speakers of Spanish were born in Venezuela, and they were recruited in the capital city of Caracas. Most of them were undergraduate students from the Simón Bolívar University. Apart from filling in the mentioned questionnaire, they completed the *Quick Placement Test* (QPT, 2001). The QPT is a validated test of English language proficiency and frequently used in second language acquisition studies (i.e. Athanasopoulos 2006, 2007). The test places the taker in 1 of the 6 levels (breakthrough, elementary, lower intermediate, upper intermediate, lower advanced, and upper advanced). We made sure of not including Spanish speakers with knowledge of English<sup>30</sup> in the Spanish monolingual group as this could affect the results. Spanish speakers obtained a mean score of 20.42 (60 points scale) in the QPT, which allocates them in the breakthrough level of proficiency. Two participants who proved to be advanced in English were discarded from the study.

Bilingual speakers were recruited mainly in UK and USA. They were all native speakers of Spanish, early and late learners of English (see Table 5.5) residents in an English speaking country. Utilizing the general questionnaire we obtained information about their second language status, such as the age of acquisition (AoA) of their L2, which varies from age 3 to 26; the age of onset (AoO)<sup>31</sup>, which diverge from age 13 to 34; the percentage of English use every week, with a mean of 60% but with large variation; and time living in an English

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<sup>30</sup> In Venezuela, the official academic program in high school education includes three years of English courses. Although it is known that these studies are not enough for acquiring the language (each course based on two hours a week), we didn't want to risk and include speakers with knowledge of English. Therefore, we decided to test their English proficiency with the QPT.

<sup>31</sup> Age of Onset (AoO) measures the age at which the participant felt he/she started to talk more properly English.

speaking country, from less than a year up to 17 years. Proficiency was formally measured with the QPT. Their scores ranged from 32 to 59 (60 points scales), with a mean of 44.18, placing speakers in a range from elementary level to upper advance level of proficiency. The mean was upper intermediate level. Table 5.5 shows bilingual speakers' ranges.

The AoO measurement was adopted because it is known that in many Spanish-speaking countries, even though children started early to attend English lessons, they did not necessarily learn the language. However, there could be an event that changes the situation later on in their life. For example, some adolescents took a trip to an English speaking country and that actually triggers the learning of that L2. In table 5.6, we can see that there were participants reporting to have started to acquire English at age 3, however, they all pointed out that they started to talk English after the 13 years of age.

**Table 5.6: Range and mean of the independent variables in the S-E bilingual speakers**

<b>Variables</b>	<b>Range</b>	<b>Mean</b>
AoA	3-26 years old	11 years old
AoO	13-34 years old	24 years old
Length of Exposure	0.5-17 years	5.6 years
% of English use (weekly)	30%-95%	60%
Score QPT	32-59/60	44.18 (advanced)

All participants received a reward for participating in the experiments.

### **Children and adolescents**

Participants were 221 children and adolescents: 88 monolingual English-speaking children; 94 monolingual Spanish-speaking children and 39 S-E bilinguals. Their age varied from 5;00 to 17;00 years-old. They all shared the same socioeconomic level (middle class) and attended and recruited from primary, secondary schools, and colleges in Venezuela or the United Kingdom accordingly.

Children were stratified by age on 5 different groups among monolingual speakers (see table 5.7 for details on age ranges). Age group 1 (henceforth, AG



1) comprised children from 5;00 to 6;00 years old; Age group 2 (henceforth, AG 2) included children from 7;00 to 9;00 years old; Age group 3 (henceforth, AG 3) included children from 10;00 to 12;00 years old; Age group 4 (henceforth, AG 4) included children from 13;00 to 15;00 year-olds; Age group 5 (henceforth, AG 5) included children from 16;00 to 17;00 year-olds. The groups' selection was made following certain criteria. First, we needed children capable to perform both tasks (the linguistic and the non-linguistic tasks). The researcher's experience was that children younger than 5 years old had difficulties understanding the similarity judgment task. Although 5 years-old children could seem older for developmental studies, many investigations showed that between 5 to 9 years-old, motion event descriptions in children were still not exactly as adults. This means, that even at these older ages the process of linguistic development in motion events is still happening (see Berman and Slobin 1994, Sebastian and Slobin 1994, Hohenstein et al. 2004). Furthermore, Lucy and Gaskins (2001), in a study comparing children and adult speakers of Yucatec and of American English, found that only 9 year-olds children were similar to adults in their cognitive preference for shape or material, suggesting that the effect of language on cognition does not happen but late in development. The groups were selected according to their educational levels, children from 5;00 to 6;00 were leaving pre-school and starting first grade of primary. Then, 7;00 to 9;00 year-old children were in the middle of primary. Children from 10;00 to 12;00 years of age were studying the last year of primary and initiating high school. Adolescents from 13;00 to 15;00 years of age were in mid high school, and adolescent from 16;00 to 17;00 were finishing high school and initiating college. Due to time limitations and difficulties finding S-E bilinguals, it was possible to collect data of these children up the age of 12;00.

**Table 5.7: Number of children under study according to age and language groups.**

	AGE GROUPS					Total
	AG 1 5;00 to 6;00	AG 2 7;00 to 9;00	AG 3 10;00 to 12;00	AG 4 13;00 to 15;00	AG 5 16;00 to 17;00	
<i>English speakers</i>	21	17	23	12	15	88
<i>Spanish speakers</i>	19	18	25	16	16	94
<i>S-E learners</i>	6	10	23	-	-	39
<i>Total</i>	46	45	71	28	31	221

Native English speakers were all born in the UK, and recruited from 5 schools across different UK cities. Younger children were recruited in Bangor, Llanfairfechan, and Llandudno; these are small cities in North Wales, UK. Some older children were recruited in schools in Preston, Manchester and Newcastle, UK.

North Wales is an area in which a large population is bilingual speakers of English and Welsh<sup>32</sup>. Additionally, Welsh language is compulsory in schools around Wales. Therefore, special care was taken in selecting monolingual English-speaking children with no or little knowledge of Welsh. The majority of participants did not have Welsh parents and if they did, the researcher made sure, in consultation with the teachers, that they did not have working knowledge of the Welsh language. The researcher also checked the child background by filling with child information the same general questionnaire applied to adults (as previously detailed on Experiment 1). Children, except the youngest, gave this information to the researcher. When the child was too young, the teacher provided the information.

Additionally, it was checked that all children did not have knowledge of Spanish or of any other path language. Some older participants studied Spanish or French at school, but they self-rated their knowledge of these languages as very basic in their questionnaire. Additionally, the researcher checked this aspect with the teacher.

Native speakers of Spanish were born in Venezuela, South America, and they were recruited in two different schools: one school was located in the capital city of Caracas, and another school was at Margarita Island. At these schools, two hours per week of English classes are usually scheduled. Additionally, most middle class populations have access to cable TV, where programs in English with Spanish subtitles are frequently shown. Furthermore, access to the internet has helped a lot of children to learn this second language nowadays. Hence, the researcher needed to be careful selecting children with

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<sup>32</sup> All Indo-European languages, except for romance languages, are manner-like (Talmy 1991), which suggests that Welsh should be a manner-language such as English.

absent or very little knowledge of English. To help with this aim, teachers that assisted with recruitment were asked not to include English speakers among the participants. Added to this, native speakers of Spanish children filled in the same general questionnaire previously completed by English speaking children, and the researcher checked personally with the child his/her language background. Additionally, children completed the PPVT (Peabody Picture Vocabulary Test American version)<sup>33</sup>. The PPVT measures receptive vocabulary and allow us to easily compared language proficiency in children. The test has several advantages: 1) it allows us to test English proficiency to young children because is based on selecting pictures; 2) it is quick to administer; 3) it allows us to detect children with learning disabilities and language disorders. The PPVT offers the possibility to convert the raw scores in normalised scores (i.e. the test has been nationally standardised in USA and the scores can be compared to mental ages). Once a normalised score is obtained the test provides information about the mental age equivalent of that score. For comparison purposes, we have added the normalised scores of a typical monolingual English-speaking child. A raw score of 51.1 (i.e. the result obtained by the speaker) corresponds to a normalised score of a 3;7 year-old native English-speaking child (Dunn & Dunn, 1981). The test starts from 2;06 years of age. Therefore, all our speakers that did not reach that age in their knowledge of English were left blank in the Table 5.8. This means that these children had the English knowledge bellow a native English child of 2;06 year of age. S-E bilingual from AG2 showed the knowledge of children from 3;07 to 3;09 years-old.

The test consists on showing to the child 4 pictures placed in a cardboard. The evaluator mentions a word and the child is asked to point out with her/his finger the picture that matches the word. This test measures the lexical knowledge of American English, being the test of reference for young children's language proficiency assessment as it is cognitively very simple. The test can be used with both older children and adults.

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<sup>33</sup> American English is the dialect taught in the majorities of the Venezuelan schools. Also, this is the main variety showed in cable TV and cinemas.

Bilingual speakers were recruited in a bilingual school in the island of Margarita in Venezuela<sup>34</sup>. This is a bilingual school in which children attended courses in English on regular basis. Additionally, most teachers speak to children in English during the school day. These children could be considered early bilinguals, as all of them started to learn English before the age of 3;00. Children aged 5;00 to 6;00 had been exposed to English since they were 3;00 or 4;00 years old. The length of exposure to English in older children varied from 3 to 5 years old. The percentage of courses taught in English varied within the School. Children aged 5;00 to 6;00 attended 8 hours of English classes per week; children aged 7;00 to 9;00 had a special school program with half of their courses taught in English, attending a total of 16 hours a week of the L2. The English proficiency of children was measured by the PPVT, American version. Table 5.8 presents mean raw scores obtained by speakers in the PPVT and the equivalent age in normalized scores in English (i.e. according to the norm, the age at which a monolingual speaker of English has that score). The results showed that monolingual speakers of Spanish had zero or very poor knowledge of English, while S-E bilinguals increased their English knowledge with age.

**Table 5.8: PPVT mean raw scores (and standard deviations) in native Spanish speakers and their age equivalent of a normal monolingual speaker of English.**

	PPVT Scores (American version)					
	AG 1 Score (SD)	Equivalent age in normalised score in English	AG 2 Score (SD)	Equivalent age in normalised score in English	AG 3 Score (SD)	Equivalent age in normalised score in English
Spanish speakers	6.53 (6.79)	< 2;06	18.58 (8.02)	< 2;06	25,1 (5.02)	2;10-2;11
S-E leaners	18.29 (5.85)	< 2;06	51.1 (19.78)	3;7-3;9	96.00 (14.18)	6;4-6;5

Some studies show that in relation to motion events, access to partial knowledge of a L2 could affect L1 production (Brown and Gullberg 2010). Therefore, studying children living in their L1 country, with daily access of small doses of a L2, allows us to study the effects of L2 learning in isolation, without

<sup>34</sup> Bilingual speakers were recruited in a different school from the one monolingual speakers were recruited from.

the possible confounds of cultural immersion in an L2-speaking cultural environment.

All children performed a vocabulary test in their native language in order to confirm that their vocabulary development was according to age. English native speakers did the BPVT (British Picture Vocabulary test) and Spanish native speakers completed the SPVT (Spanish Picture Vocabulary Test, an adaptation of the PPVT, suitable for Latin-American children). Results confirmed the fact that all children had a normal language development.

All participants received a reward (i.e. classroom tools such as pencils, erasers, pens) for participating in the experiments.

### ***Coding***

#### *Experiment 1: The similarity judgment task*

Answers from experimental stimuli were classified according to the motion event component, selected for being the more similar to the target one. This classification yielded 4 different categories of response: same-manner selection vs. same-path selection, same-causation selection vs. same-path selection. Choosing one option implied not choosing the other one. Therefore, for the analysis and results we mainly use manner selection and causation selection.

#### *Experiment 2: The linguistic task*

##### *- Path vs. manner condition*

In relation to path vs. manner condition, adult speakers' answers were selected and classified as manner verbs, path verbs and other verbs. Additionally, it was specifically codified the scenario where the main verb was followed by other path and/or manner components in the clause. Therefore, motion event descriptions of the whole sentence were obtained.

Children's answers were coded in more detail according to the characteristics of the main verb. This classification yielded five different categories of response: manner verbs, path verbs, neutral verbs, other answers, and no answers/wrong answers. Apart from manner and path verbs, children also produced neutral

verbs, defined by Slobin as forms that express motion without specifying path or manner (i.e. “to go” or “to come”). For example, “he is going to the swimming pool”, “La señora va al baño”/the lady goes to the bathroom (Slobin 2006)<sup>35</sup>.

“Other answers” were defined as lexical items expressing other actions or events that did not show path, manner, or “other motion verbs”. Those could be static descriptions like “está bajo una mesa”/(she) is under a table, or descriptions not related to path or manner like “he opened the door”. Finally, the category “No answer” included no responses and also sentences that contained two verbs (i.e. a path verb and a manner verb). This response scenario occurred despite the instructions given, as some participants produced more than one sentence per stimulus. As a consequence, in some cases participants included two or more main verbs in which path and manner were conflated, being impossible for the examiner to determine the preferred pattern (path or manner). In consequence, and regarding statistical analysis, these responses were discarded in the adult population. We placed them in a category called “No answers”. However, if there were two main verbs, but only one expressed path or manner, the sentence containing the motion event element was counted. For example, in “*She **opened** the door and **walked** through the corridor*”, the first sentence is discarded while the second one is analysed. We have to clarify that this happened for less than 1% of total participant’s answers, so it was extremely rare and did not meaningfully affect the overall pattern of results.

- *Path vs. causation condition*

In relation to this condition, we followed some of the coding criteria used by Choi (2009). The sentences from all the groups were classified as agentive or as non-agentive. The non-agentive sentence was described as an intransitive clause headed by a path main verb. The agentive sentence was transitive and it mentioned the agent that caused the figure to move. The main verb tended to encode manner and cause (see example 1).

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<sup>35</sup> There are studies in which neutral verbs are considered deictic verbs or path verbs (see for example Naigles et al. 1998). However, Slobin 2006 treats them as different simpler forms, which are more frequent at the beginning of the acquisition of the motion event system in languages. In this study, Slobin’s point of view is considered, therefore, these forms were called neutral verbs.

- (1) a. “car going down ramp” (speaker 37BH58M)
- b. “girl pushes race car down ramp” (speaker 36JO31F)
- c. “object being pushed up door” (speaker 38SH53F)

In Example 1a, only the path of the object being moved is described. The agent that caused the object to move is not mentioned, neither is the causation. However, in example 1b the agent and the causation (*girl* and *push*) are mentioned. In example 1c, although the agent is not mentioned the causation is described (*to push*). Examples 1b and 1c were coded as causative constructions while example 1a was coded as a path verb construction.

### **5.5 Chapter summary**

In this chapter we described our main aims and stated the hypotheses that were tested in the study. Additionally, we provided with detail of the design of the study which is based on two experiments: a verbal description task and a non-linguistic categorization task. For each experiment two conditions were studied, the variation between path vs. manner and path vs. causation, three component of motion events.

The chapter offered a detailed description of the materials used; how they were designed and administered. Additionally, we described the characteristics of our participants, who belonged to two different populations (i.e. adults and children and adolescents), spoke two difference languages (English and Spanish), and who were monolinguals or bilinguals. Finally we reported how the obtained data was analysed.

## **Chapter 6. Results from the adult population**

### **6.1 Chapter introduction**

The present chapter reports results from the adult population. Due to the large amount of participants and the level of detail of the analyses, results are divided in 2 large sections in order to keep clarity in the interpretation of the findings: Section 6.2 details results from adult monolingual speakers of English and Spanish; and section 6.3 reports outcomes from the adult S-E bilingual speakers. Finally, section 6.4 presents a summary of the chapter.

Each section contains two main sub-sections: one sub-section details the outcomes from Experiment 1, the similarity judgment task; and the second one reports results from Experiment 2, the linguistic description task. In each experiment, the analysis of the path vs. manner condition is presented first, followed by the results from the path vs. causation condition; finally, a subsection describes how each stimuli behaved in each experiment. In Experiment 2, a final subsection describes how other path and manner components in the sentences were combined with path and manner main verbs.

### **6.2 The study of adult monolingual speakers of English and Spanish**

#### **6.2.1. *Experiment 1: Similarity Judgment task***

This experiment aims to mainly test the hypotheses that English speakers should pay more attention to manner and cause than Spanish speakers (hypothesis D.1, section 5.2, chapter 5), because they are typologically different languages in encoding motion events. English is a S-language and Spanish is a V-language.

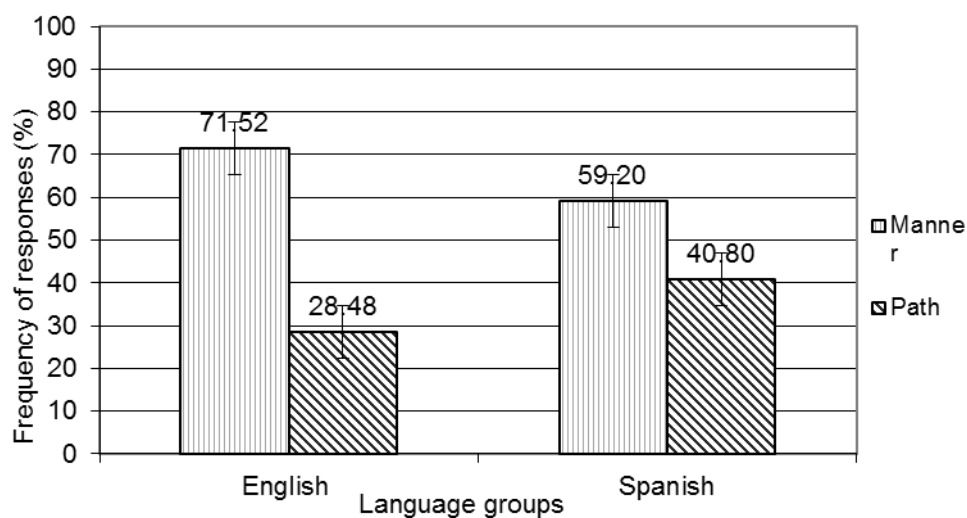
#### **Results from the manner vs. path condition**

The mean percentages of same-manner choices produced by 44 monolingual speakers of English and 40 monolingual speakers of Spanish were analysed in the similarity judgment task. In order to perform the task, participants chose



between same-path or same-manner videos. Therefore the selection of one variable implied the non-selection of the other. In this task, we report on the same-manner responses produced by participants because this is the feature in which both language groups differ, although the path variable will also be reported on in some analyses when it helps to visualize comparisons between language groups.

Both language groups found same-manner videos to be more similar to the target one (see figure 6.1 and Table 1 in the Appendix B for percentages). However, when language groups' performances were compared, it was evidenced that English speakers chose significantly more same-manner videos than Spanish speakers (mean percentages, 71.52% vs. 59.20% respectively). An independent t-test with same-manner choices as dependent variable revealed that differences between groups were significant ( $t(82) = 2.04$   $p < .05$ ). We further analysed the effect size of this finding in order to know how small or large the difference between groups is. For this, we performed a *Cohen's d* calculation which is the recommended test when 2 groups are compared. The results is *Cohen's d* = 0.444 which means that the effect is not large but moderated.



**Figure 6.1: Selection of same-path and same-manner choices in monolingual Spanish-speakers and monolingual English-speakers (%)**

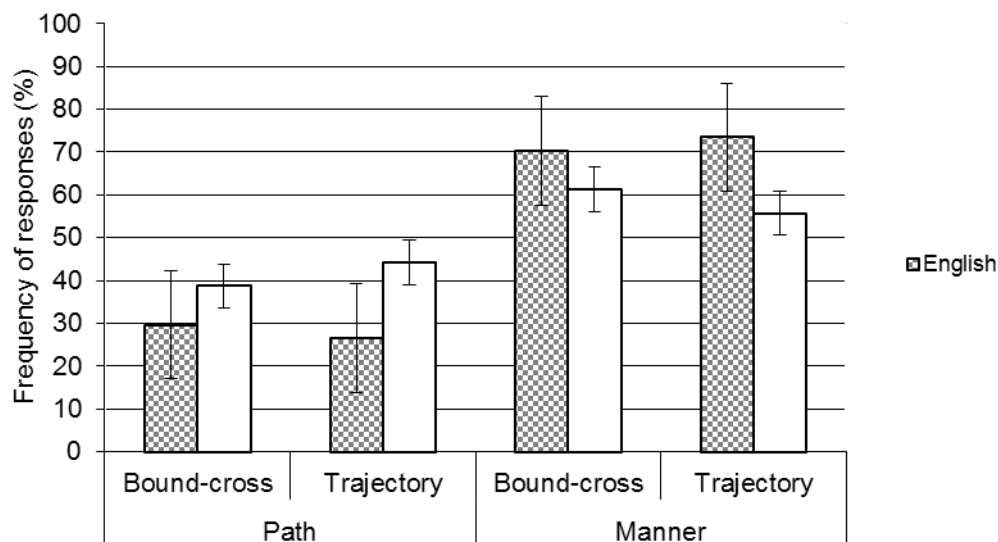
These first results show that although participants perceived the manner of the motion as more salient than the path, English monolinguals behaved moderately different from Spanish speakers in their preference for manner,

however, significant. As expected, English speakers preferred more same-manner videos than Spanish speakers did.

*Type of path (boundary-crossing path vs. trajectory path)*

As explained, when a motion event shows a *boundary-crossing* (BC) path Spanish speakers produce path verbs for encoding the trajectory. However, the production of path verbs tends to be higher when a motion event shows a BC paths that when it displays trajectory paths, in which case, manner verb is the preferred choice. In this section, the issue of whether this lexicalization pattern influences the process of categorization in Spanish-speaking and English-speaking monolinguals adults is investigated. In other words, do Spanish speakers select more same-manner choices when the videos show a trajectory path, and have the opposite pattern when a crossing-boundary path is shown? Similarly, how do English monolinguals behave in these conditions?

This analysis provides an opportunity to test the Language-as-Strategy hypothesis, formulated by Gennari et al. 2002, and specified by Wolff and Holmes (2010) as *thinking with language*. If language influences speakers' performance when they execute certain tasks such as a similarity judgment task, a difference should be observed in Spanish speaking responses when these two types of paths are compared in such task. English speakers should not show any difference. The main results are shown in Figure 6.2 (Table 2 in Appendix B shows the percentages).



**Figure 6.2: Selection of same-path and same-manner choices in crossing-boundary and trajectory paths videos in language groups (%)**

Figure 6.2 shows the percentages of same-path and same-manner choices for videos showing BC paths and trajectory paths between both language groups. Both language groups selected more same-manner videos than path-manner videos independently of the type of paths, although this preference was slightly higher in the English speaking group. A mixed ANOVA comparing same-manner preferences and type of stimulus (BC path and trajectory path) between language groups revealed a significant effect of type of path within the groups ( $F(1,82)=77.74$ ,  $MSE=306.773$   $p < 0.000$ ). However, there was no interaction between type of path and language group ( $F(1,82)= 0.51$ ,  $MSE=.201$   $p < 0.822$ ). In other words, speakers did not change their path vs. manner preferences according to the type of path in this cognitive task. Both language speakers preferred same-manner videos with both types of paths. This result seems to confirm that the type of path does not affect language group performances, at least in the context of a categorization task.

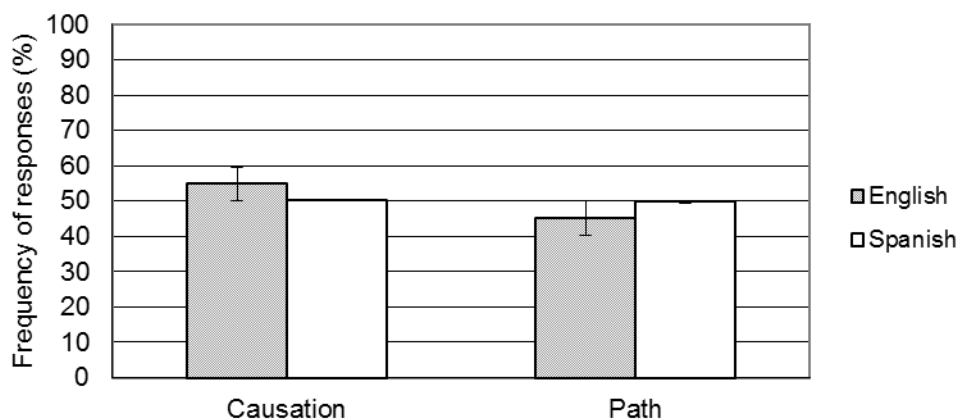
In summary, this section provided crucial results for this dissertation. They revealed that both languages groups perceived manner as more salient. However, Spanish speakers performed significantly differently to English monolinguals. The latter group paid significantly more attention to manner of motion than the former.

In relation to the type of path analysis, outcomes indicate that both groups preferred manner for all type of stimuli and that there were no interaction between type of paths and language groups, which seems to suggest that speakers did not necessarily use implicit verbal coding strategies for performing the task. This hypothesis is further developed in the Discussion.

*Results from the path vs. causation condition*

A second hypothesis under investigation in this dissertation is whether monolingual speakers of English and Spanish differ in their attention to path and cause components in motion events. According to the formulated hypothesis, English speakers should pay more attention to cause than speakers of path languages (see hypotheses D.3 and D.4, chapter 5).

Figure 6.3 (see Table 3 in Appendix B) shows the percentages of same-causation and same-path choices between monolingual groups. As expected by the linguistic relativity hypothesis, English speakers preferred same-causation videos over same-path videos. Spanish speakers, on the other hand, selected relatively the same proportion of both choices. When both language groups were compared, English speakers had more same-causation choices than Spanish speakers. A t-test comparing same-causation choices between language groups yielded a significant result ( $t(82) = 1.72$   $p < .05$ , one-tailed). Our hypothesis D.3 we expect more same-causation responses from English speakers. Therefore, reporting one-tailed p value is supported). However, we also calculated effect size, and the result yielded *Cohen's d*=0.37. This coefficient means that the effect of the difference is between small and moderate. Therefore, this result must be taken carefully and further research is necessary in order to fully confirm the hypothesis.



**Figure 6.3: Selection of same-path and same-causation choices between language groups (%)**

These results possibly indicate that English speakers paid more attention to causation than their Spanish-speaking peers. Spanish speakers did not show any particular preference.

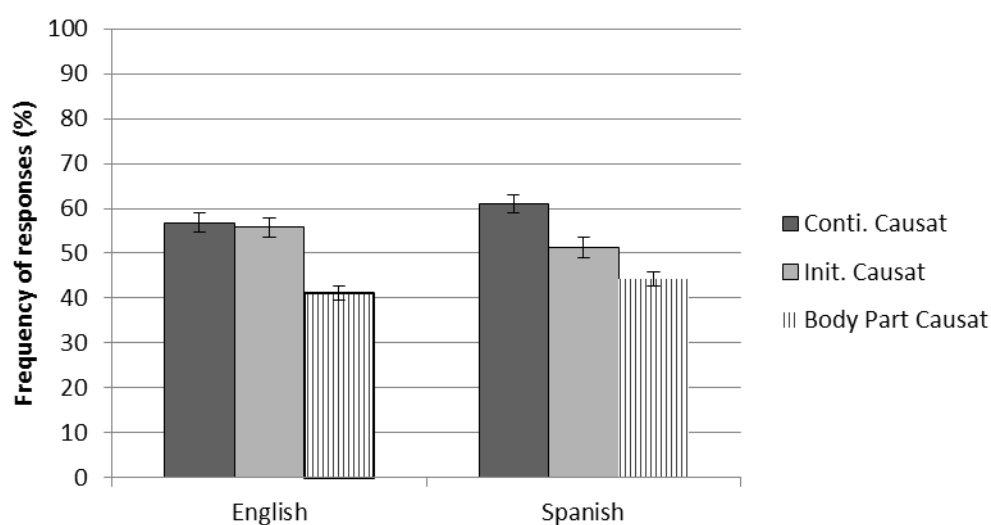
*Type of stimuli saliency*

The stimuli used in the videos for the study of the path vs. causation condition differed in terms of the agent saliency. Three types of stimuli were distinguished: initiating causation, continuous causation and body part causation (see Method). The question was whether these types of stimuli yielded different responses among the language groups. The hypothesis is that English monolinguals should pay more attention to causation than Spanish monolingual (hypothesis D.3 and D.4, chapter 5). This tendency should increase as a product of the saliency of the agents in the stimuli.

Figure 6.4 (percentages in Table 4 in Appendix B) depicts the percentages of same-causation responses according to the type of stimuli between the language groups. Both groups behaved similarly in relation to the type of cause. Continuous causation stimuli triggered the highest number of same-causation choices, followed by initiating causation stimuli, and by body-part stimuli. Therefore, a universal tendency among speakers was observed that seems to be connected to the saliency of the agent in the videos. Continuous causation videos present the option with the most salient agent; the agent moves along with the figure. Initiating causation is less salient than the previous design

because the agent, although present in the video, only propels the figure which continues its movement. Finally, the body part causation stimuli show the least salient agents of all because only a part of a body (a hand) moves a figure. Therefore, speakers can focus on the figure rather than on the agent.

When the language groups' responses were compared, it is observed that Spanish monolinguals paid less attention to cause than English monolinguals.



**Figure 6.4: Selection of same-causation responses according to type of causation in monolingual speakers of Spanish and English (%)**

A mixed ANOVA with the same-causation responses as a dependent variable, type of causation (initiating causation, continuous causation and body part causation) as a factor, and language group (English and Spanish) as a between subject variable revealed: a main effect of type of causation ( $F(2,82) = 50.59$ ,  $MSE = 70.676$ ,  $p < 0.000$ ); but no interaction between type of causations and language groups ( $F(2,82) = .461$ ,  $MSE = .644$ ,  $p < 0.631$ ). The pairwise comparison between-subjects in type of causation revealed a significant difference between body-part causation and the rest of the stimuli. These results mean that both language groups responded similarly to each type of causation.

In summary, both Spanish and English speakers behaved almost similarly in relation to the type of causation, which seems to suggest that independently of

their language background, speakers paid attention to the same perceptual aspects in these stimuli. However, English speakers generally paid more attention to causation than Spanish speakers. The hypotheses D.3 and D.4 (chapter 5), therefore are confirmed.

*Analysis of stimuli in path vs. manner condition*

It could be possible that some stimuli triggered some types of responses more than others. Therefore, the consistency among stimuli per language group was also analysed. Table 6.1 shows the mean percentages of same-manner responses and same-path responses obtained per stimuli in both language groups. The characteristics of each stimulus are detailed in the method.

The first observation is that English speakers responded more consistently than Spanish speakers. The former always preferred the same-manner response (from 52.27% to 90.91%, highlighted in grey). The latter group, on the other hand, had much more variation. In 5 stimuli, speakers chose the same-manner option (see percentages highlighted in grey), while in 3 they preferred the same-path option or remained in 50% and 50%.

**Table 6.1: Percentages of same-path and same-manner videos per stimuli in English and Spanish monolinguals**

	<i>Stimulus</i>	1	2	3	4	5	6	7	8
<i>English monolins.</i>	<i>% Same-Path</i>	25.00	36.36	31.82	24.14	30.68	22.99	47.73	9.09
	<i>% Same-Manner</i>	75.00	63.64	68.18	75.86	69.32	77.01	52.27	90.91
<i>Spanish monolins.</i>	<i>% Same-Path</i>	32.50	52.50	36.71	35.00	37.50	24.05	58.75	50.00
	<i>% Same-Manner</i>	67.50	47.50	63.29	65.00	62.50	75.95	41.25	50.00

It is possible that other factors outside language were affecting the responses of Spanish speakers, like for example, the saliency of the manners of motion. We observed that most of the sets of stimuli that showed non-familiar or everyday manners obtained the highest percentages of same-manner choices. For example, in stimulus No. 6, the variants of the target stimulus depicts a boy bumping down the stairs, while the other variant shows the boy going up the

stairs crawling using hands and feet. In the set of the stimuli No. 4 the paths are in/out of a room, but in one case the figure is walking and in another, the figure is crawling. It is feasible that the combination of usual and unusual manners makes this component of motion more salient than path. Additionally, we know from the literature that path and manner can be encoded in Spanish. This could also be a variable affecting responses in the categorization task.

#### *Analysis of stimuli in path vs. causation condition*

In relation to the path vs. causation condition, the percentages of same-path and same-causation answers per stimuli in English and Spanish monolinguals are depicted in table 6.2.

Each stimulus is categorized according to some non-linguistic factors that are related to the design of the stimuli:

1. The saliency of the agent: initiating causation, continuous causation, and body part causation.
2. If the agent is present in the target or not<sup>36</sup>.
3. If the agent is a whole human figure or just a human body part.
4. Type of path (boundary-crossing path or trajectory path).

These four factors could affect the responses. The percentages shown in table 6.2 indicate that speakers were not as consistent within this condition as they were for path vs. manner. English monolinguals tended to prefer causation over path in 5 stimuli out of 8. These stimuli showed a BC path as well as a trajectory path. They also presented a human agent and a body part agent. Some of the targets depicted the agent and others did not, and they varied according to the saliency of the agent. Therefore, with respect to English speakers, the non-linguistic factors considered in this experiment did not explain the speaker's responses. Obviously, in the types of tasks in which speakers are watching videos, it is possible that other variables which were impossible to control are commanding the speaker's attention.

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<sup>36</sup> Remember from the Method that half of these targets showed the agents moving the figure and the other half only showed the figures in motion without the agents that caused the motion.



**Table 6.2: Selection of same-path and same-causation responses according to the type of stimuli, type of path, presence of the agent in English and Spanish monolingual speakers (%)**

Saliency of Agent	Init. Causation			Continuous Causation			Body Part Causat.	
Agent present in target	No-Agent	Agent	No-Agent	No-Agent	Agent	Agent	No-Agent	Agent
Agent: human / body part	Human	Human	Human	Human	Human	Human	Body part	Body part
Type of path	BC	BC	BC	Traject.	BC	Traject.	Traject.	BC
Stimulus No.	1	7	3	6	2	8	5	4
<i>ENGLISH</i>								
<b>% Causation</b>	46.59	46.59	74.42	77.27	52.27	53.41	51.14	37.50
<i>SPANISH</i>								
<b>% Causation</b>	35.00	40.00	58.75	60.00	63.29	27.85	35.00	36.25

With relation to Spanish speakers we observe that the majority of the stimuli triggered path over causation (5 out of 8) although there are variations. Not all the stimuli that triggered more same-path responses in Spanish triggered more same-path responses in English, indicating that speakers from both languages paid attention to different aspects of the stimuli. With relation to English speakers, we also observe that most stimuli triggered causation responses (5 out of 8), however, there was variation between stimuli.

In relation to the analysed variables, answers in both language groups did not differ in relation to type of path, the type of agent, and whether an agent was present or not. In relation to saliency, with respect to body parts, we observe that Spanish speakers preferred same-path choices to same-causation videos. However, they were only two stimuli. Therefore, more fine-grained studies are necessary to determine conclusions.

In summary, this analysis showed that stimuli were very consistent throughout the experiment for path vs. manner condition, especially among English speakers who consistently preferred same-manner videos in high percentages. With respect to the path vs. causation condition there was more variation between stimuli, although overall, Spanish speakers preferred to choose same-path videos, while English speakers preferred same-causation choices.

## 6.2.2 Experiment 2: Verbal description task

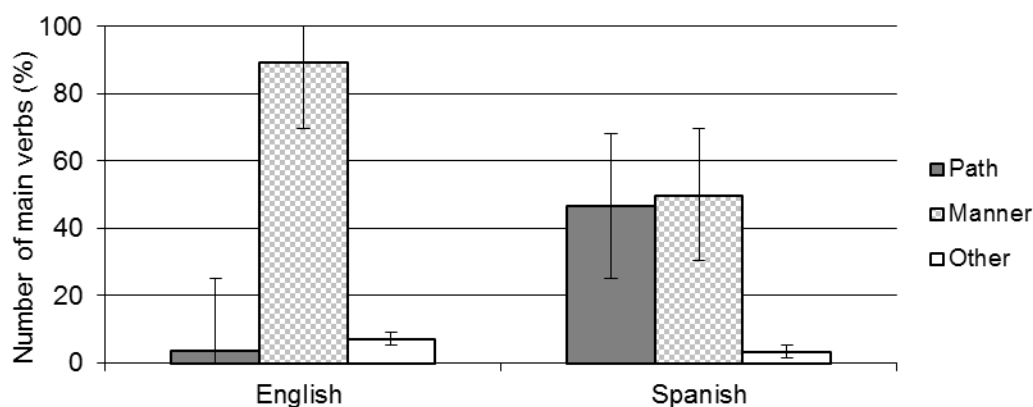
### *Results from the manner vs. path condition*

In this experiment, administered after the non-linguistic task, the same 44 monolingual speakers of English and 38 monolingual speakers of Spanish<sup>37</sup> from Experiment 1 were asked to describe in one sentence what they think happened in the videos. In this way, we determined the preferred motion event component conflated in the verb in each stimulus. However, despite the instructions, some participants produced more than one sentence per stimulus. As a consequence, in some cases participants produced two or more main verbs in which path and manner were conflated. In these cases, it was not possible to select a preferred pattern. For running the statistical analysis all the participants' answers where two main verbs encoding path and manner appeared were discarded. However, if there were two main verbs, but only one expressing path or manner, the sentence containing the motion event element was counted for the analysis. For example, in "*She **opened** the door and **walked** through the corridor*", the first sentence is discarded while the second one is analysed. When the participant's answer did not contain a path or a manner main verb it was counted as "other verb". Cases of double sentences with path and manner main verbs counted for less than 5% of the total answers from participants.

The first general results are shown in Figure 6.5 (See Table 5 in Appendix B for percentages). English speakers did prefer to encode manner verbs over path verbs (89.20% for manner and 3.69% for path). Spanish speakers encoded path and manner in relatively the same rates (46.54% for path and 49.92% for manner), although there is a slight preference (non-significant) for manner (see Figure 6.5). Both language groups produced "other verbs" as well. However, the production of these verbs is low, although it is higher than path verbs amongst English speakers.

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<sup>37</sup> Two monolingual speakers of Spanish from Experiment 1 did not participate in this task. In one case, one of the participants could not perform the second experiment, while in the other case the speaker did not answer correctly to the task and his data was discarded.



**Figure 6.5: Selection of path, manner and other main verbs in English and Spanish speakers (%)**

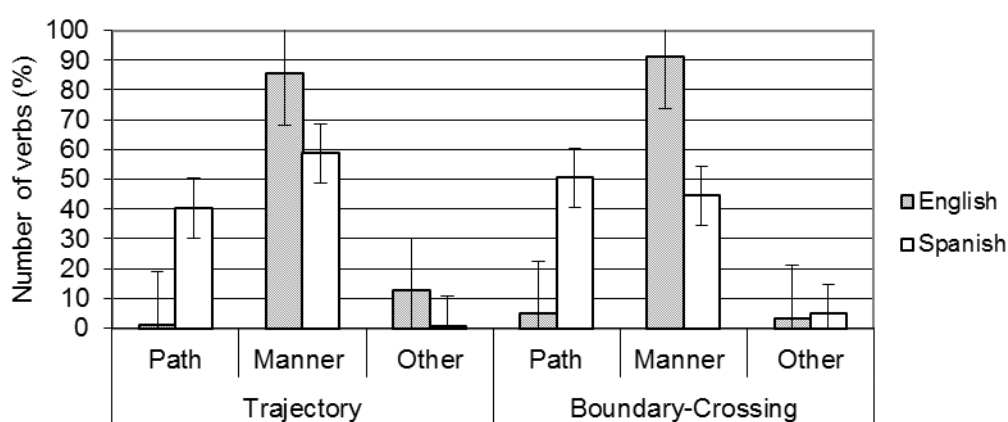
We ran an independent t-test with manner verb selection as a dependent variable and language groups as the independent variable. The test yielded significant differences between English and Spanish speakers ( $t(80) = 11.395$   $p < .000$ ). English speakers preferred to encode more manner verbs than Spanish speakers (English:  $M = 7.11$ ; Spanish:  $M = 3.89$ ). The effect size calculation revealed a large effect difference between groups (*Cohen's d* = 2.00). A second independent t-test with path verb selection as a dependent variable and language groups also revealed significant differences between speakers of both languages ( $t(80) = -12.085$   $p < .000$ ). The effect of this difference is also large (*Cohen's d* = 2.76). In this case, Spanish speakers significantly produced more path verbs than their English peers (Spanish:  $M = 3.67$ , English:  $M = .29$ ). The last independent t-test compared “other verbs” selection as a dependent variable and language groups. The test revealed significant differences between English and Spanish speakers ( $t(80) = 2.062$   $p < .040$ ). English speakers preferred to produce more “other verbs” than Spanish speakers (English:  $M = 0.57$ , Spanish  $M = .26$ ).

In conclusion, the analysis reveals that our English monolinguals behave as expected, producing almost exclusively manner verbs (hypothesis A1). Spanish monolinguals, on the other hand, slightly preferred manner verbs over path. In terms of statistics, this last language group did not show a clear tendency. This result rejects our hypothesis A.2 (chapter 5) that states that Spanish speakers should prefer to encode path verbs over manner verbs.

This high percentage of manner verbs among the Spanish monolinguals is unexpected according. However, this could be explained by the fact that our stimuli also showed trajectory paths, which we know can trigger manner verbs. The following section explores the participants' answers according to the types of path (boundary-crossing and trajectory path) in more detail.

*Type of path (boundary-crossing path vs. trajectory path)*

Manner-verbs and path-verbs selections were divided according to the type of path (BC vs. trajectory) shown in the videos. Figure 6.6 illustrates the results (Table 6 in Appendix B shows the percentages of Figure 6.6).



**Figure 6.6: Frequency of path verbs and manner verbs according to the type of path between language groups**

The analysis reveals that, in almost all cases, English speakers preferred to encode manner independently of the type of path. Spanish speakers behaved more as expected. They favoured the encoding of path when the video showed a boundary-crossing path (51%). Conversely, when videos displayed a trajectory path, the tendency was to express a manner component (59%). These percentages were statistically significant. A mixed ANOVA measuring the path verb selection as a dependent variable, type of path (boundary-crossing and trajectory), and language group as factor revealed a main effect of type of path ( $F(1,80) = 29.21$ ,  $MSE = 21.181$ ,  $p < 0.000$ ), a significant interaction between type of path and language groups ( $F(1,80) = 14.89$ ,  $MSE = 10.864$ ,  $p < 0.000$ ), and a significant effect of language groups as between subjects ( $F(1,80) =$

165.09, MSE=115.266  $p < 0.000$ ). The same significant results were obtained for manner verb selection.

Different independent t-tests comparing language groups and type of path confirmed that monolingual speakers of English and their Spanish peers had significantly different responses with respect to the type of path. In relation to boundary-crossing stimuli, English speakers and Spanish speakers differed in the proportion of manner verb encoding,  $t(80) 9.390$ ,  $p=.000$  (English speakers:  $M^{38}=4.54$ , Spanish speakers:  $M=2.12$ ). Spanish speakers, on the other hand, significantly encoded more path verbs with this type of path than English ( $t(80)=-8,198$ ,  $p < .000$ , Spanish speakers:  $M=2.44$ , English speakers:  $M=.25$ ). Within this type of stimuli, however Spanish speakers and their peers did not differ in their production of “other verbs” ( $t(80) -.533$   $p > .05$ ). In relation to trajectory path stimuli, the t-tests revealed that speakers of the languages under study differed in all the categories, that is in case of path ( $t(80)= -14.002$ ,  $p < .000$ ), of manner verbs ( $t(80)= -7,345$ ,  $p < .000$ ) and of other verbs ( $t(80)= 4.570$ ,  $p < .000$ ). The tendencies were similar to the t-tests reported for BC path stimuli. That is, English speakers encoded more manner verbs than Spanish speakers (English speakers:  $M=2.56$ , Spanish speakers:  $M= 1.76$ ), but Spanish speakers encoded more path verbs than English speakers ( $M=1.21$  and  $M= .045$  respectively). Finally, English speakers produced significantly more “other verbs” than Spanish speakers in trajectory stimuli ( $M=.38$ ,  $M=.026$  respectively).

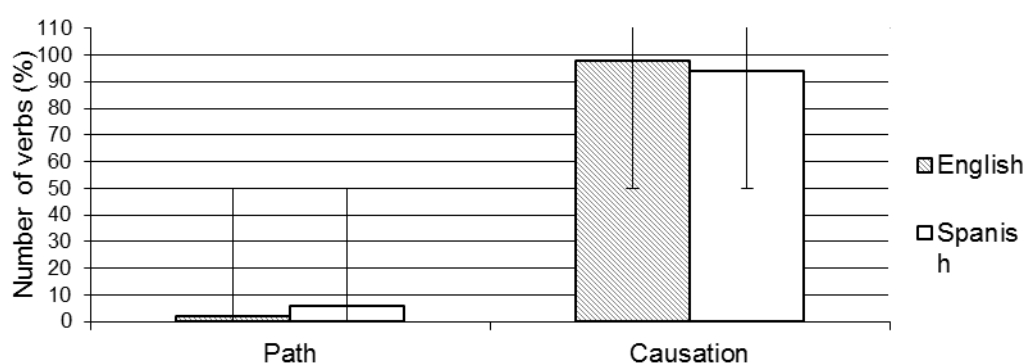
The outcomes demonstrated that these two groups definitely acted differently: English monolinguals behaved as speakers of a S-language confirming our hypothesis A3 (chapter 5), while Spanish monolinguals showed the expected tendencies from a V-language according to Slobin and other authors. Spanish speakers preferred to encode path verbs when boundary-crossing paths are shown which confirms the hypothesis A.4 (chapter 5). It is interesting to notice that, although the expected tendency in Spanish speakers was observed in the data, the differences between encoding path verbs and manner verbs for BC and trajectory paths were not great. Spanish speakers seem to be more flexible in the encoding of path or manner verbs than previously thought.

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<sup>38</sup> M= refers to the mean obtained in the statistical test.

### *Results from the path vs. causation condition*

The analyses of the path vs. causation preferences revealed that all language groups described videos mainly expressing the cause element of the motion event, i.e. the agent. Figure 6.7 shows these results (Table 7 shows percentages from this figure in Appendix B). The very few descriptions expressing path verbs were produced by Spanish monolingual speakers. However, the small difference observed between language groups was statistically significant.



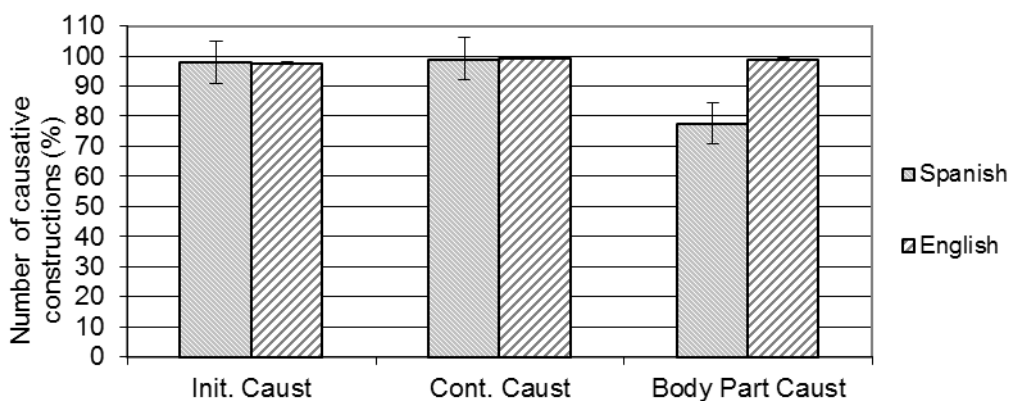
**Figure 6.7 Frequency of causative constructions and sentences with path main verbs in monolingual speakers of Spanish and English (%)**

An independent t-test measuring causative constructions as the dependent variable and language group as independent variable showed that Spanish speakers and English speakers statistically differed from each other:  $t(80) = 1.083$ ,  $p = .016$ . The *Cohen's d* effect size coefficient = 1.39 indicates that the difference between groups is large. This confirms our hypothesis A.6 (chapter 5) that states that English monolinguals show a tendency to encode more causative constructions than their Spanish peers.

### *Types of causation*

It should be remembered that the stimuli used in this task were highly salient because they all showed an agent. It could be a whole human figure or a human body part, but always an agent is introduced in the videos moving a figure. Therefore, a high percentage of causative constructions was expected. However, because the three different types of causations showed different

levels of agent saliency, it was possible to observe different responses among speakers in this study. Figure 6.8 shows the percentages of causative constructions produced by all speakers (In Appendix B Table 8 shows the figure's percentages).



**Figure 6.8: Frequency of causative constructions produced by language groups according to the type of causation (%)**

It is evident that both groups performed very similarly for the initiation causation and the continuous causation stimuli. However, the stimuli that triggered different answers between language groups were the body part causation stimuli. It is in this type of stimuli where we observed the difference between the groups, and for that reason we decided to analyse it separately from the others.

We think that Spanish speakers could have produced some path verbs because the agent is less salient in this particular condition. Remember that in this condition, the agent is a hand moving an object. It is probable that the participant could have focused more on the moving object. It is interesting to note that both groups behaved differently.

Different independent t-tests comparing language groups and type of path confirmed that English and Spanish speakers only significantly differed in relation to the body part causation. T-tests comparing type of stimuli according to saliency yielded non-significant differences. It is only when selection of path verbs were compared with selection of causative construction in the body part

stimuli across languages the t-tests revealed that Spanish speakers significantly produced more path verbs than English speakers ( $t(80) = -3.550$   $P = .001$ . Spanish speakers,  $M = .45$  and English speakers,  $M = .022$ ).

We also counted the number of speakers that produced at least one sentence with a path verb for all the stimuli. Only 3 English speakers, compared to 13 Spanish speakers, produced this type of sentence, suggesting that Spanish speakers can certainly be more driven to express path and obviate causation when describing motion events. This result helps us to reconfirm our hypothesis that English speakers prefer to encode causative constructions more than Spanish speakers (hypothesis A.6, chapter 5).

#### *Analysis of stimuli in path vs. manner condition in Experiment 2*

We analysed the consistency in answers among speakers per stimulus. With some exceptions, answers to stimuli were rather constant among speakers. For example, Spanish speakers selected path verbs per stimulus in 30% to 48% percentage. However, two stimuli had extreme opposite answers. One refers to the stimulus No. 6 (going up/sitting backwards, in Table 5.2 in Chapter 5), in which 94.44% produced the path verb *subir*/ascend. This stimulus showed a trajectory path; therefore a high production of manner verbs was expected from speakers. Secondly, new findings suggest that stimuli showing a vertical path (like up or down) should trigger more manner verbs than path among V-language speakers. However, in our case, Spanish speakers preferred the path verb *subir* “ascend”. It is interesting to notice that two speakers produced manner verbs for this stimulus (see examples 1 and 2), proving that path is not the only lexical pattern allowed in this language.

(1) *un hombre se arrastra por una escalera / a man is dragging himself to some stairs*

(2) *un muchacho haciendo culicross para arriba / a boy is sliding from above*

Spanish speakers preferred path verbs when describing this stimulus No. 6 but they frequently described the manner component of the video internally in the sentence. In this stimulus, path verbs were always accompanied by manner satellites. This is something that did not happen with other stimuli where, for example, a certain percentage of path verbs appeared alone, without any



satellite. This seems to show that despite speakers preferred to encode path in the verb, they paid also a great deal of attention to manner as well. Interestingly, in Experiment 1, Spanish speakers greatly preferred same-manner choice to the same-path one. This high percentage of path verbs in this stimulus made the total mean percentage of path selection on trajectory path events go up. Without this stimulus, trajectory path stimuli would have been mainly formed by sentences with manner verbs.

**Table 6.3: Mean percentages of path, manner and other verbs selection according to stimuli in English and Spanish monolinguals**

<i>Stimulus No.</i>	1	2	3	4	5	6	7	8
<i>English Monolinguals</i>								
<b>Path verbs</b>	0.00	13.46	10.20	13.21	0.00	0.00	0.00	0.00
<b>Manner verbs</b>	97.73	78.85	79.59	66.04	100.00	61.36	97.73	97.73
<b>Other Verbs</b>	0.00	5.77	0.00	13.21	0.00	0.00	0.00	0.00
<b>Other Verbs (related main event)</b>	2.27	1.92	10.20	7.55	0.00	38.64	2.27	2.27
<i>Spanish Monolingual</i>								
<b>Path verbs</b>	30.95	45.83	48.65	60.00	47.37	94.44	21.05	2.63
<b>Manner verbs</b>	64.29	37.50	48.65	6.67	52.63	2.78	78.95	94.74
<b>Other Verbs</b>	4.76	14.58	0.00	28.89	0.00	0.00	0.00	0.00
<b>Other Verbs (related main event)</b>	0.00	2.08	2.70	4.44	0.00	2.78	0.00	2.63

The second stimulus that produced extreme responses among Spanish speakers was No. 8. This stimulus showed a trajectory path; therefore we would have expected to see more manner verb in constructions than path verbs. Speakers actually encoded more manner verbs (94.73%) than path and “other verbs” (2.63%). The extreme percentages are surprising. Additionally, this is the only stimulus that triggered such high number of manner verbs (see Table 6.3). In this case, the path was a trajectory difficult to name, and it is possible that most speakers turned to manner (*to jump*), which is a very frequent manner. Some speakers did produce path verbs in their answers (see the following examples).

- (3) a. recorre <sub>[path]</sub> las líneas marcadas saltando <sub>[manner]</sub>  
 (he) goes over <sub>[path]</sub> the marked lines jumping <sub>[manner]</sub>
- b. Hombre salta de lado <sub>[manner]</sub> siguiendo las líneas del piso <sub>[path]</sub>  
 Man jumps from one side <sub>[manner]</sub> following the floor lines <sub>[path]</sub>
- c. Hombre salta <sub>[manner]</sub> formando un cuadro <sub>[path]</sub>  
 Man jumps <sub>[manner]</sub> forming a square (pattern) <sub>[path]</sub>

Example 3-a showed an answer in which a participant produced a neutral verb indicating motion. In this example, it was important for the speaker to show that the figure was following some lines on the floor, which definitely marked the path of the figure. The manner was encoded by the satellite (i.e. the gerund). In examples 3-b and 3-c, the verb encoded manner but the rest of the sentence marked the path. These examples seem to demonstrate that path is also important to mention. This stimulus in Experiment 1 had 50% and 50% of responses, suggesting that manner and path of motion were equally important to Spanish speakers.

There was less variation in the English groups than in the Spanish group. English speakers always preferred manner verbs (from 61% to 100%). Only two stimuli had a manner verb preference in around 60%. One of these was stimulus No. 6 whose main answers were 62% of manner verbs and 38% of “other verbs”. The characteristics of “other verbs” forms are discussed in detail below. But so far, it can be said that this 38% is formed by the verb “to go + up”, i.e. a path verb. As in the case with Spanish speakers, English speakers’ performance with respect to this stimulus reveals that despite the strong preference for manner, the option of “going up stairs” was also very frequent. In Experiment 1, English speakers preferred for this stimulus the same-manner option in 77%, which suggests that manner of motion was still highly salient.

The second stimulus that showed high percentages of answers categorized as “other verbs” was stimulus No4. This is also observed among Spanish speakers, and basically the explanation is that this stimulus showed the figure opening the door first and, therefore, this action was also encoded. Sometimes the action of opening the door was the only description given by the participant,

but in the majority of the cases participants accompanied the verb “to open” with another path or manner main verb.

#### *Analysis of stimuli in path vs. manner condition in Experiment 2*

We consider irrelevant to analyse stimuli in this condition because speakers produced high percentages of causative constructions for all stimuli from both languages. Therefore, there was little variation among stimuli and between language groups.

#### *A descriptive analysis of motion event components in sentences in the path vs. manner condition (semantic and syntactic analyses)<sup>39</sup>*

For this analysis, all the answers produced by speakers were analysed, independently of having more than one main verb. In total, 696 sentences were studied, 322 sentences from the Spanish speakers and 374 from the English speakers.

Table 6.4 shows the number and percentages of appearance of :

1. main *path verbs*;
2. main *manner verbs*;
3. total “*other verbs*” (not related to path and manner);
4. total “*other verbs*” (related to the main event).

Inside points 1 and 2 (see Table 6.4), the following was counted:

- i. path and manner components that appeared with path and manner main verbs
- ii. frequency of manner and path main verbs that appeared alone or with a locative (see examples 4a-c).
  - a. Example 4-a shows a sentence with a main manner-verb followed by a path component (out) and a locative (of the room).
  - b. Example 4-b shows a main verb plus a locative
  - c. Example 4-c presents the subject and the main manner verb, there is no other reference to path or manner. These types of

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<sup>39</sup> This analysis is only performed for the path vs. manner condition because it is where more possible outcomes can be analysed and compared with other studies.

sentences were included in section 1.1 and 2.2 and are called *only path verb* and *only manner verb*.

- (4) a. A man just walked [manner] out [path] of a room [locative]  
b. Girl hops [manner] in hall [locative]  
c. The girl is skipping [manner]

Point 3 in Table 6.4, *Total “other verbs” (not related to path or manner)*, compiles all the sentences that used main verbs unrelated to the main event designed from the experiment. Point 4 in Table 6.4, *Total “other verbs” (related to the main event)* gathers all the sentences that encoded verbs different from manner or path. Example 5 is a participant’s answer for a stimulus in which a man opened the door and walked out of a room. The participant focused on the man opening instead of his manner or path. Then, this answer was classified in “other verb” (not related to path or manner) in point 3. While a sentence counted in point 4 is exemplified in 6, in which the main verb, despite not informing about the path or manner of the stimuli, is using a verb that informs about deixis or directionality. In this case, the verb informs about the figure moving towards the camera in the video.

(5) a man opens a door ...

(6) a man has come through a door

**Table 6.4: Frequencies and percentages of manner verbs and path verbs in combination with other path and manner components in Spanish- and English- speakers**

	Spanish Monolinguals		English Monolinguals	
	Total No.	%	Total No.	%
<b>1. Path</b>				
1.1. Only path verb	44	31.21	9	47.37
1.2 Path + Manner	93	65.96	3	15.79
1.3 Path + Path +Manner	0	0	1	5.26
1.4 Path + Manner + Manner	4	2.84	1	5.26
1.5 Path +Path	0	0	5	26.32
<i>PATHS</i>	141	100	19	100
<i>Total Path</i>	141	43.79	19	4.61
<b>2. Manner</b>				
2.1 Only manners verb	104	67.97	97	30.79
2.2 Manner+ Path	23	15.03	127	40.32
2.3 Manner + Manner + Path	1	0.65	35	11.11
2.4 Manner + Path + Path	0	0	7	2.22
2.5 Manner + Manner	25	16.33	49	15.56
<i>MANNERS</i>	153	100	315	100
<i>Total Manner</i>	153	47.51	315	84.88
<b>3. “other verbs” (not related to path and manner)</b>	21	6.52	10	2.37
<b>4. “other verbs” (related to the main event)</b>	7	2.17	30	8.14
<b>5. No-answer</b>	1		0	
<i>Total No. sentences</i>	322		374	

Spanish speakers did not show a preference pattern for either path or manner verbs (43.79% and 47.51% respectively); while English speakers highly preferred manner verbs (84%) (see Table 6.4).

When Spanish speakers produced path verbs, they were followed in 65.96% of cases by a manner component (usually a gerund followed by oblique complements of mode) and in 31.21% of cases, these path verbs appeared

alone or with ground locatives. Therefore, path is mainly expressed with manner among Spanish speakers. There were four cases in which path verbs were accompanied by two manner components together. In these cases when manner appeared twice in a sentence, further manner description was necessary to properly describe the event. See example 7 in which “*saltar*” / *to jump* is not enough for expressing the manner of the figure and the speaker needs to add *on a foot*. In English, however, there is a verb that encodes *jumping on a foot*, that is, *to hop*.

(7) (él) *entra* <sub>[path]</sub> *al edificio* *saltando* <sub>[manner]</sub> *en un pie* <sub>[manner]</sub> /  
 (he) *entered* *to the building* *jumping* *on a foot*

English: he hopped into a building

In relation to manner verbs, Spanish speakers preferred to encode them alone (67.97% of the cases). The next most produced case was manner verbs with manner components (16.33%). As it was explained above, when manner verbs appeared with other manners, speakers were specifying the characteristics of the figure’s movement in even more detail.

Spanish speakers expressed 6.52% of “*other verbs*” not related to path or manner. These cases all referred to the verb *abrir* / *to open* which were expressed in three stimuli (see example 8). On the other hand, only 2.17% of the sentences contained “*other verbs*” related to the main event (see example 9).

(8) *La muchacha abriendo una puerta* / *the girl (is) opening a door*

(9) *La muchacha va feliz a la salida* / *the girl goes happily to the way out*

English speakers produced a different performance compared to Spanish speakers. Firstly, only 4.61% of the sentences had a main path verb. Nine out of 19 of these verbs were path alones (see example 10-a) and 3 cases were path verbs with manner satellites (see example 10-b). Almost half of these path verb sentences appeared with another sentence in which manner is mentioned before or after, as in example 10-c.

- (10) a. A person enters the building  
 b. The person entered the building hopping  
 c. the woman hops towards a door and enters it.

Examples 10 a-b are very interesting as they are typical Spanish structures of motion event description, yet we find them among English speakers. This suggests that these typical sentences from one language are not necessarily impossible in another language, although very infrequent. These three examples in 10 were produced by different speakers to the same stimulus.

In relation to expressions with manner verbs among English speakers, we observed that the combination of manner and path satellites was the most common pattern (40.32%) followed by *only manner verb* (30.79%). Around 26% of manner verbs had another manner. Usually that was formed by additional components in the form of oblique complements expressing mode that worked to further specify the manner of action (see examples 11a and b).

- (11) a. man hopping<sub>[manner 1]</sub> on one leg<sub>[manner 2]</sub> into building  
 b. the man is shuffling<sub>[manner 1]</sub> up the stairs using his hands and feet<sub>[manner 2]</sub>

Path satellites depended on the motion events, but they were typically prepositions such as *down*, *up*, *across*, *out*, *in*, *into*, *through*, *towards*, among others. English speakers were the only language group that produced more than one path in a sentence, and we already know that this is allowed in English. Spanish speakers did not show similar cases (see Table 6.4). Most of the second paths in English sentences were also prepositions, as in example (12-a). We had very few cases in which this second path was a subordinate clause as in 12-b.

- (12) a. girl **twirls** out<sub>[path 1]</sub> from room into<sub>[path 2]</sub> corridor  
 b. a woman's spinning as she enters<sub>[path 1-subord clause]</sub> a room through<sub>[path 2]</sub>  
 a door

In total, 2.37% of the sentences produced by English speakers had “*other verbs*” not related to path or manner. In these cases, as in Spanish, the verb was always “to open”, and it appeared in the same two stimuli in the Spanish population. Sentences carrying this verb “to open” were mainly followed by another sentence, usually expressing a manner verb. This suggests that in these two main stimuli, the action of *opening the door* was somehow salient and people expressed it. However, although observed in both languages, it was produced in a higher percentage (6.52%) in Spanish than in English.

In relation to “other verbs” related to the motion events, English speakers produced the complete opposite pattern compared to Spanish speakers. In this case, many neutral verbs were used to express motion, directionality or deixis: *going, coming, moving, doing*. They constituted 8.14% of the main verbs in the total number of sentences. Some examples are shown in 13a-b.

- (13) a. *she's moving under the table*  
b. *lady is doing circles across the room*

It is worth drawing attention to the high percentage of only manner and only path verbs produced by Spanish speakers. In table 6.4, the frequencies of these forms constituted in total (44 + 104=148) 45.96% of the cases, almost half of the produced sentences (bearing in mind that these cases include bare verbs and verbs with locatives or grounds). Therefore, it was important to know how many of these sentences contained bare verbs. Out of this 45.96%, 26.35% were bare verbs in Spanish (see 14a-b for examples of bare verbs in Spanish). Table 6.5 shows the frequency of bare verb sentences in English and Spanish, and the percentage of that frequency in relation to the total number of sentences produced by both speaker groups. This table clearly shows that first, bare verbs appeared mainly with manner verbs in both languages, and secondly, that Spanish speakers produced far more of these verb forms than English speakers (12.11% versus 3.74% respectively). This confirms the hypothesis A.5 (see chapter 5) that Spanish is a language with a tendency to produce high percentages of bare verbs and that usually expresses manner.



**Table 6.5: Frequencies and percentages of bare verbs production in English and Spanish monolinguals**

	Path	Manner	Total	% in relation to total no. sentences ( 696 )
Spanish speakers	1	38	39	12.11
English speakers	0	14	14	3.74

(14) a. una muchacha trota / a girl jogs

b. un hombre llegando / a man (is) arriving

Summarising thus far our comparisons between English speakers and their Spanish peers show that the presence of manner verbs with path satellites is more frequent in the former group's productions than in the latter's. Secondly, Spanish speakers produced many more manner verbs and path verbs alone (without other path or manner components), 45.96% compared to 28.34%. Additionally, when percentages of bare verbs were compared, Spanish speakers showed a high percentage of these structures in relation to English speakers. The use of "other verbs" (not related to path or manner) was generally low in both languages, however, much more present in Spanish speakers than in English speakers. These findings might support some of the hypotheses that express that Spanish speakers see other aspects, rather than only focusing on path or manner of motion. Nevertheless, the percentage is too low to make any conclusion. Both types of speakers basically produced path or manner main verbs. Only 10% or less produced "other verbs", and some of them were still associated with paths or manner through the use of neutral verbs. Finally, these results also proved the reliability of the stimuli for the purpose of the task.

In Table 6.6 the same data from table 6.4 is detailed, but divided according to the type of stimuli: boundary crossing path and trajectory path. The preference for Spanish and English speakers in relation to BC and trajectory paths was already shown in section *Type of path (boundary-crossing path vs. trajectory*

*path*) in the present chapter. With Spanish speakers, in the present analysis, when the event showed a BC path, 55% of the path verbs were accompanied by a manner component and 40.82% were *other path verbs* (see Table 6.6). However, when the events showed trajectory paths, Spanish speakers mainly preferred path verbs with manner component (90.70%). One possible explanation for this pattern is that speakers encode path verbs with trajectory path because path verbs are the preferred option in Spanish. However, manner is still important when this type of path is shown (trajectory) because there is not a change of state in the figure. Thus, if manner is still important, at least some information about it has to be incorporated. As a result, Spanish speakers will encode path verbs accompanied with manner satellites in this case. When the event showed a BC path, the selection of manner verbs and its components were very similar to trajectory events. Only *manner verb* is the preferred pattern.

**Table 6.6: Frequencies and percentages of manner verbs and path verb in combination with other path and manner components according to the type of path in Spanish- and English- monolinguals**

	Spanish Monolinguals					English Monolinguals				
	Boundary crossing path		Trajectory path		Total	Boundary crossing path		Trajectory path		Total
	No.	%	No.	%		No.	%	No.	%	
<b>1. Path</b>										
<b>1.1 Only path verb</b>	40	40.82	4	9.30	44	9	47.37	0	0.00	9
<b>1.2 Path + Manner</b>	54	55.10	39	90.70	93	3	15.79	0	0.00	3
<b>1.3 Path + Path +Manner</b>	0	0.00	0	0.00	0	1	5.26	0	0.00	1
<b>1.4 Path + Manner + Manner</b>	4	4.08	0	0.00	4	1	5.26	0	0.00	1
<b>1.5 Path +Path</b>	0	0.00	0	0.00	0	5	26.32	0	0.00	5
<b><i>PATH</i></b>	98	100.00	43	100.00	141	19	100.00	0	0.00	19
<b><i>Total Path</i></b>		46.56		39.38			7.37		0.00	
<b>Manner</b>										
<b>2.1 Only manner verb</b>	60	69.77	44	65.67	104	35	17.33	62	54.87	97
<b>2.2 Manner+ Path</b>	8	9.30	15	22.39	23	108	53.47	19	16.81	127
<b>2.3 Manner + Manner + Path</b>	1	1.16	0	0.00	1	16	7.92	19	16.81	35
<b>2.4 Manner + Path + Path</b>	0	0.00	0	0.00	0	6	2.97	1	0.88	7
<b>2.5 Manner + Manner</b>	17	19.77	8	11.94	25	37	18.32	12	10.62	49
<b><i>MANNER</i></b>	86	100.00	67	100.00	153	202	100.00	113	100.00	315
<b><i>Total Manner</i></b>		41.95		58.82			84.44		85.61	
<b>3.Total “other verbs” (not related to path and manner)</b>	21	9.64	0	0.00	21	10	3.80	0	0.00	10
<b>4. Total “other verbs” (related to the main event)</b>	5	1.84	2	1.80	7	11	4.39	19	14.39	30
<b><i>Total Sentences</i></b>	210		112		322	242		132		374
<b><i>Double Gerunds</i></b>	1		0		1	0		0		0

According to the literature, type of path should not affect speakers of S-languages. However, in Table 6.6, some differences in answers are observed in this regard among English speakers. The first likely finding is that in this language, path verbs were used exclusively with BC path, and there were no

cases of path verbs with trajectory paths. As far as we know, this is the first time this outcome has been found in this type of analysis.

In relation to the distribution of manner verbs, point 2 in Table 6.6, there seems to be variation between patterns of preferences between the two types of paths in English. The general percentages between them did not change too much (for boundary-crossing 84.44%, for trajectory 85.61%) but internally there are differences in terms of the preference for *only manner verbs* and *manner verbs+path*. English speakers preferred to produce more *only manner verbs* when the path was a trajectory (54.87%), whereas they preferred to encode more manner verbs + path satellites when the path showed a boundary-crossing event (53.47%). This again seems to confirm that despite the manner verb preference in English, when a path showed a figure crossing a boundary, speakers of this language seem to specify the path to a certain extent, and they encode it in the form of satellites. This looks less necessary when the path shows a trajectory.

Finally, in Table 6.6 a row called “Double gerunds” can be seen. This pattern came from the analysis of bilingual data, which is discussed in section 6.3. It refers to sentences which express two gerunds, one after the other, implying that two activities are occurring at the same time. In Spanish, it is possible to produce two gerunds as in 15-a. There is a coordinate conjunction that allows listeners to understand that this example refers to two main sentences in which the auxiliary *estar* “to be” has been obviated. However, in example 15-b we are not certain if the sentence contains two main verbs, or one main verb and a subordinate sentence modifying a noun.

- (15) a. muchacho saltando en un solo pie y entrando a un cuarto  
a boy jumping in one foot and entering into a room
- b. una muchacha saltando en un solo pie entrando por una puerta de vidrio  
a girl jumping in one foot entering through a glass door

Example 15b could be understood like a) a girl jumping on one foot is entering a glass door, or like b) a girl is jumping on one foot and is entering a glass door. Cases like 15-b were classified as double gerunds.

### 6.3. The study of adult bilingual speakers of English and Spanish

#### 6.3.1. Experiment 1: Similarity Judgment task

##### *Results from the manner vs. path condition*

We calculated the percentages of same-manner choices produced by 36 S-E bilinguals in the similarity judgment task. Bilinguals were studied as a whole group and also according to their proficiency differences, age of acquisition (AoA) and time living in an English speaking country (TLEC). These variables were chosen because they seem to affect bilingual conceptualization and categorization. We also collected data about the frequency of L2 use. However, we ended up not analysing this variable because speakers did not differ greatly in their responses. Finally, we compared bilinguals with monolingual speakers of English and Spanish.

**Table 6.7: Mean percentage and standard deviation of same-manner and same-path responses in bilingual speakers**

	Same-manner		Same-path	
	Mean	$\sigma$	Mean	$\sigma$
S-E bilinguals	59.14	4.08	40.86	4.14

##### *Bilinguals' performance according to their proficiency*

S-E bilingual speakers, as a whole group, found same-manner videos more similar to the targets (see Table 6.7). However, it is possible that bilinguals differ in their responses according to their level of English proficiency, AoA, and/or TLEC. More proficient speakers probably have their categorization skills more affected by a second language such as English, which is so manner dominant. Table 6.8 shows the percentages of same-path and same-manner choices according to the proficiency of the speakers based on the QPT. Speakers were divided in the *advanced group* and the *intermediate group*. The table showed essentially the same performance between both groups, although there is a

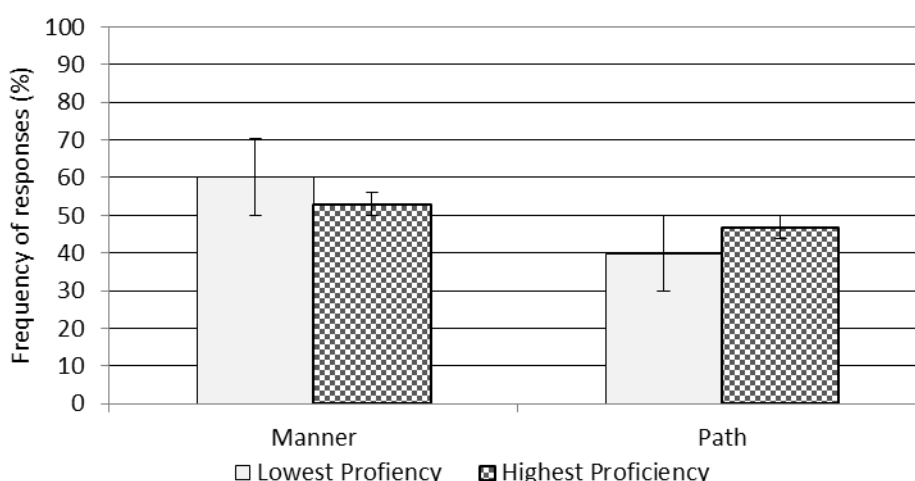
minimal preference for manner among advanced speakers. A t-test yielded non-significant results.

**Table 6.8: Percentages of same-path and same-manner choices according to the proficiency of the speakers based on the QPT**

	Same-manner		Same-path	
	Mean	$\sigma$	Mean	$\sigma$
Advanced speakers	58.60	4.50	41.40	4.50
Intermediate speakers	55.35	4.71	44.64	4.71

Due to difficulties collecting data, the researcher could not control the desired number of speakers in each proficiency level. Therefore, groups were not constituted by an equal number of speakers. In this case only 8 speakers out of 36 were highly advanced in English, while the rest could be considered speakers with less-advanced or intermediate level of proficiency. As a consequence, it is possible that results from Table 6.8 are measuring similar speakers with similar levels of proficiency.

Given the fact that the QPT is our best indicator of proficiency among speakers, we decided to adjust the scores and compare the 8<sup>40</sup> speakers with the highest proficiency (QPT score over 50) and the 8 speakers with the lowest proficiency score (QPT score below 32). The results are shown in percentages in Table 6.9 and depicted in a figure in 6.9 (see percentages in Table 9 in Appendix B).



<sup>40</sup> For this analysis we decided to select the same number of speakers in both proficiency level groups (the highest proficient bilinguals and the lowest proficient bilinguals). Because we only found 8 speakers with high proficient bilinguals we decided to work with this number and seek for the 8 lowest proficient speakers.

**Figure 6.9: Same-path and same-manner choices according to the proficiency of the speakers in their L2 on the QPT**

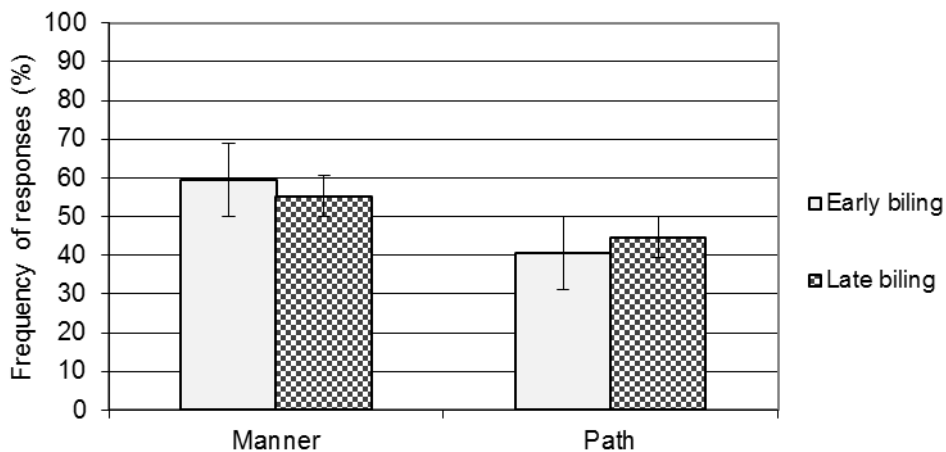
This analysis shows a tendency that is completely opposite to what it was expected. That is, the most proficient speakers choose more same-path and less same-manner responses than speakers with lowest proficiency. However, this tendency resulted as non-significant when a t-test was performed, meaning that the hypothesis that proficiency could affect the L1 pattern of categorization in bilingual speakers is rejected (hypothesis E.2).

Due to the data not showing great differences, and bearing in mind that the mean proficiency of the bilingual group resulted in the level of advanced according to the QPT classification, the third option of analysis was to run correlations. However, none of them were significant. Still, the tendencies in the correlations are interesting to report because they show the same tendency persistently along the other variables.

Although non-significant statistically, correlations between QPT and bilinguals showed a tendency that revealed that the higher the QPT, the lower the same-manner selection; and the lower the QPT, the higher the selection of same-path responses. This is an unexpected result and similar to what the figure 6.9 shows.

### *Bilinguals' performance according to their AoA*

Bilinguals were divided according to those who acquired English before and after the age of 12 and those who acquired it after the age of 12. If concepts from a second language permeate in bilingual speakers, differences could be expected between early and late bilinguals. Figure 6.10 (see Table 10 in Appendix B) showed that early bilinguals have a slight preference to same-manner choices compared to late bilinguals. However, the difference is very slight and a t-test did not reveal significant results. In this case, groups were not homogeneous in number; therefore, a second division was performed with the 12 earliest learners and the 12 latest learners. As with the proficiency variable, t-tests did not yield significant results. Finally, we ran Pearson correlations comparing AoA and bilingual choices. Results did not show any significant relationships between variables.



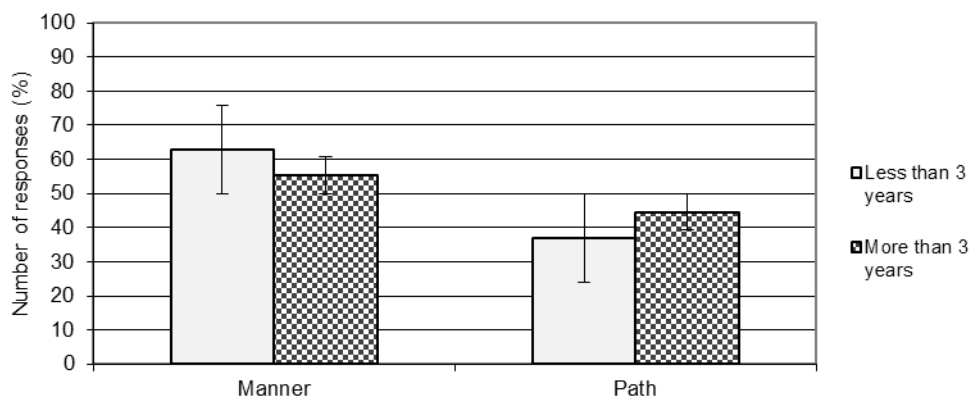
**Figure 6.10: Same-manner and same-path preferences in early bilingual speakers and late bilingual speakers (%)**

Interestingly, the tendencies among the correlations were opposite to those obtained for proficiency: The earlier the AoA, the lower the number of same-path selection, and the higher the AoA, the lower the selection of same-manner. However, the non-significant results only allow us to reject the hypothesis that AoA could affect the L1 pattern of categorization in bilingual speakers (hypothesis E.2).



### *Bilinguals' performance according to their TLEC*

Similar results to those found with previous variables were obtained in the analysis of bilingual speakers according to their TLEC. In Figure 6.11 (see Table 11 in Appendix B), it is observed that speakers who have lived for less than 3 years in an English speaking country actually selected more same-manner videos than the group that has lived in an English speaking country for more than 3 years. Additional t-tests were run yielding non-significant results. Furthermore, Pearson correlations comparing TLEC and same-manner and same-path choices did not show significant relations between variables.



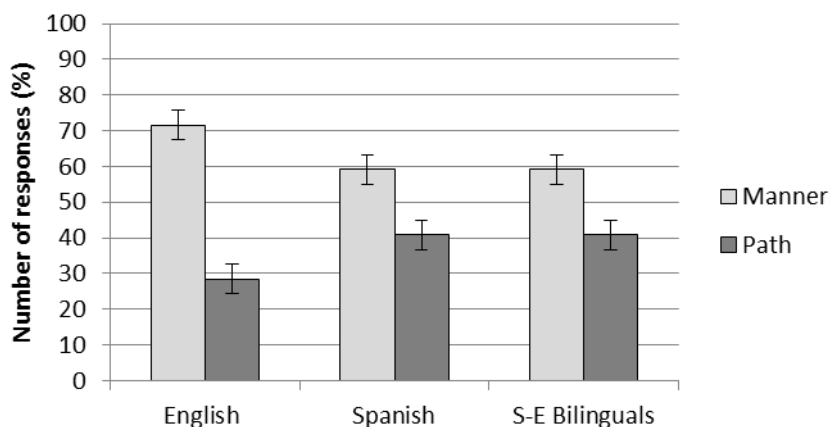
**Figure 6.11: Same-manner and same-path choices in bilingual speakers based on their TLEC**

What the study of these extra linguistic variables seems to suggest is that the bilingual group is apparently very homogenous and behaves in a similar way. In general, they were very similar to Spanish monolinguals. However, it is interesting to note that there is a contrasting tendency between early and late bilingual speakers. Earlier bilinguals selected less same-path choices than the later ones. However, these are only tendencies not confirmed statistically.

The performance of bilinguals was compared to that of monolingual speakers. We compared bilingual speakers as a homogenous group given that the variables proficiency, AoA and TLEC did not yield significant differences.

Therefore, in our case these variables did not affect the L1 pattern of categorization in bilingual speakers (hypothesis E.2).

Figure 6.12 depicts the percentages of same-path and same-manner choices between the language groups (see Table 12 in Appendix B for percentages).



**Figure 6.12: Same-path and same-manner choices between English and Spanish monolinguals and S-E bilingual speakers**

One-way ANOVA comparing same-manner selections between language groups revealed significant differences between groups:  $F(2, 119) = 3.418$ ,  $MSE = 58.158$ ,  $p = .036$ . Post hoc tests yielded significant differences between the S-E bilinguals and the English monolinguals for manner ( $p < .05$  at one-tailed<sup>41</sup>) but not between the S-E bilinguals and the Spanish monolinguals ( $p > .05$ ) for manner.

These first results showed that although participants perceived manner of the action as more salient than the path in the videos, English monolinguals behaved rather differently in their amount of preference of manner to the other groups. English speakers, as expected, preferred same-manner videos. Spanish monolinguals and S-E bilinguals performed similarly (see Table 6.12). Bilingual did not show any changes in their performance as a product of learning English as L2, which rejects our hypothesis E1 (chapter 5).

<sup>41</sup> We think that in this case it is supported the report of one-tailed p value, because we know both groups prefers just one option (same-manner choice).

*Type of path (crossing-boundary path vs. trajectory path)*

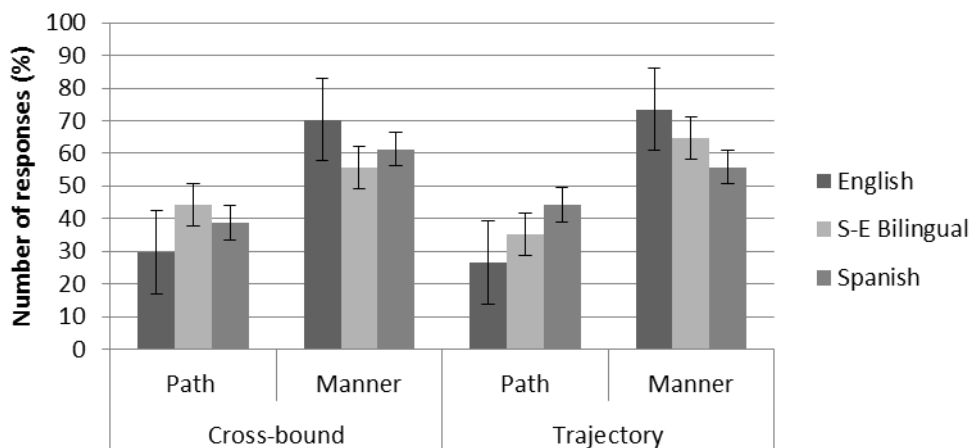
Following the same line of analyses performed with monolingual speakers, in this section the issue of whether the type of path (trajectory path vs. crossing-boundary path) influenced the selection of same-manner and same-path among bilingual speakers was studied. As in the previous section, bilinguals were analysed as a unified group and their answers were compared with those obtained by monolingual speakers. The first main result is depicted in Table 6.9.

**Table 6.9: Same-manner and same-path choices based on the type of path in S-E bilingual speakers**

	Boundary-crossing		Trajectory	
	Path	Manner	Path	Manner
S-E Bilingual	44.24	55.76	35.19	64.81

In general, bilingual speakers preferred same-manner videos independently of the type of path. However, the highest preference for same-manner choices was observed in the trajectory stimuli.

In general, bilingual speakers in manner vs. path condition in the similarity judgment task behaved similar to Spanish speakers. Indeed, in figure 6.13 results from Spanish and English monolinguals are incorporated with those obtained by bilinguals in order to make language group comparisons. Table 13 in Appendix B details these percentages.



**Figure 6.13: Same-path and same-manner choices in crossing-boundary and trajectory paths videos in language groups (%)**

Figure 6.13 shows the percentages of same-path and same-manner choices for videos showing crossing-boundary paths and trajectory paths between language groups. All language groups selected more same-manner videos than path-manner videos independently of the type of paths, although this preference is higher in the English speaking group. S-E bilinguals produced more same-path choices in the crossing-boundary path videos than the rest of the groups (a tendency expected from Spanish speakers according to the Language-as-Strategy hypothesis). However, a mixed ANOVA comparing same-manner preferences and type of path (crossing-boundary paths and trajectory paths) as a factor, and language group (English, Spanish and the bilingual group) as a between subject variable revealed: a main effect of type of path ( $F(2,117)=4.102$ ,  $MSE=158.619$   $p < .000$ ); but no interaction between type of path and language groups ( $F(2,117)=1.681$ ,  $MSE=6.501$   $p < 0.05$ ). In other words, speakers did not change their manner preferences according to the type of path. All language groups preferred same-manner videos with both types of paths. This result then rejects our hypothesis (E.3, chapter 5) that bilingual-speaking adults diverge from Spanish-speaking monolinguals in their categorization of motion events differentiating trajectory from boundary-crossing paths.

Due to the non-significant differences observed between S-E bilinguals as a function of their proficiency, AoA and TLEC, we decided not to continue with further statistical tests comparing monolingual speakers and bilinguals according to these variables (Tables 14-16 in Appendix B show percentages).

To summarize the results from the similarity judgment task, we found that all the language groups perceived manner as more salient during this task. However, Spanish monolinguals and S-E bilinguals performed significantly differently to English monolinguals. The latter group paid significantly more attention to the manner element of the videos than the other language groups. Bilinguals behaved very similarly to Spanish monolinguals despite their knowledge of English.

In relation to the type of path analysis, we confirmed that all three groups preferred manner for all types of paths and that there were no interaction between type of paths and language groups, which suggests that speakers do not necessarily turn to language for performing the similarity judgment task.

These results suggest that bilingual speakers, independently of their proficiency and AoA, still followed the conceptualization of motion events from their L1, Spanish rejecting our hypothesis that being bilingual change speakers patterns of categorize path vs. manner of motion events.

*Results from the path vs. cause condition*

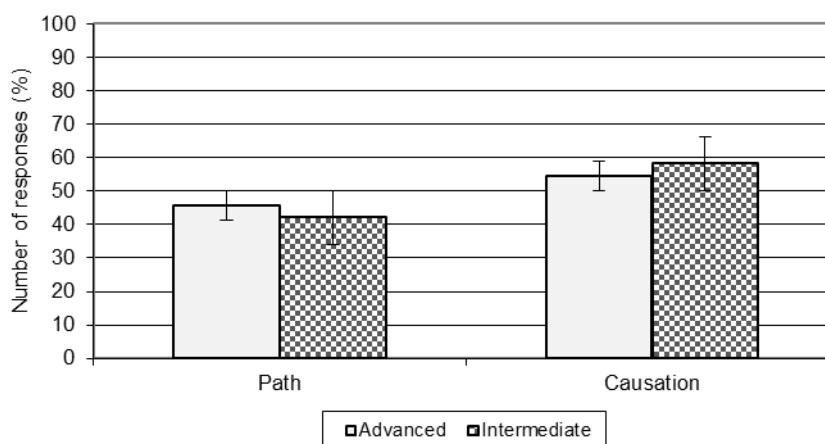
It was investigated whether bilingual speakers differ in their attention to path and cause components of ME´s according to their proficiency level, AoA and TLEC. Additionally, we compared their performance with that of English or Spanish monolingual speakers.

**Table 6.10: Same-causation and same-path choices in the similarity judgment task among bilinguals with advanced and intermediate proficiency**

	Same-causation	Same-path
Advanced bilinguals	54.44	45.51
Intermediate bilinguals	58.04	41.96
All bilingual speakers	55.10	44.90

Table 6.10 shows the preferences for same-causation and same-path videos in the entire bilingual group, and it show the preferences in the advanced group and in the intermediate group. Bilingual speakers, as one group, showed similar behaviour to English speakers by selecting more same-causation videos than same-path videos. When this data was classified according to the proficiency level (taking into account all the 36 bilinguals and divided them in *advanced* and *intermediate* speakers) we notice that percentages were quite similar (see Figure 6.17).

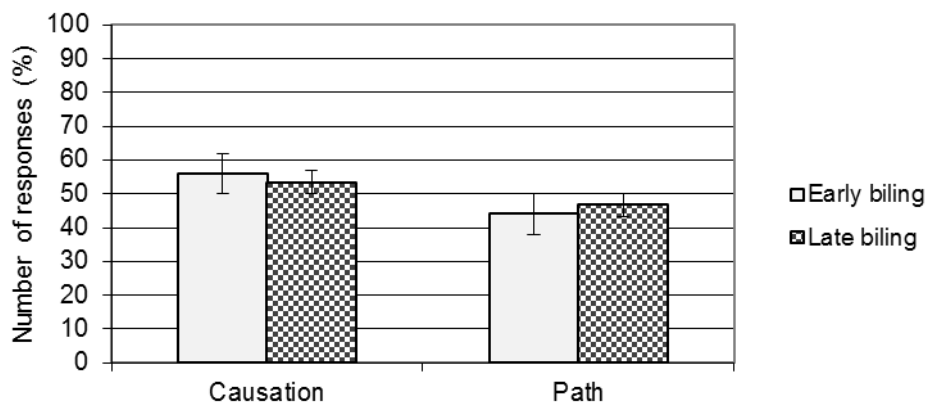
A t-test comparing proficiency level and same-causation proportions did not yield significant results. Additionally, some correlations were run as well, obtaining non-significant results. Nonetheless, these correlations showed the tendency observed in the figure 6.14 (see Table 17 in Appendix B). That is, the higher the QPT score, the lower the selection of same-causation and the opposite, and the lower the QPT score, the higher the selection of same-path choices.



**Figure 6.14: Same-causation and same-path choices in advanced and intermediate bilingual speakers in the similarity judgment task (%)**

So far, we observed that among bilingual speakers in causation vs. path condition, the tendency among high proficient speakers is to perform more like Spanish prototypical monolinguals by paying attention to path over manner. However, these are only tendencies.

In the analysis of bilinguals according to the AoA, we also find a very small difference between early and late bilinguals, with early bilinguals being the group that slight preferred more same-causation videos over same-path videos in comparison to late bilinguals (56% vs. 53.37%, see Figure 6.15 and Table 18 in Appendix B). However, the t-tests did not show any significant results. In order to confirm this tendency, speakers were further divided in groups of 12 (12 earliest S-E bilinguals and 12 latest S-E bilinguals). The tendency was confirmed in terms of percentages, the earliest bilinguals presented a higher same-causation percentage (60.93%) compared to the latest bilinguals (56.26%). T-tests and correlations did not result in significant differences.

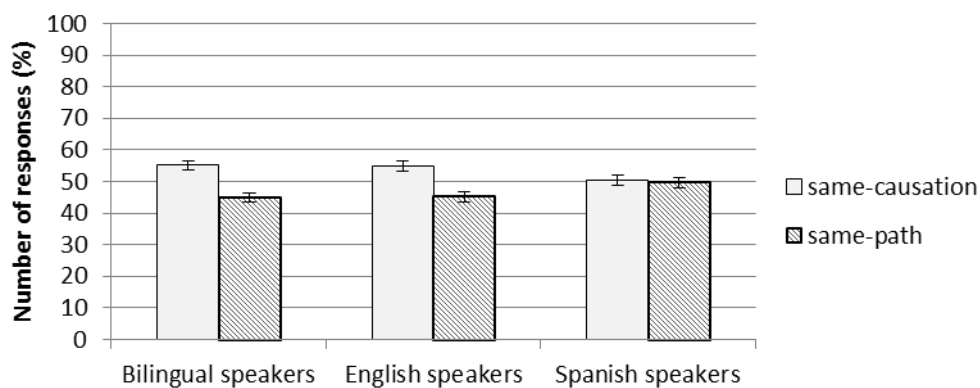


**Figure 6.15: Same-causation and same-path selection in S-E bilinguals based on their AoA**

The same non-significant results were obtained when bilinguals were compared as a function of their TLEC. They all preferred causation over path in almost the same percentages (56.25% vs. 54.5% respectively, see Table 19 in Appendix B for percentages).

In summary, results from causation vs. path among bilingual speakers suggested that this group was very homogenous. These results agreed with those obtained in the manner vs. path condition, which could suggest that S-E bilinguals do not present high differences between them.

The following analysis compared S-E bilinguals as a whole group and monolingual speakers. Figure 6.16 shows the first results (Table 20 in Appendix B showed the percentages).



**Figure 6.16: Same-causation and same path in monolinguals speakers and S-E bilinguals**

Two planned comparison t-tests<sup>42</sup> comparing same-causation choices between, first, S-E bilinguals and Spanish monolinguals, and secondly, between S-E bilinguals and English speakers were run. The first t-test (S-E bilinguals and Spanish speakers) yielded significant differences:  $t(76) = -1.711$   $p < .023$  (one-tailed). Results from the effect size calculation (Cohen's  $d = .37$ ) yielded small to moderate effect. On the other hand, the t-test comparing S-E bilinguals and English monolinguals did not show significant results:  $t(80) = -0.68$   $p > .025$ . From section 6.2 it was observed that Spanish speakers behaved was significantly different from English speakers. These results pointed to the direction that S-E bilinguals paid attention to causation as English speakers, and they differed statistically from their Spanish peers; however, the small to moderate effect of the Cohen's  $d$  coefficient suggest that this conclusion must be carefully taken. Therefore, this finding suggests that conceptualization of bilingual speakers could change for this particular condition: path vs. causation, confirming our E.1 hypothesis only in relation to the path vs. causation distinction. However, bilinguals seemed to act very similarly independently of variables such as proficiency, AoA, and TLEC.

#### *Type of causation*

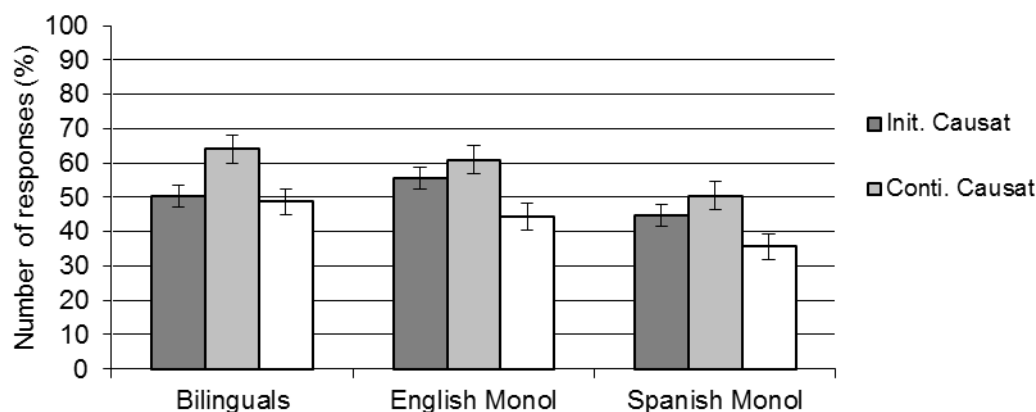
All groups behaved similar in relation to the type of causations. Bilingual speakers repeated the same general pattern observed among monolingual speakers. That is, the highest number of same-causation choices was triggered by the most salient causation (continuous causation stimuli), followed by initiating causation stimuli, and body-part stimuli. The already proposed universal tendency among speakers in relation to these stimuli is supported by the bilingual data as well. Spanish monolinguals were the language group that produced less causative constructions.

Figure 6.17 (see Table 12 in Appendix B) shows the percentages of same-causation responses according to the type of causation in bilingual speakers and the monolingual groups. It seems that bilinguals acted more similarly to English speakers than to Spanish speakers.

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<sup>42</sup> We think that performing planned comparison t-tests is acceptable in this case because we have specific hypotheses to test. In this case, S-E bilinguals differ from Spanish monolinguals.





**Figure 6.17: Same-causation responses according to the type of causation in monolingual speakers and S-E bilinguals**

A mixed ANOVA with same-causation responses as a dependent variable, type of causation as a factor, and language group as a between subjects variable revealed: a main effect of type of causation between initiating causation and body part causation ( $F(2,117) = 23.974$ ,  $MSE = 31.669$ ,  $p < 0.000$ ); but no interaction between type of causation and language groups ( $F(2,117) = 1.454$ ,  $MSE = 1.921$ ,  $p > .05$ ). The pairwise comparison between-subjects in type of causation revealed a significant difference between all the stimuli except those which showed continuous causation and body part causation. These results imply that responses significantly differed according to type of causation, except for stimuli continuous causation and body part causation. Furthermore, they suggest that although each language group responded differently for each type of causation, language groups behaved very similarly. That is, all language groups perceived the continuous causation stimuli as more salient, and the body-part stimuli as less salient.

In summary, all language groups performed very similarly; independently of their language background, they paid attention to the same perceptual aspects in these stimuli. Bilinguals performed similarly independently of their AoA, proficiency, TLEC (see Tables 21, 22, and 23 in Appendix B).

#### *Analysis of stimuli in path vs. manner condition in Experiment 1*

As we explained in the same analysis done with monolingual speakers, the aim of this analysis is to check the performance of each stimulus by looking at the

percentages and their prefer tendencies. The idea is to analyse any important discrepancies that could be affecting results due to the characteristics of the stimuli. From table 6.11 we noticed that bilingual speakers preferred path option in 5 out of 8 stimuli, i.e. in the majority of the cases. The numbers of the stimuli correspond to the stimuli described in Table 5.2 in chapter 5.

**Table 6.11: Mean percentages of same-path choices and same-manner choices in each stimuli**

	<i>Stimulus</i>							
	1	2	3	4	5	6	7	8
% <i>Path</i>	43.33	76.67	56.67	55.00	56.67	66.67	46.67	20.00
% <i>Manner</i>	56.67	23.33	43.33	45.00	43.33	33.33	53.33	80.00

The only stimulus that called our attention is No. 8. This stimulus shows a trajectory path (the figure followed a squared pattern on the floor) jumping. In this case, bilingual speakers highly focused on the manner of the motion event.

*Analysis of stimuli in path vs. causation condition in Experiment 1*

In the path vs. causation condition, each stimulus was also categorized according to some non-linguistic factors that were related to the design of the stimuli:

1. The saliency of the agent: initiating causation, continuous causation, and body part causation.
2. If the agent is present in the target or not<sup>43</sup>.
3. If the agent is a whole human figure or just a human body part.
4. Type of path (boundary-crossing path or trajectory path).

Table 6.12 presents the results of this analysis.

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<sup>43</sup> Remember from the Method that half of these targets showed the agents moving the figure and the other half only showed the figures in motion without the agents that caused the motion.

**Table 6.12: Mean percentages of same-path and same-causation responses according to the type of stimuli, type of path, and presence of the agent in videos**

Saliency of Agent	Init. Causat	Init. Causat	Init. Causat	Cont. Causat	Cont. Causat	Cont. Causat	Body Part	Body Part
Agent present in target	No-Agent	Agent	No-Agent	No-Agent	Agent	Agent	No-Agent	Agent
Agent: human / body part	Human	Human	Human	Human	Human	Human	Body part	Body part
Type of path	Bound.-Cross	Bound.-Cross	Bound.-Cross	Traject.	Bound.-Cross	Traject.	Traject.	Bound.-Cross
Stimulus	1	7	3	6	2	8	5	4
Causation (%)	41.67	28.33	73.33	85.00	45.00	48.33	53.33	45.00

We performed a simple analysis in which we looked at the preferred choices obtained per stimuli. Some variables were also considered in this study: type of causation, agentivity (in the agent present or not in the target video), animacy (a whole human figure moves the object), and type of path (boundary-crossing or trajectory path). From Table 6.12 we observed that bilingual speakers chose more percentages of same-causation only with three stimuli. These stimuli are only similar in terms of animacy. That is, all of them presented a human figure in the target. However, there is another stimulus, No. 1 (see Table 5.4 in chapter 5), that did present a human figure in the target and its preferred pattern was path. Therefore, we do not believe that this variable (animacy) is making speakers to go for causation. In 5 stimuli out of 8, on the other hand, speakers preferred same-path choices over same-manner choices. That is, more stimuli had more than 50% of path choices than causation. Possible hypotheses to explain this outcome are discussed in the Chapter of Discussion.

### **6.3.2 Experiment 2: Linguistic Description Task**

#### *Results from the manner vs. path condition*

In experiment 2, bilingual speakers had to describe the videos in one sentence. But in this case, the speakers performed the task twice. Not all speakers could perform the task in both languages. With the same speakers performing in both languages, we were able to determine not only whether their L1 is influencing

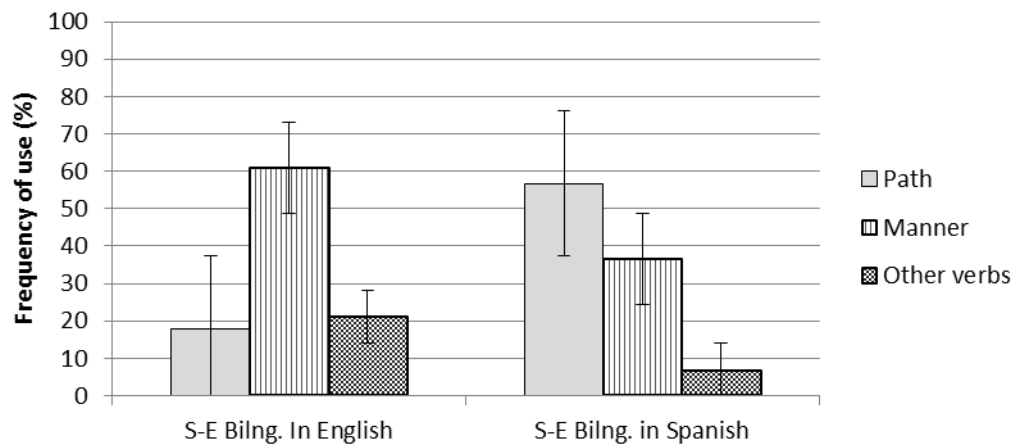
their L2, but we could also check whether their L1 is affected by their L2. We applied the same methodology used with adult monolinguals.

In total 39 speakers performed the task in English, while 34 performed it in Spanish. There was an extra speaker carrying out this task who had problems performing experiment 1, this participant was discarded in Experiment 1 but his data was used in Experiment 2.

Figure 6.18 depicts mean percentages of path, manner, and 'other verbs' responses in Spanish and in English by the bilingual group (Table 25 in Appendix B shows these percentages). This group performed differently in each of the languages (English and Spanish). When performed in English, bilinguals highly preferred to encode manner verbs (60.96%); path verbs were produced only 17.91% of the time. When performing in Spanish, bilinguals produced a high percentage of path verbs (56.67%), even higher than Spanish monolinguals (40.80%) and a much lower percentage of manner verbs (36.54%). In relation to 'other verbs' their percentage of use was much higher when bilinguals performed in English. T-tests were run to compare the production of path verbs, manner verbs and "other verb" as a dependent variable and bilinguals performing in English, and performing in Spanish as an independent variable. Results were significant. Bilinguals in Spanish<sup>44</sup> significantly encoded more path verbs than when they did the task in English ( $t(71)=-8.491$   $p < .000$ ). Along the same lines, in Spanish, bilinguals encoded less manner verbs ( $t(71)=4.343$   $p < .000$ ) and less other verbs ( $t(71)= 3.804$   $p < .000$ ) than in English.

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<sup>44</sup> In order to facilitate the reading, we called the *bilingual in Spanish* the bilinguals when performed the task in Spanish, and *bilingual in English* will refer to the bilinguals when they performed the task in English.



**Figure 6.18: Frequency of path-, manner- verbs and “other verbs” in S-E bilinguals in English and Spanish speakers**

In order to establish differences within the bilingual group as a function of their proficiency, AoA, and TLEC, we performed statistical correlations for bilinguals in their English and in Spanish answers.

*Results from Pearson correlations for bilinguals when performed in Spanish:*

1. The higher the proficiency level the more they produced manner verbs in Spanish ( $r = .405$ ,  $p = .017$ ). This indicates that L1 is affected in some degree by the L2, English.
2. The later the bilingual speakers the lesser they used manner verbs in Spanish ( $r = -.402$ ,  $p = .018$ ) and the more they produced path verbs ( $r = .349$ ,  $p = 0.43$ ).
3. The higher the TLEC the more manner verbs were produced by speakers in Spanish ( $r = .588$ ,  $p < .000$ ). Furthermore, the lower the TLEC, the higher the production of path verbs in Spanish ( $r = -.398$ ,  $p < .05$ ).

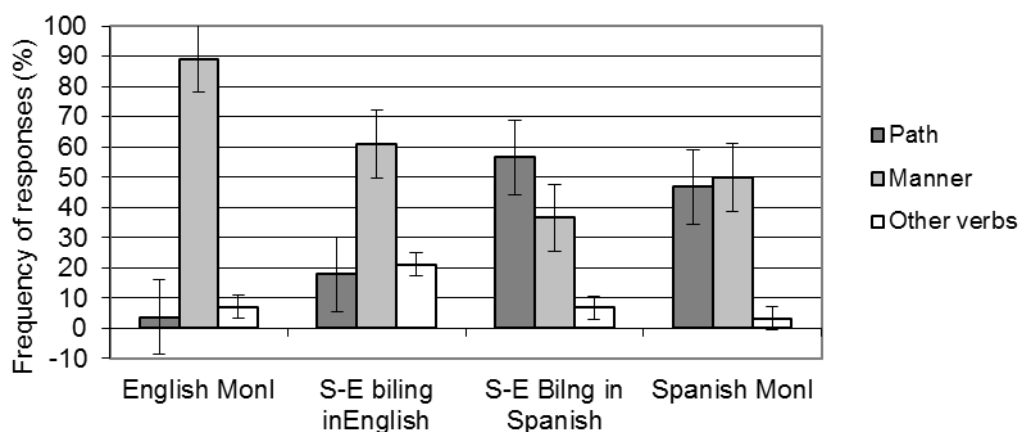
What is interesting from these results is that bilingual speakers are showing different tendencies in their native language as a function of their proficiency, AoA and TLEC. The differences are mostly observed in the encoding of manner verbs. L2 seems to affect L1 to some degree, confirming our hypothesis B.3 and B.4 (chapter 5).

*Results from Pearson correlations for bilinguals when performed in English:*

1. The higher the proficiency level in speakers, the higher the speaker production of manner verbs in English ( $r = .387, p = .016$ ). This suggests that L2 proficiency plays an important role in the production of more manner verbs. Path verbs production almost varied as a function of proficiency ( $r = -.282, p = .087$ ). Thus, it is possible that the higher the proficiency the lower the path production. “Other verbs” production was not affected by proficiency.
2. The later the bilinguals acquired English (AoA), the lower their production of manner verbs in English ( $r = -.403, p = .012$ ). Additionally, the later bilingual acquired English, the higher their production of “other verbs” ( $r = .308, p = .030$ ) and the opposite. For path selection there were non-significant correlations.
3. The higher the TLEC in the bilingual speaker, the higher his/her production of manner verbs in English ( $r = .373, p = .021$ ). Path verbs and other verbs did not vary as a function of the TLEC.

Results from correlations in bilinguals when performed in English suggest that these speakers are already producing the typical motion event pattern from English. This confirms our hypothesis B.1 that bilingual adults show the same pattern observed in monolingual-speaking adults of their L2 (see chapter 5). However, this acquisition happens slowly, in a piece-meal fashion. We observe that proficiency, AoA and TLEC are good indicators of the level of knowledge that speakers have in relation to motion events in the L2 (hypothesis B.3.). It seems that manner of motion is the most important component that changes, at least in relation to main verbs. The option of encoding “other verbs” instead of manner or path in the sentences seems a resource for these bilinguals who still have not mastered the intricate and detailed manner vocabulary in English. The characteristics of these “other verbs” are described in detail in the last section of this chapter.

In the next analysis bilingual speakers’ performances were compared to those from monolingual speakers. Figure 6.19 showed the percentages of path verbs, manner verbs and “other verbs” in all language groups (Table 26 in Appendix B shows the percentages).



**Figure 6.19: Frequency of path, manner and “other verbs” responses in S-E bilinguals and monolingual speakers of Spanish and English (%)**

Looking at figure 6.19, we noticed that S-E bilinguals in English performed more similarly to English monolinguals than to Spanish monolinguals. Bilinguals produced a high percentage of manner verbs followed by “other verbs” and by path verbs. This is the same tendency observed among monolingual speakers of English. However, bilinguals in English still produced higher percentages of “other verbs” and path verbs compared to English monolinguals. The same is observed for bilinguals in Spanish. This group performed more similarly to Spanish monolinguals than to English monolinguals. And furthermore, when performed in Spanish, bilinguals produced a high percentage of path verbs, even higher than the Spanish monolinguals (56.67% for path and 36.54% for manner). Contrary to our predictions, bilinguals in Spanish behaved like speakers of a path language in a much higher degree than the same Spanish monolinguals from this study, who slightly preferred manner over path. In relation to “other verbs”, their production also increased in the bilingual group when performed in Spanish.

We ran a One-way Anova with manner verbs, path verbs, and “other verbs” selection as a dependent variable and bilinguals in English, bilinguals in Spanish, English- and Spanish- monolingual groups. The test yielded significant differences between groups. We reported Brown-Forsythe tests due to lack of variance homogeneity: for manner the result was  $F(3,114.743) = 57.274$ ,

MSE=134.796,  $p < .000$ ; for path  $F(3, 114.659) = 73.44$ , MSE=144.839  $p < .000$ ; and for “other verb”  $F(3, 97.77) = 14.25$ , MSE=11.564,  $p < .000$ .

Post hoc Tukey test revealed that in relation to path verb selection, English monolinguals differed from the other groups. English monolinguals were the group that encoded less path verbs (English-monolinguals  $M=.295$ , Spanish-monolingual  $M=3.66$ , Bilinguals in Spanish  $M=4.38$  and Bilinguals in English  $M=1.28$ ). Spanish monolinguals differed from English monolinguals and bilinguals in English, but not from bilinguals in Spanish. That means that Spanish monolinguals produced significantly more path verbs than English monolinguals and bilinguals in English, but not more than bilinguals in Spanish.

In relation to manner verb selection, the post hoc tests revealed that English monolinguals significantly differed from the rest of the groups. Spanish monolinguals diverged from English monolinguals and bilinguals in Spanish but not from bilinguals in English (English-monolinguals  $M=7.11$ , Spanish-monolinguals  $M=3.89$ , Bilingual in Spanish  $M=.79$  and Bilinguals in English  $M=4.61$ ). This suggests that Spanish monolinguals produced a similar percentage of manner verbs than bilinguals in English. This could be explained by the high percentages of manner verbs that both groups produced.

In relation to the use of “other verbs”, post hoc Tukey test revealed that English monolinguals produced significantly fewer “other verbs” only with respect to bilinguals in English. Bilingual speakers in English produced significantly more “other verbs” than the rest of the language groups. The remaining combinations were not significant. That is, Spanish monolinguals (3.34% of the cases) did not differ from bilinguals in Spanish (6.79% of the cases), nor from English monolinguals (7.10% of the cases). Bilinguals in English did produce a high percentage of “other verbs” (21.12% of the cases).

In conclusion, the analysis revealed that the performance of bilingual speakers differed significantly from both monolingual groups. When they performed in Spanish, they used many more path verbs and fewer manner verbs than their monolingual peers. But when they performed in English, they produced many more path verbs and “other verbs”, but fewer manner verbs than English monolingual speakers. Furthermore, we already analysed how these bilinguals



differed between each other according to variables such as proficiency, AoA, and TLEC. Therefore, when performed in Spanish bilingual speakers with less English proficiency, late AoA and less TLEC produced more path verbs and less manner verbs. When bilinguals did the task in English, speakers with less proficiency in English, late AoA and less TLEC tend to produced more “other verbs” forms.

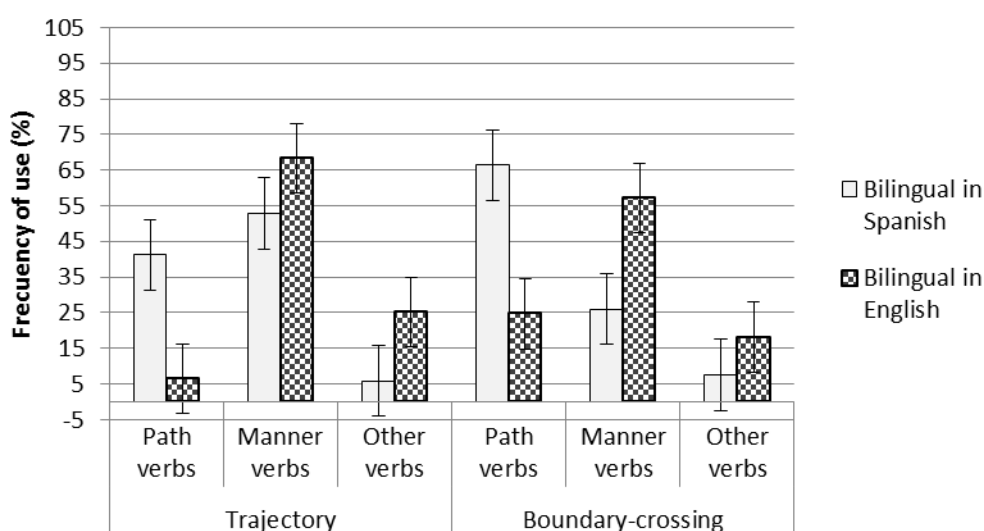
Therefore most of our hypotheses in relation to bilingual speakers are confirmed. We observed that the English of our speakers generally showed the same pattern observed in English monolingual but we also observe some transference from L1 (i.e. Spanish) which affecting the encoding of path, manner and causation (hypothesis B.1). In the same way, the Spanish patterns of lexicalization of bilinguals showed effect from L2 (B.2, B.4) Variables such as proficiency, age of acquisition, and TLEC affected bilinguals' lexicalization patterns (B.3). Finally, our bilinguals showed the typical L2 pattern of causation in their English (hypothesis B.5)

We observed in the study that the high percentage of manner verb selection among Spanish monolinguals diluted once the data was divided considering the type of path (trajectory path videos and boundary-crossing). In this case, we performed the same analysis with bilingual speakers, because we observed that when performing the task in Spanish, bilingual speakers unexpectedly produced a high number of path verbs, significantly different from Spanish monolinguals. In the following analysis, we shall try to explore the characteristics of participants' answers with regards to the types of path (boundary-crossing and trajectory path) in more detail.

#### *Type of path (boundary-crossing path vs. trajectory path)*

We initially analysed the path verb and manner verb selection according to the type of path (boundary-crossing vs. trajectory) only in bilingual speakers. Figure 6.17 showed the percentages of path verbs, manner verbs and “other verbs” expressed by bilinguals in English and in Spanish. When performed in Spanish, bilinguals' answers were very similar to Spanish speakers for trajectory paths, that is to say, they produced more manner verbs than path verbs (52.94%

manner verbs vs. 41.18% path verbs). Although both language groups followed the same tendency for boundary-crossing paths, bilinguals in Spanish used a much higher percentage of path verbs than Spanish monolinguals (66.37% vs. 51%). When performing in English, bilinguals produced much more manner verbs for boundary-crossing paths, therefore, acting similarly to English speakers. However, bilinguals in English produced a high percentage of path verbs for boundary-crossing paths (see figure 6.20 and Table 27 in Appendix B for percentages), which suggests that although these speakers are acquiring the pattern of the L2, there is still interference from L1.



**Figure 6.20: Percentages of path, manner, and other verbs according to the type of path produced by bilinguals in English and in Spanish**

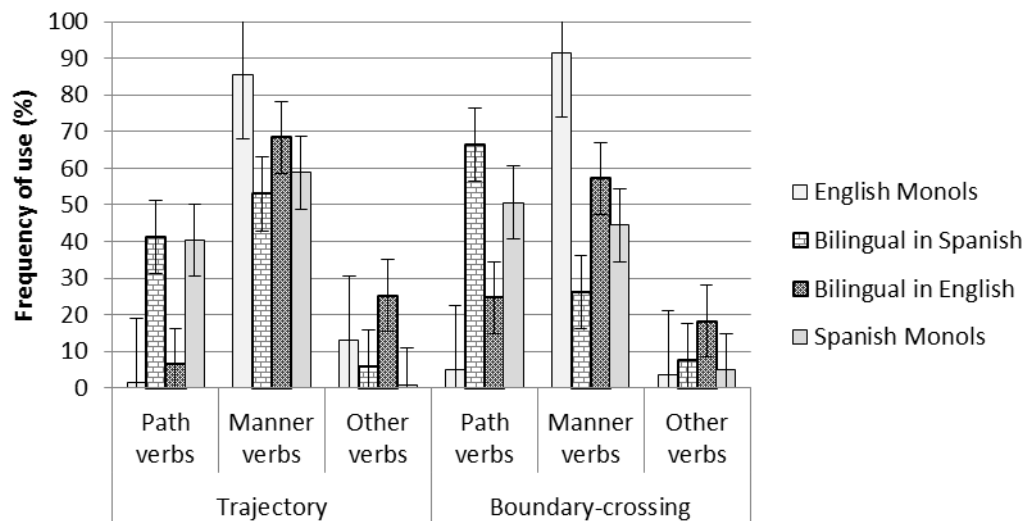
It was our interest to study whether all bilingual speakers followed the same patterns when they performed in English as they did in Spanish. Therefore, we analysed bilinguals as a function of their proficiency, AoA and TLEC.

First, we started by analysing bilingual speakers in Spanish and comparing all the speakers who performed this task in this language (34). We performed t-tests comparing proficiency, AoA and TLEC as independent variables and type of verb as a dependent variable for boundary-crossing path, and the same analysis was done for stimuli showing trajectory paths.

When speakers performed the experiment in Spanish, in relation to boundary-crossing path-videos, there were no differences between speakers according to their proficiency, AoA, TLEC. Interestingly, proficiency, AoA and TLEC variables did affect bilinguals in Spanish when they answered for trajectory stimuli. Results revealed that advanced proficient bilinguals significantly produced less path verbs than intermediate proficient bilinguals ( $t(32) = -2.419$ ,  $p < .05$ , advanced proficient bilinguals had  $M = 1.09$ , intermediate proficiency bilinguals had  $M = 1.55$ ). Also, bilinguals with at least 3 years of TLEC significantly produced more manner verbs than bilinguals living for less than 3 years in an English speaking country ( $t(32) = 2.728$ ,  $p < .05$ , bilinguals with high TLEC  $M = 1.789$ , bilinguals with low TLEC  $M = 1.23$ ). Finally, the last t-tests revealed that bilinguals with more than 3 years of TLEC produced less “other verbs” than those living more than 3 years ( $t(32) = 2.691$ ,  $p < .011$ , bilinguals with high TLEC  $M = .047$ , bilinguals with Low TLEC  $M = .38$ )

When bilingual speakers performed in English, in relation to trajectory path videos there were non-significant differences between selection of path, manner and “other verbs” according to the proficiency, AoA, and TLEC. However, in relation to boundary-crossing path-videos, there were some differences between speakers, specifically in relation to proficiency. T-tests show that low proficient speakers in English produced more path verbs than high proficient bilinguals in English ( $t(38) = 2.399$ ,  $p < .022$ , advanced proficient bilinguals  $M = 3.78$ , intermediate proficiency bilinguals  $M = 1.95$ ). Furthermore, high proficient bilinguals in English produced more manner verbs than their lower proficient peers ( $t(38) = -4.334$ ,  $p < .00$ , advanced proficient bilinguals  $M = 3.78$ , intermediate proficiency bilinguals  $M = 1.95$ ). Finally, low proficient bilinguals in English produced more “other verbs” than high proficient bilingual speakers in this language ( $t(38) = 2.223$ ,  $p < .05$ , advanced proficient bilinguals  $M = .357$ , intermediate proficiency bilinguals  $M = 1.04$ ).

We compared Bilinguals’ performances with monolingual speakers’ performances. In Figure 6.21, the percentages for all 4 groups are classified according to the production of manner verbs, path verbs and “other verbs” by each type of path (see percentages in Table 28 in the Appendix B).



**Figure 6.21: Frequency of path verbs and manner verbs according to the type of path in language groups (%)**

A mixed ANOVA measuring the manner verb selection as a dependent variable, type of path (crossing-boundary and trajectory), and language group as factor, revealed a main effect of type of path ( $F(3,151)=38.064$   $p < 0.000$ ), a significant interaction between type of path and language groups ( $F(3,151)=24.087$   $p < 0.000$ ), and a significant effect of language groups as between subjects ( $F(3,151)=58.691$ ,  $MSE=134.796$ ,  $p < 0.000$ ). The same significant results were obtained for path verb selection.

Two One-Way ANOVAS, one measuring boundary-crossing path selections and language groups, and another one measuring trajectory path selections and language groups yielded significant results. Results from crossing-boundary path yielded: for path  $F(1,154)=42.019$ ,  $MSE=66.09$   $p=.000$ , for manner  $F(1,154)=50.360$ ,  $MSE=79.458$   $p=.000$ , for “other verbs”  $F(1,154)=6.841$ ,  $MSE=2.813$ ,  $p=.000$ ; results from trajectory path revealed: for path  $F(1,154)=86.399$ ,  $MSE=16.070$ ,  $p=.000$ , for manner  $F(1,154)=19.531$ ,  $MSE=7.356$ ,  $p=.000$ , and for “other verbs”  $F(1,154)=16.530$ ,  $MSE=3.698$   $p=.000$ .

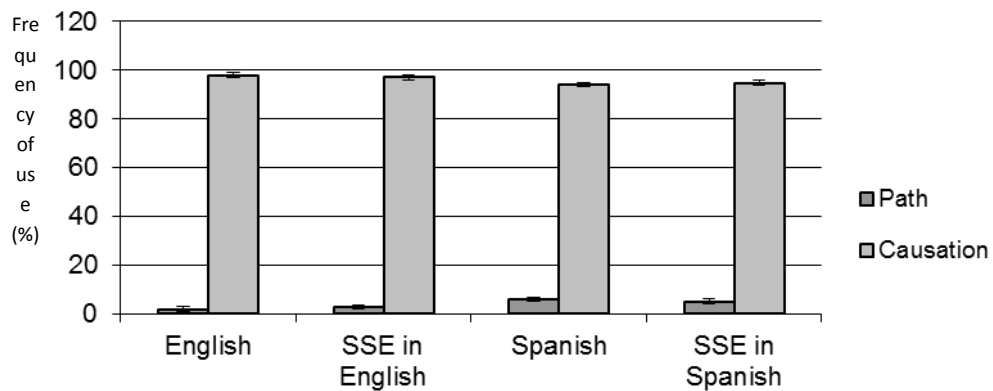
A t-test comparing path and manner productions for both types of path in English monolinguals and bilinguals in English, revealed that they behaved statistically differently with respect to boundary-crossing path stimuli (for path

verb:  $t(81) -3,633, p=.001$ ; and manner verbs:  $t(81) 7.156, p=.000$ ). T-tests comparing trajectory path stimuli in these two language groups yielded a significant result for manner verb production ( $t(81) 3.821, p=.000$ ), but not for path verb production ( $t(81) -1.698, p=.096$ ) which indicates that bilinguals, when they performed in English, did not act like native speakers of English. However, they behaved similarly for trajectory path, specifically, in terms of path verb production, which was low. Bilinguals do not use manner verbs like native speakers of English..

T-tests comparing Spanish monolinguals and bilinguals in Spanish, showed that these two groups significantly differed in their production of path and manner verbs when they described crossing-boundary paths (for path verbs:  $t(70) -2.001, p=.049$ ; and for manner verbs  $t(70) 2.947, p=.004$ ). However, the groups behaved similar in relation to their production of path verbs and manner verbs when videos showed trajectory paths (for path verbs  $t(70) -.204, p=.839$ , and for manner verbs  $t(70) 1.290, p=.209$ ). These results were unexpected; they showed that bilinguals in Spanish performed partially different from Spanish monolinguals. We think that the main differences between both groups are related, first, to the high production of path verbs for crossing-boundary paths and “other verbs” in the bilingual group. “Other verbs” are practically non-existent in Spanish monolinguals. However, we still are not sure why Spanish monolinguals produced less path verbs than bilinguals in Spanish.

#### *Results from the path vs. causation condition*

The analyses of the path vs. causation condition revealed that all language groups described videos mainly expressing the cause element of the motion event. Figure 6.22 shows these results (see percentages in Table 29 in Appendix B). The very few descriptions expressing path verbs were produced by Spanish monolinguals and by bilingual speakers. Interestingly, bilinguals produced more causation when they performed in English than when in Spanish. However, the differences between all language groups are minimal.



**Figure 6.22: Frequency of path vs. causation sentences in monolingual speakers and bilinguals in Spanish and English (%)**

Independent t-tests measuring causative elements as the dependent variable and language group as independent variable showed that Spanish monolinguals and English monolinguals were the only pair of groups that statistically differed from each other:  $t(80) = 1.083$ ,  $p = .016$ . Other t-tests, comparing English monolinguals with Bilinguals in English, and Spanish monolinguals with Bilinguals in Spanish, did not yield statistical significance. English and Spanish monolinguals performed differently, but bilinguals seem to be in-between both languages.

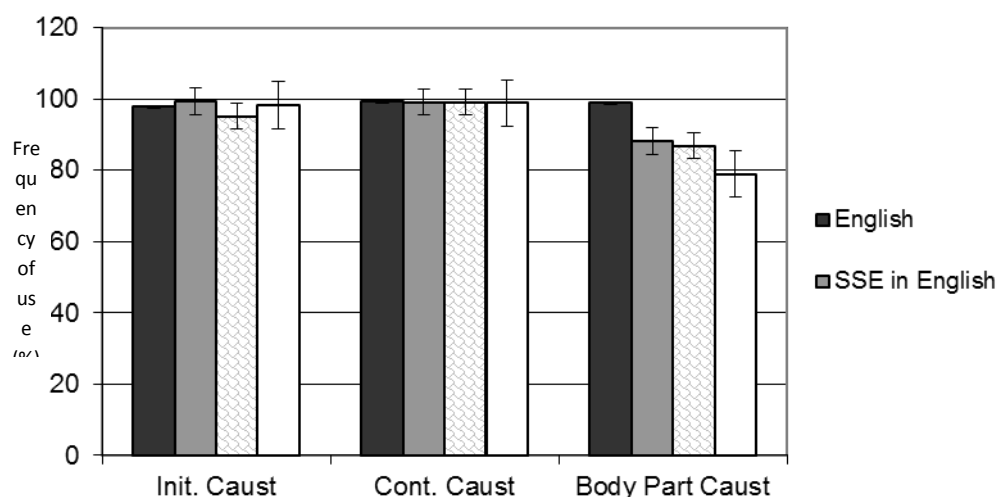
If we take a closer look at the bilingual data, it is observed that the number of speakers producing sentences with path verbs is very low (5 speakers in the Spanish task, and 6 speakers in the English task) compared to the number of Spanish monolinguals (13 speakers). This number in bilinguals is more similar to the number of English monolinguals producing this type of verb (3 speakers). Therefore, we think that the non-significant results between Spanish monolinguals and bilinguals are due to the high percentage of path verbs used by very few speakers. However, the fact that only a small number of speakers are producing path verbs moves the bilingual group away from the Spanish monolingual group.

Following the same order of analysis carried out across the whole chapter, we analysed whether the proficiency, AoA and TLEC of bilingual speakers interfered with their responses. We ran correlations comparing the linguistic and extra linguistic variables, and speakers' answers. None of the correlations were significant. However, we believe that this is related to the high number of

causation responses that were likely triggered by the type of stimuli. This is explained in the discussion.

### *Types of causation*

We studied whether the three different types of causations designed in this study triggered different responses in speakers. Figure 6.23 shows the percentages of causative constructions produced by all speakers (Table 30 shows percentages in the Appendix).



**Figure 6.23: Mean percentages of causative constructions produced by language groups according to the type of causation**

Figure 6.23 shows the percentages of causative constructions produced by speakers of all groups. It is evident that all groups performed very similar for the initiation causation and the continuous causation stimuli. However, the stimuli that triggered the differences observed were the body part stimuli. It is in this condition where differences between language groups were observed, and for that reason it was decided to analyse it separately from the others.

One-Way ANOVA comparing causative sentences in the body part stimuli as dependent variable and language group as independent yielded significant results:  $F(3,153)=3.737$   $p= .013$ . Post hoc test Bonferroni revealed that the

significant difference is observed only between monolingual groups ( $p = .007$ ). The other comparisons did not yield significant differences. Therefore, bilinguals did not differ from English monolinguals or from Spanish monolinguals neither in Spanish nor in English.

*Analysis of stimuli in path vs. manner condition in Experiment 2*

Table 6.13 presents the mean percentages of path verbs, manner verbs, and other verbs (related and not relation to the motion event) per stimuli in Spanish and English produced by bilinguals. The numbers of the stimuli correspond to target stimuli described in Table 5.2 in chapter 5. Results are very similar to those obtain for monolingual speakers. That is to say, not all the stimuli produced the same preference. In English, manner verbs were the favourite option because 4 of out 8 stimuli encoded this option. Path verbs were encoded between 0.00% and 32.50%, which suggests that definitely path verbs were not the favourite option in any stimuli. Two stimuli had high percentages of “other verbs” especially No 4. (68.42%), the “boy going up stairs” stimulus.

**Table 6.13: Mean percentages of path, manner and other verbs selection according to stimuli in English and Spanish monolinguals**

<i>Stimulus No.</i>	1	2	3	4	5	6	7	8
<i>English version in bilinguals</i>								
<b>Path</b>	21.43	27.66	25.00	0.00	32.50	5.26	24.44	7.69
<b>Manner</b>	66.67	46.81	45.00	31.58	62.50	86.84	46.67	84.62
<b>Other Verbs</b>	2.38	2.13	0.00	0.00	0.00	0.00	13.33	2.56
<b>Other Verbs Related to motion</b>	9.52	23.40	30.00	68.42	5.00	7.89	15.56	5.13
<i>Spanish version in bilinguals</i>								
<b>Path</b>	44.00	68.00	66.67	86.36	65.22	28.57	84.62	4.76
<b>Manner</b>	24.00	20.00	28.57	13.64	21.74	52.38	7.69	76.19
<b>Other Verbs</b>	4.00	4.00	0.00	0.00	0.00	0.00	7.69	4.76
<b>Other Verbs Related to motion</b>	28.00	8.00	4.76	0.00	13.04	19.05	0.00	14.29

Bilinguals preferred to encode path verbs when performed in Spanish in more than 50% (5 out of 8). Thus, stimuli in general behaved pretty similar. Manner verbs were not the preferred pattern, as 5 stimuli out of 8 varied from 7.69 % to



28%. As we observed in the monolingual group of Spanish speakers, stimulus 8 (zigzagging in a squared pattern) triggered a very high manner verb percentage. We already gave the possible explanations for this outcome.

#### *Analysis of stimuli in path vs. causation condition in Experiment 2*

As it was assumed with monolingual speakers, in this case we also considered irrelevant to analyse stimuli in this condition.

#### **6.4. A descriptive analysis of motion events components in sentences in the path vs. manner condition (semantic and syntactic analyses)<sup>45</sup>**

For this analysis, all the answers produced by speakers were analysed, independently of having more than one main verb. In total, 513 sentences were scrutinized, 184 sentences from the bilinguals in Spanish and 329 sentences from bilinguals in English.

As with the monolingual groups, we displayed the following patterns observed in bilingual speakers:

1. main *path verbs*;
2. main *manner verbs*;
3. total “*other verbs*” (not related to path and manner);
4. total “*other verbs*” (related to the main event).

In addition to this, we studied the remaining other path and manner components that appeared with manner and path main verbs, and whether they changed according to the language spoken by the bilinguals. Furthermore, we analysed the two types of “other verbs”: “*other verbs*” (not related to path and manner), and “*other verbs*” (related to the main event).

The general percentages of total path verbs, manner verbs and “other verbs” have been previously reported. Therefore, the focus of attention was placed in the combinations of verb forms and motion events components when bilinguals answered in Spanish and when they performed in English. In follow up analysis,

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<sup>45</sup> As we explained in footnote 2, this analysis is only done in path vs. manner causation.

we further classified the data according to the type of path, and it compared to data from the monolingual groups.

*Bilinguals in Spanish: a comparison with Spanish monolinguals*

In Table 6.14 we observe that the pattern produced by bilinguals in Spanish was more similar to that of Spanish monolinguals, and it differed significantly from their own English version. In Spanish, these bilinguals preferred to encode path verbs + manner components (60%) followed by *only path verbs* (26.67%). A relatively high percentage of *path verbs + manner + manner* (example (16) is of note, 13.33%) because it was much higher than the rate produced by Spanish monolinguals, 2.83%. This could be explained as a necessity to encode more manner information by bilinguals in Spanish. The rest of the percentages in the Spanish version for path verbs were very similar to the percentages produced by Spanish monolinguals (see Table 6.4). In relation to manner verbs and the components that appeared with them in this language, results indicated that the preferred pattern for encoding motion events was the *only manner verb* (61.11%), followed by *manner verbs + manner* components (35.19%). The rest of the patterns did not have a production higher than 2% of use. Although the general pattern was somehow similar to that from Spanish monolinguals, some interesting differences appeared. The *only manner verb* option was the preferred pattern in Spanish monolinguals, although the percentage was a bit higher than the one of bilinguals (67.87%). But interestingly in the bilingual group the presence of *manner verbs + path* component, which was produced in 15.03% among Spanish monolinguals, was very low in the Spanish of bilinguals (i.e. less than 2%). Additionally, the production of *manner + manner* (see example 17) in Spanish monolinguals (16.33%) was much lower than in bilinguals in Spanish (35.19%). These preliminary results are suggesting that the Spanish of bilingual speakers seem to be more inundated with manner components in the sentence despite their high frequency of use of path verbs. This analysis confirms even further the hypothesis B.2 and B.3 that states that transfer from L2 to L1 is observed.

(16) Una persona que *entra* [path verb] **saltando** [manner 1] **en un solo pie** [manner 2]  
**en una sola pierna** [manner 3]

A person that enters jumping in only one foot in only one leg

(17) Camina [manner verb] dando vueltas [manner satellite]

(she) walks doing circles

**Table 6.14: Frequencies and percentages of manner verbs and path verb in combination with other path and manner components in bilingual speakers**

	Bilinguals in Spanish		Bilinguals in English			
	Total No.	%	Total %	Total No.	%	Total %
Path						
Only path verb	28	26.67		13.00	21.31	
Path + Manner	63	60.00		22.00	36.07	
Path + Path +Manner	0	0.00		8.00	13.11	
Path + Manner + Manner	14	13.33		4.00	6.56	
Path +Path	0	0.00		14.00	22.95	
TOTAL PATH	105	100.00		61.00	100.00	
% Path			56.02			18.00
Manner						
Only manner verb	33	61.11		77.00	40.10	
Manner+ Path	1	1.85		75.00	39.06	
Manner + Manner + Path	1	1.85		10.00	5.21	
Manner + Path + Path	0	0.00		2.00	1.04	
Manner + Manner	19	35.19		28.00	14.58	
TOTAL MANNER	54	100.00		192.00	100.00	
% Manner			30.53			58.83
other verbs (not related to motion)	5		2.56	9.00		2.55
other verbs (related to motion)	20		10.89	67.00		20.62
NA				1		
DOUBLE GERUNDS	3			8		
TOTAL	184		100	329		

In relation to “other verbs” (not related to the motion event) their production remains the same between monolingual speakers of Spanish and bilinguals in Spanish. However, the use of “other verbs” (related to motions) (see examples 18 a-b) was higher in bilinguals in Spanish compared to Spanish monolinguals (10.89% vs. 2.17%). Finally, in this bilingual group, we observed 3 cases with double gerund sentences.

(18) a. se va cojeando/ (she) is leaving limping

b. chica practica jogging / girl practices jogging

In summary, we observed some differences in the production of motion events between the Spanish produced by monolinguals and the Spanish spoken by the bilingual group. However, the changes were mainly related to the frequency of use of patterns while the patterns themselves practically remained the same.

#### *Bilingual in English: a comparison with English monolinguals*

In relation to bilinguals' performance in English, it differed from English monolinguals' responses. First, in this case 18% of the sentences encoded a path verb, while in the English monolingual group only 4.61% of the sentences had a main path verb. In their English, the use of path verbs with other components was more diverse compared to the English monolingual group. The preferred pattern was *path + manner* (36.07%) followed by the *path + path* components (22.95%), and the pattern *only path verbs* (21.31%). And as the reader can confirm, bilinguals in English produced all the types of patterns studied. We believe that the meaning of this outcome is that first, bilingual speakers are encoding more path components as satellites, even in combination with path verbs (this is not observed in Spanish, not among monolinguals nor among the Spanish version of bilinguals). Secondly, these bilinguals when performing in English still need to produce path main verbs (see examples in 19, all speakers encoded path in the verb, following a typical Spanish structure). In example 19c the speaker used incorrectly a path preposition that cannot be used with the verb “to enter”. It seems that this speaker is using the typical Spanish structure in English. Thirdly, the necessity to encode manner as a component could be explained by the knowledge that manner is highly present in English. Therefore, although the speaker produced

path verbs, the manner component of the motion seems to be salient and thus encoded. If the proper vocabulary has not been acquired, these speakers could tend to produce the sentence following the Spanish structure that they are familiar with.

- (19) a. a girl enters <sub>[path verb]</sub> in a room <sub>[ground]</sub> hopping <sub>[manner satellite]</sub>  
b. a man enters <sub>[path verb alone]</sub> a room  
c. a woman enters <sub>[path verb]</sub> in circles<sub>[manner]</sub> \*in <sub>[path satellites]</sub> a room <sub>[ground]</sub>

In relation to manner verbs and their components, bilinguals in English preferred to encode *only manner verbs* 40.10% of the time, followed by *manner + path* (39.06%), and *manner + manner* (14%). We see obvious differences when these rates were compared to the English monolinguals. For example, the production of *only manner verbs* was substantially lower in English monolinguals (this is a typical pattern from Spanish), while the production of *manner verbs + path* components remained very similar between both bilinguals and English monolingual speakers. We also observed a high percentage of use of “other verbs” (related to motion) among bilinguals in English. In the English monolingual data, these forms reached 10% of frequency, but in bilinguals in English there were 20.62%. We looked at these structures in more depth, as we thought they provided evidence of the lack of manner vocabulary to express motion events as native speakers of English. In example 20 the speaker chose an “other verb”, a deictic, to express the motion event. The manner was later expressed in a satellite. The path is expressed as typical English speakers will do, through the preposition “out”. However, it is interesting to notice that the 80% of English monolinguals used a manner main verb for this stimulus (to *walk, to twirl, and to spin*). We believe that this high proportion of other verbs in bilinguals in English indicates a lack of manner vocabulary. In English, manner lexicon is much richer than in Spanish (Slobin 1996, 2006).

(20) a girl is coming out of the room turning around

Finally, we noticed that the number of double gerunds substantially increased in sentences produced by bilinguals in English. Examples (21a and 21b) show

these structures which are ungrammatical in English and acceptable in Spanish, although not common.

- (21) a. a lady with a white t-shirt is bouncing rotating within a room  
 b. man sitting climbing the stairs with his bum

**Table 6.15: Frequency and percentages of manner verbs and path verb in combination with other path and manner components according to the type of path in bilingual speakers**

	Bilinguals in Spanish				Bilinguals in English			
	Boundary-crossing path		Trajectory path		Boundary-crossing path		Trajectory path	
	No.	%	No.	%	No.	%	No.	%
<b>1. Path</b>								
<b>1.2 Only path verb</b>	44	35.48	6	14.63	10	17.86	3	60.00
<b>1.2 Path + Manner</b>	60	48.39	33	80.49	22	39.29	0	0.00
<b>1.3 Path + Path +Manner</b>	0	0.00	0	0.00	7	12.50	1	20.00
<b>1.4 Path + Manner + Manner</b>	20	16.13	2	4.88	4	7.14	0	0.00
<b>1.5 Path +Path</b>	0	0.00	0	0.00	13	23.21	1	20.00
<b>PATH</b>	124	100.00	41	100.00	56	100.00	5	100.00
<b>Total Path</b>		66.38		38.20		26.21		4.32
<b>Manner</b>								
<b>2.1 Only manner verb</b>	20	45.45	34	64.15	31	27.19	46	58.97
<b>2.2 Manner+ Path</b>	5	11.36	3	5.66	61	53.51	14	17.95
<b>2.3 Manner + Manner + Path</b>	2	4.55	1	1.89	6	5.26	4	5.13
<b>2.4 Manner + Path + Path</b>	0	0.00	0	0.00	1	0.88	1	1.28
<b>2.5 Manner + Manner</b>	17	38.64	15	28.30	15	13.16	13	16.67
<b>MANNER</b>	44	100.00	53	100.00	114	100.00	78	100.00
<b>Total Manner</b>		25.95		54.17		53.53		67.68
<b>3.Total "other verbs" (not related to path and manner)</b>	5	2.28	1	0.79	8	3.57	1	0.85
<b>4. Total "other verbs" (related to the main event)</b>	13	5.38	8	6.84	36	16.70	31	27.15
<b>Total Sentences</b>	120	100.00	103	100.00	214	100.00	115	100.00
<b>Double Gerunds</b>	2		3		7		0	
NR	1							

Table 6.15 showed the same data from Table 6.6 but in bilingual speakers in English and in Spanish. The analysis yielded two main general conclusions: 1) bilinguals in Spanish followed the pattern of their native language (Spanish), although the frequencies of these patterns differed to those from monolingual speakers; and 2) bilinguals in English achieved the encoding of motion events in their L2 (English). However, there were patterns not observed among monolingual speakers that seem to be related to the process of acquiring this L2.

Looking in more details to these outcomes, we observed that the selection of path verbs in relation to manner verbs was very high among bilinguals in Spanish. As we have mentioned previously, it was even higher than among Spanish monolinguals. The use of path verbs with other components among bilinguals in Spanish remained more or less the same. For boundary crossing path, the preferred pattern was path + manner, followed by “only path verb”. However, the encoding of more than one manner component was much higher than among monolingual Spanish speakers (compare to table 6.6). This is an unusual pattern because Spanish does not necessarily encode manner with path. In relation to trajectory paths, the tendency was similar to that from Spanish monolinguals. “Only path verbs” percentage was higher in bilinguals than in Spanish monolinguals (14.63% vs. 9.30% respectively) and the patterns of path + manner were lower in bilinguals in Spanish than in their monolingual peers (80% vs. 90.70%). In Spanish monolinguals, the production of path verbs with boundary crossing path was 46.56% and 39.38% for trajectory path. In the Spanish of bilinguals that difference was much higher: 66.38% and 38.20%. It seems that more path verbs started to appear with boundary crossing events, which is the expected tendency in Spanish speakers.

In relation to manner verb choices, the most important difference observed between Spanish monolinguals and bilinguals in Spanish is that in the latter, the *only manner verb* proportions were much lower with boundary-crossing events. Remember that this is a typical Spanish pattern. Additionally, “other verb” cases are much higher among bilinguals in Spanish in comparison to Spanish monolinguals (6% vs. 1.83% respectively).

Differences between monolinguals and bilinguals in English were more noticeable. Firstly, there are few cases (4.32%) of path verbs with trajectory path (none appeared among English monolinguals). For boundary crossing path stimuli, the preferred pattern between bilinguals was the path verb + manner component (39.29%) but in monolingual speakers of English, it was (15.79%). The preferred pattern by far was the *only path verbs* (47.37%). In relation to manner, the pattern remains very similar for the boundary crossing path between monolingual speakers and bilinguals in English. Although in bilinguals the presence of *only manner verbs* is higher than in English monolinguals (27.19% vs. 17.33% respectively), in relation to trajectory path the patterns were very similar.

## 6.5 Chapter summary

This chapter presents the results of the study of the adult population. Summarizing the results, we find some important differences in monolingual speakers and in bilingual speakers that lead us to support the linguistic relativity hypothesis. We found a correspondence between the non-linguistic categorization and the lexicalization patterns in monolingual speakers in the path vs. manner condition and in the path vs. causation condition. Furthermore, the analysis of the type of path (boundary crossing events and trajectory events) in the non-linguistic categorization task suggests that the influence of language in categorization is not the product of the use of language as a strategy to solve the task.

The analysis of the verbal data also reveals new findings and supports other findings from previous research in the area of lexicalization of motion events. The results mainly suggest that Spanish speaker can focus on manner of motion in conditions in which previous studies do not observe.

Results from bilingual additionally suggest that learning a second language can restructure the non-linguistic cognition. We observe changes in the path vs. causation condition in which bilinguals performed like the monolingual speakers of their L2. These changes correspond with changes in the verbal data as well,



which suggests that non-linguistic performance could be related to changes in the linguistic system. Furthermore, the analysis of the variables of AoA, TLEC and proficiency in the non-linguistic task does not revealed significant effects but these variables do affect the linguistic performance of bilinguals. In conclusion the study reveals a bidirectional influence from L1 on L2 and L2 on L1 in the lexicalization of motion events and a restructuration of the non-linguistic process of categorizing in motion events as a result of learning a second language.

## **Chapter 7. Results from children and adolescent bilingual and monolingual speakers**

### **7.1. Chapter overview**

This chapter reports results obtained from the study of the monolingual and bilingual child and adolescent populations. We look at answering research questions related to cognitive development and linguistic development.

As has been explained in the methodology, due to the conditions of the data collection, the age of our monolingual speakers ranges from 5 to 19 years. Speakers were divided in 5 different age groups (AG). AG1 includes children from 5 to 6 years old; AG2 contains speakers from 7 to 9 years old; AG3 includes children from 10 to 12; AG4 includes 13 to 15 year-old children and finally AG5 contains 16 to 18 years-old adolescents. The age for our bilingual children ranges from 5 to 12 years. Thus there were divided in three age groups: AG 1, AG 2, and AG 3. The same distribution of speakers applied with this population. We present first results from monolingual speakers, followed by the bilingual speakers' one. Our bilingual had different levels of language proficiency in English, which varied according to age: older children were more proficient as they had had more exposure to English than younger children.

Results are divided in two sections: Section 7.2 reports on the results for the child and adolescent monolingual speakers of English and Spanish; section 7.3 reports on the results for the Spanish-English bilingual children. Finally, section 7.4 presents a summary of the chapter.

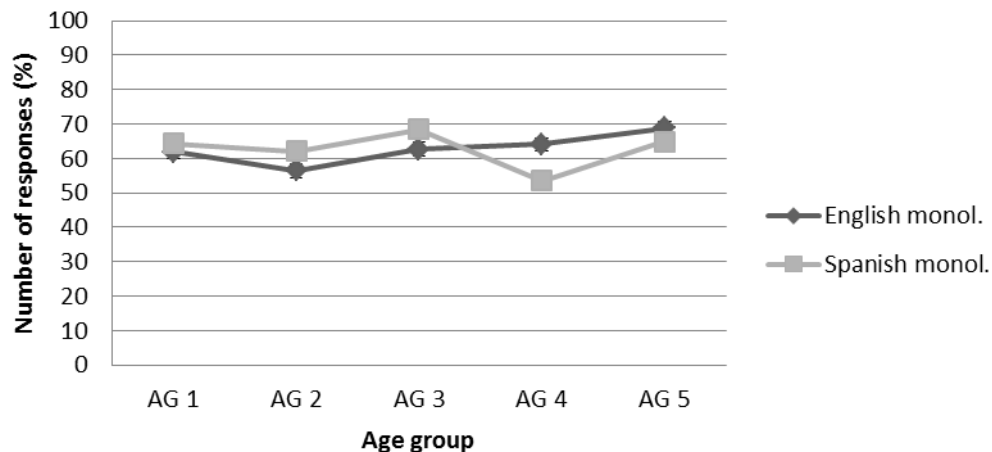
Each section contains two main sub-sections, one on the results of Experiment 1 (the similarity judgment task), and the other on the results of Experiment 2 (the verbal description task). In each experiment, the results of the path vs. manner condition are presented first, followed by path vs. causation condition. In Experiment 2, there is also a subsection dealing with the way in which other path and manner components in the sentences were combined with path and manner main verbs.

## 7.2. The study of child and adolescent monolingual speakers of English and Spanish

### 7.2.1 Experiment 1: Similarity Judgment task

#### *Results from the path vs. manner condition*

As we did in Experiment 1 with the adult population, our dependent variable of analysis with the child population was same-manner selection, i.e. the manner variant video similar to the target one. In this section, we analysed the data of monolingual child speakers of English (83 children) and of Spanish (92 children). Children's choices were scored as the number of times they selected a same-manner response. These scores were converted into percentages and the mean was calculated for each language group and age group. Figure 7.1 depicts these mean percentages and Table 1 in Appendix C shows the actual mean percentages.



**Figure 7.1: Same-manner choices according to language group and age groups (%)**

Means in Figure 7.1 showed that all participants at all ages preferred same-manner choices over same-path choices (all mean percentages over 50%). Additionally, children behaved very similarly, independently of language or age group. The only difference we observed was that Spanish-speaking children showed more variability in their choices than English-speaking children. That is to say, Spanish-speaking children in AG 1, AG 2 and AG 3 preferred same-manner choices to a greater extent than English-speaking children from the

same age groups (see in Figure 7.1). However, this preference for same-manner choices decreased in Spanish-speaking children from AG 4 and AG 5, whereas it increased in English-speaking children of the same age. This performance observed in Spanish AG 4 and AG 5 is expected according to the linguistic relativity hypothesis. Attention to manner should decrease in Spanish speaking children as they grow older.

We first compared the two language groups. Then, we compared each age group within each language group. We started by conducting a Two-Way ANOVA that examined the effect of age group and language group on the selection of same-manner. There were no main effects of language group ( $p = .985$ ) or age group ( $p = .454$ ) on same-manner selections. Also, there was no significant interaction between language group and age group,  $F(4,175) = .849$ ,  $MSE = 10.581$ ,  $p = .496$ . Spanish-speaking children and English-speaking children performed very similarly in this respect.

It is possible not to observe significant changes between children from contiguous age periods because their cognitive patterns become language-specific gradually as a product of experience and language use. Based on this hypothesis, the planned comparisons<sup>46</sup> will target age-groups with the most extreme differences in each language group. Thus, we first compared AG 5 with AG 2 in the English group and the test revealed some significant differences, ( $t(31) = -1.887$   $p = .03$  (one-tailed<sup>47</sup>)) implying that English-speaking children in AG 5 (Mean 68.75%) selected many more same-manner choices than English-speaking children in AG 2 (Mean 56.48%). Although this result does not provide conclusive evidence of developmental differences between age groups in English, it is suggesting that English-speaking children could be attending more to manner of motion as their ages advance.

In the Spanish group we also performed some planned comparison t-test between AG 3 and AG 4, and we found significant differences between these

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<sup>46</sup> Planned comparison tests are supported by the specific hypothesis that the older the child, the closer his/her performance to the adult pattern.

<sup>47</sup> We know from adult's performance that the tendency is to increase the selection of same-manner choice. Therefore, we know the direction of the tendencies between age groups in children but we want to know whether the difference between these tendencies is statistically significant. Consequently, reporting one-tailed  $p$  value is supported.

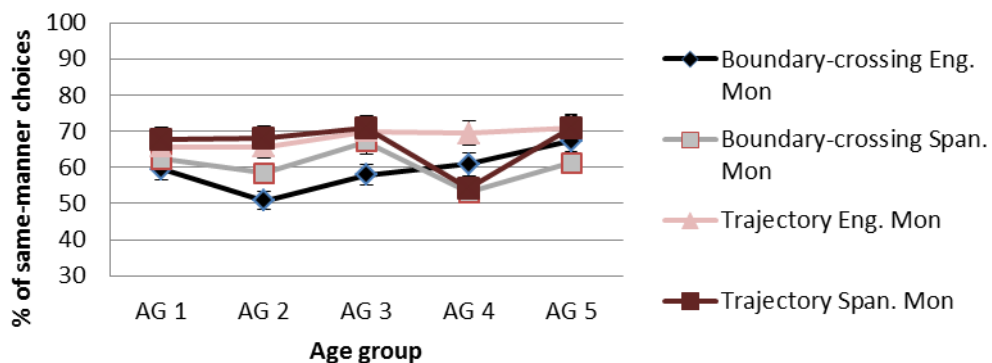
two groups ( $t(38)=2.095$   $p .043$ ). Children from AG 4 (Mean 53.52%) significantly selected less same-manner choices than children from AG 3 (Mean 68.48%).

Results from this analysis mainly reveal that motion events patterns do not affect non-linguistic cognitive task in our children, therefore, this rejects out hypothesis (D.5, chapter 5). We find some particular analyses that suggest changes in children’s categorization towards the adult pattern. However, they are not definite.

*Type of path (boundary-crossing path vs. trajectory paths)*

We analysed children’s same-manner choices according to the type of path (BC-path vs. trajectory-path). The results from the adult data revealed that Spanish and English speakers did not differ in their preference for same-manner choices as a function of the type of path. Figure 7.2 depicts the mean percentages produced by child speakers of English and of Spanish (Table 2 in Appendix C shows mean percentages). A first overview of this figure revealed:

- i. In relation to Spanish-speaking children’s performance:
  - a. These speakers performed very similarly, regardless of type of path or age.
  - b. For both types of paths and in all age groups, these speakers preferred same-manner videos over same-path videos. Nevertheless, the percentage of same-manner choices was slightly higher for trajectory paths than for BC-path.



**Figure 7.2: Same-manner choices according to the type of path (BC vs. trajectory) by language group and age group (%)**

- ii. In relation to English-speaking children's performance:
  - a. These speakers preferred same-manner choices over same-path choices, regardless of type of path or age.
  - b. A difference was observed between trajectory-path and BC-path: these speakers produced more same-manner choices with trajectory path videos than with BC-path videos (see Figure 7.2). This difference in same-manner choices seemed to reduce in older children.
  - c. These speakers chose same-manner choices to the same extent across the age groups when the videos showed a trajectory path. However, their same-manner choices increased even further with age when the videos showed a BC-path video. This difference is very interesting because English monolingual adults, according to literature, did not show a preference according to the type of path.
- iii. Comparison between language groups:
  - a. The main difference between both language groups is that English-speaking children were more constant, less variable in their performance, while Spanish-speaking children's group went from one choice to another one without showing any identifiable trend.
  - b. Additionally, Spanish-speaking children showed a similar performance for both type of paths. In contrast, English-speaking children showed a very marked difference between mean percentages for BC paths and mean percentages for trajectory path. The overall mean percentages for English and Spanish-speaking children are not very different from each other though.

In order to analyse this data in more depth, we performed a number of different statistical analyses. A mixed ANOVA comparing same-manner preferences and type of stimulus (boundary-crossing paths and trajectory path) between age group in Spanish speakers revealed a significant effect of type of path within the groups ( $F(1,87)=65.05$ ,  $MSE=193.021$   $p < .000$ ). However, there was no interaction between type of path and age group ( $F(1,87)=.246$ ,  $MSE=.731$   $p < .911$ ). In other words, Spanish speakers at the different ages did not change

their path vs. manner preferences according to the type of path in this cognitive task. All age groups preferred same-manner videos with both types of paths.

A second mixed ANOVA comparing same-manner preferences and type of stimulus (boundary-crossing paths and trajectory path) between age groups in English speakers revealed a significant effect of type of path within the groups ( $F(1,78)=44.372$ ,  $MSE=129.857$   $p < 0.000$ ). However, there was no interaction between type of path and age group ( $F(1,78)=.796$ ,  $MSE=2.330$   $p < .531$ ).

On the other hand, at the different ages English-speaking children did not change their path vs. manner preferences according to the type of path in this cognitive task. Given the significant difference we observed in Figure 7.2 in the same-manner selection for BC-path and trajectory path between younger ages and older ages, we performed a planned comparison t-test between speakers from AG2 and AG5 for BC paths and trajectory paths. The differences were only significant for BC paths ( $t(31)=-2.218$   $p = .034$ ) implying that English-speaking children in AG 5 selected significantly more same-manner choices than English-speaking children from AG 2 for BC paths. English-speaking children did not show any differences by age for trajectory paths. In conclusion, it seems that the difference observed in the same-manner selection in English speaking children from AG 2 and AG 5 is related to a change in the pattern of answer selection in BC path. As children age their preference for same-manner videos increased for BC paths.

A third mixed ANOVA comparing same-manner preferences and type of stimulus (boundary-crossing paths and trajectory path) between age group and language groups as factors did not show any interaction between type of path and age group, neither interaction between type of path and language group, nor between type of path, age group and language group.

In summary, the analysis of path vs. manner condition in the children data seems to indicate that:

1. Children preferred manner regardless of language group.
2. Spanish-speaking children did not show differences by age or type of path in their preference for manner. Although they selected more same-

manner choices with trajectory path than with BC-path in terms of percentages.

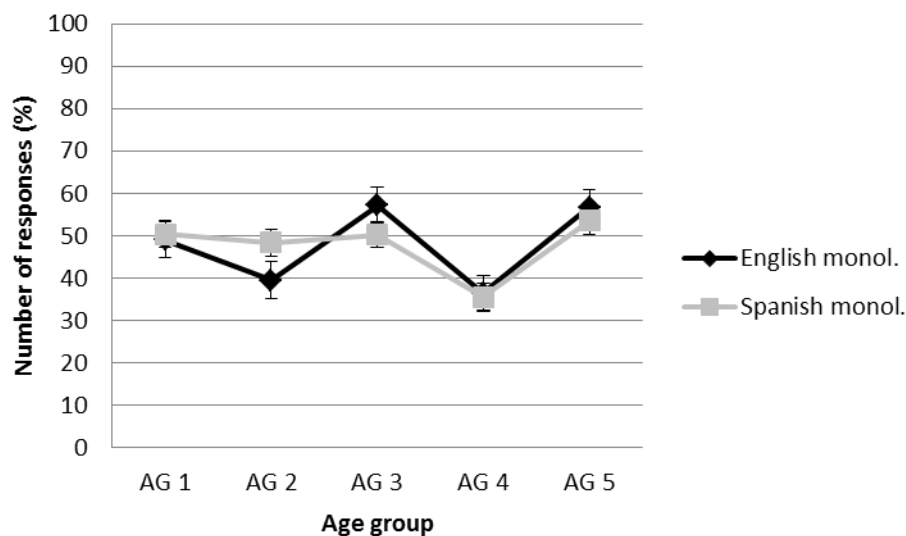
3. English-speaking children increased their preference for manner, but the difference was only statistically significant between AG2 and AG5, and only for BC path. This is an unexpected result, because the English and Spanish adults in our study did not show differences by type of path. Although this variation is small, the study of the percentages and the t-test results suggest that these changes could be related to language acquisition in the English group. In Spanish, we did not observe any such tendency.

#### *Results from the path vs. causation condition*

The second condition under analysis is whether English speaking- and Spanish-speaking children differ in their attention to path and cause components of motion events. Additionally, if any difference is observed, we would like to know whether there is a period in which English-speaking children develop a preference for cause over path and whether there is a period in which Spanish-speaking children develop a preference for path over cause.

Figure 7.3 shows the percentages of same-causation choices between both language groups (see percentages in Table 3 Appendix C). Children from both language groups paid almost equally attention to path and to causation across almost all ages.





**Figure 7.3: Mean percentages of same-causation choices between English-speaking and Spanish-speaking children**

We also compared English-speaking children with Spanish-speaking children by conducting a Two-Way ANOVA that examined the effect of age group and language group on the selection of same-cause responses. There was no significant interaction between the effects of age group and language group on same-cause selection,  $F(4,175) = .485$ ,  $MSE = 8.379$ ,  $p = .747$ . Main effects analysis did not show an effect of language group on same-manner selections ( $p = .869$ ), but there was an effect of age group ( $p = .039$ ). Post-hoc Tukey tests revealed a significant difference between speakers from AG 3 and from AG 4 ( $.047$ ). This difference is explained by the sudden decline in both language groups in the frequency of same-causation selection between AG3 and AG 4 (see figure 7.3). This drawback observed in AG 4 in Spanish-speaking and English-speaking children is difficult to explain. We cannot say that one group showed a tendency over the other. If we look at the frequencies and percentages we observe that Spanish speakers are more constant in their choices until AG 4, while English speakers tended to vary more across ages.

#### *Type of causation*

Significant results could be diluted in the general results. Therefore, we studied children's responses in the different type of causations reflected in the stimuli:

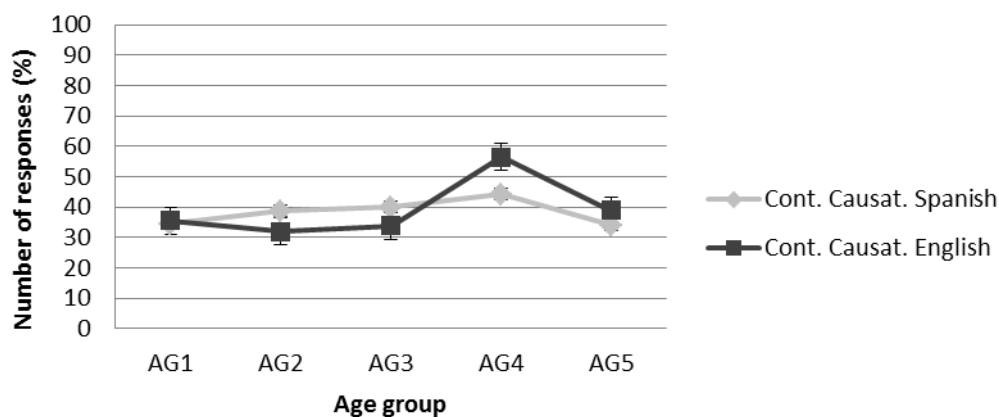
initiating causation, continuous causation and body part causation (see Method). We examined whether Spanish-speaking children encoded less causative constructions than English-speaking children according to these types of causation, and the age at which they started, if there were any differences.

Figures 7.4 to 7.6 depict the mean percentages of same-causation responses in the language groups according to the type of causation. Table 7.1 shows that English-speaking children selected more same-causation with initiation-causation stimuli (total means 42.01%), followed by continuous causation stimuli (total means 39.29%) and finally by body-part causation (total means 18.69%). Spanish-speaking children selected more same-causation with continuous causation stimuli (total means 38.32%) followed by initiation-causation stimuli (total means 34.43%), and finally by body-part causation (total means 27.25%). English-speaking children had slightly more same-causation responses than path responses, except in the body-part causation stimuli. Surprisingly, Spanish-speaking children overwhelmingly paid more attention to causation in body-part stimuli than English-speaking children. This is the opposite performance to the one found in adults.

**Table 7.1: Mean percentages of same-manner choices according to type of causation, age group in English speaking- and Spanish speaking-children**

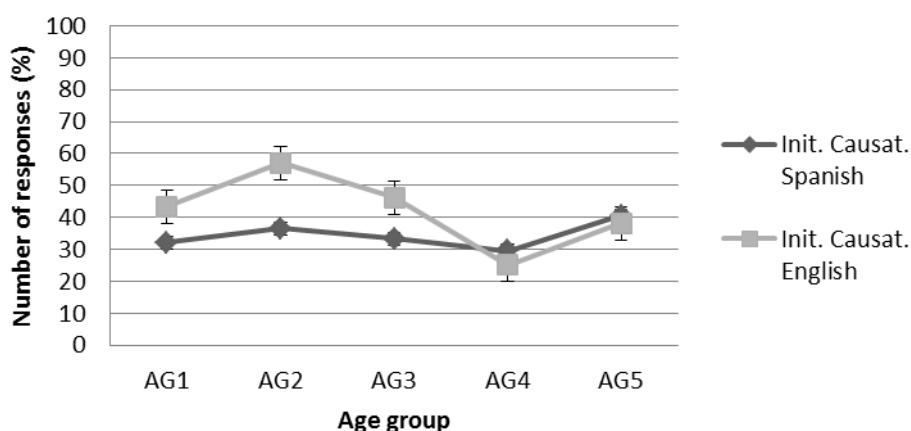
	Cont. Causat. (%)		Init. Causat. (%)		Body-part Causat. (%)	
	<i>Spanish</i>	<i>English</i>	<i>Spanish</i>	<i>English</i>	<i>Spanish</i>	<i>English</i>
<i>AG1</i>	34.53	35.46	32.07	43.34	33.40	21.20
<i>AG2</i>	38.72	31.86	36.56	57.11	24.72	11.03
<i>AG3</i>	39.99	33.84	33.36	46.26	26.66	19.89
<i>AG4</i>	44.23	56.50	29.55	25.14	26.22	18.36
<i>AG5</i>	34.16	38.81	40.59	38.22	25.26	22.97
<i>Total</i>	<b>38.33</b>	<b>39.29</b>	<b>34.43</b>	<b>42.01</b>	<b>27.25</b>	<b>18.69</b>

Figure 7.4 shows that AG1 to AG3 Spanish-speaking children paid more attention to causation videos in *continuous causation stimuli* than English-speaking children. However, in AG4 and AG5, English-speaking children started to pay more attention to causation than Spanish-speaking children.



**Figure 7.4: Mean percentages of same-causation choices for continuous causation between Spanish-speaking- and English-speaking- children**

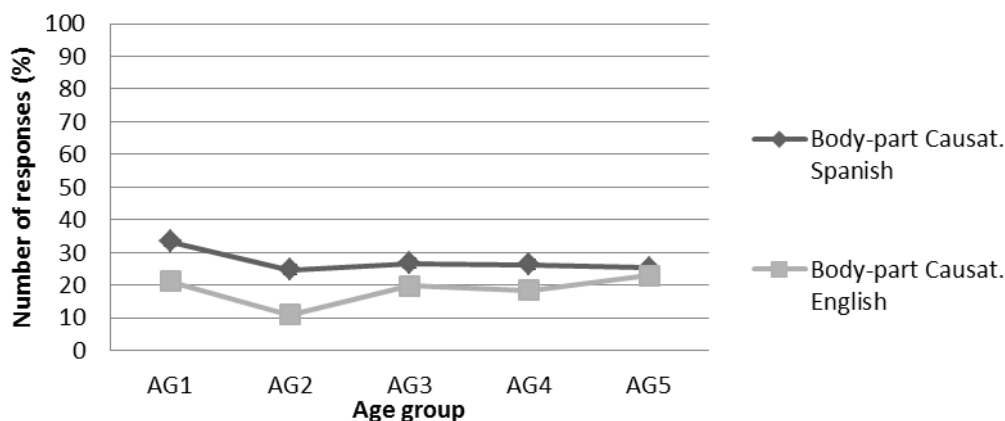
A different picture is observed in Figure 7.5, which shows that English-speaking children paid more attention to causation when they observed *initiating causation stimuli*. However, in AG 4 and AG 5, speakers of both languages had similar percentages of same-causation responses.



**Figure 7.5: Mean percentages of same-causation choices for initiation causation between Spanish-speaking- and English-speaking- children**

Figure 7.6 shows that Spanish-speaking children paid more attention to causation than English-speaking children, but the difference between both language groups decreased in older children. Specifically, the selection of causation decreased in the Spanish language group and increased in the English language group. Children belonging to AG 5 from both language groups paid attention to cause of motion to almost the same extent. We would like to point out that speakers in AG 5 from both language groups had similar

percentages of selection of same-causation for the three types of causation, as shown by the three figures from this section (7.4 to 7.6). This is striking because our adults preferred path of motion for body-part stimuli. A different picture obtains with children.



**Figure 7.6: Mean percentages of same-causation choices for body-part causation between Spanish-speaking- and English-speaking- children**

Both language groups were compared by conducting a two-way ANOVA that examined the effect of age group and language group on the selection of same-manner. Significant results were obtained for two types of causation: initiating causation stimuli and body-part causation stimuli. For initiating causation stimuli the two-way ANOVA did not show interaction between language groups and age groups, neither a language effect, but it showed an age group effect ( $F(4,174)=3.821, MSE=44.603, p = .005$ ). Speakers in AG 4 significantly chose less cause of motion than speakers in AG 3 (.002) and AG 5 (.047). For body part stimuli, there was an effect of age group ( $F(4,174)=3.648, MSE= 5.632, p = .007$ ) and language group ( $F(1,174)=4.321, MSE= 6.672, p = .039$ ), but no interaction between language group and age group. Namely, the Spanish-speaking children paid more attention to causation than path in videos that showed a body part causing the movement, contrary to what we found in adults.

In order to compared the different age groups within each language group we ran planned comparison t-tests with the most extreme age groups as we did in the analyses of path vs. manner condition assuming the same hypothesis that children would need enough exposure to their language patterns in order to

affect their cognitive patterns of motion events. Results showed that Spanish-speaking children—speaking children in AG4 paid significantly less attention to causation of motion than in AG 1,  $t(31) = 3.009$   $p = .005$ . This result is similar to the one obtained in the path vs. manner condition. Children AG 4 are showing a change of pattern in relation to younger children, and this pattern is more similar to the specific pattern of their language.

In the same way, we conducted planned comparison t-tests within the English speaking group (see footnote 11). These tests revealed that children from AG3 and from AG5 performed significant changes in relation to the other groups. Children from AG3 significantly paid more attention to causation for body part causation than children from AG 2 ( $t(39)=2.741$   $p < .025$ ). Children from AG5 paid significantly more attention to causation in initiating causation stimuli than children from AG4 ( $t(25)=27.78$   $p < .025$ ).

This analysis seems to indicate that as children age small changes in the patterns of categorization happen in both language groups. The English group is performing more changes than the Spanish group. But these small changes seem to get more similar to the patterns observed in adults.

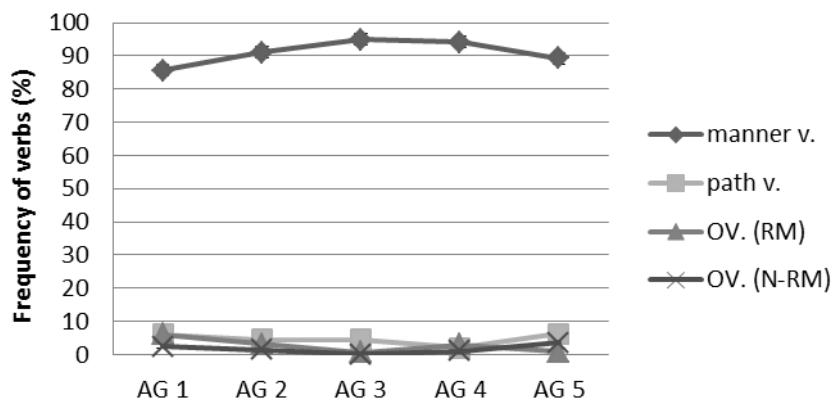
### **7.2.2 Experiment 2: Linguistic description task**

#### *Results from the manner vs. path condition*

In experiment 2 a total of 89 Spanish speaking children and adolescents, and 84 English speaking children and adolescents were asked to describe in one sentence what they thought had happened in the videos, as the adults did in the same linguistic description task. Thus we determined the preferred motion event component conflated in the verb for each stimulus.

As we explained in Chapter 6, in the section 6.2.2, some participants produced more than one sentence per stimulus, making impossible to determine which the preferred pattern was. Therefore, we adopted the same criteria for running the statistical analysis on the child data as we did for the adult data. Specifically, we discarded all the participants' answers where two main verbs encoding path and manner appeared. Cases of double sentences with path and manner main verbs counted for less than 5% of the total answers from participants.

The general results from English-speaking children are shown in figure 7.7 (See percentages in Table 4 in Appendix C). English-speaking children overwhelmingly preferred to encode manner verbs over path verbs (at all ages). Their selection of manner verbs went from 85.63% to 94.89%. And the tendency observed from AG 1 speakers to AG 4 speakers was to increase their production of manner verbs at the expense of path verbs with age. However, speakers from AG 5 behaved somewhat differently as they produced sentences with less manner verbs (in relation to AG 2, AG 3 and AG 4) and increased their selection of path verbs to 6.25%. However, the percentage differences were very low.

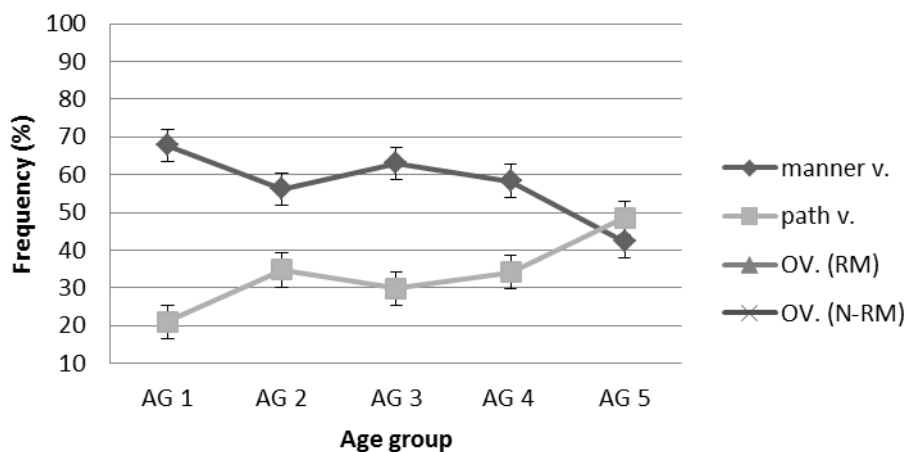


**Figure 7.7: Frequency of main verb concepts produced by English-speaking children and adolescents according to age (%)**

Interestingly, OV-RM (other verbs related to the motion event) tended to decrease in older children. Most of these verbs were “to go”, “to come” “to get”, general directionality verbs in Slobin’s terminology. With respect to OV-NRM (other verbs non-related to the motion event), most of them were used in very low percentages and they mostly referred to other aspects of the videos like “opening a door before the agent performs the main motion event”. The low percentage of these forms indicated that speakers did pay attention to the central motion event depicted in the stimuli.

The general results from Spanish-speaking children are shown in Figure 7.8 (See percentages in Table 5 in Appendix C). Younger Spanish-speaking children showed a tendency to select more manner verbs than path verbs. However, path selection is the preferred option at AG 5, unlike English-speaking

children, and unlike Spanish-speaking adults, who in general produced more manner main verbs than path verbs. With regard to OV (other verbs), they were selected in less than 10% per age group. However, there was more presence of OV-RM (related to motion events) than OV-NRM (non-related to motion events).



**Figure 7.8: Main verb concepts encoded by Spanish-speaking children and adolescents according to age**

We conducted two One-Way ANOVAS on the different language groups and age groups, in order to look at the developmental aspect. One ANOVA measured the effect of age group in manner verb and path verb selection in Spanish-speaking children. The other one was conducted on English-speaking children. Due to the small numbers obtained for OV we did not perform statistics on these types of verbs.

Results from Spanish-speaking children showed a significant difference in manner verb selection among age groups ( $F(3,88)= 3.723$ ,  $MSE=8.990$   $p < .05$ ). Tukey post-hoc tests revealed that children from AG 1 ( $M= 67.76\%$ ) produced significantly more manner verbs than children from AG4 ( $M=58.33\%$ ). Also, children from AG 3 ( $M= 63.04\%$ ) produced significantly more manner verbs than AG 5 children ( $M=42.22\%$ ). Although not all the age groups produced significant results, the behaviour of the whole group seemed to indicate that Spanish-speaking children produce less manner verbs as they grow older. The results for path verb selection also revealed significant differences (Brown-Forsythe test,  $F(4, 63.393)= 4.078$ ,  $p = .005$ ). The Games-Howell *post-hoc* test showed that AG 1 produced significantly less path verbs than AG 5.

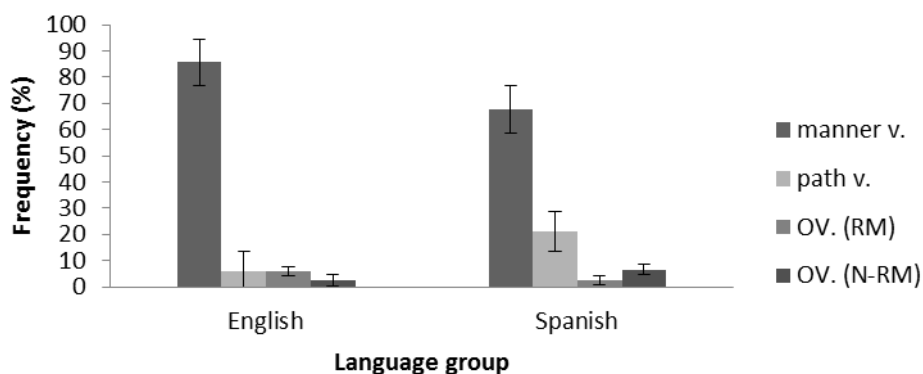
It appears that the manner verb selection in Spanish-speaking children decreased with age. Older children produced less manner verbs and paid more attention to path. The variations in the lexicalization patterns in children seem to happen in a gradual fashion. Our results are unexpected in the sense that other studies like Slobin (1996), Slobin and Hoiting (1994) among others, showed that children already between 3;00 and 5;00 years old are displaying the lexicalization pattern of their language. Our Spanish speaking children are still changing towards the adult pattern. With regard to the English-speaking children, a One-Way ANOVA comparing the effect of age groups in manner verbs and path verbs revealed significant differences for manner verbs ( $F(4, 83) = 2.739, p = .034$ ). Tukey post-hoc tests showed that speakers from AG 1 ( $M=85.63\%$ ) significantly produced less manner verbs than speakers from AG 3 ( $M=94.89\%$ ) and AG 4 ( $M=94.23\%$ ). These findings support our hypotheses C.1, C.2, and C.3 (see chapter 5)

#### *A comparison between English and Spanish monolinguals*

Are English and Spanish-speaking children really different in their preferences for encoding motion events? This section examines this question. Figures 7.9 to 7.13 show manner verb, path verbs, and “other verbs” preferences per age group, and compare English-speaking children and Spanish-speaking children (percentages of Figures 7.9 to 7.13 shown in Table 6 in Appendix C).

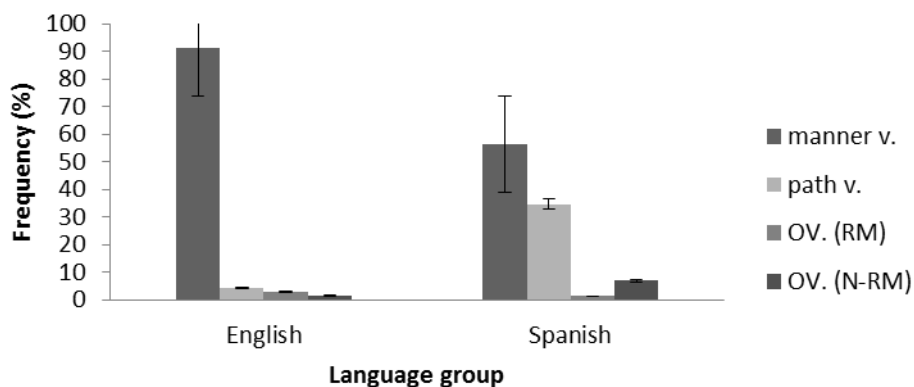
Figure 7.9 shows that English- and Spanish- speakers in AG 1 both showed a high preference for manner verbs. However, Spanish-speaking children produced a high quantity of path verbs that was not present in the English-speaking children.





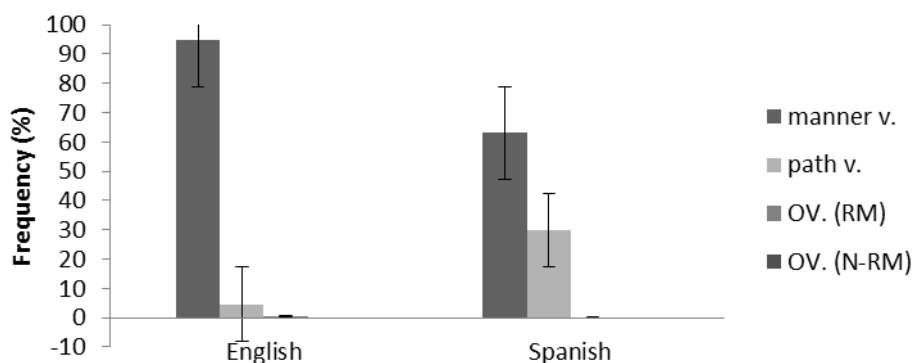
**Figure 7.9: Distribution of verb concepts in sentences produced by children from AG 1 according to language groups (%)**

In AG2, the preference for manner among English-speaking children increased compared to AG 1. Spanish-speaking children in AG 2 also preferred to encode more manner verbs than path verbs. However, the frequency of path verbs was higher in AG2 than AG1 (34.72% vs. 21.05%). As expected, the frequency of manner verbs was lower in AG 2 compared to AG 1.



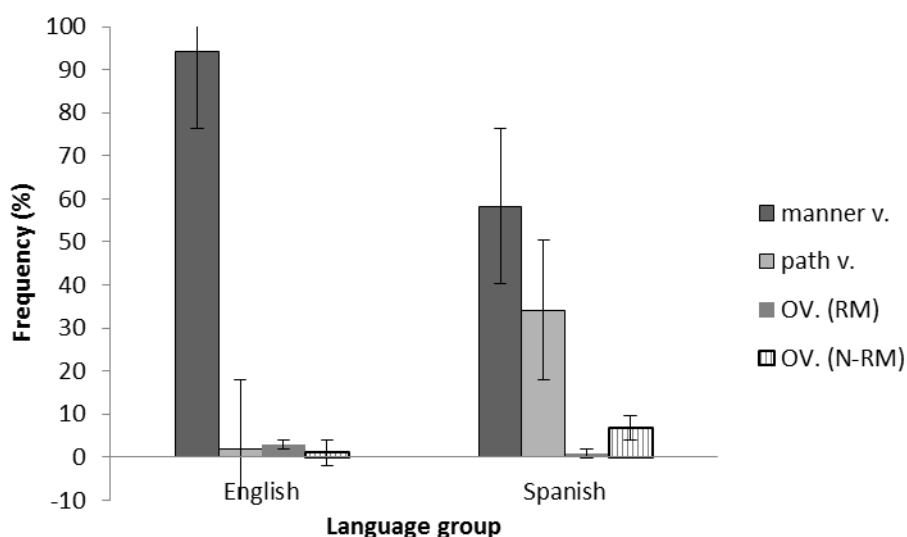
**Figure 7.10: Distribution verb concepts in sentences produced by children from AG 2 according to language groups (in percentages).**

In AG 3, the changes were more evident in the English group. Their preferences for manner verbs were higher (94.89%) compared to AG 2 (91,07%). Path verbs remained lower than 5%. Spanish-speaking children in AG 3 produced similar percentages to those in AG 2.



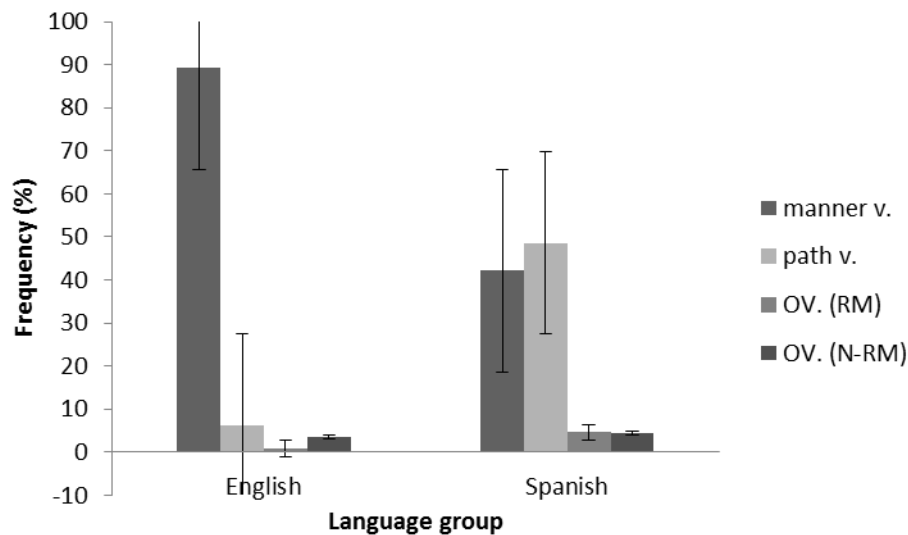
**Figure 7.11: Distribution of type of verbs in sentences produced by children from AG 3 according to language groups (in percentages).**

In AG 4, the pattern remained almost exactly as in AG 3 for both languages. There were some appearances of OV, most significantly in the Spanish group (6.67% of OV(N-RM)).



**Figure 7.12: Distribution of type of verbs in sentences produced by children from AG 4 according to language groups (in percentages).**

In AG 5, English-speaking children practically showed the same pattern observed in AG 4 and AG 3. In contrast, Spanish-speaking children (particularly adolescents) produced more path verbs than manner verbs.



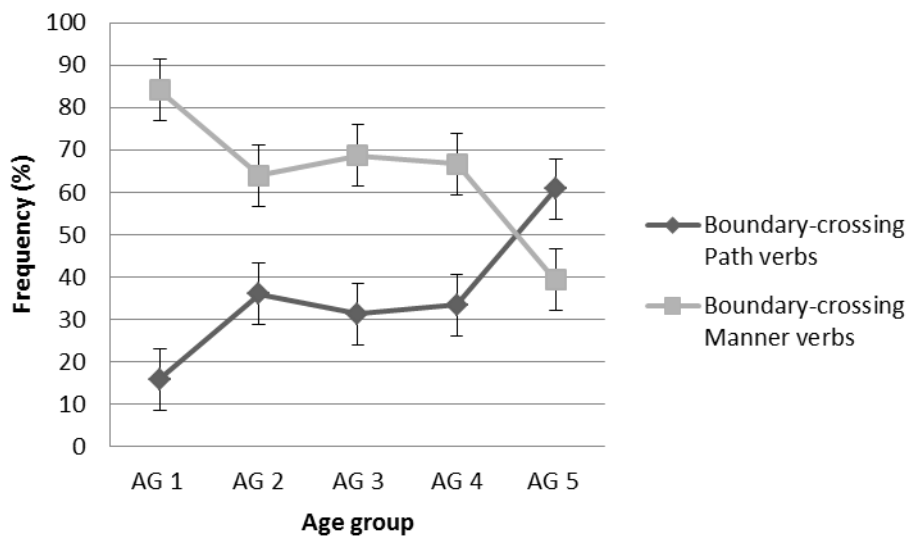
**Figure 7.13: Distribution of type of verbs in sentences produced by children from AG 5 according to language groups (in percentages).**

In order to statistically compare Spanish-speaking- and English-speaking children, we performed two t-tests. One t-test compared manner verb selection between language groups and the other t-test compared path verb selection between language groups. Results showed that English speakers significantly encoded more manner verbs, less path verbs, and “other verbs” non-related to the motion event, than Spanish speakers ( $t(1, 130.883) = 12.435$   $p < .000$ ,  $t(109.413) = -12.500$ ,  $p < .000$ , and  $t(156.865) = -2.192$   $p < .000$  respectively).

In summary, the results from this analysis confirm our hypotheses C.1 and C.2. It shows that Spanish-speaking children and English-speaking children differed in how they encode motion events. English-speaking children preferred manner verbs while Spanish-speaking children preferred more path verbs. Spanish-speaking children from AG1 to AG 4 generally encoded more manner than path in verbs. This tendency was reversed in AG5. In contrast, English-speaking children in all age groups increasingly preferred to encode manner in main verbs.

*Type of path (crossing-boundary path vs. trajectory path)*

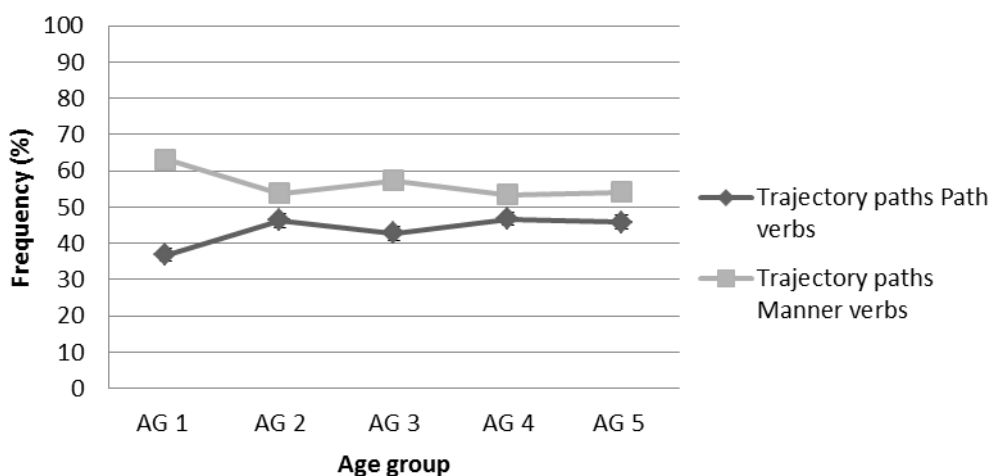
Sentences with manner verbs and path verbs were divided according to the type of path of the stimuli (boundary-crossing vs. trajectory). Figure 7.14 illustrates results (Table 7 in Appendix C shows the percentages of Figures 7.14 and 7.15).



**Figure 7.14: Mean percentages of path verbs according to the type of path and age groups in Spanish speaking children and adolescents (%)**

Figure 7.14 showed that Spanish-speaking children in AG 1 encoded more manner verbs with BC-paths. This tendency decreased in older children. Spanish-speaking children in AG 5 clearly preferred to encode path verbs with boundary crossing events, as expected.

Figure 7.15 shows, on the other hand, that children at all ages preferred to produce manner verbs when describing trajectory events, even though the presence of path verbs is not insignificant.

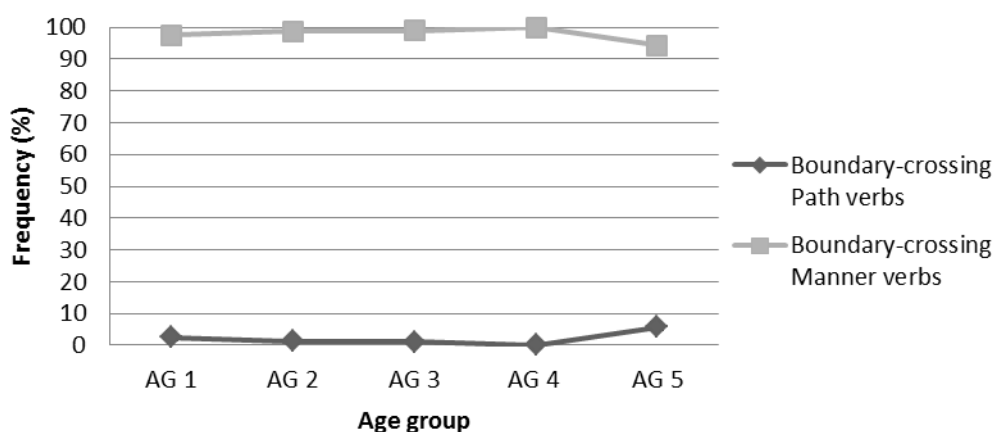


**Figure 7.15: Mean percentages of path verbs according to the type of path and age groups in Spanish speaking children and adolescents (%)**

A Two-Way ANOVA was conducted on Spanish-speaking children of all age groups with manner verb production as a dependent variable and boundary crossing as an independent variable. The differences were significant ( $F(2,84)=3.849, p=.006$ ). Tukey post-hoc tests revealed that children in AG 5 produced significantly less manner verbs than children in AG 3 and AG 1. A second One-Way ANOVA, conducted on Spanish-speaking children of all age with manner verb production as a dependent variable and trajectory path as independent variable did not yield significant results ( $F(2,84)=.598, p=.665$ ). This results and the analysis of the percentages seem to suggest that speakers did not show differences across ages in relation to the encoding of trajectory path.

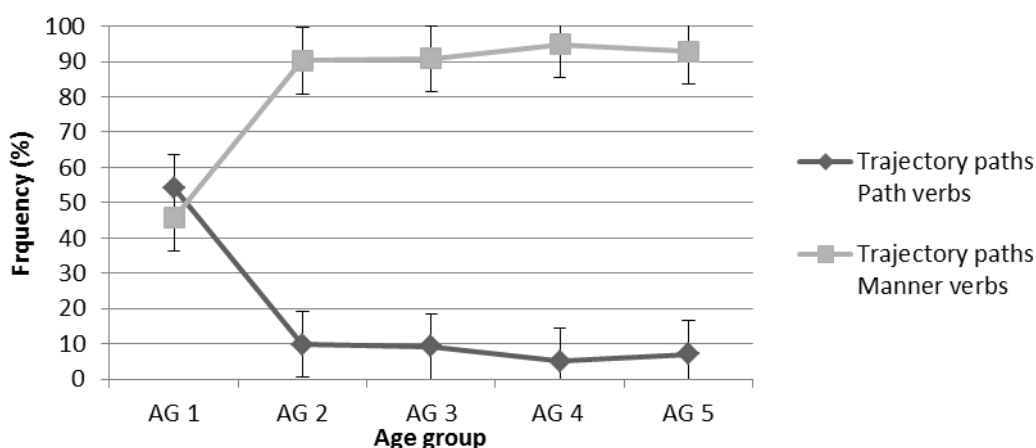
In summary these results indicate that children from AG 1 to AG4 (i.e. aged 5;00 to 15;00) did not follow the tendency that was observed in adults, that is to say, to prefer manner verbs over path verbs when the motion event shows a BC-paths. This is unexpected, as Slobin and colleagues have observed that children from early on (3;00) show the typical Spanish pattern of their language when encoding motion events (i.e. a path manner preference). However, AG 5 did follow the expected pattern. Therefore, our hypothesis C.4 is partially rejected. There are some possible explanations. However, a possible one is that children are still acquiring the pattern of lexicalization of motion events for type of path.

With regard to English, figures 7.16 and figure 7.17 (see percentages for both figures in Table 8 in Appendix C) showed that children from all age groups encoded manner verbs independently of the type of path, except AG 1 children. Children of this group produced more path verbs for trajectory path than for BC path (see figure 7.17). This is explained by the high presence of the verb “to go up”, considered the common form for expressing ascension in the stimulus No. 6, and that was considered a path verb. However, children in older age groups increased their use of manner verbs for such stimuli producing forms such as “to climb” and “to shuffle” which dominated their sentences.



**Figure 7.16: Mean percentages of path verbs according to the type of path and age groups in English speaking children and adolescents.**

This result is confirmed by the non-significant results obtained in two One-Way ANOVAS in which manner verb selection was compared with BC paths and trajectory paths ( $F(2,83)= 1.690, MSE= .551 p=.161$ ) and ( $F(2,83)= 2.029, MSE=.582 p=.098$ ) respectively.



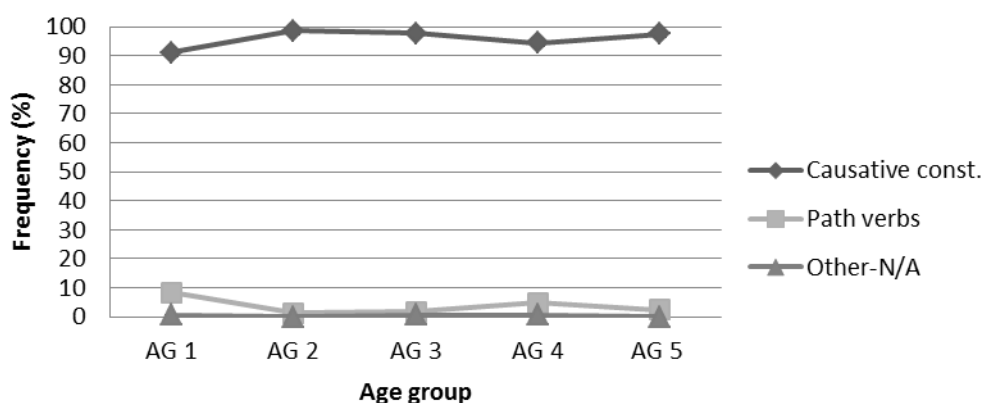
**Figure 7.17: Mean percentages of manner verbs according to the type of path and age groups in English speaking children and adolescents.**

We compared both languages groups and run two t-tests comparing English-speaking children and Spanish-speaking children as two independent groups in their production of manner verbs with boundary-crossing path and with trajectory path showed that these two languages differed in their production of manner verbs with BC-path ( $t(119.956)=9.879 p < .000$ ). English-speaking children significantly produced more manner verbs than Spanish-speaking children with BC-path. English-speaking children also significantly produced

more manner verbs than Spanish-speaking children with trajectory path ( $t(165.08)= 9.803 p < .000$ ). The only variable that did not reveal any significant results was “other verbs”.

### *Path vs. causation condition*

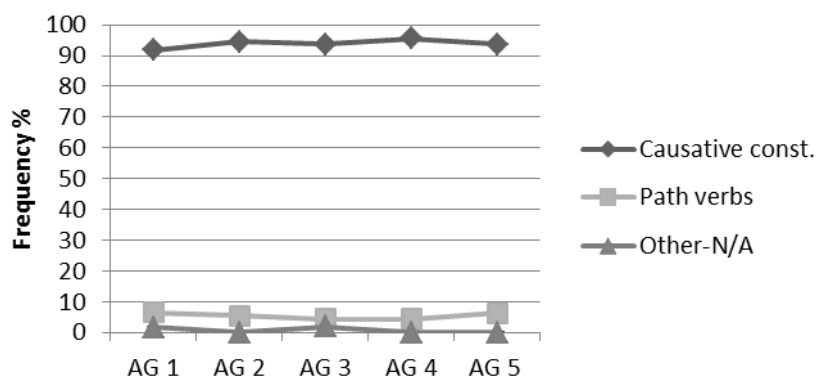
The analyses of the path vs. causation preferences revealed that English-speaking- and Spanish-speaking children described videos using mainly causative constructions, i.e. showing the agent that caused the figure to move. This happened in English-speaking children at all age groups (see Figure 7.18 and Table 9 in Appendix C)). Figure 7.18 shows the high tendency of production of causative constructions. The same happened among Spanish-speaking children at all age groups (see figure 7.19 and Table 10 in Appendix C). However, it is clear that the production of path verbs was slightly higher in this language group than in the English group. The “other forms” refers mostly to cases in which the child did not provide any answer. This result seems to suggest that children from either language group did not show great changes in their encoding of causation of motion between the studied age periods.



**Figure 7.18: Causative constructions, path verbs, and other forms produced by English speaking children divided by age group (%)**

We conducted some statistical analyses in order to confirm these results. Two One-Way ANOVAs comparing means for all age groups in Spanish-speaking children did not yield significant results for causative constructions (Brown-Forsythe  $F(4,65.909)=.102, p < .05$ ) or for path verbs (Brown-Forsythe  $F(4,61.491)=.160, p < .05$ ). Games-Howell post-hoc tests revealed that Spanish speakers from AG 1 produced significantly less causative constructions than

their peers from AG 2 (.041). In the case of English-speaking children, the results for causative constructions were significant (Brown-Forsythe  $F(4,42.793)=2.666$ ,  $p = .045$ ). A second ANOVA measured the production of path verbs in English speaking children per age group. The test did not yield significant result (Brown-Forsythe  $F(4,44.249)=2.304$ ,  $p = .073$ ).



**Figure 7.19: Mean percentages of causative constructions produced by Spanish speaking children divided by age group.**

Finally, we wanted to run a two-way ANOVA to contrast language groups and age groups. Therefore, we decided to conduct two t-tests comparing language groups as independent variables and causative construction and path verbs as dependent variables. None of the tests yielded significant results.

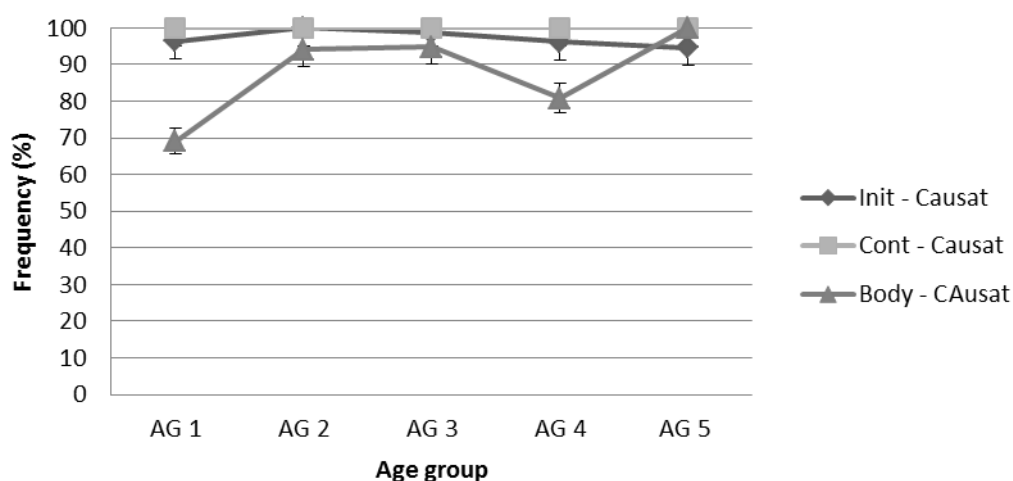
In summary, the Spanish group did not show differences by age group. However, the English group increased their production of causative constructions from AG 1 to AG 2. This finding suggests that from the age of 7;00, English speaking children start to produce significantly more causative constructions than younger children. On the other hand, English-speaking and Spanish-speaking children did not differ significantly. Therefore, the findings support the hypothesis that English-speaking children tend to decrease the production of path and neutral verbs and increase the use of cause verbs with age (C.2. in chapter 5). Furthermore, we show that older English-speaking children produce the adult pattern of lexicalization of motion event (C.3)



### *Types of causation*

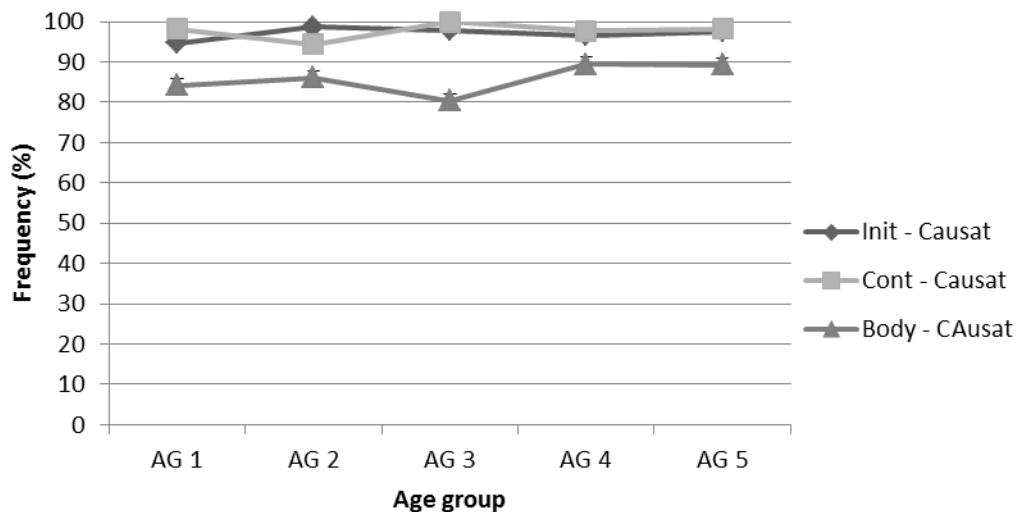
In the study of the adult population we were able to show that most of the variation between causative constructions and sentences with path verbs was mainly in the body part stimuli as opposed to continuous causation and initiating causation stimuli. Therefore, we examined the data according to the three different type of causation (continuous causation, initiating causation and body part causation) to see if there were differences between language groups and age groups in the child population.

The first results are depicted in figure 7.20 (see percentages in Table 11 in Appendix C) in which percentages of causative constructions for English speaking children are presented according to type of causation. Among English-speaking children the tendency is to produce more causative constructions with continuous causation stimuli, followed by initiating causation and finally body part causation.



**Figure 7.20: Causative constructions produced by English speaking children divided by the type of causation and age groups.**

In the Spanish-speaking children, the picture is pretty similar to English-speaking children, with the difference that path verb sentences appeared with all types of causation and their tendency is very constant across age groups. For example, if you look at body part causation in figure 7.21 (percentages can be observed in Table 12 in Appendix C), the variation in percentages of causative construction across the ages is very small.



**Figure 7.21: Mean percentages of causative constructions produced by Spanish speaking children divided by the type of causation and age groups.**

Due to the lack of homogeneity among variances we performed some non-parametric tests in the language groups. First, we conducted a Kruskal-Wallis test to examine statistical differences in the Spanish group with production of causative constructions as a dependent variable and age group as an independent variable. The tests were conducted separately for the initiating causation stimuli, the continuous causation stimuli and the body-part causation stimuli. Results did not yield significant differences between age groups or causative constructions in any of the types of causation.

Secondly, we also conducted Kruskal-Wallis tests to examine statistical differences in the English group. Results yielded a significant difference between age groups and causative constructions, but only in the body part causation stimuli ( $H(4)=13.939$   $p = .007$ ), with a mean rank of 32.26 for AG 1, 46.41 for AG 2, 46.89 for AG 3, 38.35 for AG 4, and 51.00 for AG 5. Additional Mann-Whitney tests comparing age groups for causative constructions for body part causation revealed that:

- i) English-speaking children in AG 1 used significantly less causative constructions than AG 2 ( $U=118.00$ ,  $p=.026$ ), AG 3 ( $U=130.000$ ,  $p=.016$ ) and AG 5 ( $U=84.000$ ,  $p = .006$ ).
- ii) English-speaking children in AG 4 significantly used less causative constructions than AG 5 ( $U=63.000$ ,  $p=.028$ ).

These results confirmed what we observed in the first section of the study of path vs. causation: the English speaking children were the language group that showed some developmental patterns. Basically, their production of causative constructions increased significantly from the ages of 7 to 9 years-old. We are not saying that causative constructions are not the preferred pattern among children in AG 1, because these forms are preponderant across all age groups. However, we noticed that between the ages of 7;00 and 9;00, children significantly preferred causative constructions.

*A descriptive analysis of motion events components in sentences in the path vs. manner condition (semantic and syntactic analyses)<sup>48</sup>*

In this section we looked at the patterns of encoding manner vs. path of motion in monolingual children and adolescents. We focused on how motion event components were represented for this condition in the sentences of each of the language groups. Additionally, we looked at possible developmental changes among children and adolescents, which we were able to study by looking at whole phrases. Although the literature indicates that young Spanish and English-speaking children know the pattern of preference for encoding manner and path in the verb, Slobin 1994 finds that children even at the age of 7;00 years are still acquiring the patterns for the rest of the sentence.

In this analysis, all the answers produced by speakers were studied, regardless of whether there was more than one main verb (see table 7.2 for more details).

	Number of sentences studies by participants					
	AG 1	AG 2	AG 3	AG 4	AG 5	Total
Spanish mono.	145	108	183	122	105	663
English mono.	167	146	159	95	111	578
Total	312	254	332	217	216	1241

**Table 7.2: Total number of sentences studied by language groups and age groups**

<sup>48</sup> This analysis is only performed for the path vs. manner condition because it is where more possible outcomes can be analysed and compared with other studies. In relation to path vs. causation only two types of constructions were analysed and marked a difference between the two languages, i.e. the transitivity or intransitivity of the sentences.

Table 7.3a and Table 7.3b show the percentages of usage of path verbs, manner verbs, other verbs (R-M and N-RM) and No answers, and their combination with other path or manner components in the sentence (see section 6.4 in Chapter 6) for a description of this type of table).

With regard to path and other components in Spanish, Table 7.3a shows that the production of main path verbs increased with age. In the section in which path is the main verb, the preferred patterns were path verb + manner at all ages except in AG 1 children, where *only path verbs* outnumbered other patterns. The production of *path + manner* increased considerably in AG 3 children. Therefore, in relation to the production of path verbs with other components, we observed a change across the ages that could be related to linguistic developmental issues. Also, there is the issue of the saliency of manner components in the videos, as mentioned earlier. For example, for the trajectory-path stimuli in which *a girl crawls under a table*, all Spanish-speaking children tended to produce manner verbs. However, at AG 4 and AG 5, we started to observe some production of path verbs or other verbs like: a. *una muchacha que se mueve hacia adelante en cuatro*/ a girl that moves forwards in four (legs and hands); b. *muchacha pasa por debajo de una mesa*/ a girl passes under a table. These examples show that speakers are paying attention to other aspects of motion event rather than manner. Therefore, the tendency to produce manner or path could change according to age.

**Table 7.3a: Distribution of encoding patterns of manner and path of motion in Spanish-speaking children**

	AG 1	AG 2	AG 3	AG 4	AG 5
	%				
Path					
Only path verb	57.14	44.44	42.37	32.08	50.00
Path + Manner	40.00	55.55	54.24	67.92	56.82
Path + Path +Manner	2.86	0.00	0.00	0.00	0.00
Path + Manner + Manner	0.00	0.00	3.39	0.00	0.00
Path +Path	0.00	0.00	0.00	0.00	0.00
TOTAL PATH	100	100	100	100	100
% Path	<b>24.14</b>	<b>33.33</b>	<b>32.24</b>	<b>43.44</b>	<b>41.27</b>
Manner					
Only manner verb	84.38	72.13	73.73	58.18	42.86
Manner+ Path	6.25	0.00	6.78	12.73	22.45
Manner + Manner + Path	1.04	0.00	0.85	7.27	12.24
Manner + Path + Path	0.00	0.00	0.00	0.00	0.00
Manner + Manner	8.33	27.87	18.64	21.82	22.45
TOTAL MANNER	100	100	100	100	100
% Manner	<b>66.20</b>	<b>56.48</b>	<b>64.48</b>	<b>45.08</b>	<b>47.52</b>
other verbs (not related to motion)	<b>6.20</b>	<b>0.42</b>	<b>1.64</b>	<b>5.74</b>	<b>6.86</b>
other verbs (related to motion)	<b>2.77</b>	<b>0.42</b>	<b>0.00</b>	<b>3.28</b>	<b>4.36</b>
NA	<b>0.69</b>	<b>0.92</b>	<b>1.64</b>	<b>2.46</b>	<b>0.00</b>
TOTAL	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

With regard to manner verbs plus other components in Spanish, “*only manner verbs*” was the preferred pattern at all ages. In this category, we observed very little variation until the group AG 4, where more combinations of manner verbs plus other components appear, specifically more than one component. This fact could be related to the ability in older children have to construct sentences with many more adjuncts and embedded clauses. For example: i) una mujer salta mientras camina hacia una puerta / a woman jumps while she walks towards

the door (AG 5). The underlined section is an embedded clause that denotes direction.

The production of OV's (RM and N-RM) was very low across age groups. Therefore, it seems we cannot deduce from the data any conclusion with regard to these forms. However, something interesting is that some of the sentences classified as OV were static sentences. Although we observed them in English-speaking children as well, they appeared more frequently in Spanish. These sentences are interesting because their production in such type of experiment in which the dynamic of motion is so salient was not expected. But they support Sebastián and Slobin (1994) suggestion that Spanish speakers (and other V-languages' speakers) can pay less attention to movement and show more interest in describing the settings and the emotional circumstances of the people involved in a motion event (see examples 1a to c).

- (1) a. Estaba ebria / She was drunk (AG 2 )
- b. Está debajo de la mesa/ (she) is under the table (AG 3)
- c. Parece estar mareada /(She) seems to be dizzy (AG 3)

In Spanish monolinguals, path verbs were mainly followed by manner components expressed through gerunds, oblique phrases characterizing the mode of motion, and some embedded clauses, more typical in older children (see example 2).

- (2) Un hombre entra a un edificio trotando/A man enters in a building jogging (AG 5)

English monolinguals showed a different pattern. First, from a total of 678 sentences, no more than 10% included path verbs (see table 7.3b). However, we observed that at AG 5 children, speakers produced a few more path verbs (percentages are still low) but they combined with all possible patterns. This result does not imply necessarily that these speakers are paying more attention to path, but that they are paying less attention to manner. If our primary hypothesis is confirmed, and our stimuli were salient in manner, that could

explain the very low percentages of path verbs in English monolinguals, and even in Spanish monolinguals.

**Table 7.3b: Distribution of encoding patterns of manner and path of motion in English-speaking children (in %)**

	AG 1	AG 2	AG 3	AG 4	AG 5
	%				
Path					
Only path verbs	0.00	14.29	14.29	0.00	18.18
Path + Manner	0.00	28.57	85.71	100.00	45.45
Path + Path +Manner	0.00	0.00	0.00	0.00	9.09
Path + Manner + Manner	0.00	0.00	0.00	0.00	9.09
Path +Path	100.00	57.14	0.00	0.00	18.18
TOTAL PATH	100.00	100.00	100.00	100.00	100.00
% Path	<b>7.24</b>	<b>4.17</b>	<b>4.17</b>	<b>5.49</b>	<b>9.36</b>
Manner					
Only manner verbs	53.57	32.00	35.62	26.14	22.34
Manner+ Path	37.14	66.40	52.05	64.77	63.83
Manner + Manner + Path	0.00	0.80	5.48	4.55	8.51
Manner + Path + Path	0.00	0.00	1.37	1.14	1.06
Manner + Manner	9.29	0.80	5.48	3.41	4.26
TOTAL MANNER	100.00	100.00	100.00	100.00	100.00
% Manner	<b>83.79</b>	<b>87.44</b>	<b>92.41</b>	<b>92.46</b>	<b>85.19</b>
other verbs (not related to motion)	<b>1.66</b>	<b>2.65</b>	<b>1.63</b>	<b>2.04</b>	<b>0.00</b>
other verbs (related to motion)	<b>7.32</b>	<b>0.00</b>	<b>1.80</b>	<b>0.00</b>	<b>1.56</b>
NA	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
TOTAL No of sentences	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

With regard to manner verbs plus other components in English, children from AG 1 were the only one that preferred *only manner verbs* over *manner + path* (also explained by limitations in their vocabulary), while AG 2 to AG 5 children considerably preferred *manner verbs +path component* (preferred pattern in English for encoding motion events, as confirmed by Slobin in numerous

studies). Additionally, we observed that English-speaking children started to produce manner verbs combined with all sorts of components in AG 3 children, making their sentences more complex and elaborated (see examples 3 a and b).

- (3) a. A man *crawls backwards on his bum* up the steps (AG 3)  
b. A woman *is jogging* through a door into a room (AG 3)

With regard to other verbs (R-M), there was a clear decline with age. Children of AG 1 produced many more of these forms (*go, move, to do, get, etc.*) than the rest of the age groups. This production declined considerably in AG 3 children. Some examples of these sentences are shown in 4a to 4c.

- (4) a. He was getting through the door (AG 1)  
b. A man came in the room (AG 3)  
c. He went into there (AG 1)

In relation to OV (N-RM), their frequency of appearance was very low. It contained some examples of static sentences as in Spanish data but they were very few examples like examples 5a and 5b.

- (5) a. He is under the table (AG 1)  
b. The man is backward on the stairs with his bum (AG 1)

## **7.3 The study of child bilingual speakers of Spanish and English**

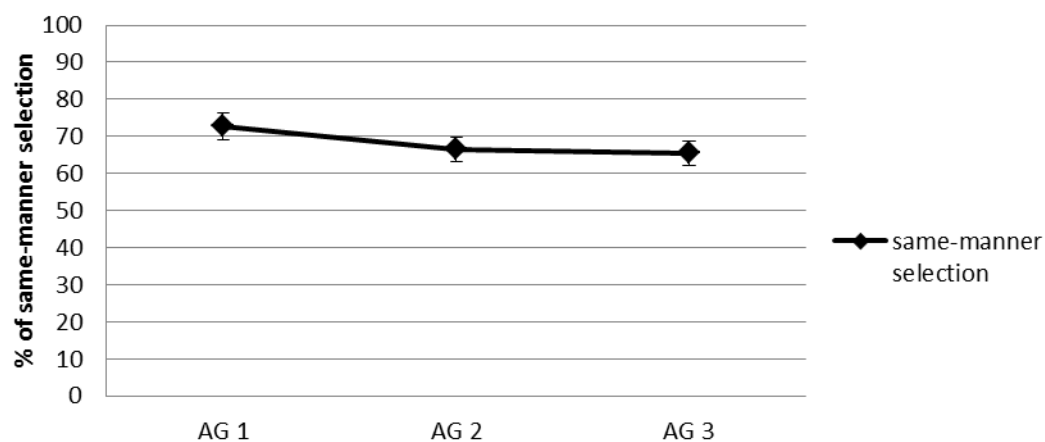
### **7.3.1 Experiment 1: Similarity Judgment task**

#### *Results from the manner vs. path condition*

With regard to same-manner and same-path selection, Figure 7.22 (see Table 13 in Appendix C for total percentages) shows that bilingual speakers chose more same-manner videos than same-path videos across all age groups. AG 1 selected many more same-manner responses than AG 2; AG 2 selected more



same-manner responses than AG 3. In short, older children selected less same-manner responses than younger children.

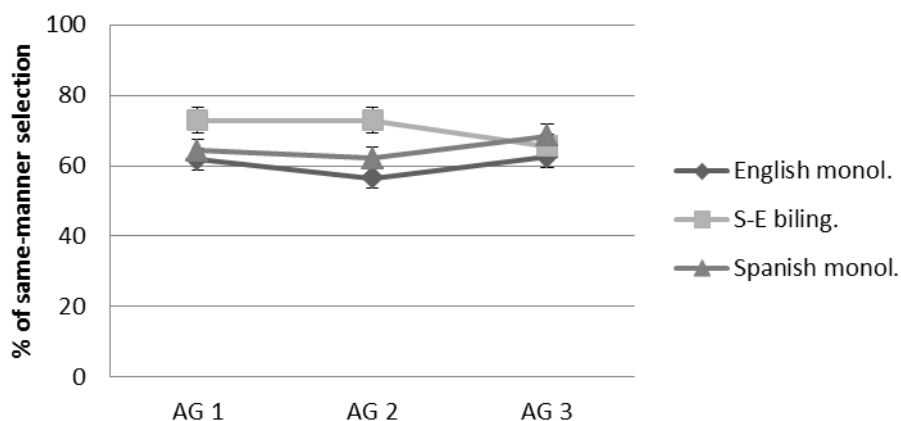


**Figure 7.22: Same-manner selection in the similarity judgment task according to age in bilingual children (in percentages).**

A one-way ANOVA with same-manner selection as a dependent variable and age group as an independent variable was not significant ( $F(2,38)=.180$   $p > .05$ ).

Bilinguals were compared to monolinguals by means of a two-Way ANOVA examining the effect of age and language group on the selection of same-manner. There was no significant interaction between age and language group on manner selection.

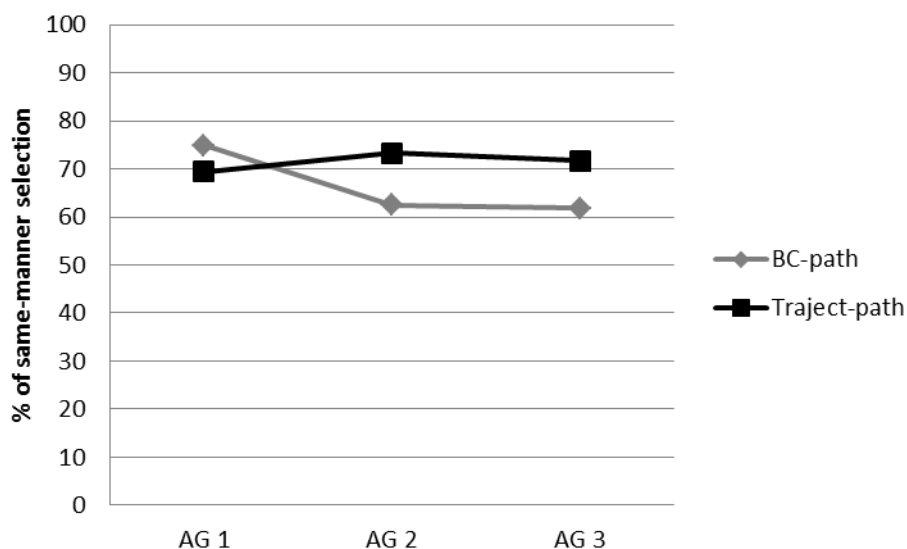
We conducted a one-way ANOVA on the selection of same-manner responses across languages and age groups. The results were not significantly different either. As shown in figure 7.23, the age groups appear to be performing similarly. Interestingly, older children appear to converge to a greater extent than younger children for all language groups, which would suggest that older children tended to pay attention to manner independently of their language.



**Figure 7.23: Same-manner selection in the similarity judgment task according to age in S-E bilingual and monolingual children (in percentages).**

*Type of path (boundary-crossing path vs. trajectory paths)*

Figure 7.24 shows the results of the same-manner choices split by the type of path for the bilinguals in (see Table 13 in Appendix C for mean percentages).



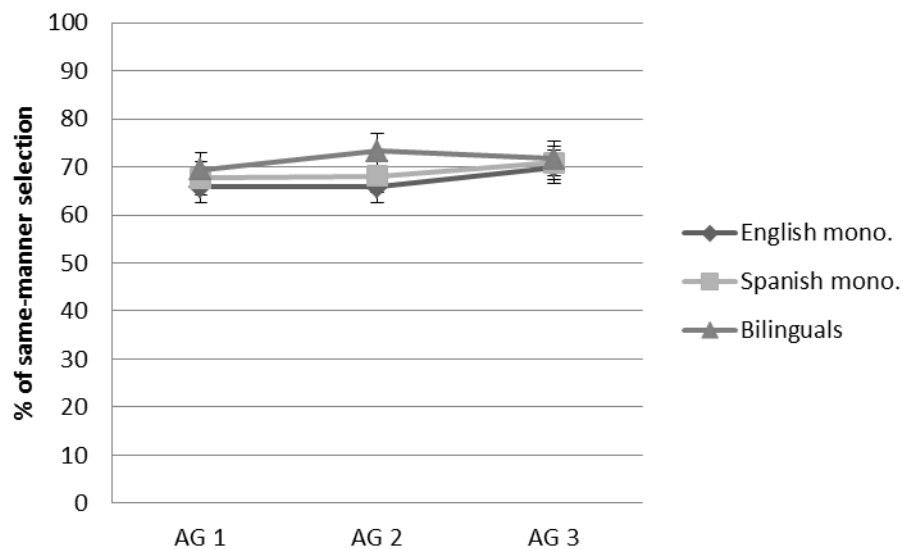
**Figure 7.24: Same-manner selection in the similarity judgment task in bilingual children according to type of path (in percentages).**

AG 2 and AG 3 preferred same-manner choices with trajectory path stimuli than with BC-path stimuli. AG 1 on the other hand seemed to choose more same-manner videos for trajectory-path stimuli, but the difference is minimal. Results from AG 1 should be interpreted cautiously, as we explained this age group is formed for a small number of subjects. Therefore, it is possible that the difference observed is due to this factor.

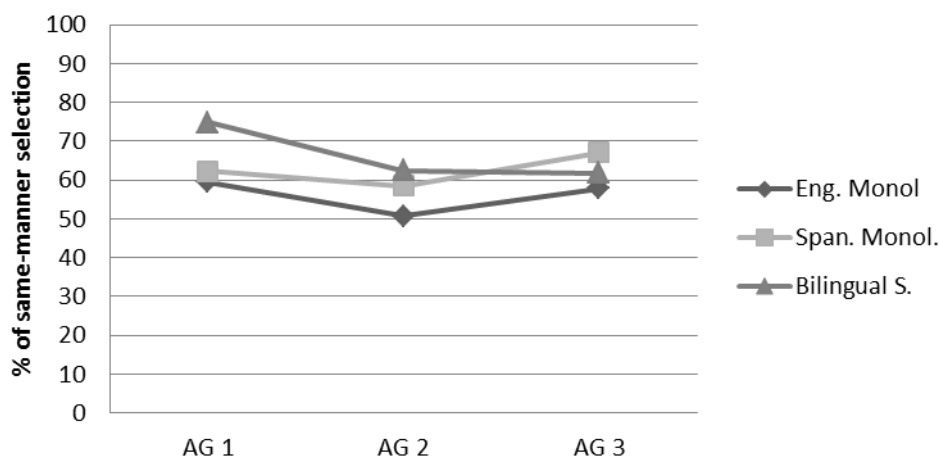
We did two one-way ANOVAs to look at the effect of age group on the selection of same-manner responses in BC-path and in Trajectory path. The differences were not significant for BC-path ( $F(2,38) = .433$ ,  $MSE = 3.368$ ,  $p > .05$ ) or trajectory-path ( $F(2,38) = .050$ ,  $MSE = .102$ ,  $p > .05$ ).

#### *Comparisons between language groups*

We did two two-way ANOVAS to look at the effect of age groups and language groups on the selection of: i) same-manner responses for BC-path stimuli; ii) same-manner responses for trajectory-path stimuli. None of the ANOVAS showed significant interactions or main effects (see Figure 7.25 and Figure 7.26 which depicted the mean percentages of same-manner selection between language groups and according to age groups, and same-manner selection according to type of path, see also bilingual data in Table 13 in Appendix C).



**Figure 7.25: Same-manner selection for trajectory path in bilingual and monolingual children (in percentages).**



**Figure 7.26: Same-manner selection for BC- path in bilingual and monolingual children (in percentages).**

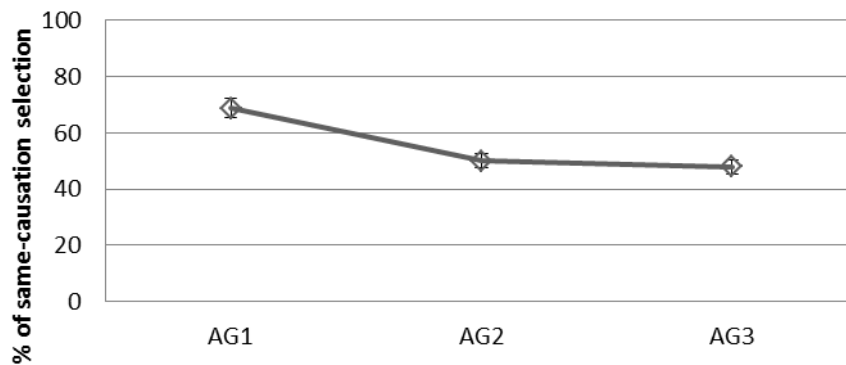
The percentages indicated that speakers of all language groups behaved very similarly at all ages, particularly at AG3.

In summary, these results are indicating that bilingual children paid more attention to manner than path across all ages. There was a tendency to select less same-manner videos as children got older, but that tendency was not statistically significant. Additionally, there were no significant differences between bilinguals and monolinguals, regardless of age. This suggests that these three groups of speakers behaved similarly in this task. When answers were divided according to the type of path we observed a tendency between bilinguals and monolinguals, regardless of age to choose more same-manner options for trajectory path stimuli than for BC-path stimuli. Therefore, we observed the expected tendency but statistics did not reveal significant differences. This results suggests that bilingual children, as adults, do not change their categorization patterns as a function of language, at least for path vs. manner condition (hypothesis E.1 is rejected).

#### *Results from the path vs. causation condition*

We analysed bilinguals' performance in relation to attention to path of motion vs. causation of motion. As with the monolingual children, we examined : i) whether there was a preference for path over causation; ii) whether there was an age period in which children develop a preference for one motion component over the other.

Figure 7.27 shows the percentage of same-causation choices for bilinguals. Bilingual children preferred same-causation videos over same-path videos across all ages. Similarly to selection of manner over path, selection of same-causation over same-path declined as the children got older, although they still paid attention to cause.



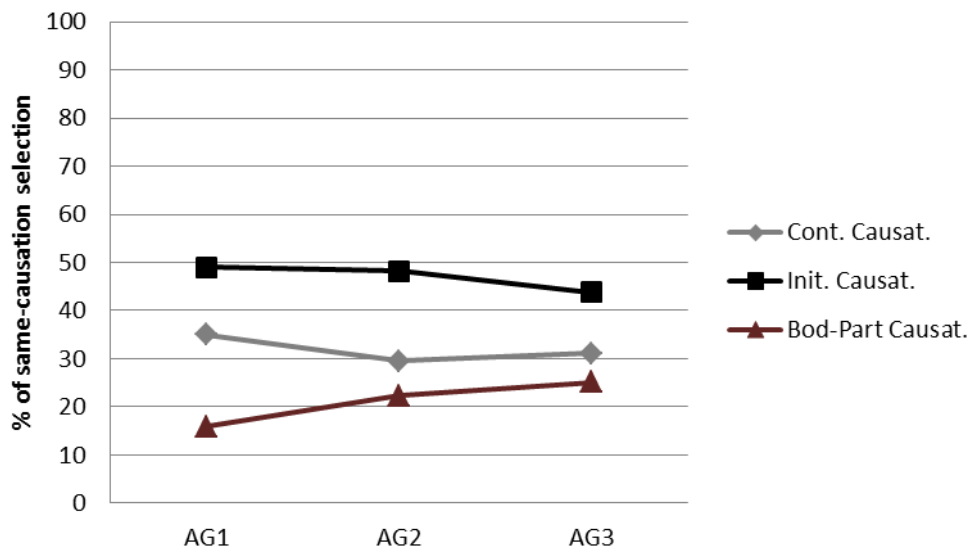
**Figure 7.27: Mean percentages of same-causation choices in S-E bilingual children according to age.**

A One-Way ANOVA looking at the effect of age in the selection of same-cause videos was not significant.

We also did three One-Way ANOVAs on bilinguals, one for each type of causation (continuous causation, initiating causation, and body-part causation). Only the initiating causation results were significant (Brown-Forsythe test,  $F(2, 23.492)=4.797$   $p=.018$ ). Post hoc tests revealed that speakers from AG 1 significantly selected more same-causation videos than speakers from AG 3 ( $.027$ ). This result suggested older the speakers performed more similar to Spanish monolinguals, i.e. preferring less causation.

Figure 7.28 shows the mean percentages per age group according to the type of causation. The general tendency is to prefer same-causation videos with initiating causation stimuli, followed by continuous causation stimuli and finally body part causation stimuli. The tendency in older children was to select less same-causation videos than younger children, for all types of causation except for body-part causation. In this type of causation, speakers increased causation

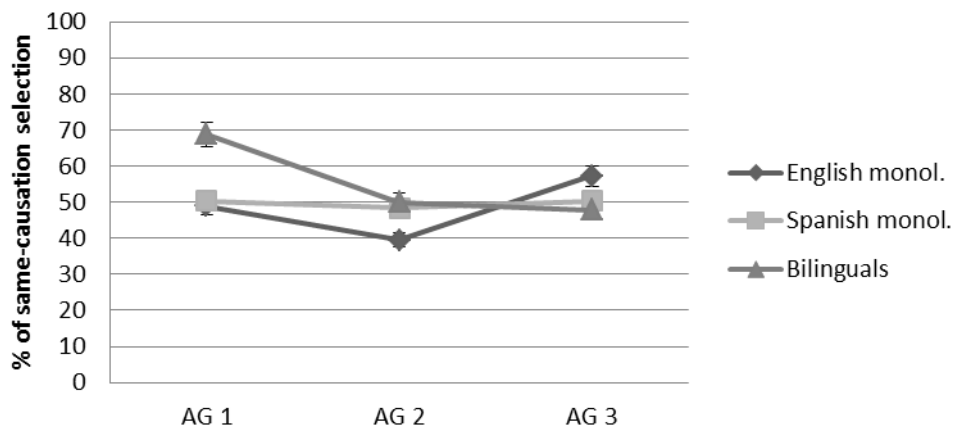
selection with age. At AG 3 the gap in the speakers' selection of same-causation videos between the three types of causation was reduced.



**Figure 7.28: Mean percentages of same-causation selection in bilingual speakers according to age group and type of causation.**

*Language group comparisons*

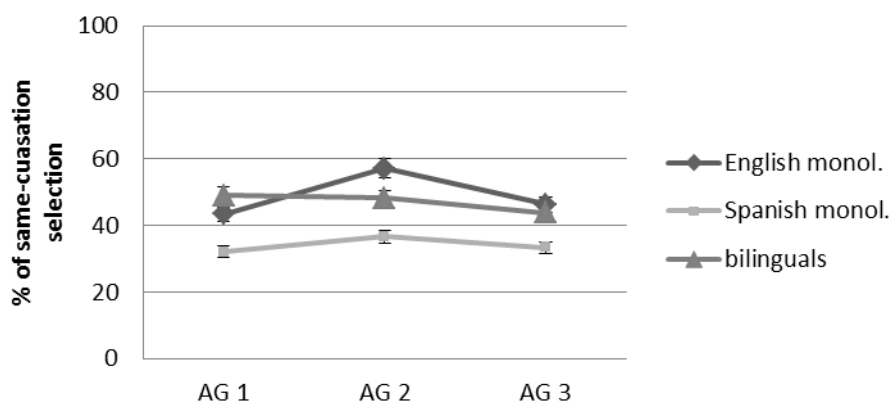
We did a two-way ANOVA with same-causation selection comparing language groups and age groups. There was no interaction between language and age groups, and no main effect of age or language group.



**Figure 7.29: Mean percentages of same-causation selection per language groups according to age groups.**

Finally we compared monolingual with bilingual speakers across age groups for each of the different types of causation. Only the one-way ANOVA for initiating causation and AG1 was significant ( $F(2,38)=3.501$ ,  $MSE=10.648$   $p < .05$ ). We

found that AG1 Spanish monolinguals ( $M=2.82$ ) significantly selected less same-cause choices than AG 1 bilingual speakers ( $M=5.00$ ) (post hoc test,  $p < .05$ ) stimuli. Figure 7.30 shows mean percentages of same-cause selection for *initiating causation stimuli* among speakers in the different language groups.



**Figure 7.30: Mean percentages of same-causation selection per language groups according to age groups for initiating causation stimuli.**

In summary, there was only a significant difference between bilingual and monolingual speakers in AG1 for the initiating causation stimuli. This indicates that Spanish monolinguals selected significantly less same-cause videos in this condition than bilingual speakers and even English monolinguals. We do not have an explanation for this result. AG1 bilingual speakers have very little knowledge of English, as they are just starting bilingual school. Therefore, it is unclear why they performed differently from the Spanish monolinguals. In addition, this is the smallest of all the bilinguals groups; therefore, it is possible that this group did not completely capture the patterns of that age group. This is developed in more detail in the discussion.

### **7.3.2 Experiment 2: Linguistic Description Task**

#### *Results from the manner vs. path condition*

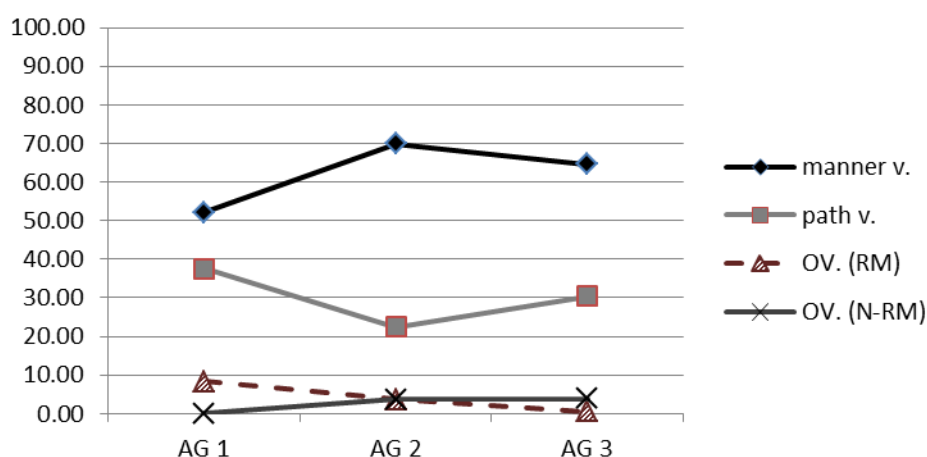
As mentioned earlier, bilingual children performed this task in Spanish only. Therefore, our study focused on observing the preferred verb patterns in Spanish (their L1) when speakers described motion events and on determining possible changes between speakers of different ages. If there were changes, we examined whether these changes were related to the learning of the L2

(English). Finally, bilingual patterns were compared to those observed among monolingual speakers in order to check possible effects of the L2 on the L1.

**Table 7.4: Mean percentages of path, manner and other verbs (related to motion), other verbs (non-related to motion), and no answer in bilingual children.**

	Manner verbs	Path verbs	OV (RM)	OV(N-RM)	N/A
AG 1	52.08	37.50	8.33	0.00	2.08
AG 2	70.00	22.50	3.75	3.75	0.00
AG 3	64.67	25.26	0.89	3.57	1.02

OV.(RM) = other verbs (related to the motion event); OV (N-RM)= other verbs (non-related to the motion event);  
N/A= no answer



**Figure 7.31: Mean percentages of path, manner, and other verbs (related to motion and non-related to motion) in bilingual children according to age.**

Figure 7.31 shows mean percentages for path, manner, and other verbs in bilinguals. They produced more manner verbs than path verbs across all ages. Therefore, they repeated the pattern observed in adults and in monolingual children. AG 1 showed the smallest difference between percentages of path verbs and percentages of manner verbs. In contrast, AG 2 bilingual speakers produced a greater percentage of manner verbs than AG 1. This percentage slightly decreased in AG 3, but it still exceeds the percentage of path verbs. In relation to OV (RM), the percentages decreased in older children, whereas OV (N-RM) increased with age. However, these two forms appeared in less than 10% of the cases.

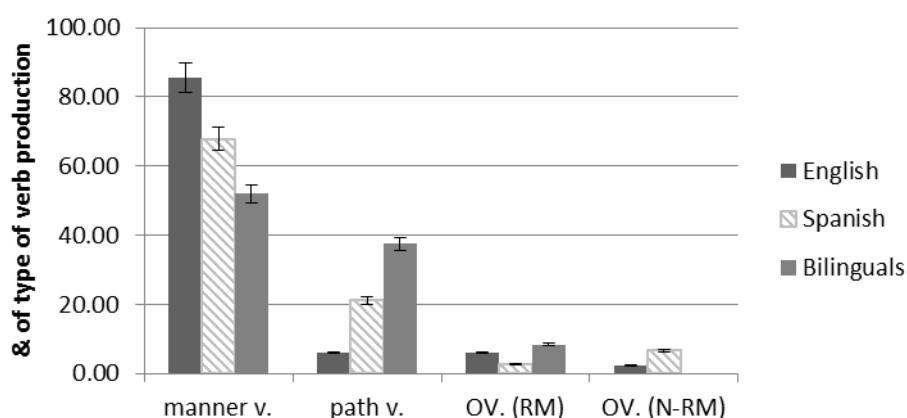


Four One-way ANOVAs looking at the effect of age group on type of verbs (manner verbs, path verbs, OV (RM), and OV (N-RM)) only showed a near significant effect of age on OV(RM) (Brown-Forsythe  $F(14.77) = 3.3382$   $p = 0.62$ ). This result is in line with Slobin and Bowerman (2007) hypothesis that children initially use this type of neutral verbs more frequently. However, the statistic does not show a clear and significant outcome.

### *Language groups comparisons*

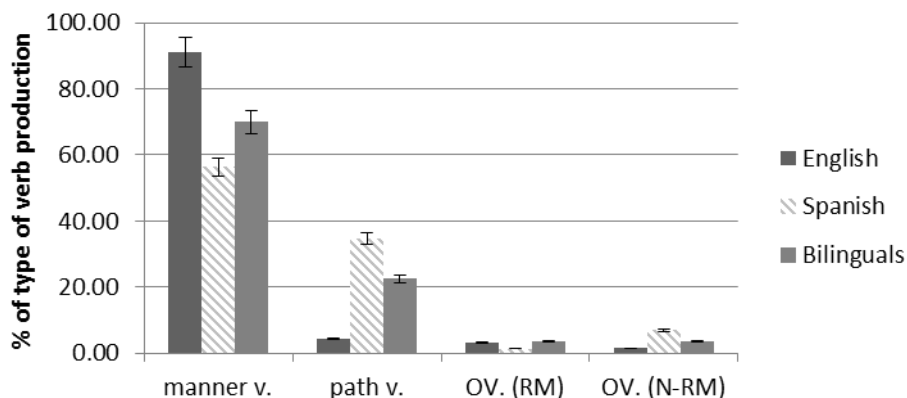
Figures 7.32 to 7.34 show the distribution of the different types of verb across language groups (Table 15 in the Appendix provides the percentages). It is clear that English monolinguals of all age groups produced more manner verbs than the other language groups. AG 1 Spanish monolinguals produced more manner verbs than the bilinguals. However, AG2 bilinguals produced more manner verbs than Spanish monolinguals. At AG 3 both language groups (Spanish monolinguals and bilinguals) performed very similarly in their preferences for path verbs and manner verbs.

The focus of this analysis was on comparing bilinguals with monolinguals. The patterns observed in AG 1 bilinguals were different from those of AG1 monolinguals. Figure 7.31 shows that bilinguals preferred manner verbs like the other two language groups; however, the production is much lower compared to Spanish and English monolinguals. On the other hand, out of all the language groups monolinguals produced the highest percentage of path verbs at AG1.



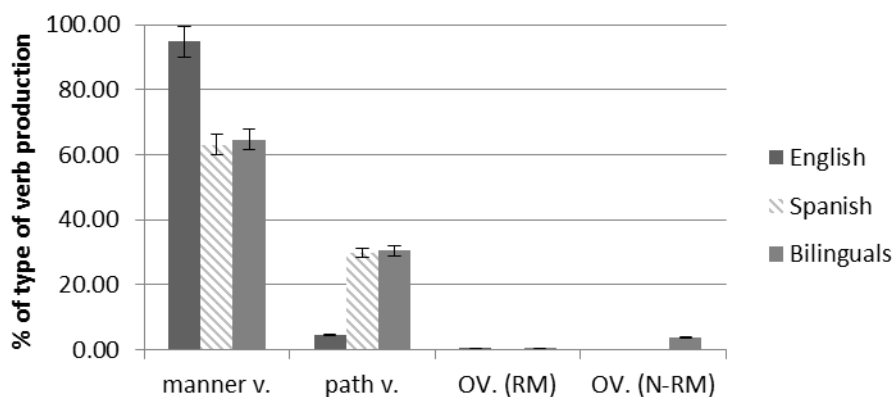
**Figure 7.32: Distribution of production of manner verbs, path verbs, other verbs (RM and N-RM) in AG 1 according to language groups (in percentages).**

At AG 2 the pattern changed. Bilinguals produced less path verbs than Spanish speakers and produced much more manner verbs than their monolingual peers. This unexpected change matched the patterns of English monolingual for what it is possible to hypothesize that the L2 in bilingual speakers is influencing their L1. Additionally, we must keep in mind that this group is having the double of hours in English lessons compared to the other groups, which could affect deeper the language system.



**Figure 7.33: Distribution of production of manner verbs, path verbs, other verbs (RM and N-RM) in AG 2 according to language groups (in percentages).**

Finally, at AG 3 the picture changed completely for bilinguals, who started to produce more manner verbs than Spanish speaker monolinguals. As it happened with the bilingual adults, AG3 child bilingual performed more similar to a prototypical V-language speaker than AG3 Spanish children.



**Figure 7.34: Distribution of production of manner verbs, path verbs, other verbs (RM and N-RM) in AG 3 according to language groups (in percentages).**

We did 4 Two-Way ANOVAS that examined the effect of language and age group on the production of manner verbs, path verbs, OV(RM) and (OV (N-RM)). These tests showed that data was not homogeneous, so we ran a number of additional analyses. Firstly, we did a one-way ANOVA with type of verb as a dependent variable and language group as an independent variable, in order to determine whether there were significant differences among all language groups. For example, it could be that English monolinguals differ from Spanish monolinguals, but not from bilinguals. In addition, we ran three one-way ANOVAS with age group as an independent variable, to compare the three language groups by age. These are the results for each type of verb:

i) Manner verbs: There was a significant effect of language on manner verb selection (Brown-Forsythe,  $F(2,119.495)= 69.563$   $p < .000$ ). Post hoc Games-Howell revealed a significant difference between English monolinguals and other language groups (.000 for Spanish monolinguals and bilinguals). Spanish monolinguals did not differ from bilinguals (.899). With regard to the results by age group:

- At all ages there was a significant difference for manner-verb selection. Post hoc tests showed that English monolinguals produced significantly more manner verbs than Spanish monolinguals and bilinguals. Spanish monolinguals did not differ from bilinguals. At AG 1 results from Brown-Forsythe showed  $F(2,11.12)= 6.453$   $p = .014$ ; post hoc tests showed a significant difference between English monolinguals and Spanish monolinguals (.012) and bilinguals (.001). At AG 2 results from Brown-Forsythe yielded  $F(2,32.816)= 23.326$   $p = .000$ . Post hoc tests showed a significant difference between English monolinguals and Spanish monolinguals and bilinguals. At AG 3, comparisons with the Brown-Forsythe test yielded  $F(2,53.599)= 31.586$   $p = .000$ . Post hoc test showed significant differences between English monolinguals and Spanish monolinguals and bilinguals. Spanish did not differ significantly from bilinguals ( $p=1.000$ ).

ii) Tests on path verbs: There was a significant effect of language group on path verb selection (Brown-Forsythe,  $F(2,90.383)= 42.099$   $p < .000$ ). Post hoc Games-Howell revealed a significant difference between English monolinguals

and the other language groups (.000 for Spanish monolinguals and bilinguals). Bilinguals did not differ from Spanish monolinguals (.980). With regard to the results by age group:

- At AG 1 the Brown-Forsythe test yielded  $F(2,8.140) = 5.199$   $p = .035$ . Post hoc tests showed that English monolinguals produced significantly less path verbs than Spanish monolinguals ( $p = .014$ ) and bilinguals ( $p = .001$ ). At AG 2 the Brown-Forsythe test yielded  $F(2,29.337) = 22.580$   $p = .000$ . Post hoc tests showed that English monolinguals produced significantly less path verbs than Spanish monolinguals and bilinguals. Finally, at AG 3 speakers Brown-Forsythe test yielded  $F(2,47.09) = 24.633$   $p = .000$ . Post hoc test showed the same tendencies observed above between English and Spanish and bilinguals.

iii. For OV (RM) and OV (N-RM) the statistical tests yielded non-significant results for OV(RM) (Brown-Forsythe  $F(2,117.08) = 1.652$   $p = .196$ ) and near significant for OV(N-RM) (Brown-Forsythe  $F(2,136.694) = 2.899$   $p = .059$ ). We did not look at age group differences for OV(N-RM) because in some age groups the production of cases was zero. Just by looking at the means we observe that Spanish monolinguals at AG 1 and AG 2 tend to produce more of this type of verbs than the other two language groups.

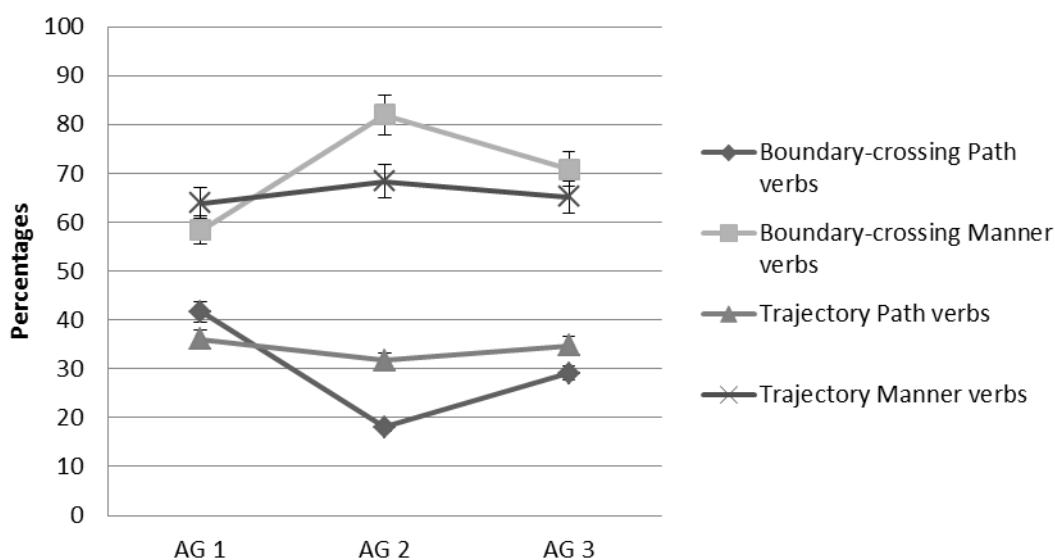
We proposed the hypothesis that bilinguals speakers would lexicalize motion events following the patterns of their L1 (Spanish), and this is in general what we observed in these analyses. Bilinguals performed closer to Spanish than to English. However, we observed in AG 2, a sudden increment of manner verbs which probably could be explained by influence of L2 in L1, similar to what we observed in the bilingual adult population.

#### *Type of path (boundary crossing path vs. trajectory path)*

We know from the literature that Spanish monolinguals tend to produce more path verbs with BC-paths and more manner-verbs with trajectory paths. This was confirmed in our results from the Spanish monolingual adult group.

However, only AG 5 children showed this pattern of preference. This result was unexpected given that some authors suggest that the BC/trajectory difference is observed in speakers of V-languages from early linguistics stages. Therefore,

we wanted to examine further how bilinguals behaved: whether they strictly followed the Spanish patterns or whether they showed differences that could be attributed to the acquisition of a second language. Figure 7.34 shows the mean percentages of production of path verbs and manner verbs in bilingual speakers according to the type of path shown in the stimuli (see also Table 15 in Appendix C).



**Figure 7.35: Distributions of path verbs and manner verbs according to the type of path in bilingual speakers (in percentages).**

Figure 7.35 reveals contrasting patterns (see Table 16 in Appendix C for percentages). First, it shows that independently of the type of path, bilingual speakers from all age groups preferred to encode more manner verbs than path verbs. As we explained in the case of the monolingual children, this means that children from our study at these ages did not pay attention in these particular differences of motion events (i.e. trajectory path events vs. boundary-crossing path events) (see Slobin's studies in the Motion Event chapter). Although manner verbs still outnumbered path verbs in AG 1 bilinguals, the difference between manner and path verbs selection was smaller in this age group than in AG 2 and AG 3. However, AG 2 bilinguals performed in a completely unexpected fashion. There was a change in the preference for manner and path verbs for boundary-crossing events. From Figure 7.35 it is observed that for trajectory path, the production of manner verbs always outnumbered path verbs but they more or less showed the same percentages across age groups. However, for boundary-crossing events, AG 2 bilinguals showed a different

pattern. They importantly decreased their production of path verbs with boundary-crossing paths, and increased their production of manner verbs with the same type of path. These differences observed in AG 2 disappeared in speakers of AG 3, where we observed a tendency to produce manner verbs at the same rate independently of the type of path, and the same for path verbs. It is possible that this change in AG 2 bilinguals is related to an influence from L2 on L1. The unexpected changes match the patterns of English monolingual. Additionally, we must keep in mind that this group is having the double of hours in English lessons compared to the other groups. Thus, it is possible to assume a modest influence from L2 in L1 that disappeared in AG 3 children. We conducted one-way ANOVAS on production of path verbs and manner verbs according to the type of path. None of the tests yielded significant results.

In summary, bilinguals did not perform as monolinguals. That is, this language group did not use more path verbs than manner verbs when stimuli showed a BC-path. In fact, although we observed that by AG 3 they conformed more to the expected pattern, the pattern in AG 2 was the complete opposite to what has been observed in adult speakers. There are different possible explanations (e.g., AG 2 bilinguals are being affected by their L2, or we are observing a U-shaped curve). In any case, bilinguals have to be compared with monolingual speakers in order to detect similarities or differences between the language groups, and thus confirm these explanations.

#### *Language group comparisons*

Due to problems with the homogeneity of the data in certain cases, we decided to conduct non-parametric tests. Four Kruskal-Wallis tests were carried out with language group as an independent variable and manner verbs, path verbs, OV(RM) and OV(N\_RM) as dependent variables. The result revealed statistical differences between language group and manner verb for BC-path stimuli ( $H(2)=55.44, p=.000$ ) with a mean rank of 112.49 for English monolinguals, 60.11 for Spanish monolinguals and 57.12 for bilinguals. There were also statistically significant differences between language groups and manner verb for trajectory stimuli ( $H(2)=55.44, p=.000$ ) with a mean rank of 105.02 for English monolinguals, 58.77 for Spanish monolinguals and 70.10 for bilinguals.

Additional Mann-Whitney tests comparing the different language groups for manner verbs with trajectory path and for BC path revealed that :

- iii) English monolinguals significantly used more manner-verbs for trajectory paths than Spanish monolinguals ( $U=580.500$ ,  $p=.003$ ) and bilinguals ( $U=303.50$ ,  $p=.000$ ). However, bilingual speakers and Spanish monolinguals did not differ.
- iv) English monolinguals significantly used more manner-verbs for BC paths than Spanish monolinguals ( $U=723.500$ ,  $p=.003$ ) and bilinguals ( $U=586.50$ ,  $p=.000$ ). However, bilingual speakers and Spanish monolinguals did not differ.

In relation to path verb selection, there were statistical differences between language groups and path verb in BC-path stimuli ( $H(2)=53.126$   $p=.000$ ) with a mean rank of 46.68 for English monolinguals, 96.67 for Spanish monolinguals and 97.06 for bilinguals. However, there were no significant differences between language groups and path verbs in trajectory-path stimuli ( $H(2)=1.728$ ,  $p=.421$ ). Additional Mann-Whitney tests comparing the different language groups for path verbs with BC-path stimuli revealed that English monolinguals used significantly less path-verbs for BC paths than Spanish monolinguals ( $U=638.00$ ,  $p=.003$ ) and bilinguals ( $U=639.50$ ,  $p=.000$ ). As with the rest of the tests bilinguals and Spanish monolinguals did not differ.

So far the statistical tests are showing that bilingual children performed differently from monolingual English children but not from monolingual Spanish children. Even though the bilinguals are not showing the expected patterns according to the adult norm, their behaviour is more Spanish-like than English-like. These tests do not differentiate among age groups, so we carried out Kruskal-Wallis tests on AG 1, AG 2 and AG 3 separately, in order to measure whether language groups differed in their production of manner verbs according to the type of path by age. This would allow us to establish developmental hypotheses.

With regard to AG1, two Kruskal-Wallis tests were carried out for BC-path stimuli and trajectory-path stimuli respectively. Language group was the independent variable and manner selection was the dependent variable. There

was a significant difference only for BC-stimuli:  $H(2)=16.726$ ,  $p= .000$ . Mann-Whitney tests showed significant differences between English and Spanish ( $U=96.000$ ,  $p= .003$ ). English monolinguals ( $M= 31.05$ ) significantly selected more manner verbs than Spanish ( $19.74$ ) in this condition. Similar results were obtained between English monolinguals and bilinguals ( $U=7.500$ ,  $p= .000$ ). Additionally, Spanish monolinguals ( $M=14.66$ ) produced significantly more manner verbs in BC-path stimuli than bilinguals ( $M= 7.75$ ) ( $U=25.500$ ,  $p= .035$ ). The Kruskal-Wallis test for trajectory-path was not significant ( $H(2)=5.057$ ,  $p=.080$ ).

With regard to AG2, There were significant differences for both conditions: BC-stimuli ( $H(2)=18.013$ ),  $p< .000$ ) and trajectory stimuli ( $H(2)=15.925$ ,  $p< .000$ ). Mann-Whitney tests showed that English monolinguals produced more manner verbs than Spanish monolinguals ( $U=41.000$ ,  $p< .000$ ) and bilinguals ( $U=48.500$ ,  $p< .000$ ) with both types of stimuli. Spanish monolinguals and bilinguals did not differ.

With regard to AG3, there were significant differences for both conditions: BC-path stimuli ( $H=25.861$ ,  $p=.000$ ) and trajectory-path stimuli ( $H=24.897$ ,  $p=.000$ ). Mann-Whitney tests showed that English monolinguals produced more manner verbs than Spanish monolinguals for BC-path ( $U=57.500$ ,  $p< .000$ ) and trajectory stimuli ( $U=64.000$ ,  $p< .000$ ), as well as bilinguals (BC-paths ( $U=40.500$ ,  $p .000$ ) and trajectory paths ( $U=85.500$ ,  $p .000$ )).

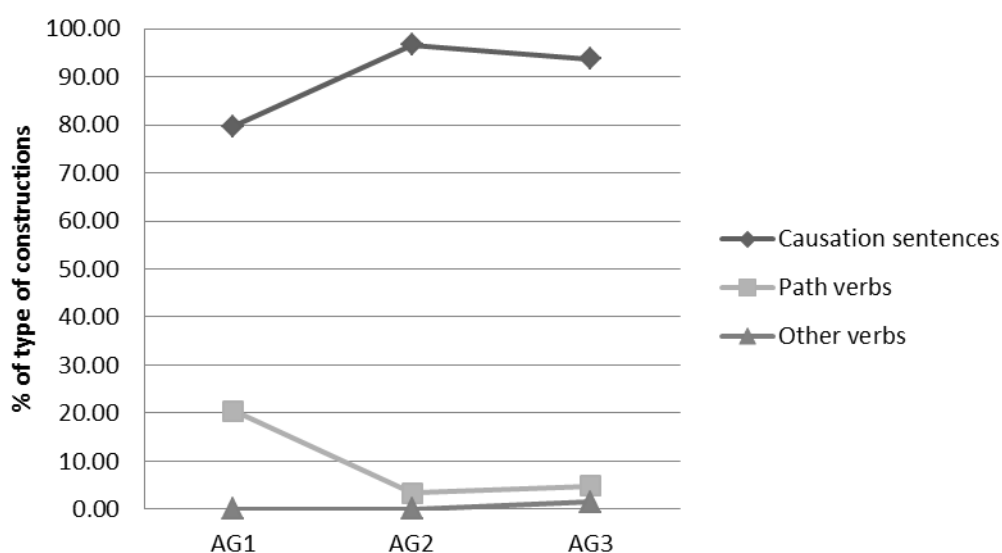
Our conclusion is that these children partially showed the adult pattern. English monolinguals did prefer to encode more manner than path verbs, independently of the conditions, and significantly more than bilinguals and Spanish monolinguals at all ages. However, bilinguals and Spanish monolinguals did not show a clear preference for manner verbs with trajectory-path stimuli. Therefore, they did not follow the adult pattern. This could be explained by two aspects: 1) children could be responding differently to stimuli due to cognitive aspects such as underdeveloped attention; 2) it might be that children have still not developed the language characteristics for encoding motion events (we must keep in mind that we are only analysing three age groups, and the age group 1 in bilinguals were only 6 children. Therefore, there was a variation



between the numbers of participants in the bilingual group). . Both hypotheses are possible. It is even probable that both aspects as affecting children's responses. This issue is further will be dealt with in more detail when we compare the children's results with the adults' in the discussion.

*Path vs. causation condition*

Figure 7.36 shows the distribution of causative constructions and sentences with path verbs and other verbs in bilinguals (see Table 17 in Appendix C for the actual percentages).



**Figure 7.36: Distribution of causative constructions, sentences with path verbs and other verbs in the bilingual group (in percentages).**

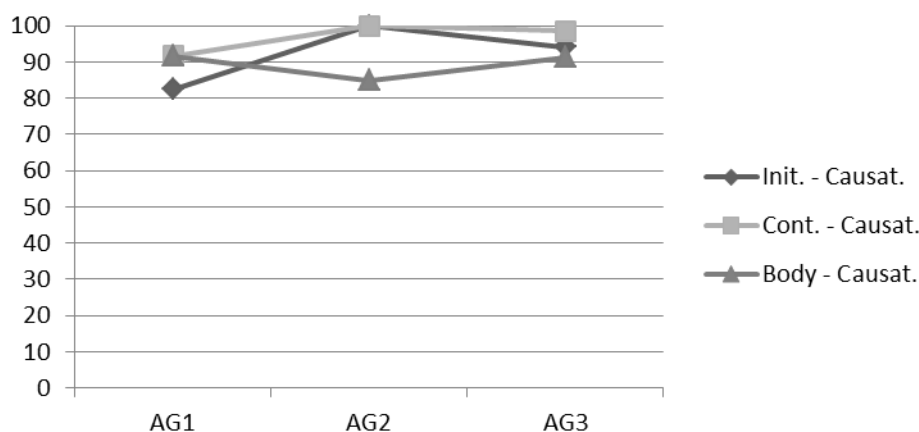
The distribution of the patterns indicates that the preferred option for encoding sentences was the causative construction. Path sentences correspond to 20% of total production in AG1. This percentage drastically decreases in AG2 and AG3.

A Kruskal-Wallis test yielded a non- statistically significant difference between the different age groups in their selection of causation constructions ( $H(2)=2.143, p= .342$ ), with a mean rank of 15.50 for AG 1, 22.70 for AG 2 and 20.00 for AG 3.

One of the problems with this result is that speakers from all language groups widely preferred to encode causative constructions. As we have explained before, these stimuli were very salient in terms of cause. However, we must analyse subject responses according to the different types of stimuli because they vary in terms of the agent saliency.

### *Type of causation*

As observed with adults, it is possible that differences between causation and path are more apparent in some stimuli. Therefore, we performed some statistical analysis in order to examine the data in more detail and check for possible differences. Figure 7.37 shows the distribution of causation constructions by age groups and type of stimuli (see Table 18 in Appendix C for the actual percentages).



**Figure 7.37: Distribution of causative constructions according to the type of stimuli in the bilingual data (in percentages).**

Responses were very similar for all types of causation and at all age groups. Only AG 2 diverged from the rest in their percentages of causative constructions for body-part stimuli (85% vs. 91% for AG 1 and AG 2). It appears that bilinguals from AG 2 selected some path verbs sentences when describing these stimuli.

Three Kruskal-Wallis tests were carried out with age groups as an independent variable and causative constructions in the three types of stimuli in the bilingual group. There were statistical differences between causative constructions for initiating causation ( $H(2)=6.305$   $p=.043$ ) [mean rank of 13.58 for AG 1, 24.00

for AG 2 and 19.93 for AG 3] and continuous causation ( $H(2)=6.578$   $p=.037$ ) [mean rank of 15.00 for AG 1, 21.50 for AG 2 and 20.65 for AG 3].

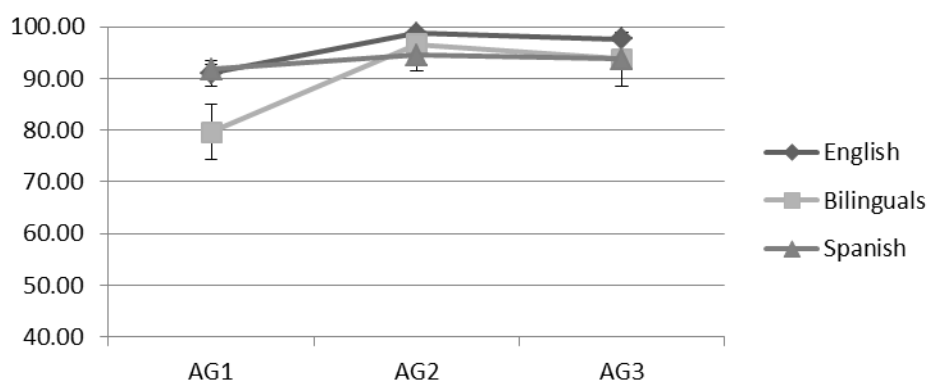
Additional Mann-Whitney tests comparing the different age groups for causation constructions with initiating causation and for continuous causation revealed that:

- i) AG 1 significantly used less causative constructions with continuous causation stimuli than AG 3 ( $U=49.00$ ,  $p=.041$ ) and almost significantly less than AG 2 ( $U=20$ ,  $p=.059$ ).
- ii) AG 2 and AG 3 did not differ in their production of causative constructions for continuous stimuli nor for initiating causation stimuli.
- iii) Only AG 1 produced significantly less causative constructions with stimuli showing initiating causation.

Bilinguals seemed to move from using less causative constructions to using more with age. It is possible that L2 is having an effect on the production of causative construction in these speakers. In order to verify this hypothesis, we compare bilinguals and monolinguals.

#### *Language group comparison*

At first glance, a comparison between language groups and their preference for causative constructions showed that the biggest difference appears in AG 1 (figure 7.38, see Table 19 in Appendix C for percentages).



**Figure 7.38: Distribution of causative constructions among speakers according to language groups and age groups (in percentages).**<sup>49</sup>

<sup>49</sup> The y axis has been set from 40% in order to observe easier the differences between the percentages.

We examined the variables that yielded significant results in the bilingual age groups (continuous causation and initiating causation stimuli) with the monolingual groups (see Tables 20, 21, and 22 in the Appendix C). Two Kruskal-Wallis tests were carried out in which language group was the independent variable and the frequencies of causative constructions were the dependent variables. None of the tests revealed significant differences. This shows that for these types of causation the three language groups behaved similarly. We also looked at possible differences by age group. At AG1, a Kruskal-Wallis test showed a statistically significant difference between the different language groups in their selection of causative constructions on continuous causation type ( $H(2)=6.523$ ,  $p=.038$ ), with a mean rank of 25.50 for English monolinguals, 23.08 for Spanish monolinguals and 17.83 for bilinguals. Additional Mann-Whitney tests comparing the different language groups revealed that English monolinguals used significantly more causative constructions than bilinguals ( $U=42$ ,  $p=.007$ ). The other comparisons were not significant. The differences between language groups at AG2 and AG 3 were non-significant.

*A descriptive analysis of motion events components in sentences in the path vs. manner condition (semantic and syntactic analyses) in bilingual speakers*

In this section, we repeat the same analysis from section 7.2.2, a descriptive analysis of path and manner of motion in the sentences with bilingual participants. We first describe the preferred motion events patterns in sentences produced by bilingual children and then we compare them with Spanish monolinguals and English monolinguals respectively. The idea is to determine whether bilinguals performed following the patterns of their L1 or their L2. For clarity, we report the data on three tables, each of which describes the patterns for bilinguals, English monolinguals and Spanish monolinguals from the same age group. Because English and Spanish patterns have been described and analysed already, we focus only on bilinguals here.

All the answers were analysed, independently of whether there was more than one main verb. In total, 233 sentences produced by bilinguals were studied: 58 sentences for AG 1, 83 sentences for AG 2, and 92 sentences for AG 3.

**Table 7.5: Distribution of pattern of encoding manner and path of motion in the sentence in bilinguals, Spanish monolinguals and English monolinguals from AG1 (frequency and percentages)**

AG 1	Bilinguals			Spanish monolinguals			English monolinguals		
	No.	%	Total %	No.	%	Total %	No.	%	Total %
Path									
Only path verb	9	40.91		20	57.14		0	0	
Path + Manner	12	54.54		14	40		0	0	
Path + Path +Manner	0	0		1	2.86		0	0	
Path + Manner + Manner	1	4.55		0	0		0	0	
Path +Path	0	0		0	0		11	100	
TOTAL PATH	22	100		35	100		11	100	
% Path			37.93			24.14			7.24
Manner									
Only manner verb	19	61.29		81	84.38		75	53.57	
Manner+ Path	3	9.68		6	6.25		52	37.14	
Manner + Manner + Path	0	0		1	1.04		0	0	
Manner + Path + Path	0	0		0	0		0	0	
Manner + Manner	9	29.03		8	8.33		13	9.29	
TOTAL MANNER	31	100		96	100		140	100	
% Manner			53.45			66.2			83.79
other verbs (not related to motion)	4		6.9	9		6.2	3		1.66
other verbs (related to motion)	0		0	4		72.76	13		7.32
NA	1		1.72	1		0.69	1		
TOTAL	58		100	145		100	167		

Table 7.5 shows the percentages for path, manner and *other verbs* (R-M and N-RM) and their combination with other path of manner components for AG 1. Table 7.6 and Table 7.7 present the same data for AG 2 and AG 3 respectively.

In relation to path verb patterns: Results from the bilinguals in the three age groups indicated that the preferred pattern was *path + manner* followed by *only path verb*. The percentages were very constant across age groups. Main path verbs may be followed by another manner component but this was very rare. Manner components accompanied by a main path are mainly gerunds (see example 6) but there were also cases of oblique phrases that indicate mode of motion (see 7). The example from 7 provides evidence that children at AG2 were already using relative clauses for expressing manner. We also observe the use of subordinate sentences in older children, as Slobin points out in some of his studies on Spanish (see example 8).

(6) *un señor entró[path] por una puerta caminando[manner gerund]*

‘A gentleman entered through a door walking’

(7) *la señora [caminando[manner, gerund] en un solo pie [manner, oblique]] relative sentence entra al edificio*

‘The lady [walking on one foot] enters to the building’

(8) *una señora [esta] saltando[manner verb] [mientras que se dirige a una puerta] [subordinate sentence encoding direction and location]*

A lady was jumping while she was heading to a door

**Table 7.6: Distribution of pattern of encoding manner and path of motion in the sentence in bilinguals, Spanish monolinguals and English monolinguals from AG2 (frequency and percentages)**

AG 2	Bilinguals			Spanish monolinguals			English monolinguals		
	Total No.	%	Total %	Total No.	%	Total %	Total No.	%	Total %
Path									
Only path verb	8	42.11		16	44.44		1	14.29	
Path + Manner	10	52.63		20	55.55		2	28.57	
Path + Path +Manner	0	0		0	0		0	0	
Path + Manner + Manner	1	5.26		0	0		0	0	
Path +Path	0			0	0		4	57.14	
TOTAL PATH	19	100		36	100		7	100	
% Path			23			33.33			4.17
Manner									
Only manner verb	45	77.59		44	72.13		40	32	
Manner+ Path	0	0		0	0		83	66.4	
Manner + Manner + Path	1	1.72		0	0		1	0.8	
Manner + Path + Path	0	0		0	0		0	0	
Manner + Manner	12	20.69		17	27.87		1	0.8	
TOTAL MANNER	58	100		61	100		125	100	
% Manner			71			56.48			87.44
other verbs (not related to motion)	3		4	5		0.42	4		2.65
other verbs (related to motion)	3		4	5		0.42	10		5.74
NA			0	2		0.92			
TOTAL	83		100	108		100	146		

As observed by Slobin, gerunds in Spanish tend to appear in the last position of the phrase (see example 6). This is related to the preferred structure of information in which the unknown information is placed at the end of the sentence in Spanish (Bentivoglio 1997). Therefore , in relation to the

combination of path verbs with other motion event components in the phrase, we can say that the patterns evidenced by the bilinguals do not seem to change with age. Also, if we compare them to Spanish monolinguals, they are very similar.

**Table 7.7: Distribution of pattern of encoding manner and path of motion in the sentence in bilinguals, Spanish monolinguals and English monolinguals from AG3 (frequency and percentages)**

AG 3	Bilinguals			Spanish monolinguals			English monolinguals		
	Total No.	%	Total %	Total No.	%	Total %	Total No.	%	Total %
Path									
Only path verbs	15	45.45		25	42.37		1	14.29	
Path + Manner	17	51.52		32	54.24		6	85.71	
Path + Path +Manner	0	0		0	0		0	0	
Path + Manner + Manner	1	3.03		2	3.39		0	0	
Path +Path	0	0		0	0		0	0	
TOTAL PATH	33	100		59	100		7	100	
% Path			35.11			32.24			4.17
Manner									
Only manner verbs	35	62.5		87	73.73		52	35.62	
Manner+ Path	11	19.64		8	6.78		76	52.05	
Manner + Manner + Path	2	3.57		1	0.85		8	5.48	
Manner + Path + Path	0	0		0	0		2	1.37	
Manner + Manner	8	14.29		22	18.64		8	5.48	
TOTAL MANNER	53	100		118	100		146	100	
% Manner			59.57			64.48			92.41
other verbs (not related to motion)	3		3.26	3		1.64	3		1.63
other verbs (related to motion)	2		2.71				3		1.8
NA	1		1.08	3		1.64			
TOTAL	92		100	183		100	159		



In relation to manner verb patterns: the preferred pattern was *only manner verbs*. *Only manner verb* is according to the literature the preferred pattern in speakers of V-languages when manner is encoded in the main verb. Therefore, bilinguals behaved in this respect like Spanish speakers. The second most frequent pattern was *manner + manner* in AG 1 and AG 2. This pattern decreased considerably in AG 3 (29,03 , 20,69 and 14.29% respectively). The use of *manner verbs + path* component is almost non-existent in AG 1 and AG 2, whereas it appears to be the second most preferred pattern at AG3 (6.68%, 0.0% and 19.64% respectively). We think that developmental aspects can explain these changes across the ages. Firstly, the production of manner verbs plus manner components could be related to the need in younger children to be more specific about the manner of motion depicted in the stimulus: (el) camina saltando/(he) walks jumping. Another answer was: ii) ella camina dando vueltas/ she walks giving turns (pattern manner verb+ manner component). However, at AG 3 the answer for the same stimulus was: iii) una muchacha gira/ a girl spins.

We also think that manner might be salient in younger children, and therefore they tended to pay more attention to this component. In older children, this effect of attention might be diluted and they start to pay more attention to language patterns, i.e. path, and include it in their sentence. However, it called our attention the high percentage of manner verbs used by AG2 children (71%), which is more similar to the percentage produced by English children from the same age (87%) than the percentage produced by Spanish monolingual children (56.48%). Children from AG2 were attending more English lessons than AG 3 children. It could be possible that these speakers were experiencing L2 effects on their L1 as a result of the learning situation. AG3 children received the half of hours in English lessons. Therefore, they could experience some drawback in their English learning process.

In conclusion, the patterns observed in bilinguals are more similar to the patterns produced by Spanish monolinguals than to the ones produced by English monolinguals. However, we did observe a high production of manner

verbs in AG2 bilinguals which could be connected with an influence from their L2, English, in their L1. Furthermore, when we compared bilinguals

#### **7.4 Summary of the chapter**

In this chapter we present the results of the analyses of the child monolingual and bilingual data. The results did not show cross-linguistic differences between language groups in the non-linguistic task. Actually, all language groups performed similarly. However, when we analysed children within each language group, some changes appeared. In relation to bilingual children, in the non-linguistic task they performed exactly like their monolingual peers.

Monolingual children produced the lexicalization patterns of their languages; however, we observed changes that suggested that even at 10;00 years of age, these children are acquiring the adult pattern. Bilingual speakers showed some language patterns from their L2 in their L1 suggesting that it may be cross-linguistics influence, i.e. from L2 into L1.

## Chapter 8. Discussion

### 8.1. Chapter overview

This research investigates motion event lexicalization and non-linguistic categorization in monolingual Spanish and English adults and children and S-E bilingual adults and children. In the following lines the results are discussed in the light of the hypotheses. First, this chapter summarizes and discusses how adult population (firstly, monolingual speakers and secondly, bilingual speakers) encoded and categorized motion events (sections 8.2 and 8.3). In the subsequent sections, 8.4 and 8.5 we summarize and discuss the results from the child population (monolingual and bilingual speakers). In section 8.6 we present the implications of the present investigation for studies on linguistic relativity. Section 8.7 shows the discussion of the findings in relation to motion event verbalization in monolingual and bilingual adult speakers. In section 8.8 we explain the implications of the results in the child population for the studies in first language acquisition and bilingualism in development, and linguistic relativity and motion events. Finally, in section 8.9 we discuss methodological aspects related to the studies of motion event and non-linguistic cognition. Section 8.10 presents a summary of the conclusions.

The following table summarizes the hypotheses tested in this study and exposes which has been confirmed or rejected. In the chapter, we will refer to these hypotheses by their letter and number.

**Table 8.1: Status of the hypotheses tested in the study**

Hypotheses	Status
<b><i>Hypotheses related to lexicalization patterns of motion events</i></b>	
<b><i>A. Monolingual-speaking adults</i></b>	
A.1 English speakers show a stronger bias towards manner, by encoding this element in the main verb when describing spontaneous motion events.	<b>Confirmed</b>
A.2. Spanish speakers tend to encode path in main verbs.	<b>Rejected</b>
A.3. When the event shows a boundary crossing path, Spanish speakers tend to encode path on the main verb; manner, if mentioned, tends to be expressed in satellites mainly through gerunds.	<b>Confirmed</b>
A.4 When the event shows a trajectory path, Spanish speakers tend to encode manner on the main verb.	<b>Confirmed</b>
A.5 Spanish speakers should produce more sentences with bare verbs, and these bare verbs should tend to encode manner rather than path.	<b>Confirmed</b>
A.6 When confronted with cause events, English speakers should encode more agentive sentences with causative verbs than Spanish speakers.	<b>Confirmed</b>
<b><i>B. Bilingual-speaking adults</i></b>	
B.1 When describing videos showing motion events in English, bilingual adults show the same pattern observed in monolingual-speaking adults of their L2 but some transference from L1 (i.e. Spanish) is observed affecting the codification of path, manner and causation.	<b>Confirmed</b>
B.2 When speaking in Spanish, their L1, bilinguals produce the same pattern observed in monolingual Spanish speakers.	<b>Confirmed</b>
B.3 Proficiency, age of acquisition, and time leaving in an English speaking country affect bilinguals' lexicalization patterns	<b>Confirmed</b>
B.4 Bilingual speakers can produce transfer from L1 to L2 and effect from L2 to L1.	<b>Confirmed</b>
B.5 When describing videos showing motion events in English, bilingual adults show the same pattern observed in monolingual-speaking adults of their L2 (i.e. a preference for causation over path when describing events in English).	<b>Rejected</b>
<b><i>C. Monolingual-speaking children and adolescents (from age 5;00 to 17;00)</i></b>	
C.1 Spanish-speaking children and adolescents (henceforth, children) show an increase in the use of path verbs and a decrease in the use of "neutral verb" in the early ages.	<b>Confirmed</b>
C.2 English-speaking children tend to decrease the production of path and neutral verbs and increase the use of manner and cause verbs with age.	<b>Confirmed</b>
C.3 Older children produce the adult pattern of lexicalization of motion events from their languages.	<b>Confirmed</b>
C.4 When the event shows a boundary crossing path, Spanish speaking children tend to encode path on the main verb; manner, if mentioned, tends to be expressed in satellites mainly through gerunds. When the event shows a trajectory path, they tend to encode manner	<b>Confirmed</b>

on the main verb.	
C.5 When confronted with cause events, English-speaking children should encode more agentive sentences with causative verbs than Spanish-speaking children.	<b>Confirmed</b>
<b><i>Hypotheses related to non-linguistic cognition of motion events</i></b>	
<b><i>D. Monolingual-speaking adults</i></b>	
D.1. In the non-linguistic cognitive task, English speakers prefer to pay attention to the manner aspect of the motion while the Spanish group does not show preferences.	<b>Confirmed</b>
D.2 Spanish speaking adults do not display a particular tendency in boundary crossing paths and trajectory paths shown in the videos.	<b>Confirmed</b>
D.3 Speakers of English pay more attention to the cause of the event than to the path.	<b>Confirmed</b>
D.4 Because Spanish does not show a clear tendency, Spanish speakers can pay attention to either path or cause.	<b>Confirmed</b>
<b><i>Monolingual-speaking children</i></b>	
D.5 Motion events patterns in children affect non-linguistic cognitive task after the language-specific patterns of their languages are fully acquired.	<b>Rejected</b>
D.6 Children, older than 9;00 years of age, show a language effect on the categorization task until later in age.	<b>Rejected</b>
<b><i>E. Bilingual speakers</i></b>	
<b><i>-Bilingual-speaking adults</i></b>	
E.1 Bilingual-speaking adults change their patterns of categorization (path vs. manner and causation vs. path) of motion events. We can observe different tendencies and the exact ones are unknown.	<b>Partially confirmed</b>
E.2 Variables such as Proficiency, AoA, time leaving in UK diverge bilingual-speaking adults' performance from the L1 pattern.	<b>Rejected</b>
E.3 Bilingual-speaking adults differ from Spanish-speaking monolinguals in their categorization of path vs. manner of motion events that show trajectory and boundary-crossing paths.	<b>Rejected</b>
<b><i>-Bilingual-speaking children</i></b>	
E.4 Bilingual children perform as monolingual speakers of their L1. However, their exact behaviour is unknown.	<b>Rejected</b>

## 8.2 Lexicalization patterns of motion events in adult speakers

### 8.2.1 What monolingual adult speakers of English and Spanish produce when describing motion events

The data was analysed in two ways. First, we observed the patterns of lexicalization of path vs. manner (in verb position) and patterns of lexicalization of causation vs. path (causatives vs. non-causatives sentences) in order to

confirm previous theoretical claims that English is a S-language and Spanish is a V-language. Secondly, we examined how path and manner of motions were encoded in other grammatical categories in the sentence. The aim of this analysis was to obtain a complete picture of how path and manner components were encoded by speakers.

The adult data provided further insights into the studies on lexicalization patterns of motion events. As predicted in A.1 (see Table 8.1), English speakers show a stronger bias towards manner by encoding this element in the main verb compared to Spanish speakers. Spanish speakers, on the other hand, did not show a tendency towards path verbs. This rejects our hypothesis A.2, although partially. This result is not totally unexpected because we combined in this test motion events with different type of path that could trigger either path verbs or manner verbs. Therefore, when verbs were classified according to the type of path (BC- path and trajectory path), Spanish speakers did favour path verbs with BC- path stimuli, while manner verbs were favoured by trajectory path stimuli. This finding confirms our hypothesis A.3 and A.4 (Table 8.1). However, the mean percentage of manner verbs in BC- path stimuli was still relatively high compared to what other studies have reported. Slobin and Hoiting (1994) indicate that Spanish speakers produce path verbs when conveying path in BC- path events. These first results seem to indicate that Spanish speakers can produce many more manner verbs than previously thought.

The descriptive analysis of the lexicalization patterns of motion events in the whole sentence shows that in relation to English language, speakers highly used a great deal of manner components in their descriptions. In more than 50% of the sentences path descriptions were absent. This suggests in our case that English speakers do not show the tendency to express *manner verb + a path preposition* as other studies have found (Slobin and colleagues).

The finding that Spanish speakers lexicalised many more manner components than previously observed, and the finding that English speakers focused more on manner than in the typical English combination of *manner + path* is important for assumptions related to the possible effects of language on thought in motion events. For example, Gennari et al. (2002) based their analysis in the effect of

path on non-linguistic tasks in English and Spanish monolingual speakers, and they did not find significant results that led to confirm the linguistic relativity hypothesis. However, according to our results, Spanish speakers can produce manner of motion if this component is salient, in line with Feist et al. (2007); therefore, the difference between these two languages seems to be in the high preference for manner in English speakers compared to Spanish speakers, and not in relation to their path preferences. This is in line with Kersten et al. (2010).

Another important finding in this investigation is that in English speakers' sentences path verbs only appeared in BC- path (7.37% of the times). These speakers produced many more manner verbs with path components when describing boundary-crossing stimuli (53.47%) than when describing trajectory stimuli (16.81%). This indicates that although manner is the preferred motion event component without any doubt, the presence of path components in the sentence seems to be affected by the type of path as in Spanish. This finding is relevant for the studies of lexicalization patterns of motion events because it has been claimed from Slobin and colleagues' studies that type of path does not affect S-languages in their lexicalization patterns because manner and path can be encoded in the same sentence. Our results suggest that the focus on path for boundary-crossing events in verbalisation tasks is to a certain extent common to speakers of different typological languages. However, this is a hypothesis that needs further investigation.

#### *Path vs. Causation*

Results from the path vs. causation condition confirmed the hypothesis that English speakers paid more attention to causation than Spanish speakers when they had to describe dynamic motion events (A.6 in Table 8.1.).

Very few path descriptions were produced by Spanish speakers; however, they significantly produced more of these structures than English speakers. The analysis of the type of causation stimuli allowed us to detect that mainly one type of the stimuli (i.e. the body-part causation) triggered path responses in speakers. We think this happened because in all stimuli, except in body-part causation events, the agents were highly salient. Actually, similar stimuli in

Choi's (2009) study yielded similar responses between English and Spanish speakers; both language groups only produced causative constructions. But when the saliency of the agent was lowered in the videos, i.e. the agent was not visible and cause is mixed with spontaneous events, English speakers produced more causative sentences than Spanish speakers. What calls our attention is that despite showing a body-part of an agent, some Spanish-speakers still preferred to focus on path rather than in the agent. This demonstrates that the language groups differed in their encoding of this component.

In conclusion, our results support Choi's hypothesis: English speakers behaved linguistically different from Spanish speakers. The former tended to encode more causation verbs in sentences than the other group when describing motion events. These findings are also supported by Fausey and Boroditsky (2011), who find similar differences between Spanish-speakers and English speakers by measuring differently causation but using a different methodology.

### ***8.2.2 What S-E bilingual adult speakers produce when they describe motion events***

Bilingual speakers differed significantly from both monolingual groups. When they performed in English, their lexicalization patterns were similar to English monolinguals in that they preferred to use more manner verbs, confirming our hypothesis B.2 (Tables 8.1). However, the percentage of manner verbs was still much lower than the percentage used by English monolingual speakers, and additionally they produced a high percentage of "other verbs", which links us to a lack of manner vocabulary in this population. Bilingual speakers still do not produce manner verbs at similar rates to their English peers (hypothesis B.4 in Table 8.1). These results revealed transfer from L1 to L2.

When bilinguals performed in Spanish they preferred to encode videos with path verbs followed by manner verbs. Interestingly, they produced many more path verbs (56.67%) than the Spanish monolingual group (46.54%), which confirms as well our second hypothesis (B.2 Table 8.1): bilinguals follow their L1 lexicalization patterns.



Bilingual speakers also differed significantly in the task responses among each other, which confirms the hypothesis that factor such as proficiency, age of acquisition, and TLEC may affect bilinguals' lexicalization patterns (B.3 in Table 8.1). When speakers performed in Spanish, we observed that those with higher proficiency, longer TLEC, and earlier AoA produced more manner verbs than speakers with lower proficiency, shortest TLEC and later AoA. Thus bilinguals did not perform exactly like monolingual speakers of Spanish. It seems that most experienced speakers in L2 have their L1 affected up to some degree by the frequency and preponderance of manner verbs in English. When they performed in English, we observed that speakers with higher proficiency and higher TLEC produced more manner verbs than speakers with lower proficiency and lower TLEC. In relation to AoA, speakers with later AoA showed a high production of "*other verbs*".

The study of the responses according to type of path revealed that bilinguals, when performed in Spanish significantly differed from their monolingual peers in boundary-crossing paths. They produced more path verbs than Spanish monolinguals, performing more similarly to what is expected from a Spanish speaker according to studies on description of motion events than the monolingual group. When describing in English, bilinguals produced many more path verbs in boundary-crossing events than monolingual English speakers. This seems to indicate that producing path verbs in boundary crossing events is a strong restriction of the Spanish language that seems to affect bilingual speakers when they describe motion events in English. This finding confirms that there is cross-linguistic influence from both languages in these speakers (hypothesis B.4)

When bilingual speakers performed in English, high proficient bilinguals produced a high number of manner verbs in boundary-crossing paths compared to less proficient bilinguals. Remember that when performed in Spanish, these speakers produced more path verbs in BC- paths than our Spanish monolinguals. This seems to reconfirm that bilinguals behaved completely different when performed in Spanish and in English.

The analysis of how path and manner components appeared in the sentence showed some interesting differences. When bilinguals performed in Spanish, they showed a high use of path verbs compared to monolingual Spanish speakers. However, the number of manner components accompanying those verbs was very high compared to Spanish monolinguals. This could be an effect of the saliency of manner in their L2 language.

The analysis of the sentence components suggests that bilinguals transfer patterns from their L1 into L2. When performed in English, bilinguals showed differences in verbal encoding patterns with respect to their monolingual peers. Bilinguals encoded more path components as satellites, even in combination with path verbs, i.e. *path verb + path preposition*. This is not observed in our Spanish monolinguals and it seems a hybrid structure that combines path verbs, more frequent in Spanish, and the path prepositions, typical from English. Bilinguals produced ungrammatical path prepositions and double gerunds; the last pattern is usually allowed in Spanish but not in English. Additionally, these speakers produced very high percentages of “other verbs” in English, which we think is connected to the lack of more refined manner vocabulary. These “other verbs” are the typical lexical-semantic forms used in children when developing the lexicalization patterns of their languages (Bowerman and Choi 2001).

The cross-linguistic bidirectional influence found in the current research is an important contribution to bilingualism studies that do not seem to agree on this matter. Some recent studies (Brown and Gullberg 2010) have found that adult S-E bilingual speakers of different typological languages show bidirectional influence in relation to motion events, that is, transfer from L1 to L2 and effect from L2 on L1 at modest levels of proficiency. Similar bidirectional effect can be observed in Hohenstein et al. (2006) and Filipović (2011). Their bilingual speakers used more manner verbs in their description of motion events in Spanish but less of these verbs when performed in English. Other studies only find transfer from L1 to L2. However, most of them (Cadierno and Ruiz, 2006; Larragaña et al. 2011; Navarro and Cadierno 2005) analysed bilingual speakers whose native language is English. Brown and Gullberg (2010), on the other hand, tested native speakers of Japanese, a V-language, with knowledge of

English. We think that it is possible that the effect of L2 on L1 is more likely to occur when the L2 is an S-language such as English than when the L2 is a V-language like Spanish. Spanish allows both types of motion event components (path vs. manner) to be encoded in the verb. But in English manner of motion is the element mainly encoded in the verb position. Therefore, manner in English is more salient than path in Spanish. One possible explanation, under the usage-based account, is that frequency of use and salience of manner verbs make these forms easy to attend and reshape the L1 system. The saliency of manner would compete with the L1 pattern in our bilinguals.

#### *Path vs. Causation*

Bilinguals performed half way between both monolingual groups in their production of causative constructions in both languages, indicating that cause of motion, as expressed in English, is probably permeating bilinguals' L1, and their L2 is affected by the path tendency from the Spanish. Therefore, the hypothesis in which bilinguals perform like their L1 when describing in Spanish, and perform like their L2 when describing in English (B.5 in table 8.1.) is partially confirmed, because we found cross-linguistic influence in both directions.

Given the small amount of data, we think these findings need further testing. It seems important to portray a more precise picture of how causation and path are lexicalised in English and Spanish.

### **8.3 Categorization of motion events in monolingual and bilingual adult speakers**

#### *Path vs. Manner*

The similarity judgment task allowed us to examine participants' categorization preferences of motion events. We measured whether speakers chose same-manner responses or same-path responses. Same-manner responses were preferred than same-path responses in both language groups. However, English speakers preferred this option when compared to Spanish speakers. This preference although significant is moderate, as the effect size calculation

showed. Therefore our results suggest that language may affect or influence other cognitive processes such as categorization (hypothesis D.1 in Table 8.1).

The Spanish group did not show a significant preference for manner over path in the categorization task. Thus, a significant tendency in categorization is only observed in the English group. In the English speakers, the production of manner verbs indeed predominates over the production of path verbs among speakers, which connects language patterns with categorization patterns. Interestingly, Spanish speakers did not show a clear tendency for manner or path in their language, and this also happened in the categorization task. Classical studies define English as a manner language, but even Ibarretxe (2008, p. 410), who compared 24 languages in their preference for path, placed English with the languages that showed the lowest-path salience, confirming that this language does indeed have a high preference for manner. On the other hand, although Spanish is usually described as a language that prefers path over manner, more recent studies have shown that it can encode manner in several conditions depending on type of path, vertical/horizontal plane, saliency, animacy, and type of manner verb (Feist et al. 2007 ; Gennari et al. 2002; Larragaña et al. 2011). Ibarretxe (2008, p. 410) places the Spanish in the middle of the continuum of language with path-salience indicating that this language can produce path and manner verbs equally. This is in lines with our results. Spanish speakers did not show a clear preference in verbs. . If we consider that the effect of language on non-linguistic cognition occurs by effects of experience and association (Casasanto 2008, p. 75), one possibility is that the language-specific patterns in English (i.e. manner saliency) could affect non-linguistic categorization in speakers of this language. This is not the case of Spanish speakers, as their language does not show a highly preponderant pattern.

When results from the linguistic task are compared with those from the non-linguistic task we observed similarities in the speakers' preferences for path and manner in each language group. A possible explanation is that participants are indeed using language in the similarity judgment task. As Gennari et al. (2002) explain, speakers can use language as a strategy to solve tasks in which disambiguation turns out to be difficult. However, these authors find this effect

when the categorization task follows a linguistic description task. Speakers have access to a specific domain (path or manner) in the similarity judgement task as a consequence of its dominance in the linguistic description task. Actually, in their study the English and Spanish groups speakers that only performed the categorization task did not show significant difference, proving that they did not have access to language to solve the task. In the present study, our participants performed the categorization task before the linguistic task. Additionally, we did not use any particular instruction that could have facilitated the use of language on the categorization task (Papafragou and Selimis 2010). Furthermore, we suggest that the results from the analysis of type of path in the similarity judgment task supports the hypothesis that language is not used in categorization at least as a task-specific resource (i.e. to solve a difficult task), and that the observed effect is not a transient but it implies a reorganization of attention by the effect of the language patterns. A second aspect that could prove our point is the fact that we did not observe the difference between path and manner verbs in relation to type of path (BC vs. trajectory paths) reflected in the responses in the categorization task. If speakers use language as a strategy when they categorise, we should have observed a preference to choose same-path stimuli in BC-path target clips and same-manner stimuli with trajectory path target clips in Spanish speakers. This has not been previously reported because most similar studies selected only BC-path events for their stimuli in advance.

In the manner vs. path condition bilingual speakers' categorization process remained in line with Spanish monolingual patterns, out of English influence. We did observe some tendencies in the speakers' percentages that showed that those with advanced proficiency in L2 tended to select more same-manner choices than speakers with low proficiency in L2. But none of the statistical tests yielded significant differences or correlations. In conclusion, we reject our hypothesis that bilingual-speaking adults change their pattern of categorization of motion events in relation to path and manner. In this condition, variables such as proficiency, AoA, TELC do not seem to affect bilingual performance which tended to be like their L1 (hypotheses E.1 and E.2 in Table 8.1).

### *Path vs. Causation*

In the categorization task, we also found significant differences between monolingual English speakers and monolingual Spanish speakers in their categorization of path vs. causation events. However, the effect size calculation indicated that the difference is between small and moderate. This suggests that it may be possible that language affects categorization in motion events in relation to path vs. causation (hypothesis D.3). English speakers preferred same-causation choices over same-path or agent-free videos, while Spanish speakers did not show a particular preference. English speakers' preferences are in line with their tendency in their language, which suggest that it is possible that the observed effect is connected to language influences.

In this condition, S-E bilinguals performed similarly to English and differently from Spanish speakers by paying a great deal of attention to causation. This finding suggests that categorization preferences of bilingual speakers could change for this particular condition: path vs. causation, confirming the hypothesis E.1 for this particular condition. As we explained before, the effect of the difference was small to moderate for what we still need to further test the hypothesis in order to find stronger relations between language and cognition. Bilinguals seemed to act very similarly, independently of variables such as proficiency, AoA, and TLEC, revealing that the differences for encoding causation vs. path affected non-linguistic cognitive performance in bilingual speakers, even at high intermediate level of proficiency (hypothesis E.2).

## **8.4 Lexicalization patterns of motion events in child speakers**

### ***8.4.1 What monolingual children, speakers of English and Spanish, produce when describing motion events***

It seems that the lexicalization patterns of motion events of a language are not entirely acquired from early ages according to our findings. The child performance in the verbal description task suggests that between 5;00 years-old and 16;00 years of age certain patterns of development occur. Although manner verbs were the preferred choice in English-speaking children in all age groups, we observed that the percentage of use of this form kept increasing

with age. Even 10;00 year-old children or older showed changes in their percentages of preferences. Additionally, the production of “other verbs” was present in the youngest group (ages 5;00 to 6;00) and decreased in older children. These changes in the patterns seemed to be developmental changes in the child lexicon. Children are still approaching the lexicalization patterns of adults. This confirms our hypothesis C.2 (Table 8.1) that English-speaking children tend to decrease the production of path and neutral verbs and increase the use of manner with age.

Similar changes were observed among Spanish-speaking children, who until the age of 15;00 produced more manner verbs than path verbs. However, children older than 16;00 years of age preferred to describe videos with path verbs. This bias towards path verbs was only observed in BC paths. Trajectory path stimuli remained stable in all age groups. Therefore, as stated we confirm that Spanish-speaking children increase the production of path verbs (hypothesis C.1). Furthermore, when the motion event showed a boundary crossing path, these kids convey path in the main verb. When a motion event showed a trajectory path, as expected in hypothesis C.4, Spanish-speaking children prefer to encode manner in the main verb.

When language groups were compared, we observed that English-speaking children significantly differed from Spanish-speaking children by preferring more manner verbs. These English speakers’ general performance was similar to that of adults. We did not observe a general tendency among Spanish-speaking children to prefer path verbs until aged 16;00 or older. These findings let us to confirm our C.3 hypothesis that states that older children produce the adult pattern of lexicalization of motion events. At the same time, English speaking children seems to master the adult patterns quicker than Spanish-speaking children.

The study of the production of manner and path components in the whole sentence also showed that the typical patterns of *path verbs + manner components* in Spanish speakers substantially increased by the age of 10;00. By this age, English speakers also started to produce more combinations of *manner verbs + other path/manner components*. It seems that children are

producing later on in life the typical adult pattern for encoding motion events in the whole sentence according to Talmy's typology.

In relation to the stimuli that measured path vs. causation preferences, we observed that Spanish speakers did not show differences between age groups. However, we observed some developmental changes only in the English speaking groups. Children aged 7;00 produced significantly more causation than younger children. Therefore, the findings support the hypothesis that English-speaking children decrease the production of path and neutral verbs and increase the use of cause verbs with age (C.2. in Table 8.1). Furthermore, we find that older English-speaking children produce the adult pattern of lexicalization of motion event (C.3 in Table 8.1).

The evidence so far in development of motion events and linguistic relativity seems pretty homogeneous. Papafragou et al. (2002), although they study less age-groups, find that English-speaking children and Greek-speaking children differed between each other. Each group produced the pattern of lexicalization of their language, although they do not report interaction within language group and age groups. However, we must keep in mind that photos were used as stimuli in this study. In Papafragou and Selimis (2010), Greek-speaking children (of similar age to those in previous study) performed also like the adults speakers of Greek. However, the older group of English-speaking children still produce less manner verbs than adults, native speakers of English.

Hohenstein (2005) finds differences between Spanish- and English- speaking children in a learning novel task. Only the group of older Spanish-speaking children (mean age 7;00) prefers to match novel verbs according to the lexical tendencies of their language in the manner frame condition. English speaking children and younger Spanish-speaking children do not follow this pattern.

In conclusion, our study and these two mentioned previously find similar results. Although, in our case, Spanish-speaking children took more time to develop the lexicalization patterns of motion events. If our results are valid, one possible explanation for these different cross-linguistic outcomes could be that in English the strong presence and frequency of causative constructions and manner of



path makes these linguistic features. In Spanish, there seems to be more competition and more ambiguity between path and manner, and path and causation. Thus, it is plausible to assume, under the usage-based accounts, that for English-speaking children these patterns are more accessible than for Spanish-speaking children (see further discussion in section 8.8).

#### ***8.4.2 What bilingual child speakers of English and Spanish produce when describing motion events***

For the study of bilingual children we did not posit a hypothesis with respect to their linguistic behaviour because we did not know what to expect. Bilingual children only performed the linguistic description task in Spanish for what we only expected to study their L1. Results showed L2 influence on L1 lexicalization patterns of motion events. Specifically, bilinguals used more manner verbs and fewer path verbs in their L1 compared to Spanish monolinguals. These results revealed for the first time effects of L2 on L1 conceptualisation in Spanish-speaking children, L2 learners, in the domain of motion events. It is important to stress the aspect that we are observing these patterns in L2 learners, with a high intermediate level of proficiency. This is in line with Brown and Gullberg (2010) who find that bilingual adults with intermediate levels of proficiency are showing cross-linguistic influence in L1. In conclusion our finding supports this hypothesis and furthermore, it suggests that cross-linguistic influence is manifested in bilingual children with intermediate levels of proficiency. This pattern of verbal behaviour supports previous theories of bilingual semantic representation that postulated a merged lexico-semantic system in early bilinguals (Ameel et al 2005). This finding is further discussed in the section 8.8.

### **8.5 Categorization of motion events in monolingual and bilingual child speakers**

#### *Manner vs. Path*

In the categorization task Spanish-speaking children and English-speaking children did not differ statistically. In terms of percentage preferences, we did

observe that English-speaking children from 13;00 years-old started to prefer more manner than their Spanish-speaking peers, who started to produce more same-path responses; younger groups performed in the opposite way.

Because we did not observe substantial changes between contiguous language groups similar in age, we decided to test extreme age groups (e.g. comparing A1 with AG5) and see if differences were observed. We found that in English-speaking older children (from 16;00 years of age) significantly paid more attention to manner than same speakers from the age group 7;00-9;00. In Spanish, we found a significant change in children aged between 13;00-to-15;00. This group paid significantly less attention to manner. However, we could not explain why this tendency is not kept in the older age group (16;00-17;00).

Children and adolescents did not show the cross-linguistic differences observed in adults in the categorization task. We did observe, however, that this population was moving toward the adult pattern but results were not overwhelming.

Bilingual children preferred same-manner choices. However, we did not find differences between age groups that could lead us to observe developmental changes. Along the same lines, we did not find differences between bilingual group and Spanish- or English- monolingual groups.

A particular procedure in this study is that participants perform firstly the similarity judgment task and secondly, the verbal task. Hohenstein (2005) argues in favour of the linguistic relativity hypothesis and discards the hypothesis of interference from language in the non-linguistic task. On one hand, in the similarity judgment task the author uses non-linguistic labels to identify videos in order to avoid in speakers the interference from language during their performance of the task.

Furthermore, because the verbal encoding task is done after the similarity judgement task, the author rules out the possible language facilitation effect in responses (Gennari et al. 2002; Papafragou et al. 2002; Papafragou and Selimis 2010). The study also shows that influence from language on

categorization begins at around 7;00 years of age, and does not equally affect speakers from both languages. Additionally, results show that only older children begin to prefer to match novel verbs according to the lexical tendencies of their language in the manner frame condition. That is, older Spanish speakers prefer the path interpretation in manner frames more than older English speakers, but the opposite pattern is not observed in English speakers in path frames.

#### *Path vs. Causation*

In relation to the path vs. causation condition, no clear language-specific effect was found in the results for Spanish-speaking and English-speaking children. We did obtain a significant decline in the selection of same-causation videos in 10;00 to 12;00 year-old children from both language groups. However, we cannot explain these results in terms of development. The youngest bilingual children were the only group that paid more attention to causation. Later age groups performed similarly and they did not differ from their monolingual peers.

In summary findings reject the hypothesis related to monolingual and bilingual children and categorization. That is, any effect from language on non-linguistic cognition (D.5 and D.6,). These hypotheses were confirmed in the adult population for what we should expect that there is a moment in individuals where patterns of causation/manner/path starts to affect categorization processes. Probably these children and adolescent still need more exposure to language.

#### ***8.6. Does language affect other non-linguistic cognitive processes in speakers?***

In the present thesis we aim to test the linguistic relativity hypothesis in the domain of motion events through a cross-linguistic study in which monolingual speakers of English and of Spanish were compared.

In this regard our first hypothesis was whether monolingual speakers of English and of Spanish differed in their attention to manner vs. path in a non-linguistic categorization task; the findings confirm the hypothesis (see hypotheses D.1,

D.2, in Table 8.1). English speakers paid more attention to manner than Spanish speakers. This cognitive difference in categorization could be related to the language-specific patterns of their languages. The linguistic performance and the non-linguistic performance showed high similarities in both language groups for both conditions.

We also support the hypothesis that monolingual English speakers attend more to causation than Spanish speakers in the categorization task, which confirms hypotheses D.3 and D.4 (see Table 8.1). Cross-linguistic studies in causation are becoming a topic of interesting more recently. Choi (2009) studies how speakers of V-languages (Japanese, Spanish and Korean) and speakers of S-languages (English) encode path and causation. The author finds that speakers of English emphasize the cause of motion while speakers of the V-languages highlighted the path of motion. Choi's study reveals the preferences in these speakers of typologically different languages. However, the effect of language on cognition was not tested, as far as we know, until Fausey and Boroditsky (2011) assessed whether differences in the encoding of agentivity between Spanish speakers and English speakers affect memory. The study focuses on the speaker capability to memorize accidental vs. intentional events and finds that English speakers are better at remembering accidental events than Spanish speakers suggesting that the observed difference in memory is caused by the language differences. In our study we tested a similar hypothesis with causation, but in our case, we focused on the contrast between causation vs. path, as in Choi's (2009) study. To our knowledge this study is the first study to report that English speakers prefer cause over path when contrasting cause vs. path. Therefore, this cognitive difference also could be related to the language-specific patterns of their languages

We showed in chapter 2 that since first formally formulated, the LRH has been refined into several different versions. Today many of these versions are still under empirical test but there seems to be consent in the research community that some type of language effect on thought is possible.

One interesting framework of discussion regarding the current versions of the LRH is the one posited by Wolf and Holmes, and explained in chapter 2 (see

figure 2.1). Language differs from thought and it may affect it in different ways. But particularly of interest for this section it is the possibility that language and thinking are triggered simultaneously (i.e. language acting as a *meddler* or alternatively as an *augmenter*); or that thinking happens after language, in which case it is assumed that the frequency of use of aspects in language could make speakers to pay attention to these aspects in the world. Language may be used as a *spotlight*.

In language as *augmenter*, language codes become crucial along with non-linguistic representations to make possible for speakers to solve a particular task (see chapter 2). Linguistic representations help to enable non-linguistic representation. This is the hypothesis supported by Gennari et al. (2002). After finding a correlation between the non-linguistic task and the linguistic one only when speakers performed the categorization task following the verbal task, the authors conclude that language is used as a tool for solving difficult tasks. The group of participants that did not perform a verbal descriptive task before the categorization did not show similarities.

We think this hypothesis does not explain our results. Participants did not perform a previous linguistic task neither any linguistic labelling that could have prompted the use of language for resolving the task. For example, in Papafragou and Selimis (2010), we think that the use of the instruction: “*What is the turtle doing?*” would trigger manner responses because the question is focusing mainly in the figure and not in the relation between trajectory and ground. Actually, these authors performed a second experiment and changed this instruction. In our case, we selected an instruction that would not bias the speaker towards any particular aspect in the clip (i.e. *What has happened in the video?*). We think, therefore, that our methodological decisions discard the possibility that language may have worked as an *augmenter* (see Chapter 2. Figure 2.1), that is to say, that speakers could have solved the task because they have used before language and that helped them to decipher the comparison, as Gennari et al (2002), Papafragou et al. (2002) and Papafragou and Selimis (2010) found in their studies.

Another explanation to our results is the possibility that in categorizing motion events, language acts as a *meddler*: language representations and non-linguistic representations happen together in the process of categorization. Linguistic codes and non-linguistic codes together take the decision in the non-linguistic task. Finkbeiner et al. (2002), for example, support this view. These authors suggest that language is used in non-linguistic cognitive tasks such as categorization, where working memory is required. One of the disadvantages in this study is that there is not cross-linguistic comparison. Two English-speaking groups were compared in two different memory tasks. In one there was verbal interference, and in the other one, there was not. We think that in order to better understand outcomes in these types of experiments and to be able to say language affects thinking, two different languages must be compared. However, these aspects do not rule out the hypothesis. We think it needs extended research.

Papafragou, Hulbert and Trueswell (2008) also support the hypothesis of language as a *meddler*, by studying eye-movements in English and Greek speakers while observing animations of motion events. Speakers' attention during the animation did not differ between language groups, but differences were observed at the end of the animation when the scene froze. According to the authors, this result is explained by a spontaneous use of language during the memorization task.

This view of language as a meddler is controversial. For example, Fausey and Boroditsky (2011) posit that this could explain the observed effect. They explain that speakers could unconsciously produce "subvocal descriptions" descriptions that are stored and that could serve as secondary code in a memory task, for example. This explanation implies that language is used together with non-linguistic cognition. And the observed effect would be a transient effect of language. Under this view, working memory would be mediated with language, as shown by Finkbeiner et al. (2002). If this is the case, as Fausey and Boroditsky explain, it is still important to disentangle how language and non-linguistic cognition are working. Furthermore, Kersten et al. (2010) express:

“ Even if linguistic relativity effects are limited to problem-solving tasks, however, humans spend a non-trivial amount of time engaged in such tasks, and thus effects of one’s native language on high-level problem-solving are still of considerable interest. Moreover, even if linguistic relativity effects are limited to contexts in which participants engage in covert labelling, humans may engage in such covert use of language quite frequently, and thus, one’s native language may influence cognitive performance in a variety of different contexts...” (2010, p. 36-37)

We think, however, that under this view, we would have observed the differences in encoding boundary-crossing and trajectory paths in Spanish reflected in the categorization task. This was not the case. We explained previously that Spanish and other V-languages are particularly sensitive to the use of path verbs when the path showed a figure crossing a boundary. In our verbal task, where speakers generally tended to prefer or produce descriptions with manner verbs, when events were divided between BC- and trajectory path, we obtained a robust preference for path verbs in BC- trajectory. This was observed in adults, in bilinguals, and in the oldest group of children. Therefore, we think that if language is used in working memory task as a meddler or as augments, speakers would have shown this pattern of preference in their choices, and they did not.

A third explanation to the mechanism of how language would affect thinking is the language as a *spotlight*. Language-specific patterns would affect cognition in more general way, by modulating it. The frequency of certain patterns in language would guide participants’ attention to similar aspects in the world. In the present study, the frequency of manner verbs among English speakers when they observe different real dynamic motion events would guide the attention towards manner and causation aspects. This hypothesis is in line with the second explanation that Fausey and Boroditsky (2011) propose to the LR hypothesis. In their term, language could modulate memory by making speakers to visually pay attention to aspects of events observed in reality. In this case, the effect of language would be more general. It is possible to suggest that under this hypothesis a verbal interference task, for example, would not affect results, because we are assuming that cognition is being

affected by language patterns due to their high frequency of use. However, this hypothesis is necessary to test.

How language would act as a spotlight? We think Casasanto (2008) provides with an explanations connected to usage-based models and connectionist models. The characteristics of the morphosyntax and lexicon induce the language to be manner salient in English. This regularity of the language patterns and the frequency of use of the motion event concepts which are around humans every day of their life strengthen the connections between language and referents from the real world.

Casasanto explains the possible mechanism that could make language to modulate non-linguistic cognition the connectionist approach. Although this author makes a hypothesis in relation to space/time, we think it is generalizable to motion events. Mental representations about any given domain once available in language, they may influence these representations and transform them.

Casasanto explains how this mechanism works in relation to temporal representations in languages that differ in how they describe time. Some languages describe durations in terms of distance (e.g. long time, in English) or in terms of substance or amount (e.g. megalos or polis, which refers to large and much physically in Greek). The author suggest that initially, it is possible that children start to stablish mappings only between concrete to abstract domains of knowledge (from space to time) in a pre-linguistic stage. For example, people understanding a kind of relations such as “more time passes as moving objects travel faster” or that “more time passes as substances accumulate more”. Once children acquire the patterns of their language, and these patterns become sufficiently entrenched or cognitively routinized (in Langacker’s term (1999) , children map or associate those frequent language patterns and the abstracts domains for knowledge. This approach is in lines with the usage-based model and neuropsychological explains by the connectionist approach.



Barlow and Kemmer (2010) explains that the linguistic system of the user is primarily involved with usage linguistics events “built up from such lexical specific instances, only gradually abstracting more general representations, such as morphemes, syntactic patters from the repetition of similar instances of use” (2010:viii). This process of abstraction is helped by mechanism such as frequency of use and associations. High frequent linguistic units will result in higher degrees of entrenchment. One important consequence of this mechanism is that it infers that language units are not fix but dynamic subject to creative extension and reshaping with use. We think this could explain conceptual and morphosyntactic bidirectional influence between L1 and L2 in bilingual speakers. Furthermore, under this approach, the model would be is applicable to other kinds of cognitive patterns beside language (Barlow and Kemmer 2010) because it assumes that linguistic and non-linguistic cognitive systems are interconnected.

We think that also importantly, it is that the usage-based approach can be explained and it is supported by the connectionist approach, which provides a neural-network metaphor for how the brain works. Cognition in general is formed by neuronal networks. The neural networks are grouped neurons that learn by contact with the input and mechanism of frequency and analogy reinforce the weights of the connections (Elman et al. 1996).

Conceiving usage-based models and connectionist approaches would more general implies that i) language is part of a more general cognitive mechanism, ii) in which cognitive functions may be intereconnected. Although possible, still these views need further research.

As Kersten et al. (2010) suggest maybe is more “constructive” to the studies of LR to determine the cases and conditions in which effects of language on cognition happen, as this approach could yield clearer findings about how non-linguistic cognition and language interact.

What is determinant for expecting a language effect on categorization in the lexicalization of motion events? Previous studies, based on Talmy’s typology of language, have assumed that English speakers would prefer to pay attention to

manner components while Spanish speakers would prefer path components; these languages have these differences when expressing motion events in the verb category. However, more recent studies have pointed out that English speakers path components are as important as manner because they are encoded in the sentence as well. Hohenstein (2005) directly addressed this issue, usually taken for granted, and explained that the verb being the most semantically salient element in the predicate, English participants would prefer to pay attention to this component. Kersten et al. (2010) suggested that components, path or manner, are equally important to English speakers. If English speakers perform a task in which path and manner components are present, they can show a preference for either component. In any case, it seems that LR studies in motion events have advanced at the same time that the details of the lexicalization patterns of this domain are discovered. We consider that this has been a problem for the interpretation of the results. In this regard the present study confronted English speakers with both components of motion events, and nevertheless, they showed a clear evidence for manner. Thus, the findings in the present thesis seem to indicate that verb rather than preposition is the salient feature in the sentence; verb is *what matters* for categorization.

In conclusion, our study on monolingual adults seems to confirm that Talmy's typological differences between V-languages and S-languages permeate categorization tasks. However, there seems to be enough evidence that show that apart from categorization, other cognitive processes, such as memory are also affected by language-specific patterns. We presented evidence for an effect of language on cognition. Furthermore, the effect does not seem to be associated with the use of language for task-solving purposes, rather it could be the case that a more general effect is happening, in which cognition could be modulated or reorganised by some frequent patterns in a given language.

Further research is still crucial. One possible research scenario would be to test paths and manners that do not have specific names attached to them. In this way we could dissociate even further language from the non-linguistic cognitive tasks. Additionally, very few studies have try techniques such as reaction times. This technique has the advantage of measuring on-line tasks and is a good

predictor of mental processes. Also, it would be interesting to replicate Finkbeiner et al. study with verbal interference using cross-linguistic data.

### *Bilingual cognition*

Our research went further by testing additionally bilingual adult speakers, specifically Spanish native speakers, learners of English. The study of bilingualism in linguistic relativity contributes to the topic by showing that non-linguistic cognition in bilingual speakers can be similar to that of speakers from their L2 in certain domains and languages and in some circumstances. This suggests that these speakers can restructure their cognition as it happens in their two languages (i.e. transfers from L1 to L2 and effect from L2 on L1). In the chapter of linguistic relativity and motion event we described studies that showed different results. Some research indicate that bilinguals' cognitive behaviour is similar to that from monolingual speakers of their L1; in other cases results suggest similarity with monolingual speakers of the L2; and also some studies registered bilingual performance somewhere in-between or in a unique way (see chapter 4). Additionally, some studies revealed that the extend of the cognitive changes correlates with factors such as proficiency level (Boroditsky, Schmidt and Phillips, 2003; Dewaele, 2004; Athanasopoulos 2006, 2007; Athanasopoulos and Kasai 2008; Kersten, et al. 2010), the age of L2 acquisition (Boroditsky, 2001; Boroditsky et al., 2003), length of cultural immersion in the second language (L2) speaking country (Cook et al. 2006; Athanasopoulos, 2009) and length of language use (Boroditsky et al., 2003, see also Bassetti, 2007), and even the language used for task instructions (Boroditsky, Ham, and Ramscar, 2002; Kousta, Vinson, and Vigliocco, 2008, Kersten et al., in press).

Our results did not revealed restructuring of cognition in bilingual speakers in the manner vs. path condition. These speakers performed like Spanish monolingual speakers. However, in relation to causation vs. path, results yielded a significant difference between bilingual speakers and Spanish monolinguals. Bilinguals performed more similar to English than to Spanish. This finding differs from other studies which have shown that attention to manner is enhanced in non-linguistic tasks among S-E bilinguals. One such study is Filipović (2011), in which early English-Spanish speakers' preference for manner is observed in a recognition memory task. Filipović found a language-specific effect from English in bilinguals in the non-linguistic task. The

author explained that the effect was probably explained by the fact that all bilinguals were early bilinguals. In the present study, bilingual participants varied greatly in terms of their age of acquisition of the L2. Therefore, we could not test very precisely Filipović's (2011) hypothesis, thus, further analysis is necessary. Kersten et al. (2010) is a second study that performed an experiment in motion events with Spanish-English bilingual speakers and, much like Filipović, found effect from language in a categorization task. In their study, the categorization is measured with a new methodology (i.e. path and manner components did not compete in the task). Additionally, Kersten et al.'s participants were classified according to their age of acquisition (early bilinguals = learned English before 5;00; late bilinguals = learned English after 5;00). Proficiency is not reported, so we do not know if this factor was controlled in the experiment. Bilinguals' responses in the categorization task were measured according to language used for instructions. Kersten et al. found that early bilinguals behaved similarly in the two languages, performing similarly to English monolinguals (i.e. paying more attention to manner). However, responses in late bilinguals depended on the language context used during instructions. That is to say, they performed like English monolinguals when the instructions of the experiments were done in English, and like Spanish monolinguals when the instructions were given in Spanish. Our findings are very different to those from these two studies reported in this section. But differences in methodologies could explain the variation in the results. First, Kersten et al. (2010) designed a very different experimental task to ours. Although they used a categorization task, it contained clips with animations in which non-natural creatures performed actions. Secondly, the categorization or discrimination tasks were designed in a way that path and manner never competed. In one task only manner was the possible discrimination component; while in a second task only path of motion was the component to discriminate. Filipović (2011) on the other hand designed a recognition task. Additionally, each of their stimulus showed three different manners of motions with the idea of measuring different memory loads. Furthermore, Filipović tested balanced bilinguals. These differences between the studies and the present thesis could explain also the non-observed effect of language on categorization in the condition of path vs. manner. Therefore, it seems necessary to further test the hypothesis on bilingual speakers in order to explain the different results. For

example, it seems crucial to run studies with high proficient speakers and to control for age of acquisition as these two variables are always mentioned to be responsible of changes in cognition.

The present study did find language-specific effects on categorization in relation to causation vs. path in S-E bilingual speakers. We do not know of studies that have investigated the same question in bilinguals. Fausey and Boroditsky (2011) studied causation in English speakers and Spanish speakers with knowledge of English, and found effect of causation in two memory tasks. However, the authors pointed out that although Spanish speakers had some English background, their main language of daily use is Spanish. Thus, they were treated as monolinguals and were cross-linguistically compared to English participants.

We showed that speaking a second language that typologically differs from L1 can affect non-linguistic cognitive process such as classification. This effect from L2 was observed in speakers with advanced and high intermediate levels of proficiency in L2. However, the effect from L2 was only partially observed, namely, in the path vs. causation condition. A question that emerges from these outcomes is why in our bilingual speakers do we observe this partial effect of L2 in speakers' categorization? A possible explanation is that the difference between path vs. causation is linguistically more salient than the difference between path vs. manner for S-E bilinguals. This saliency could be related to frequency of appearance in input and speech. However, this is a hypothesis to be tested. Another possibility is that such saliency is related to a higher syntactic and semantic contrast between causation vs. path than between path vs. manner in Spanish and English. Patterns of encoding causation and path differ in syntactic structures (transitive vs. intransitives) and in the presence or not of an agent that performed an action affecting an object. Path vs. manner compete in the same syntactic categories (i.e. main verbs and satellites) and both components require the presence of a subject which performs the action. Additionally, both languages, Spanish and English, do not differ greatly in their use of path vs. manner because Spanish allows and requires manner verbs in certain conditions. These suggestions, of course, would need to be tested.

### **8.7. How do we explain the lexicalization of motion events in monolingual and bilingual speakers?**

All hypotheses tested in relation to how monolingual speakers, except one, encode motion event were all supported by the study (A.1, A3-A.6, C.1-C.5 see table 8.1). First, we did find that English speakers were biased towards manner. We must keep in mind that according to some studies (e.g. Kersten et al. 2010), path is equally important to manner, and both tend to be conveyed in the sentences. However, in our study, *manner verb+path preposition* was present in 40% of the sentences. Therefore, it was not the prevailing pattern, although highly present. It could be that manner of motion was highly salient in the stimuli.

From classical studies made by Slobin and colleagues it has been claimed that Spanish speakers tend to encode path verbs when they describe motion events. This tendency is clearer when an event shows a boundary crossing path. Our study did support this claim, despite this language group prefer to encode manner verbs overall. Additionally, our study supported the Slobin's claim that Spanish speakers produce more bare verbs than English speakers and they commonly encoded manner of motion rather than path of motion.

In relation to causation, our study presents similar results from those of Choi (2009). When confronted with cause events, English speakers encoded more agentive sentences with cause verbs than Spanish speakers.

In conclusion, despite our speakers produced a great deal of manner verbs in their verbal answers, monolingual groups differed statistically, and each group performed according to the expected tendency of their language.

We think these findings provide support for the *thinking-for-speaking* hypothesis, formulated by Slobin and colleagues. *Thinking-for-speaking* suggests that when speakers are expressing their thoughts they think in a special form determined by the characteristics (lexical and grammatical) of their languages. Each language has its own set of grammatical options for encoding

any message and speakers are “forced” to express their messages according to this set of options. This “forced to express” can be understood in Slobin’s (1996b) terms as a “mental level of representation”, a thinking that is predisposed by the particular rules of a grammar. *Thinking for speaking*, as explained in Chapter 2, involves picking those characteristics that (a) fit some conceptualization of the event, and (b) are readily encodable in the language” (Slobin 1987, p. 435); it is “a special thought that is mobilized for communication” (Slobin 1996b, p. 76)

What are the consequences? First, we are dealing with an important relationship between thought and language that generates constraints and makes speakers of contrasting languages to differ in their way of expressing motion events. The process indicates that language constraints indirectly affect the preferred structures in a given language, and additionally, implies that there could be preferred structures (Slobin 1996). Furthermore, it means that speakers could leave outside the verbal expression aspects of an event. Importantly, as this author expresses, *thinking-for-speaking* is not only about choosing a particular lexical item or grammatical pattern, this process restructure mental representation of an event for verbal expressions.

Our study supports this hypothesis. See for example figure 8.1. We present a sequence of photos of the stimulus 2 (table 5.4, Chapter 5)



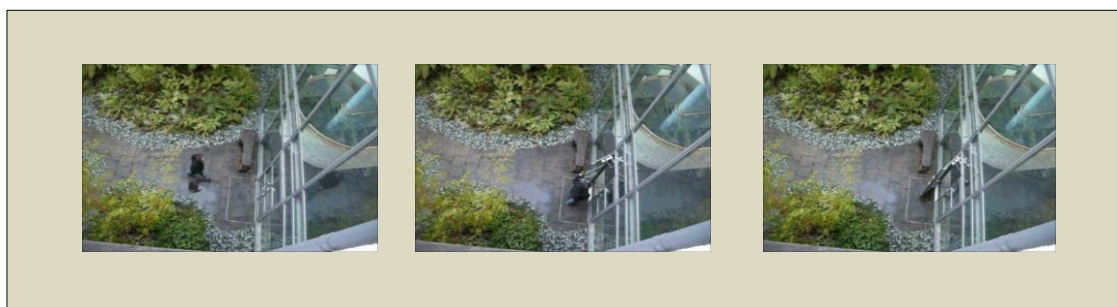
**Figure.8.1: Sequence of photos from stimulus 2**

All English-speakers focused in describing the hand that pushes the turtle down the slope. However, some Spanish-speakers, and this was statistically different, prefer to focus on the path that the turtle followed, describing this clip as “*la tortuguita baja por la rampa*”/the little turtle descend through the ramp. We



think that despite the hand in the clip is too obvious, the Spanish tendency to focus on path predispose speakers to focus in this component.

In the clip depicted in figure 8.2 (Clip 6, see Table 5.2, Chapter 5), Spanish speakers produced examples such as *“la mujer entra al edificio”/the woman enters the building*. English speakers produced their typical pattern of *manner verb +path preposition*, a woman is walking into the building.



**Figure 8.2: Sequence of photos from stimulus 6**

Of course, we must keep in mind that we are observing a predisposition, a tendency. Thinking-for-speaking is also observed in children. Slobin (1996b) suggests that children as well are guided by the most frequent patterns to talk about the world. We observed children following these tendencies.

#### *Lexicalization of motion events in bilinguals*

The investigation has interesting findings for the study of bilingualism in the specific domains of conceptualization and lexicalization patterns of motion events.

First, we found a bidirectional cross-linguistics influence from L1 on L2 and from L2 on L1. The influence was significant depending mainly on proficiency and TLEC than in the other variables analysed. This finding is in line with studies, such as Athanasopoulos (2007), who investigates the effect of speaking a second language (Japanese-English bilinguals) in object categorization and find that proficiency was the best indicator for such effect on bilingual speakers. Although Athanasopoulos (2007) does not investigate motion event, it is the first study on linguistic relativity that controls a good number of extra-linguistic variables in bilingual speakers.

Our findings also suggest that the linguistic system in bilinguals can be flexible. Not only did adult bilinguals present bidirectional effect from Spanish and English, but also we observed some modest levels of effect of L2 on L1 among bilingual children. These results can be explained by Ameel et al.'s (2005) theory of lexical-semantic representations in early bilinguals: "through the mutual influence of the languages, the category boundaries in the two languages move towards one another and hence diverge from the boundaries drawn by the native speakers" (2005: 79). Our study supports this assumption in relation to influence from L2 on the L1, and provides converging evidence from child and adult L2 learners to show that this mutual influence from the two languages of the bilingual can extend beyond the single word level and static objects to the lexical-semantics of verbs used to describe dynamic motion events. These conclusion connects our findings with the multi-competence framework posits by Cook (1992, 2011), Cook and Bassetti (2011) in language and cognition. This framework states that the state of mind of a bilingual or L2 user is different from a monolingual. It is a state of mind because the bilingual is not the addition of two languages; it is a different multi-competent speaker. If we check our results against this framework it is evidenced that our bilinguals differed from monolinguals in their L1 knowledge. They performed differently from monolingual speaker (i.e. higher percentage of manner verbs). Additionally, the L2 in bilinguals differed from patterns in monolinguals (i.e. higher percentage of path verbs, effect of type of path in expressions of path and manner in verbs). Furthermore, our bilinguals showed different cognition from monolingual speakers of L1 and L2 (i.e. different categorization of path and causation).

### **8.8 Implications for studies of first language acquisition, child bilingualism in motion events and linguistic relativity**

Based on previous studies' results, motion events patterns in children should affect non-linguistic cognition after fully acquired the lexicalization and syntactic patterns of their language, which should be between 7;00 to 9;00 year-olds considering other studies (Lucy and Gaskin 2001, Hohenstein 2005). Therefore, our main hypothesis is that children not necessary show a language effect on

the categorization task until later in age, once the language patterns are fully developed. English-speaking children should pay more attention to the manner and cause of motion; while the Spanish-speaking group could not show an exact tendency (hypotheses D.5 and D.6).

First, we must remember that our infant participants showed the lexicalization pattern of their language. Manner is the preferred option in Spanish-speaking children up to 16;00 years of age, when speakers changed drastically toward the adult pattern. However, despite the manner verb saliency before 16;00, in each age group we observed an increment in the production of path verbs. English speakers showed a clearer pattern from early on by always preferring more manner verbs. This production of manner verbs increased in older children. From 10;00 years of age, English-speaking children start to combine more manner verbs + path satellite. In relation to causation vs. path, Spanish-speaking children did not revealed significant changes in the age groups. English-speaking children, on the other hand, started to use significantly more causation from age 7;00. Bilinguals performed similar to Spanish-speaking children in that they did not showed significant difference in their selection of same-manner choices and same-causation in the similarity judgement task according to age.

Previous studies have shown that : i) the process of acquisition starts very early in children, i.e. 2;00-to 2;05 years of age (and Berman and Slobin 1994, Özçalışkan and Slobin 2000), but it still continues in later stages of development in children, i.e. 7;00 to 9;00 (Hohenstein 2005, Slobin 1994); ii) Spanish-speaking and English-speaking children start to follow their typological language patterns from early on.

Hohenstein (2005) studies the capacity of Spanish speaking- and English speaking- children to encode new words according to their language syntactic patterns. The author finds that only older Spanish-speaking children (mean 7;00) are able to perform this task correctly. The author concludes that only this language and age group is able to generalize their specific lexical pattern. Only this group fully acquires the syntactic and lexical patterns of motion events. Similar results about generalization in lexical semantic patterns in child

speakers of these two languages are observed in Hohenstein et al. (2004) and Hohenstein and Naigles (1999). In conclusion, Hohenstein (2005) does not observe a clear adult pattern in their children. Therefore, it is possible that it is not until late in age that these children fully follow the exact pattern of motion event lexicalization from adults.

We did not observe a difference in categorization between English-speaking children and Spanish-speaking children. We did observe developmental changes within each language group that suggest that their language patterns were slowly affecting their categorization of motion events. For example, 13;00 years-old and older English-speaking children were more prone to categorize motion events according to manner of motion than 7;00 to 9;00 years-old children and younger. Spanish speaking children aged 13;00 to 15;00, on the other hand, started to pay more attention to path than younger children; and this effect, however, is not observed in 16;00-17;00 children. Bilingual children did not show any particular tendency either. This group of speakers performed similarly to Spanish-speaking and English-speaking children. We tested bilinguals up to the age of 12;00, due to time limitations and accessibility to participants. Therefore, it could be possible that these speakers need more exposure to the second language in order to make changes in their non-linguistic cognition.

In conclusion, our findings in relation to non-linguistic categorization are not clear. It is possible that these small differences are evidence of a piecemeal, gradual shift toward language-specific categorization.

One question that we must address is why children from the different language groups did not show different categorization processes? Our findings coincide with those from Papafragou et al. 2002. In their study the hypothesis of language effect on a recognition task in English speaking- and Greek speaking-children (mean age 7;00) is rejected, despite children show the lexicalization patterns of their language. However, Hohenstein (2005) did find an effect from language on categorization in her group of 7;00 year-old English-speaking children. But interestingly, results from this categorization task are not supported by their linguistic results. That is to say, Hohenstein does not find a

generalization of the language patterns in English group. Therefore, the non-linguistic task outcome does not seem to be supported by the linguistic task outcome. In our case, older children already show the lexicalization pattern from adults. Overall, English-speaking children differed from Spanish-speaking children by producing significantly more manner verbs.

Therefore, how could we explain the lack of relation between verbal and non-verbal task if we observed in adults? How we explain these results? We think our findings have several possible explanations. One is that the lack of connection between linguistic and non-linguistic task could mean that children are not using language as a meddler or as an augments. Language is not used for working memory processes; otherwise, we would have expected such correspondence between the two tasks. Nonetheless, it is possible to assume that the stimuli could have made children to pay attention to manner rather than to the most salient patterns of their language because manner was salient. Monolingual and bilingual children from both language groups produced very high percentages of manner in the linguistic task and in the categorization task, suggesting the hypothesis of manner saliency. We already know by the study of Feist et al. (2007) that manner could be made salient in V-languages like Spanish. Additionally, studies on brain development show that children younger than 12 years of age differ from adults in their cognition because the process of myelinisation in the brain has not still finished. This affects importantly processes such as attention, working memory, speed processing, response inhibition, among others. In few words, both groups (adults vs. children) have different cognitions. For example Luna, Garver, Urban, Lazar, and Sweeney (2004), in a study with 245 children and adults from 8 to 30 years of age found that processing speed and voluntary response suppression matured late in childhood and adolescent. Furthermore, the adult performance in working memory (a process involved in categorization task) was observed from 19 year-old adults and in speed processing (another cognitive factor that could influence a similarity judgment task) was observed in children from 15 year-old adolescent. Additionally, it has been found that in a process such as categorization other factors such as the novelty of the stimuli (some of our manner components in the stimuli were unusual) and movement affect greatly attention in younger people (Wolfe, 2010). This cognitive developmental aspect

could explain the differences in responses between children and adults in our study. Maybe children focused persistently in manner due to the unusualness. Nonetheless, a second explanation is a developmental one. It is possible too that our children need more exposure to language patterns in order to affect categorization. It could be that in relation to motion events, children's language takes longer to affect thinking.

Although our findings were not straightforward, we think that they were not contradictory. We described in Chapter 2 that three main theories could explain our results in relation to development of cognition: i) language and cognition develop in tandem; ii) language can influence cognitive processes already developed; iii) language affects cognition only when the speaker is preparing for speaking (*thinking-for-speaking hypothesis*). Our results so far support the *thinking-for-speaking hypothesis*. Children encoded stimuli according to the restriction of their language.

Our findings suggest that the acquisition of motion events patterns: i) is a long process; ii) that differs between English-speaking children and Spanish-speaking children; and iii) that seems to be acquired earlier in English-speaking children compared to Spanish-speaking children.

## **8.9 Methodology does matter**

We previously reported the differences in results on studies of LR and motion events. One possibility that explains such a big array of different findings is in the methodologies applied. This already has been discussed by Pourcel (2009) and Kersten et al. (2010). We think that in this discussion we should summarize at least the most important differences in the methodologies used in these studies. We think this small section could help in guiding future studies towards more precise methods.

Table 8.2 offers a summary of the main studies that tested linguistic relativity in motion events with their methodology aspects: type of task performed; stimuli used; number and type of participants. It immediately calls our attention that all

these studies differ in some ways. For example, in studies 2, 4, 5, and 9 their native speakers of Spanish have knowledge of English. English is the language to be contrasted with Spanish. Therefore, it could be risky to use speakers with these characteristics because they could have influence from L2 in their L1. It is possible that this aspect could be affecting results in these studies. In bilingual studies, the differences in the characteristics of bilinguals vary greatly.

Tasks are mainly the same. Most focused on categorization tasks and memory. And they are usually measured in the same way. Categorization is measured through similarity judgment tasks in which two events are compared to a target event. In the events, except in Kersten et al. (2010), always path and manner are contrasted. Memory is usually measured through a recognition task.

However, most of the differences among research are in the type of stimuli. Studies 1 used static pictures, even black and white. Studies 2, 3, 5 and 6 used some form of dynamic videos of non-real life animations. The use of animation has been criticised because in many cases they show unrealistic motions (for a discussion see Pourcel 2009). Most of the studies are experimental which implies that the participant watch short examples of events. However, other like Pourcel (2009) involves narratives or short narratives after looking at a film.

These aspects can certainly explain the differences in the findings.

**Table 8.2: Summary of methodological aspects in studies on LR and motion events**

<i>Study</i>	<i>Tasks</i>	<i>Stimuli</i>	<i>Participants</i>
1. Papafragou et al. (2002)	Path & Manner Memory and categorization tasks  Procedure: Linguistics description followed by memory task A similarity judgment task	Exp. 1: 6 Static pictures in black and white  Exp. 2: 8 coloured pictures.	Monolingual Greek and English speakers  Adults (26) and children (mean, 5;8 - 12)
2. Papafragou and Selimis (2010)	Path & Manner Categorization task And verbal description  Exp. 1. Verbal description followed by similarity judgment task  Exp. 2. similarity judgment task followed by verbal description	Dynamic animation	Monolingual speakers of Greek and English  Exp. 1. 36 adults 20 children  Exp. 2 : 22 adults 20 children
3. Gennari et al.(2002)	Path & Manner Categorization Memory Verbal description  1)Categorization alone 2)Verbal task followed by categorization task 3)Categorization task followed by verbal task 4)Memory task after watching videos	Real dynamic motion events	Spanish and English speakers  Spanish speakers have knowledge of English  Categorization alone: 30 speakers  Rest of tasks: 93
4. Finkbeiner et al. (2002)	Path & Manner Categorization, memory and verbal description  Exp. 1. Similarity judgment tasks with novel events  Exp. 2. -sole memory task -memory task with verbal interference	3D animations	Exp. 1. 61 Speakers (Spanish, Japanese and English speakers)  Spanish speakers have some knowledge of English  Exp. 2. Only English speakers (63). There is not cross-linguistic study
5. Papafragou et al. (2008)	Path & Manner Verbal description task, Memory task Eye-movement tracking	Instrumental motion Dynamic animations (i.e. a person skating, sailing, skiing, etc.)	34 speakers of Greek (with some knowledge of English) and English speakers
6. Kersten et al. (2010)	Path & Manner Category discrimination task (but path and manner are contrasted with novel	Animation of creature-like	Exp. 1  240 Monolinguals speakers of Spanish and



	<p>events and components) Verb-learning strategy</p> <p>Exp. 1 stimuli with linguistic label Exp. 2 stimuli without linguistic label</p>	figures	<p>English</p> <p>Exp. 2 120 Speakers of English and Spanish</p> <p>Exp. 3 300 Speakers (60 English Speakers, 60 Spanish Speakers, 60 early bilinguals, 60 late bilinguals)</p> <p>Early bilinguals = exposed to English before 6 Late bilinguals= exposed to English after 6.</p>
7. Pourcel (2009)	<p>Path &amp; Manner Memory Verbal inferences</p> <p>Recall recognition Verbal inferences</p> <p>Narrative elicitation</p>	<p>Charlie Chaplin's film City Lights.</p> <p>Participants responded 24 hours later to a questionnaire</p>	47 French and English speakers
8. Hohenstein (2005)	<p>Path &amp; Manner Similarity judgment task Novel verb learning task Eye-moment recording</p>	Real dynamic video	47 children (3,5 and 7;00)
9. Fausey & Boroditsky (2011)	<p>Path &amp; Causation Recognition and attention task Verbal description task</p> <p>1. Object orientation task (it measure general memory and it should not differ among language) 2. Agent memory task</p>	<p>8 Real dynamic motion event clips</p> <ul style="list-style-type: none"> <li>- accidental events</li> <li>- intentional events</li> </ul> <p>- Photos showing actors from clips</p>	222 Spanish speakers (with knowledge of English) and English speakers
10. Filipović (2011)	<p>Path &amp; Manner Verbal task Memory task</p> <p>Two blocks: 1. Some participants describe videos. Others do not (non-verbalization) 2. description of videos and recognition task</p>	<p>Video clips of real life scenes</p> <p>Each video contains 3 manner of motion</p>	<p>90 English and Spanish monolingual and bilingual speakers</p> <p>Balanced bilinguals</p> <p>Half of bilinguals performed in Spanish first and in English later, and the other half did it in the reverse order.</p>
10. Present study	<p>Path &amp; Manner; Path &amp; Causation</p> <p>Categorization task (similarity judgment task)</p>	<p>6 sec. dynamic motion events (realistic) Path is contrasting against manner Path is contrasting against causation</p>	<p>Monolingual speakers of English (adults and children) Monolingual speakers of Spanish (adults and children) Bilinguals, native speakers of Spanish with</p>

			<p>knowledge of English at different proficiency levels (adults and children)</p> <p>Children and adolescent (aged 5;00-16;00)</p>
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A second important factor to the studies of LR in motion events is the lack of clarity in how motion events are encoded in languages (Pourcel 2009). As studies advance, we discover that Talmy’s typology of Satellite Languages vs. Verb Languages is not as accurate as previously thought. Spanish seems to have many more constraints in relation to how motion events are lexicalised and expressed in language. This has an important impact to the studies of linguistic relativity, specifically when proposing assumptions about frequent patterns that may affect though.

Given the variety of findings in the studies of motion events we point out that the research is far from over. On the contrary, it seems that studies have recently begun refining their methodologies and finding more interesting results which are leading us to a better understanding of how language and other cognitive processes interact.

### **8.10 Summary of the chapter**

This chapter presented the discussions of the findings of the present study. We firstly discussed the results from the adult population, monolingual and bilingual, and then presented a discussion of the main findings from the child population (bilingual and monolingual). We compared our results with those obtained in similar studies in an attempt to interpret what all these studies are telling us about the linguistic relativity hypothesis in the domain of motion events. Finally, we suggested some hypotheses that explain our results and provide with some possible explanations for the effect of language on non-linguistic cognitive processes.

## Chapter 9. Conclusion

Collectively, the results of all the experimental tasks have led to the following conclusions:

- Lexicalization patterns of motion events seem to influence non-linguistic categorization. The size effect was moderate, for what this hypothesis should be further tested in order to be reconfirmed. In this case we think that the influence could be explained by a reorganization of attention in cognition by the effect of language patterns. One possibility is that the reorganization is product of association and frequency of use of linguistic structure.
- Results from the bilingual study in adults suggest that cognition could be a flexible and interconnected system that can be restructured as a function of learning a second language.
- The process of language effect on thought is not observed in early children, actually, we observed some tendencies that suggest developmental patterns, but the results are not clear.
- The study of the lexicalization patterns revealed new findings contributing to the studies in motion events in Spanish and English. We generally support Talmy's typology of motion event, but our study demonstrates, in line with Ibarretxe (2008), that English and Spanish languages are better understood as part of a continuum in relation to their expression of manner rather than a dichotomy. Spanish speakers can focus on manner more than previously thought.

- Results from the bilingual children did not show LR effects. We suggest that it is possible that the effects of language on motion event cognition may be observed later in development.

The findings of the present investigation suggest that further research is required. For example, most of the studies in LR and motion events focused on assessing cognition through mainly categorization tasks. It would be ideal to test other cognitive reasoning functions in order to clarify what is the role of language in non-cognitive function.

## Appendix A. Materials for method

### 1. Adult Consent form

#### Research: Can language affect motion event cognition?

Evidence from monolingual and bilingual speakers of Spanish and English.

**Researcher:** Fraibet Aveledo G., PhD Student

**Supervisor:** Panos Athanasopoulos

#### Research project:

This project is a research in the area of language acquisition and bilingualism. We are studying the relation between language and thought. Specifically, we would like to study whether the use of the language affect the way speakers perceive their world.

Participants will do two tasks:

1. *Task 1.* They will see sets of 6 sec. clips and have to decide in terms of similarity. That is, they have to decide which clip is more similar to a target one. This task will take approximately 18 minutes.
2. *Task 2.* Participants will see 21 clips (6 sec. each) and have to describe briefly what is happening. This task takes around 12 minutes.

Additionally, in the same session they will fill in a brief questionnaire with general background information. English-Spanish bilingual speakers will be asked to do the second task in both languages (English and Spanish) with one week apart. Therefore, they will be contacted later.

Any participant can ask any question about the tasks and can decide to leave the experiment if he/she wishes at any moment.

#### Confidentiality and anonymity

We would like to thank you for your collaboration. Also, we would like to inform you that the results of this investigation will be treated confidentially and anonymous. If you have any question about the results of this research you can contact Fraibet Aveledo ([elpb78@bangor.ac.uk](mailto:elpb78@bangor.ac.uk)) or Panos Athanasopoulos ([panos.athanasopoulos@ncl.ac.uk](mailto:panos.athanasopoulos@ncl.ac.uk)).

#### Consent

I understand that I can omit questions that I do not want to answer.

I understand that this research is voluntary and I have the right to withdraw at any time without penalty.

"I agree to participate in this study. I have been given a copy of this form and had a chance to read it."

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Investigator: \_\_\_\_\_

**Complaints:** in case you want to complain about how this research has been conducted,

please write to Fraibet Aveledo ([f.e.aveledo@newcastle.ac.uk](mailto:f.e.aveledo@newcastle.ac.uk)) or

Panos Athanasopoulos ([panos.athanasopoulos@ncl.ac.uk](mailto:panos.athanasopoulos@ncl.ac.uk)).

## 2. Consent form for parents

### Consent form for parents

#### **Research: Can language affect motion event cognition?**

Evidence from monolingual and bilingual speakers of Spanish and English.

**Researcher:** Fraibet Aveledo G., PhD Student

**Supervisor:** Panos Athanasopoulos

#### **Research project:**

This project is a research in the area of language acquisition and bilingualism. We are studying the relation between language and thought. Specifically, we would like to study whether the use of the language affect the way speakers perceive their world.

Participants will do two tasks:

1. *Task 1.* They will see sets of 6 sec. video clips and have to decide in terms of similarity. That is, they have to decide which video clip is more similar to a target one. This task will take approximately 18 minutes.
2. *Task 2.* Participants will see 21 video clips (6 sec. each) and have to describe briefly what is happening. This task takes around 12 minutes.

The video clips show persons performing a motion event (e.g. i. boy goes out of a door walking; ii. a woman throwing a car down a ramp; iii. a man crossing a room jumping or skipping).

Additionally, in the same session children will fill in a brief questionnaire with general background information (name, age, sex, languages spoken at home, etc) with the help of their teachers and researcher if necessary.

We are requesting your permission for your child to participate in this study. If you grant your permission, we will invite your child to participate in the study. Your child will not be forced into participating, and if at any stage he or she wishes to withdraw, he or she will be free to do so.

#### **Confidentiality and anonymity**

We would like to thank you and your child for your collaboration. Also, we would like to inform you that the results of this investigation will be treated confidentially and anonymous. If you have any question about the results of this research you can contact Fraibet Aveledo ([elpb78@bangor.ac.uk](mailto:elpb78@bangor.ac.uk)) or Panos Athanosopoulos ([panos.athanasopoulos@ncl.ac.uk](mailto:panos.athanasopoulos@ncl.ac.uk)).

#### **Consent**

I understand that my child can omit questions that he/she does not want to answer.  
 I understand that this research is voluntary and my child has the right to withdraw at any time without penalty.

"I consent for my child \_\_\_\_\_ to participate in this study. I have been given a copy of this form and had a chance to read it."

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Investigator: \_\_\_\_\_

**Complaints:** in case you want to complain about how this research has been conducted, please write to Fraibet Aveledo ([f.e.aveledo@newcastle.ac.uk](mailto:f.e.aveledo@newcastle.ac.uk)) or Panos Athanasopoulos ([panos.athanasopoulos@ncl.ac.uk](mailto:panos.athanasopoulos@ncl.ac.uk))

**Research: Can language affect motion event cognition?** Evidence from monolingual and bilingual speakers of Spanish and English.

### 3. Questionnaire for adults and children

**Research: Can language affect motion event cognition?**

Evidence from monolingual and bilingual speakers of Spanish and English.

#### Questionnaire for adults and children

Name:							
Age:		Sex: F M					
Mother's language:							
List all the languages you speak (except your mother tongue). In the second column, indicate at what age you started learning them. In the third column, indicate the level of proficiency for each of the languages you speak. The scale is from 1 to 6, being 1=very basic and 6=very advanced.							
Language	Age at which the learning started	Level					
		1	2	3	4	5	6
		1	2	3	4	5	6
		1	2	3	4	5	6
		1	2	3	4	5	6
		1	2	3	4	5	6
How many hours a week do you spend speaking and listening to each language? You can include time watching TV, films, reading, studying.							
Language	Time (in hours a week)						
What is your level of education?							
Observations (i.e. if you have lived abroad) :							
Thank you very much,							

## Appendix B

**Table 1:** Selection of same-path and same-manner choices in monolingual Spanish-speakers and monolingual English-speakers (%)

	Manner	Path
	% (SD)	% (SD)
English	71.52 (26)	28.48 (26)
Spanish	59.20 (29)	40.80 (29)

**Table 2:** Selection of same-path and same-manner choices in crossing-boundary and trajectory paths videos in language groups (%)

	Path		Manner	
	Boundary crossing	Trajectory	Boundary crossing	Trajectory
	% (SD)	% (SD)	% (SD)	% (SD)
English	29.67 (31)	26.52 (25)	70.33 (31)	73.48 (25)
Spanish	38.75 (36)	44.25 (30)	61.25 (36)	55.75 (30)

**Table 3:** Selection of same-path and same-causation choices between languages groups (%)

	Causation	Path
	% (SD)	% (SD)
English	59.79 (24)	40.21 (24)
Spanish	50.73 (25)	49.27 (25)

**Table 4:** Selection of same-causation responses according to type of causation in monolingual speakers of Spanish and English (%)

	Continuous causation	Initiating causation	Body Part causation
	% (SD)	% (SD)	% (SD)
English	60.98 (31)	55.49 (31)	62.88 (24)
Spanish	50.42 (31)	44.58 (31)	57.08 (26)

**Table 5:** Selection of path, manner and other main verbs in English and Spanish speakers (%)

	Path	Manner	Other
	% (SD)	% (SD)	% (SD)
English	4 (21)	89 (20)	7 (6)
Spanish	47 (6)	50 (11)	3 (10)



**Table 6:** Frequency of path verbs and manner verbs according to the type of path between language groups

	Trajectory			Boundary-Crossing		
	Path	Manner	Other	Path	Manner	Other
	% (SD)	% (SD)	% (SD)	% (SD)	% (SD)	% (SD)
English	2 (16)	86 (16)	13(5)	5 (32)	91(30)	4 (9)
Spanish	40 (7)	59 (17)	1 (16)	51 (10)	45 (12)	5 (10)

**Table 7:** Frequency of causative constructions and sentences with path main verbs in monolingual speakers of Spanish and English (%)

	Path	Causation
	% (SD)	% (SD)
English	2 (6)	98 (6)
Spanish	6 (10)	94 (10)

**Table 8:** Frequency of causative constructions produced by language groups according to the type of causation (%)

	Initiating causation	Continuous causation	Body Part causation
	% (SD)	% (SD)	% (SD)
Spanish	98.03 (9)	99.12 (5)	77.63 (36)
English	97.73 (12)	99.24 (5)	98.86 (8)

**Table 9:** Percentages of same-path and same-manner choices according to the proficiency of the speakers based on the QPT

	Manner	Path
Lowest Proficiency	60.16	39.84
Highest Proficiency	53.13	46.88

**Table 10:** Percentages of same-manner and same-path preference between early bilingual speakers and late bilingual speakers

	Manner	Path
Early bilingual	59.42	40.58
Late bilingual	55.28	44.71

**Table 11:** Percentages of same-manner and same-path choices between bilingual speakers according to their TLEC.

	Same Manner	Same-Path
Less than 3 years	62.98	37.02
More than 3 years	55.42	44.59

**Table 12:** Percentages of same-path and same-manner choices between English and Spanish monolinguals and S-E bilingual speakers

	Manner	Path
	% (SD)	% (SD)
English	71.52 (26)	28.48 (26)
Spanish	59.20 (29)	40.80 (29)
S-E Bilingual	59.14 (26)	40.86 (26)

**Table 13:** Percentages of same-path and same-manner choices in crossing-boundary and trajectory paths videos in language groups.

	Boundary-crossing		Trajectory	
	% (SD)	% (SD)	% (SD)	% (SD)
	Path	Manner	Path	Manner
English	29.67 (31)	70.33(31)	26.52 (24)	73.48(24)
S-E Bilingual	44.24 (32)	55.76(32)	35.19 (25)	64.81 (25)
Spanish	38.75 (36)	61.25 (36)	44.25 (30)	55.75 (30)

**Table 14:** Percentages of same-manner and same-path responses according to the type of path in early and late bilinguals

	Boundary-crossing		Trajectory	
	Path	Manner	Path	Manner
Early Bilingual	42.9	57.1	36.67	63.33
Late Bilingual	51.53	48.46	33.33	66.66

**Table 15:** Mean percentages of same-manner and same-path selection according to TLEC in S-E bilingual speakers

	Boundary-crossing		Trajectory Path	
	Path	Manner	Path	Manner
Less than 3 year	39.23	60.77	33.33	66.67
More than 3 year	49.3	50.7	36.67	63.33

**Table 16:** Percentages of same-manner and same-path causation according to the type of path based on to proficiency

	Boundary-crossing		Trajectory	
	Manner	Path	Manner	Path
Lowest Proficiency	60.00	40.00	58.33	41.67
Highest Proficiency	50.00	50.00	60.42	39.58

**Table 17:** Percentages of same-causation and same-path choices among advanced and intermediate bilingual speakers in the similarity judgment task

	Path	Causation
Advanced	45.56	54.44

Intermediate	41.96	58.04
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**Table 18:** Mean percentages of same-causation and same-path selection in S-E bilinguals according to their AoA

	Causation	Path
Early bilingual	56	44
Late bilingual	53.37	46.64

**Table 19:** Same-causation and same-path selection according to the TLEC among bilingual speakers

	Causation	Path
Less than 3 years	56.25	43.75
More than 3 years	54.5	45.5

**Table 20:** Percentages of same-causation and same-path by monolinguals speakers and S-E bilinguals.

	Same-Causation	Same-Path
Bilingual Speakers	55.1(24)	44.9 (24)
English Speakers	44.9 (24)	45.15 (24)
Spanish Speakers	50.26 (25)	49.73 (25)

**Table 21:** Mean percentages of same-causation selections according to the type of causation and proficiency in S-E bilingual speakers

	Initiating Causation	Continuous Causation	Body Part Causation
	% (SD)	% (SD)	% (SD)
Advanced	33.33	62.5	37.5
Intermediate	56.25	68.75	59.37

**Table 22:** percentage of same-causation selections according to the type of causation between early and late bilinguals.

	Initiating Causation	Continuous Causation	Body Part Causation
Early bilinguals	54.18	70.83	56.25
Late bilinguals	52.78	62.5	52.08

**Table 23:** percentage of same-causation selections according to the type of causation between S-E bilinguals according to their TLEC.

	Initiating Causation	Continuous Causation	Body Part Causation
Less than 3 years	51.28	65.38	50.00
More than 3	50.00	63.33	48.00

years			
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**Table 24:** Percentages of same-causation responses according to type of causation between language groups.

	Initiating Causation	Continuous Causation	Body Part Causation
	% (SD)	% (SD)	% (SD)
Bilinguals	50.44 (31)	64.04(30)	48.68 (26)
English Monolingual	55.49 (31)	60.98 (31)	44.32 (24)
Spanish Monolingual	44.58 (31)	50.42 (31)	35.63 (26)

**Table 25:** Mean percentages of path, manner and “other verbs” in S-E bilinguals in English and Spanish speakers.

	Path	Manner	Other verbs
	% (SD)	% (SD)	% (SD)
S-E Bilingual In English	17.91	60.96	21.12
S-E Bilingual in Spanish	56.67	36.54	6.79

**Table 26:** Mean percentages of path, manner and “other verbs” in S-E bilinguals and Spanish and English, and in English and Spanish speakers.

	Path	Manner	Other verbs
English Monolingual	3.69	89.20	7.10
S-E bilingual in English	17.91	60.96	21.12
S-E Bilingual in Spanish	56.67	36.54	6.79
Spanish Monolingual	46.74	49.92	3.34

**Table 27:** Percentages of path, manner, and other verbs according to the type of path produced by bilinguals in English and in Spanish

	Trajectory			Boundary-crossing		
	Path verbs	Manner verbs	Other verbs	Path verbs	Manner verbs	Other verbs
Bilingual in Spanish	41.18	52.94	5.88	66.37	26.03	7.60
Bilingual in English	6.41	68.38	25.21	24.70	57.14	18.16

**Table 28:** Mean percentages of path verbs and manner verbs according to the type of path between language groups

	Trajectory			Boundary-crossing		
	Path verbs	Manner verbs	Other verbs	Path verbs	Manner verbs	Other verbs
	% (SD)	% (SD)	% (SD)	% (SD)	% (SD)	% (SD)
English Monolinguals	1.52	85.61	12.88	5.00	91.36	3.64
Bilingual in Spanish	41.18	52.94	5.88	66.37	26.03	7.60
Bilingual in English	6.41	68.38	25.21	24.70	57.14	18.16

Spanish Monolinguals	40.35	58.77	0.88	50.61	44.52	4.87
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**Table 29:** Mean percentages of path vs. causation sentences in monolingual speakers and bilinguals in Spanish and English.

	Path	Causation
English	2	98
SSE in English	2.89	97.11
Spanish	6	94
SSE in Spanish	5.22	94.77

**Table 30:** Mean percentages of causative constructions produced by language groups according to the type of causation

	Initiating Causation.	Continuous Causation.	Body Part Causation.
English	97.72	99.24	98.86
SSE in English	99.34	99.12	88.15
SSE in Spanish	95.09	99.01	86.76
Spanish	98.30	98.90	78.95

## Appendix C

**Table 1:** Mean percentages of same-manner choices according to language group and age groups.

		No. of children	Same-manner responses (%)	SD
<i>English mon.</i>	AG 1	18	61.81	21
	AG 2	18	56.48	19
	AG 3	20	62.41	25
	AG 4	12	64.06	19
	AG 5	15	68.75	20
<i>Spanish mon.</i>	AG 1	17	64.34	24
	AG 2	19	62.04	25
	AG 3	24	68.48	22
	AG 4	16	53.52	22
	AG 5	16	64.84	21

**Table 2:** Same-manner choices according to the type of path (boundary-crossing and trajectory) by language group and age group (%)

Type of path	English monolingual		Spanish monolingual	
	<i>BC</i>	<i>Trajectory</i>	<i>BC</i>	<i>Trajectory</i>
	% (SD)	% (SD)	% (SD)	% (SD)
AG 1	59.44 (28)	65.74 (21)	62.35 (27)	67.65 (25)
AG 2	50.80 (20)	65.74 (23)	58.42 (30)	68.07 (26)
AG 3	57.88 (30)	70.00 (26)	67.08 (25)	70.83 (27)
AG 4	60.83 (24)	69.44 (19)	53.13 (25)	54.17 (30)
AG 5	67.33 (25)	71.11 (26)	61.25 (28)	70.83 (19)

**Table 3:** Mean percentages of same-causation choices between English-speaking and Spanish-speaking children

	English monol.		Spanish monol.	
	%	SD	%	SD
AG 1	48.96	22	50.37	28
AG 2	39.51	28	48.36	29
AG 3	57.18	23	50.26	26
AG 4	36.45	23	35.54	22
AG 5	56.63	23	53.52	30
<i>Total Mean</i>	<b>47.74</b>		<b>47.61</b>	

**Table 4:** Main verb concepts produced by English-speaking children and adolescents according to age (% SD)

	AG 1	AG 2	AG 3	AG 4	AG 5
manner v.	85.63 (13)	91.07 (9)	94.89 (7)	94.23 (8)	89.29 (8)
path v.	6.04 (7)	4.41 (6)	4.55 (3)	1.92 (5)	6.25 (6)
OV. (RM)	5.95 (11)	3.05 (6)	0.57 (3)	2.88 (6)	0.89 (3)
OV. (N-RM)	2.38 (6)	1.47 (6)	0.00 (0)	0.96 (1)	3.57 (8)

**Table 5:** Main verb concepts encoded by Spanish-speaking children and adolescents according to age (% SD)

	AG 1	AG 2	AG 3	AG 4	AG 5
manner v.	67.76 (20)	56.25 (20)	63.04 (12)	58.33 (17)	42.22 (24)
path v.	21.05 (18)	34.72 (19)	29.89 (12)	34.17 (18)	48.60 (22)
OV. (RM)	2.63 (5)	1.39 (4)	0.00 (0)	0.83 (3)	4.59 (11)
OV. (N-RM)	6.58 (9)	6.94 (9)	0.00 (0)	6.67(8)	4.46 (6)

**Table 6:** Main verb concepts encoded by Spanish-speaking children and adolescents according to age (%)

	AG 1		AG 2		AG 3		AG 4		AG 5	
	English	Spanish	English	Spanish	English	Spanish	English	Spanish	English	Spanish
Manner v.	85.63	67.76	91.07	56.25	94.89	63.04	94.23	58.33	89.29	42.22
path v.	6.04	21.05	4.41	34.72	4.55	29.89	1.92	34.17	6.25	48.60
OV. (RM)	5.95	2.63	3.05	1.39	0.57	0.00	2.88	0.83	0.89	4.59
OV. (N-RM)	2.38	6.58	1.47	6.94	0.00	0.00	0.96	6.67	3.57	4.46

**Table 7:** Path and manner verb encoding according to the type of path and age groups in Spanish speaking children and adolescents (% SD)

	Boundary-crossing		Trajectory paths	
	Path verbs	Manner verbs	Path verbs	Manner verbs
AG 1	15.88 (19)	84.12 (20)	36.84 (26)	63.16 (26)
AG 2	36.02 (24)	63.98 (24)	46.30 (28)	53.70 (28)
AG 3	31.30 (24)	68.70 (24)	42.75 (21)	57.25 (21)
AG 4	33.33 (28)	66.67 (28)	46.67 (27)	53.33 (27)
AG 5	60.71 (31)	39.29 (31)	45.83 (31)	54.17(31)

**Table 8:** Path and manner verb encoding according to the type of path and age groups in English speaking children and adolescents (% SD)

	Boundary-crossing		Trajectory paths	
	Path verbs	Manner verbs	Path verbs	Manner verbs
AG 1	2.54 (8)	97.46 (8)	54.29 (5)	45.71 (5)
AG 2	1.18 (5)	98.82 (5)	9.80 (16)	90.20 (16)
AG 3	1.11 (4)	98.89 (4)	9.26 (16)	90.74 (16)
AG 4	0.00 (0)	100.00 (0)	5.13 (13)	94.87 (13)
AG 5	5.71 (9)	94.29 (9)	7.14 (14)	92.86 (14)

**Table 9:** Causative constructions, path verbs, and other forms produced by English speaking children divided by age group (% SD)

	Causative construct	Path verbs	Other Form
AG 1	91.00 (11)	8.46 (11)	0.52 (2)
AG 2	98.69 (4)	1.31 (4)	0 (0)
AG 3	97.66 (5)	1.75 (4)	0.58 (3)
AG 4	94.47 (11)	4.93 (9)	0.59 (2)
AG 5	97.61 (9)	2.38 (8)	0 (0)

**Table 10:** Mean percentages of causative constructions, path verbs and other forms produced by Spanish speaking children divided by age group (% SD)

	Causative construct	Path Verbs	Other forms
AG 1	91.81 (33)	6.43 (2)	1.75 (1)
AG 2	94.44 (15)	5.55 (15)	0 (0)
AG 3	93.71 (8)	4.34 (7)	1.93 (5)
AG 4	95.56 (9)	4.44 (9)	0 (0)
AG 5	93.65 (13)	6.34 (13)	0 (0)

**Table 11:** Causative constructions produced by English speaking children divided by the type of causation and age groups (%)

English	Continuous Causation	Initiating Causation	Body Part Causation
AG 1	100	96.43	69.05
AG 2	100	100	94.12
AG 3	100	98.68	94.74
AG 4	100	96.15	80.77
AG 5	100	94.64	100



**Table 12:** Causative constructions produced by Spanish speaking children divided by the type of causation and age groups (%)

Spanish	Continuous Causation	Initiating Causation	Body Part Causation
AG 1	98.25	94.74	84.21
AG 2	94.44	98.61	86.11
AG 3	100	97.83	80.43
AG 4	97.78	96.67	89.52
AG 5	98.21	97.62	89.29

**Table 13:** Same-manner and same-path selection in the similarity judgment task according to age in bilingual children (% SD)

		Bound-cross.	Trajectory	Total
<b>AG 1</b>	<i>Path</i>	25.19 (34)	30.56 (27)	27.15 (25)
	<i>Manner</i>	74.81 (34)	69.44 (27)	72.85 (25)
<b>AG2</b>	<i>Path</i>	37.56 (24)	26.67 (14)	33.46 (19)
	<i>Manner</i>	62.44 (24)	73.33 (14)	66.54 (19)
<b>AG 3</b>	<i>Path</i>	38.26 (28)	28.26 (26)	34.51 (25)
	<i>Manner</i>	61.74 (28)	71.74 (26)	65.49 (25)

**Table 14:** Mean percentages of same-causation choices in bilingual children according to the type of causation (% SD)

		Initiating causation	Continuous causation	Body-part causation	Total
<b>AG1</b>	<i>Path</i>	19.44 (16)	38.61 (22)	41.94 (17)	31.25 (22)
	<i>Causation</i>	49.05 (14)	35.01 (7)	15.94 (10)	68.75 (22)
<b>AG2</b>	<i>Path</i>	38.82 (24)	35.90 (15)	25.28 (13)	50.00 (24)
	<i>Causation</i>	48.16 (16)	29.49 (17)	22.34 (15)	50.00 (24)
<b>AG3</b>	<i>Path</i>	29.68 (13)	45.33 (17)	24.98 (15)	52.08 (19)
	<i>Causation</i>	43.84 (13)	31.11 (18)	25.06 (14)	47.92 (19)

**Table 15:** Distribution of production of manner verbs, path verbs, other verbs (RM and N-RM) according to age group and language group (% SD).

<b>AG 1</b>			
	<b>English</b>	<b>Spanish</b>	<b>Bilinguals</b>
<i>manner v.</i>	85.63 (13)	67.76 (20)	52.08 (28)
<i>path v.</i>	6.04 (7)	21.05 (18)	37.50 (30)
<i>OV. (RM)</i>	5.95 (11)	2.63 (5)	8.33 (7)
<i>OV. (N-RM)</i>	2.38 (6)	6.58 (9)	0.00 (0)
<b>AG 2</b>			
	<b>English</b>	<b>Spanish</b>	<b>Bilinguals</b>
<i>manner v.</i>	91.07 (9)	56.25 (20)	70.00 (15)
<i>path v.</i>	4.41 (6)	34.72 (19)	22.50 (13)
<i>OV. (RM)</i>	3.05 (6)	1.39 (4)	3.75 (8)
<i>OV. (N-RM)</i>	1.47 (6)	6.94 (9)	3.75 (9)
<b>AG 3</b>			
	<b>English</b>	<b>Spanish</b>	<b>Bilinguals</b>
<i>manner v.</i>	94.89 (7)	63.04 (12)	64.67 (16)
<i>path v.</i>	4.55 (3)	29.89 (12)	30.43 (18)
<i>OV. (RM)</i>	0.57 (3)	0.00 (0)	0.54 (3)
<i>OV. (N-RM)</i>	0.00 (0)	0.00 (0)	3.80 (6)

**Table 16.** Distributions of path verbs and manner verbs according to the type of path in bilingual speakers (in percentages).

	<b>Boundary-crossing</b>		<b>Trajectory</b>	
	<i>Path verbs</i>	<i>Manner verbs</i>	<i>Path verbs</i>	<i>Manner verbs</i>
AG 1	41.67	58.33	36.11	63.89
AG 2	18.00	82.00	31.67	68.33
AG 3	29.13	70.87	34.78	65.22

**Table 17:** Distribution of causative constructions, sentences with path verbs and other verbs in the bilingual group (% SD).

	Causation sentences	Path verbs	Other verbs
AG1	79.63 (28)	20.37 (28)	0.00 (0)
AG2	96.67 (8)	3.33 (8)	0.00 (0)
AG3	93.72 (11)	4.83 (10)	1.45 (4)

**Table 18.** Distribution of causative constructions according to the type of stimuli in the bilingual data (in percentages).

	Causative constructions		
	Init. - Causative	Cont. - Causative	Body - Causative
AG1	82.38	91.67	91.67
AG2	100.00	100.00	85.00
AG3	94.20	98.55	91.30

**Table 19:** Distribution of causative constructions among speakers according to language groups and age groups (in percentages)

	English	Bilinguals	Spanish
AG1	91.01	79.63	91.81
AG2	98.69	96.67	94.44
AG3	97.66	93.72	93.72

**Table 20:** Distribution of causative constructions among speakers according to language groups and age groups for initiating causation stimuli (in percentages)

	Initiating causation		
	English S.	Bilinguals	Spanish S.
AG1	96.42	82.38	94.73
AG2	96.85	100	98.61
AG3	97.01	94.20	97.82

**Table 21:** Distribution of causative constructions among speakers according to language groups and age groups continuous causation stimuli (in percentages)

	Continuous causation		
	English S.	Bilinguals	Spanish S.
AG1	100	91.67	98.25
AG2	100	100	94.44
AG3	100	98.55	100

**Table 22:** Distribution of causative constructions among speakers according to language groups and age groups for body-part causation stimuli (in percentages)

	Body part causation		
	English S.	Bilinguals	Spanish S.
AG1	69.04	91.67	84.21
AG2	62.89	85	86.11
AG3	64.84	91.30	80.43

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