Chapter 11
Verb Representation and Thinking-for-Speaking Effects in Spanish–English Bilinguals

Vicky T. Lai and Bhuvana Narasimhan

11.1 Introduction

Does the language we speak influence how we think about the events in our experience? If so, do bilingual speakers construe the same event in different ways, depending on the language they use to verbally encode that event? Or does one of the languages play a more dominant role in influencing event construal? The present study investigates whether bilingual speakers attend to different aspects of a motion event, depending on the language they use to first describe that event. Specifically, we explore whether language-specific verb representations used in encoding motion events influence subsequent performance in a nonlinguistic similarity judgment task in Spanish–English bilinguals.

We will begin by looking at different perspectives on whether language influences thought, including views on linguistic relativity and "thinking-for-speaking." Then we will focus on the domain of motion. We will present linguistic accounts of the semantic representations of motion verbs and discuss the crosslinguistic difference between English and Spanish. Next, we will review empirical studies that examine how verbal encodings influence motion event construal in monolinguals. We will also review empirical studies that explore linguistic relativity versus thinking-for-speaking in bilinguals. We then go on describe the current study. In the final section of the chapter, we discuss our findings in light of thinking-for-speaking effects, how events are conceptualized for language production, and the nature of representations in the bilingual mind.

V. T. Lai (✉)
Department of Psychology, University of South Carolina and Max Planck Institute for Psycholinguistics, 1512 Pendleton Street, Columbia, SC 29208, USA
e-mail: vicky.tzuyin.lai@gmail.com

B. Narasimhan
Department of Linguistics, University of Colorado Boulder, Hellems 290, 295 UCB, Boulder, CO 80309, USA

R. G. de Almeida, C. Manouilidou (eds.), *Cognitive Science Perspectives on Verb Representation and Processing,* DOI 10.1007/978-3-319-10112-5_11

11.2 Language and Thought

11.2.1 Linguistic Relativity

The issue of how language relates to cognition is a fundamental one that has been the focus of intense debate for decades. Some have argued that language shapes cognition, as proposed by Benjamin Lee Whorf (1956) under the influence of his mentor, Edward Sapir. The central claim of the Whorfian hypothesis is that the grammatical categories of a language can influence how its speakers perceive the world. This position was somewhat ignored in the 1960s, when the universal grammar view prevailed. Since universal grammar presupposes no distinction among languages at the conceptual level, how language relates to cognition became a minor issue.

However, the view that language has an influence on cognition has been revitalized in recent years by "neo-Whorfian" scholars, including Wilkins and Hill (1995); Levinson (1996); Pederson (1995); Lucy (1996); and Boroditsky (2001), among others. A variety of empirical studies have been conducted to examine how speakers' linguistic organization of domains, such as color, space, time, and motion, influence their nonlinguistic conceptualization of these domains (e.g., Berlin and Kay 1969; Heider 1972; Pederson et al. 1998; Boroditsky 2001; Li and Gleitman 2002; Levinson et al. 2002). Findings in support for both positions have been found in these studies, and the directionality and extent of the interaction between language and thought continue to be hotly debated.

In many of these studies, the term "thought" is used interchangeably with "cognition" which is typically measured in tasks that do not involve the use of language at all. These behavioral measures include speakers' manipulation of spatial arrays, reaction time measures, similarity judgment, eye tracking, and recognition memory (Bohnemeyer et al. 2001, 2006; Boroditsky 2001; Levinson et al. 2002; Li and Gleitman 2002; Finkbeiner et al. 2002; Gennari et al. 2002; Papafragou et al. 2002). Speakers' task performance along language-specific lines is taken to demonstrate that cognitive processing is imprinted by language-specific patterns of encoding experience. As the reasoning goes, the patterns that speakers use habitually in order to produce and comprehend language become ingrained and start influencing the ways that speakers construe their experiences from an early age, resulting in language-specific ways of thinking even in situations where language is not used to direct attention or enhance recall in any way.

11.2.2 Thinking-for-Speaking

In addition to focusing on the issue of linguistic relativity, many scholars have also investigated subtler aspects of the relativity hypothesis, whether language plays a role in influencing speakers' performance in nonlinguistic tasks shortly after they have used language to encode a particular aspect of their experience (e.g., Finkbeiner et al.

2002; Papafragou et al. 2008). This line of research hypothesizes that in order to linguistically encode a particular experience, speakers have to first fit their thoughts into a language-particular mold—that is, they engage in "thinking-for-speaking" (Slobin 1987, 1996a). The role of "thinking-for-speaking" appears to be somewhat less controversial among Whorfian and cognitivist scholars, and the role of verbal encoding in subsequent construal of experience across languages dovetails with psychological research, showing how verbal encoding of specific events influences subsequent recall and evaluation of the same events *within a language* (Loftus and Palmer 1974). In Loftus and Palmer's classic study on the interaction of language and memory, subjects viewed films of automobile accidents and were then asked to estimate the speed of the vehicles. Subjects in different groups were presented with the same question with different verbal encodings: "About how fast were the cars going when they smashed/collided/bumped/contacted/hit (into) each other?" The encoding of "smashed" elicited the highest speed estimate while the encoding of "contacted" elicited a slower speed estimate. A week later, subjects returned and answered whether they saw any broken glass in the film. About 32 % of the subjects in the "smash" encoding group answered "yes" even though there was no broken glass in the original film. The study demonstrated that mental representations can be shifted in the direction suggested by the verbal label.

Nevertheless, many open questions remain to be answered about the nature of "thinking-for-speaking" effects. For instance, are thinking-for-speaking effects more likely to arise from differences in lexical semantic representations versus patterns of syntactic encoding? Can a nonlinguistic bias be induced simply by virtue of using a particular language, or does a bias only occur with the use of specific words or constructions? How early in children's development does language begin to shape the construction of semantic categories? Do speakers of multiple languages also have multiple modes of thinking corresponding to each of their languages? Are "thinking-for-speaking" effects more likely to occur in some domains versus others?

11.3 Motion Events

11.3.1 Linguistic Encoding of Motion Events

One domain that is often used to explore the relationship between language and cognition is that of motion. Based on the influential work of Talmy (1985, 2000, 2007), the semantic domain of motion is often discussed in terms of the components of the motion event schema. The "figure" is the object that is moving or located with respect to the reference object, the "ground." The "path" is the movement of the figure with respect to the ground. In addition to the internal components above, a motion event can have an external co-event that is related to the event by "manner" or "cause" (Talmy 2007, pp. 70–71). How speakers of different languages linguistically encode the dynamically changing spatial relationship between figure and ground, the geometric properties of figure and ground, the properties of the path and manner

of motion, the causal role of an agent of motion, and other significant aspects of motion events, provide a rich and interesting testing ground for scholars interested in exploring the interaction between language and cognition.

Studies of motion event encoding have taken as their basis, the claim that there exists a typology of languages based on how they encode complex events (Talmy 1985, 2000). According to Talmy, some languages ("satellite-framed" languages), e.g., English, encode the manner of motion in the verb root, e.g., *the bottle floated out of the cave*. Other languages ("verb-framed" languages), e.g., Spanish, typically encode the path of motion (i.e., *float*) in the main verb, expressing manner of motion in a gerundial phrase, e.g., *La botella entró a la cueva flotando "the bottle moved-in to the cave floating"* (Talmy 2007, p. 89). Talmy's account has been extremely influential, although subsequent studies suggest that the crosslinguistic differences in motion event encoding are more restricted than suggested by Talmy. For instance, Aske (1989) proposes that Spanish manner of motion verbs can in fact co-occur with path phrases if they are atelic. For example, *Juan bailó en circulos* "John danced around," *La botella flotó hacia la cueva* "the bottle floated towards the cave," etc. Aske (1989) also pointed out that verb semantics also plays a role in the acceptability of the co-occurrence of manner verb and path phrases in Spanish. For example, the more strongly the motion is implied in the verb, such as "roll" and "run," the more acceptable it is to combine the verb with some path phrases. In a modification of Aske's proposal, Slobin and Hoiting (1994) propose that in verb-framed languages, such as Japanese, Dutch Sign Language, Turkish, the restriction on combining manner of motion verbs with path phrases applies only to those motion events that involve "movement across a boundary" (1994, p. 498).

The locus of these language-specific differences in motion event encoding has been discussed widely in the literature. Talmy's own account suggests that the distinction between "verb-framed" and "satellite-framed" languages is related in part to the semantics of the manner of motion verbs in the two types of languages (Talmy 1985, 2007). The manner of motion verbs in English-type "satellite-framed" languages occur in "lexicalization doublets." For instance, *kick-1* implies an agent's impacting his or her foot into some object (*I kicked-1 the wall with my left foot*), whereas *kick-2* incorporates motion with the sense encoded in *kick-1* (*I kicked-2 the ball across the field with my left foot*): I_AMOVED (by kicking-1) the ball across the field with my left foot (Talmy 2000, p. 31; Talmy 2007, p. 76). The additional specification of directed motion in a variety of manner of motion verbs such as *kick-2* is taken to explain, why these verbs combine so flexibly with directional phrases (e.g., *across the field*), in languages such as English. In contrast, the counterparts of verbs such as "kick-1" in Spanish-type "verb-framed" languages do not occur in lexicalization doublets, and lack an additional sense associated with "kick" that encodes manner of motion combined with a specification of directed motion. So, in these languages, the manner of motion verb is unable to combine with a path phrase and is more typically encoded in a gerundial phrase (for further discussion on the variable behavior of manner of motion verbs, see Levin and Rappaport Hovav 1995).

Subsequent debates have revolved around the issue of whether the crosslinguistic differences have to do with the existence of lexicalization doublets in the verb lexicon

of a language as proposed by Talmy, or whether alternative explanations are more valid, e.g., the ability of a manner verb to combine with directed motion constructions (Narasimhan 2003; semi-) productive lexical rules within the lexicon that derive extended verb senses (Levin and Rapoport 1988; Levin and Rappaport Hovav 1999), a principle of semantic composition that allow accomplishment predicates to be constructed out of an activity verb in combination with a goal prepositional phrase (Beck and Snyder 2001), or a syntactic composition operation that combines manner and motion within the verbal constituent (Zubizarreta and Oh 2007).

These accounts are centered around the nature of verb semantic representations: whether the meanings of the verbs are different across languages by virtue of their inherent semantics or by virtue of their ability to acquire more complex meanings by fitting into meaning-bearing clausal templates, undergoing lexical rules in the lexicon, or participating in compositional semantic operations in some languages but not others.

In addition to the nature of the semantic representation of the verb, additional differences between "satellite-framed" and "verb-framed" languages have to do with the richness of the manner of motion verb lexicon, and the frequency with which manner of motion verbs are used at all in descriptions of motion events (Slobin 1996b). The frequency of use of manner of motion verbs is linked to the rhetorical style used in narratives in "verb-framed" versus "satellite-framed" languages. As pointed out by Slobin (1996b) in his discussion of motion event descriptions in Spanish and English, Spanish usually sets the static scene in which the motion event takes place first (e.g., "there is a cliff," "there's a water fall," "it's high," etc). When describing the motion event, Spanish speakers describe the path, leaving the manner of motion to be inferred from the scene (e.g., "the agent jumped"). English does not set the stage as frequently, and describes the manner of motion explicitly (e.g., "the agent jumped off of the cliff into the waterfall").

11.3.2 Motion Event Construal

Although theoretical accounts of verb semantic representation differ in how they account for crosslinguistic differences in motion event encoding, they all raise an interesting psycholinguistic question: Do speakers of languages that differ in their linguistic encoding of motion events also differ in how they construe such events? Many researchers have attempted to examine the cognitive consequences of the empirical fact that speakers of "satellite-framed" languages flexibly and frequently use a variety of manner of motion verbs to combine with path phrases whereas speakers of "verb-framed" languages combine manner verbs with path phrases less often and in more restricted contexts of use. Such studies focus on the following question: Are speakers of "satellite-framed" languages, as a consequence of their habitual verbal encoding of manner of motion, also more inclined to attend to manner of motion in comparison to speakers of "verb-framed" languages?

Prior studies have experimentally investigated how speakers of languages with different ways of encoding motion events go on to perform different nonlinguistic tasks. The languages under study include Greek (Papafragou et al. 2002), Japanese (Finkbeiner et al. 2002), Spanish (Gennari et al. 2002), as well as a diverse sampling of 17 genetically and areally distinct languages from around the world (Bohnemeyer et al. 2006). The net finding of these studies is that speakers of verb-framed and satellite-framed languages do not differ in the ways in which they perform in tasks involving recognition, categorization, or similarity judgment. In the Bohnemeyer et al. study, an effect of language was found in a forced-choice similarity judgment task: Speakers had to group together motion events that had the same manner versus the same path (e.g., they were shown a ball rolling up a ramp and asked to match the scene to one of two variant scenes: a ball rolling down a ramp, or a ball bouncing up a ramp). Speakers of some languages had a significantly higher tendency to match events on the basis of same manner rather than same path. However, these language-specific differences did not conform to Talmy's satellite-framed versus verb-framed distinction. The absence of strong Whorfian effects in this domain may have to do with the crosslinguistic validity of the Talmy typology in the first place, given evidence of intra-typological variation in this domain (see Slobin 1996b). It may also have to do with the importance of the main verb in influencing event construal: The assumption that encoding manner of motion in the main verb directs attention to the manner of motion, may simply not be a correct one.

Yet interestingly, the dimensions of motion events that are encoded in the verb do appear to influence nonlinguistic cognitive processing when speakers are required to verbally encode the event first, prior to participating in a nonlinguistic task. Studies by Billman et al. (2000) and Billman and Krych (1998) show differences in event construal that correlate with differences in verbal encoding within a language. English speakers' recognition of events was influenced by whether they heard manner or path verbs when encoding motion events (e.g., *walk* versus *enter*), exhibiting less sensitivity to those aspects of the motion events that they had not verbally encoded. A similar effect of prior verbal encoding is found in studies investigating monolingual speakers of different languages. Gennari et al. (2002) show that speakers of Spanish and English construe motion events differently, when they were first asked to verbally encode the events in their native language. Interestingly, this "thinking-for-speaking" effect is constrained by the type of the task. Speakers' performance differed in the similarity judgment task, but not the recognition task, which is more automatic. And Papafragou et al. (2008) found a similar "preparing-for-speaking" effect in an eye-tracking study. The speakers rapidly fixated on the event components (e.g., manner of motion) that were typically encoded in their native language during the stage when they were preparing to describe the motion events. These findings are compatible with the notion that the language we speak influences how we think when comprehending and producing speech.

11.4 Thinking-for-Speaking in Bilinguals

11.4.1 Prior Studies

A particular intriguing possibility raised by these findings is that bilingual speakers who are fluent in languages that differ in their linguistic encoding of motion events may, in fact, have two different modes of "thinking-for-speaking" depending on the language she/he is hearing and speaking. Studies investigating thinking-for-speaking and relativity effects in bilingual and second-language learner populations have looked at the domains of time (Boroditsky 2001; Lai 2005), physical object (Athanasopolous 2007), and motion (Brown and Gullberg 2008; Gullberg 2011), among others.

In the domain of time, differences in temporal reasoning in different languages were hypothesized to influence how L2 learners reason about time in both their L1 and L2. Boroditsky (2001) investigated Mandarin speakers' descriptions of time, based on the positioning of events along a vertical axis. In Mandarin, time can be reasoned about along a vertical axis. UP represents time in the past and DOWN represents time in the future. Boroditsky hypothesized that L2 Mandarin speakers of English may be influenced by the English way of temporal reasoning, which is based only on the horizontal axis. In a priming experiment, participants first saw two objects arranged on top of each other vertically or beside each other horizontally. Then, participants were presented with English temporal phrases that were either true or false, e.g., "August comes later than/after June." The hypothesis was that viewing a spatial array that conformed to speakers' language-specific conceptualization of time along an axis would facilitate responses in the true–false decision task. It was found that L2 speakers who learned English at a later age in life were still biased to think about time, vertically, in a Mandarin way, even though the experiment was conducted in English. This finding suggests that the L1 conceptualization was still retained by learners although they produced temporal expressions in English.

In Mandarin, time can also be reasoned about along a horizontal axis. Moving a temporal event FORWARD almost always means rescheduling the event to the past, while moving an event BACKWARD means moving it to the future (Lai 2002). In English, though, when a scheduled event is moved FORWARD in time, it is usually ambiguous as to whether the event is moved to the future or to the past (McGlone and Harding 1998), but with a slight preference to move it to the future (Gentner et al. 2002). Lai (2005) hypothesized that the encoding of time in English may have influenced Mandarin-speaking immigrants who were immersed in an English-speaking culture. That is, Mandarin learners of English may be less certain about the direction of FORWARD, unlike monolingual speakers of Mandarin. Three studies were conducted in three speaker groups: Mandarin monolinguals who have been exposed to English education in high school in Taiwan, English monolinguals in four different states in America, and Mandarin–English bilingual speakers who either were immigrants or have stayed in America for more than 4 years. All speakers were asked to move the clock time forward 1 h. The relevant finding here was that

the clock time was moved to the past more often by the Mandarin monolinguals than the Mandarin–English bilinguals, even though the bilinguals were instructed in Mandarin during the experiment. In contrast to the Boroditsky study (2001), this finding provides evidence that a shift in time perspective in the direction of the L2 has occurred in the minds of bilinguals.

In the domain of physical object classification, Athanasopolous (2007) examined how language-specific grammatical concepts influence nonlinguistic object categorization preferences in bilinguals. In English, a distinction is made between count and mass nouns: A count noun can be quantified using a numeral ("one apple") whereas a mass noun needs an additional unit of measurement ("one sand" versus "one bucket of sand"). In Japanese, many common nouns are treated as mass nouns, and there is a grammatical category, classifier, used to quantify nouns (e.g., "three apples" in English versus "three pieces of apple" in Japanese). Imai and Gentner (1997) and Cook et al. (2006) found that this crosslinguistic difference influenced monolingual Japanese and English speakers' preferences for object categorization. Japanese speakers tended to categorize objects as being similar on the basis of their material properties, whereas English speakers tended to categorize objects as being similar on the basis of shape. Athanasopolous (2007) looked at this phenomenon and asked whether bilinguals alternate between two language-specific concepts, depending on the language used in the experiment. In a similarity judgment task, participants were presented with a triad of a target (e.g., plastic clip) and two alternates (e.g., a metal clip and plastic pieces). The task was carried out in English monolinguals, Japanese monolinguals, English–Japanese bilinguals instructed in L2 (English), and bilinguals instructed in L1 (Japanese). Results from bilinguals showed that regardless of the language of instruction used in the experiment, a bias for pointing to the same-shaped object in count nouns was found, consistent with the English preference. These findings suggest that English–Japanese bilinguals shifted their categorization behavior towards L2 (English).

Gesture constitutes a valuable tool in furthering our understanding of how L2 and bilingual speakers conceptualize their experience for the purpose of speaking. In the domain of motion events, gesture researchers have examined how co-speech gestures of satellite-framed and verb-framed language speakers reflect their language-specific conceptualization when they describe motion events. When speakers describe motion events, they produce gestures that convey information about aspects of the motion event, e.g., the path of motion (e.g., upwards or downwards) and the manner of motion (e.g., zigzagging, rolling, etc., Brown and Gullberg 2008). Brown and Gullberg investigated how Japanese and English monolinguals and Japanese learners of English verbally encoded and gestured about manner, when describing motion events. In a narrative-retelling task, participants watched a video clip of Tweety Bird cartoon and retold the story to the experimenters.[1] It was found that in both their L1 and L2 productions, Japanese–English learners differed significantly in their encoding of manner in speech from the monolingual English speakers, but not from the

[1] Japanese–English participants told the story once in Japanese and once in English.

monolingual Japanese speakers. A similar pattern was found in learners' encoding of manner in gesture. These findings suggest that rhetorical style is transferred from the L1 to the L2. But in terms of the extent to which gesture backgrounded the manner information, learners appeared to have adopted a rhetorical style more similar to that of English in L1 as well as L2, suggesting an influence on their L1 from the L2.

Our discussion of the studies on second-language learners and bilinguals shows that the findings are somewhat inconsistent. Boroditsky (2001) found that advanced Mandarin–English bilinguals remained L1 like in their temporal reasoning. Lai (2005) found that Mandarin–English bilingual immigrants displayed a shift towards English when reasoning about time. Athanasopolous (2007) found that their Japanese–English bilingual speakers were mainly L2 like and are likely to have acquired the English shape-bias in physical object classification. Brown and Gullberg (2008) found that their Japanese–English participants' co-speech gestures, produced when describing motion events, were gradually shifting towards L2-like behaviors. These studies point to a complex picture of the mental representations in the bilingual mind. In some cases, having acquired two languages resulted in shifts in the semantic representation. A variety of factors modulate whether this shift occurs, including proficiency, age of acquisition, and length of cultural immersion.

11.4.2 The Present Study

The prior studies investigating speakers of multiple languages are primarily concerned with the nature of change in long-term semantic representations in the bilingual mind, suggesting that over the course of learning, bilingual speakers may shift to an L2-specific conceptualization (for the purpose of speaking), retain their L1 preferences in this regard, or construct an intermediate system that is neither "purely" L1 like nor L2 like. But an intriguing question that has not yet been investigated in these studies asks, whether bilingual speakers can be induced to shift flexibly between different modes of "thinking-for-speaking" about situations depending on the language they use to encode the same situations verbally. That is, can the bilingual speaker adapt his or her thinking-for-speaking "on-the-fly" in response to the immediate demands of speech production in a specific language? Or, does she/he rely on a single conceptualization system to construe events regardless of differences in the language used to verbally encode the same situations?

The answer to this question will provide us with interesting insights into the degree to which the process of conceptualization during language production is tailored to particular languages in speakers of multiple languages. In his account of the different stages involved in the production of speech from intention to articulation, Levelt (1996) proposed an initial stage of conceptual preparation during which speakers plan what to say (macroplanning) and how to say the intended message (microplanning). The formulation process of the "preverbal message" is not the same for speakers of different languages (von Stutterheim and Nüse 2003). As discussed

earlier, prior experimental work shows that language-specific demands on the formulation of messages play a role in shaping the preparation of utterances as speakers prepare to describe motion events (Papafragou et al. 2008). The present study extends this line of research by investigating the extent to which the conceptual system is capable of supporting more than one mode of conceptualization, each associated with a distinct language. By asking bilingual speakers to describe events in either one of their languages, we can evaluate the extent to which language-particular event construals are evoked during speech production when multiple construals are potentially available. The present study investigates this issue by examining whether the language that bilinguals use, at a given point of time, to describe motion events influences the specific motion event dimension they select as the basis for similarity judgment.

Second, we ask whether nonlinguistic event construal be influenced by language-specific differences in the syntactic packaging of the core components that constitute the semantic representation of motion events. For instance, although both path and manner of motion can be described in both Spanish and English, the grammatical encoding of these concepts differ in the two languages. As discussed in Sect. 11.2.1, English speakers habitually encode the manner of motion in the main verb and the path in "satellite" path phrases (e.g., *the bottle floated out of the cave*), whereas speakers of Spanish typically encode the path of motion (i.e., *float*) in the main verb, expressing manner of motion in a gerundial phrase, e.g., *La botella entró a la cueva flotando "the bottle moved-in to the cave floating*"(Talmy 2007, p. 89). We hypothesize that, since the main verb encodes the most salient information about the event in the clause, thinking-for-speaking effects are most likely to arise from information encoded in the main verb. So in our study, although both the path and the manner of motion are encoded in motion event descriptions by speakers of Spanish and English, we predict that the types of semantic components conflated with motion in the main verb will make different aspects of the motion salient for speakers of the two languages: path in the case of Spanish, and manner in the case of English.

Third, while our experimental procedure involves verbal encoding of the stimulus prior to the nonlinguistic task as in other studies (Billman et al. 2000; Billman and Krych 1998; Gennari et al. 2002; Papafragou et al. 2008), in our study, participants do not spontaneously generate a description of the motion event, but participate in an elicited imitation task in which they hear a description produced by the experimenter which they then repeat. As discussed further in Sect. 11.4, elicited imitation of the same motion event descriptions by all participants ensures consistency in production across participants as well as uniformity in the frequency with which manner and path information is encoded in both languages. Additionally, it allows us to explore whether thinking-for-speaking effects are induced when processing information at (an arguably) a shallower level in an elicited imitation task as compared to the spontaneous generation of linguistic descriptions.

Based on the array of differences in motion event encoding in the two languages discussed earlier, we predict that when interacting in Spanish, bilingual speakers are more likely to attend to the path of motion than when they are interacting in English.

11.5 Description of the Study

In order to evaluate speakers' attention to either the manner or the path of the motion event, we used a similarity judgment task (Kita and Özyürek 2003; Bohnemeyer et al. 2001; Gennari et al. 2002; Papafragou et al. 2002) in which speakers watched a video clip of the target motion event (e.g., ball ROLLS from a cave TO a hut) followed by two alternate clips of motion events that differed from the target event in either the path (ball rolls AWAY FROM a hut to a cave) or the manner of motion (ball SLIDES from a cave to a hut). Prior to the onset of the clip, speakers heard a description of the motion event in either Spanish or English, which they then repeated. Descriptions were constructed based on prior literature describing typical patterns of motion event encoding in the two languages and in consultation with native speakers. In both languages, the description of the motion event included information about the path as well as the manner of motion (see Appendix which lists the stimuli and the descriptions in the two languages). In English, the manner of motion information was provided by the finite verb (*Mr. Red rolled towards the tree*), whereas in Spanish the manner of motion was encoded in an adverbial phrase (*El senor rojo se fue girando hacia el arbol* "Mr. Red went rolling towards the tree"). As discussed earlier, telicity is hypothesized to play an important role in crosslinguistic differences in motion event encoding, so half the descriptions consisted of atelic path phrases ("towards the tree/rock" or *hacia el arbol/la piedra*), whereas the other half consisted of telic, "boundary-crossing" descriptions ("into the hut/cave," *entro en la cabana/la cueva*; Slobin and Hoiting 1994; see also Aske 1989). Since the participants listened to the Spanish and English descriptions provided by the experimenter and then repeated them, there was no interspeaker variation in the motion event descriptions provided by the speakers in the two languages, e.g., in the frequency with which manner or path verbs were used, whether or not an adverbial phrase was provided, etc. Speakers were asked to point to the alternate clip that was more similar to the target clip. Our specific prediction was that bilingual speakers who hear and repeat motion event descriptions in Spanish are more likely to base their judgments of similarity of motion events on shared path, in comparison to bilingual speakers who hear and repeat motion event descriptions in English.

11.6 Method

11.6.1 Participants

A total of 27 bilingual speakers of English and Spanish (14 female and 13 male) participated in this study. When the experiment was completed, the participants were asked to complete a language history questionnaire, created for the multilingualism project at the Max Planck Institute of Psycholinguistics (Gullberg and Indefrey 2003). Data from three participants were discarded because one of them did not interact in fluent English at all and two of them started learning English later than 15

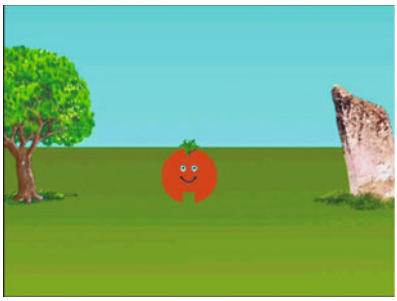
years old. The remaining 24 participants have an average age of 28.5 years (range 19–50). All of the participants learned Spanish since birth. For the participants tested in Spanish, their average age of English acquisition is 6.18 years (range 0–15) and their average duration of living in the USA is 16.8 years (range 5–24). For the participants tested in English, their average age of English acquisition is 3.82 years (range 0–13) and their average duration of living in the USA is 19.2 years (range 5–40). All the participants currently reside in the state of Colorado in the USA. According to self-report, they use both English and Spanish languages on a daily basis. The participants received payment for participation. The study is approved by the local ethics committee.

11.6.2 Design and Materials

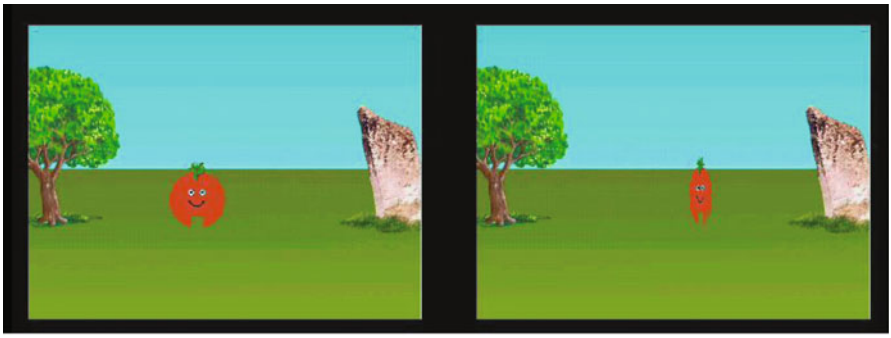
We used a subset of a larger set of simple 2D animations depicting motion events created at the Max Planck Institute for Psycholinguistics (Bohnemeyer et al. 2001). These video clips depict an animated round figure moving in various manners between different ground locations. The 16 target clips of motion events used in the current study systematically vary manners of motion (TWIRL, ROLL, JUMP, and SLIDE), pairs of ground locations (a tree and a rock, and a hut and a cave), and direction of motion (leftward and rightward). Each target clip (e.g., *roll to the left*) has a variant clip that uses the same-manner motion (e.g., *roll to the right*) and three variant clips that use the same path but vary in the manner of motion (e.g., *twirl/jump/slide to the left*). The combination of the targets and variant clips resulted in 48 experimental triads. Using a Latin square design (see Bohnemeyer et al. 2001), these triads are distributed into six lists (eight triads per list). Every list displays all its triads in one order of presentation and then the reversed order, resulting in 12 lists. Additionally, 3 practice triads and 16 filler triads are added to each one of the lists.

A given experimental triad displays the target clip for 4 s and then displays the two variant clips side by side on a split screen for another 4 s. On the target scene, two ground objects (e.g., a tree and a rock) appear on the left and the right of a green field with blue sky in the background. An agent that looks like a round "tomato man" moves from one ground object to the other, in one of the four manners (e.g., a tomato man rolls from the tree to the rock). On the split screen, each variant resembles the motion event in the target clip in 1D but differ in another (e.g., a tomato man rolls from the ROCK to the TREE versus a tomato man JUMPS from the tree to the rock). See Fig. 11.1 for an example.

Filler triads are used to prevent participants from settling into a fixed response pattern. In the fillers, two agents (animated entities constituting geometric shapes) interact with each other in four actions that are different from the motion events in the experimental trials. Specifically, two events of change of possession (GIVE and THROW an instrument such as a hammer or a stick) and two events of change of state (BREAK and HIT with an instrument such as a hammer) are employed.



Target Scene (Figure slides from tree to rock)



Two events presented side by side (split-screen)

Fig. 11.1 An example of an experimental trial

A given filler trial begins with the target scene that has the same green field and blue sky as scenes in the experimental trials. Two red and green round agents are in the center of the screen. When the action begins, one agent starts to interact with the other in one of the four actions. For example, one animated entity gives a hammer to another animated entity. This is replaced by a split screen with two action events that resemble the action in the target scene in some way. For example, variant 1 can have the same instrument as in the target scene but using different action, e.g., an animated entity throws a hammer to the other entity. Variant 2 can have the same action as in the target scene but with a different instrument, e.g., an animated entity gives a stick to the other entity. The combination of the color and shape of the agents, their actions, and the instruments used are counterbalanced.

Practice trials are used to familiarize participants with the similarity judgment task. Each trial consists of a red circle and a blue square. For instance, in one of the target clips, the red circle is in a container and then moves out of the container. In the two variant clips, one of them shows the red circle moving into the container and the other shows the blue square moving back and forth inside the container.

11.6.3 Procedure

The participants were randomly assigned to either the English session or the Spanish session, such that half the bilingual speakers participated in the English language session, the other half participated in the Spanish language session (we did not employ a repeated measures design in which the same participant would have been tested in both Spanish and English, since we expected strong carryover effects, such that participation in one language condition would affect subsequent performance in the other language condition). English sessions were conducted in English by a native speaker of English. Spanish sessions were conducted by a native speaker of Spanish. Depending on the session to which they were assigned, participants were first greeted by the experimenter in either English or Spanish. Then the experimenters chatted with the participant for 5 min using the session language. The experimenter then gave the instructions of the task. In each trial, the experimenter first gave the description of the upcoming target scene verbally. Then, the experimenter started the presentation of each triad with a mouse click. During the target clip, the experimenter repeated the description of a given scene. At the end of the target clip, the experimenter paused the video. At this time, the participant repeated the scene description once. The experimenter then continued the video and the split screen with two motion events was shown. The participant had to respond by pointing to either one of the variants, depending on which they found to be most similar to the previous target scene in their opinion. They also had to say "left" or "right" verbally while pointing. To preclude a search for the "correct" answer in their responses, participants were reassured that there was no standard correct answer. The experimenter recorded participants' responses before moving on to the next trial.

11.6.4 Analysis and Results

The participants always repeated the sentences exactly as they were presented to them. For each participant, we calculated the proportion of same-manner choices. The results showed that when spoken to in English, bilinguals selected events that have the same manner of motion as the target scene more often (50 %) than when spoken to in Spanish (21.9 %; Fig. 11.2).

We ran a mixed-effect logistic regression model (Baayen 2008) using contrast coding for the fixed effects, with classification preference ("same path" versus "same manner") as the outcome variable, and language ("Spanish," "English") as the predictor variable. There were two random effect factors, participant and item. We also entered as control variables, type of ground ("hut–cave," "tree–rock"), direction of motion ("left," "right"), manner of motion in the target clip ("twirl," "jump," "slide," "roll"), type of manner contrast shown in the target clip and the variant clip ("twirl–roll," "twirl–jump," "twirl–slide," "jump–slide," "jump–roll," "slide–roll"), and order of presentation of items ("forward," "back").

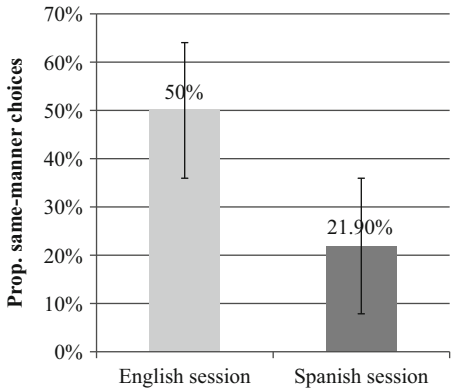


Fig. 11.2 Mean proportion of same-manner choices in English and Spanish sessions (with standard error bars)

Our results (Table 11.1) show that Spanish–English bilinguals describing a motion event in English selected the event that has the same manner of motion as the target scene, significantly more often than bilinguals describing the event in Spanish ($ß = 2.50$, $Z = 2.42$, $p < 0.05$). A likelihood ratio test confirmed the significant effect of language. Although the direction of motion and the "twirl versus roll" manner contrast approach significance, likelihood ratio tests reveal that neither direction nor any of the other variables contribute significantly to the model.

We also inspected the same-manner choices in individual speakers (Table 11.2). In the Spanish sessions, only two bilingual speakers gave same-manner choices more

Table 11.1 Effect of language on "same-path" versus "same-manner" choices in Spanish–English bilinguals

	Estimate	Standard error	Z value	p value
(Intercept)	− 0.80	1.28	− 0.62	0.53
Language: Spanish	2.50	1.03	2.42	0.02*
Order: forward	− 0.72	1.02	− 0.70	0.48
Manner contrast: twirl versus roll	2.44	1.30	1.88	0.06
Manner contrast: twirl versus slide	1.81	1.29	1.40	0.16
Manner contrast: jump versus roll	1.93	1.29	1.50	0.13
Manner contrast: jump versus slide	2.04	1.28	1.59	0.11
Manner contrast: roll versus slide	0.24	0.91	0.27	0.79
Direction: right	− 0.88	0.46	− 1.93	0.05
Ground: tree_rock	− 0.47	0.43	− 1.11	0.27
Manner_JUMP	− 0.43	0.74	− 0.58	0.56
Manner_ROLL	0.18	0.78	0.23	0.82
Manner_SLIDE	1.12	0.78	1.44	0.15

$*p < 0.05$

Table 11.2 Mean proportion of same-manner choices in percentage for 24 bilingual speakers in English and Spanish sessions (Italicized numbers indicate greater than or equal to chance level 50%)

English session (%)		Spanish session (%)	
E01	0.0	S01	0.0
E02	12.5	S02	0.0
E03	12.5	S03	0.0
E04	12.5	S04	0.0
E05	25.0	S05	0.0
E06	25.0	S06	25.0
E07	*50.0*	S07	25.0
E08	*75.0*	S08	25.0
E09	*87.5*	S09	25.0
E10	*100.0*	S10	25.0
E11	*100.0*	S11	*50.0*
E12	*100.0*	S12	*87.5*

E English session, *S* Spanish

than 50 % of the trials and five speakers never gave same-manner choices (Table 11.2, column 4). In the English sessions, six bilingual speakers provided same-manner choices more than 50 % of the trials and only one speaker avoided same-manner choices altogether (Table 11.2).

11.7 General Discussion

Our study investigates thinking-for-speaking effects in bilingual speakers of languages that differ in their linguistic packaging of motion event components. Our participants verbally encoded the motion events in either Spanish or English before they performed the nonlinguistic similarity judgment task. We found that the language the bilingual speakers used to describe motion events influenced the dimension of motion they selected as relevant for the purposes of judging similarity between two motion events. Bilingual speakers tested in English tended to select the motion events that had the same manner of motion as the motion events in the target clips. Bilingual speakers tested in Spanish selected motion events that matched the path of motion in the target clips. Further, the type of event description that speakers heard and repeated (atelic descriptions corresponding to the ground locations "tree and rock" versus telic, boundary-crossing descriptions corresponding to "hut and cave") did not play a role in their subsequent judgments of event similarity. There were two interesting trends: the direction of motion and the "twirl versus roll" manner contrast that approached significance. It is likely that left–right directional axis of motion on the horizontal plane is highly salient as it is aligned with the left–right axis in the egocentric frame of reference (Levinson 1996). Changes along this axis may draw

more attention than other changes, e.g., the source and goal objects involved ("hut-cave" versus "tree-rock"). The "twirl versus roll" manner contrast is also likely to be prominent, involving rotation of the object around its own axis: either vertical or horizontal (combined with translational motion along the horizontal axis). However, these are post hoc speculations as to the relatively greater prominence of certain geometrical configurations and need to be explored further in a systematic manner.

Our findings demonstrate that speakers of verb-framed versus satellite-framed languages not only differ in how flexibly they combine manner verbs with path phrases, but that, such differences correlate with the dimension of motion to which they attend subsequent to verbal encoding in one language or the other. Our finding that fluent bilinguals shift their event construal depending on the language of verbal encoding suggests that, at least for the purposes of thinking-for-speaking, bilinguals do not rely on a single semantic representation that is associated with either one of their languages or one that constitutes an "intermediate" semantic representation between both languages. Rather, different language-specific event construals come into play during the process of language production, suggesting the availability of multiple "thinking-for-speaking" modes in the bilingual speaker.

Our findings also contribute to the ongoing debate on the interaction between language and thought. Prior research has distinguished between conceptualization as independent of language (the universal view), language based (the Whorfian view), or language oriented (the thinking-for-speaking view; von Stutterheim and Nüse 2003). Our bilingual speakers oriented towards the different aspects of motion events based on the language in use, suggesting that conceptualization for production is oriented by language principles, supporting the intermediate thinking-for-speaking view. In our study, we required our speakers to verbally encode the events; investigation of motion event construal without prior encoding is required to adequately evaluate the universalist and language-based perspectives.

One question that arises in this respect is whether speakers are influenced by the encoding of the motion events in the experimental task or whether they are influenced by overall biases to construe motion events in language-specific ways based on their experience of habitual patterns of encoding in the two languages (see also Gennari et al. 2002). Here, the distinction between telic and atelic event descriptions is relevant. In our study, Spanish speakers heard and repeated descriptions in which the manner information was expressed in a gerundial phrase irrespective of the telicity of the event ("went towards the rock, rolling" or "entered the cave, rolling"). If their overall experience with the patterns in the language played an influential role in their similarity judgments rather than their immediate experience with the linguistic patterns that they produced for the experience, we would expect Spanish speakers to pattern more like English speakers for the "tree-rock" events where they heard atelic event descriptions. This prediction has to do with the fact that Spanish allows manner verbs to combine with path phrases that are atelic ("rolled towards the rock")—a pattern that is similar to the one in English. But we found no differences in similarity

judgments based on the telicity of the event description.[2] That is, Spanish speakers were not more likely to make same-manner choices for the scenes accompanied by atelic event descriptions. The fact that we found no differences corresponding to choice of ground location (and event description) suggests that the particular syntactic encoding patterns used in the experiment are involved in influencing event construal rather than an overall bias. However, this conclusion must be a speculative one at the current time, since we do not know whether the combination of manner verbs with atelic path phrases is a frequent, habitual encoding pattern in Spanish in ways that are comparable to English. If it is indeed the case that the specific syntactic patterns used in the experiment influence event construal rather than biases learned over a lifetime of exposure to the language, then it should be possible to induce greater attention to manner (versus path) of motion in Spanish speakers and vice versa in English speakers by manipulating the linguistic constructions employed during the experiment. For instance, since Spanish manner verbs can be combined with directional prepositional phrases (e.g., *La botella flotó hacia la cueva* "the bottle floated towards the cave," Aske 1989) and path verbs can be used in motion expressions in English (e.g., *The bottle approached the cave, floating*), speakers could be asked to produce atelic descriptions in Spanish with manner-of-motion main verbs, or corresponding descriptions in English with path-of-motion main verbs prior to participating in the similarity judgment task. Such a manipulation would allow us to examine how lexicalization of information in the main verb influences thinking-for-speaking independently of typological differences in overall patterns of motion event encoding.[3]

In conjunction with prior work, our study also provides psycholinguistic evidence that the thinking-for-speaking effect is robust, despite differences in verbal encoding methods (Billman and Krych 1998; Gennari et al. 2002; Papafragou et al. 2008). Billman et al. had their participants simply listen to the event descriptions. This can be viewed as a method of comprehension with imitation, a weak imprint of motion verb difference onto the mind. Gennari et al. had their participants use a short phrase with a single verb rather than using several verbs that encoded different subevents of the motion event. This can be viewed as a method using production together with linguistic awareness. Papafragou et al. had their participants freely inspect and describe the events. This can be viewed as a natural reminder of the daily experience to participants, which may be less controlled because different descriptions may give rise to different theoretical reasons why such an effect exists. The present study had the participants repeat predesigned event descriptions, a way to ensure that the verbal encoding is linguistically matched across subjects. The same components of motion (path and manner) were mentioned by all participants, and the types and frequency of the use of manner verbs (as main verbs or gerunds) were the same across participants.

[2] English speakers are not predicted to differ in their similarity judgments based on whether they heard telic versus atelic descriptions because telicity does not influence the ability of manner verbs to combine with path phrases in English to the extent that it does in Spanish.

[3] We thank one of the anonymous reviewers for pointing out this possibility.

Because participants were provided with the linguistically encoded message that they simply had to repeat, the depth of processing involved in the verbal encoding is arguably shallower than when natural generation of motion event descriptions is required, which may require greater focus on the meaning of the message (cf. Erlam 2006). The fact that all four studies found the effect of verbal encoding demonstrates the profound impact of such encoding. A theoretically interesting question is what the nature of such thinking-for-speaking effect is. We suspect that the nature of thinking-for-speaking may have to do with the first phase of short-term memory—the phonological loop (Baddeley and Hitch 1974). The proposed function of the phonological loop is that by providing an articulatory rehearsal component, memory traces that decay rapidly can be slowed down or revived. It is likely that verbal encoding helps the mind hold on to the event information, and depending on how those motion events are linguistically packaged, some components (e.g., manner information in English and path information in Spanish) are made more prominent and therefore are decayed slower. Or, it is likely that information in the verb is more likely to be prominent and retained in the short-term memory than information in an adverbial phrase. Those prominent aspects could then be used and influence the similarity judgment task.

A further contribution of our study lies in its demonstration of the influence of verb-specific representations on thinking-for-speaking. Whereas, both English-speaking and Spanish-speaking participants in our study described both the path and manner of motion in the video clips that they viewed, it was the semantic information encoded in the main verb, rather than in the prepositional or adverbial phrases, that influenced participants' subsequent performance in the similarity judgment task. Further research is required to examine whether aspects of information encoding other than syntactic packaging also influence thinking-for-speaking. For instance, although the experimenters read out the motion event descriptions to the participants using intonation and emphasis that was as consistent as possible, it is possible that subtle variations in their production may have also influenced participants' behavior.[4] Systematic manipulation of these variables will allow us to examine the contribution of prosody to event construal.

A possible future line of research is to examine the variable of language proficiency. In our study, we controlled for proficiency by having our bilingual speakers fill out a detailed language background questionnaire. Though the majority of our speakers self-reported that they started speaking both English and Spanish before the age of seven, they continue to use both languages, and have stayed in the USA for a long period of time; additional information (e.g., amount of interaction speakers have with both language communities) will provide us with more precise measures of proficiency. As discussed earlier, previous studies on language effect in bilingual and advanced second-language learners suggest that proficiency is a factor influencing speakers' mental construal for events, time, and object classification. Investigating

[4] We thank one of the anonymous reviewers for pointing out this possibility.

the interaction between levels of proficiency in multiple languages and the availability of more than mode of event construal will provide us with deeper insights into the nature of the "thinking-for-speaking" effect.

Acknowledgments We thank the editors of the volume and two anonymous reviewers for their valuable comments. We also thank the members of the Language, Cognition and Development Lab at the University of Colorado, Boulder, for their feedback and the research assistants Anwen Fredriksen and Elizabeth Saade for their help in running the experiments.

References

Aske, J. (1989). Path predicates in English and Spanish: A closer look. In K. Hall, M. Meacham, & R. Shapiro (Eds.), *Proceedings of the fifteenth annual meeting of the Berkeley linguistics societ*y (pp. 1–14). Berkeley: Berkeley Linguistics Society.

Athanasopolous, P. (2007). Interaction between grammatical categories and cognition in bilinguals: The role of proficiency, cultural immersion, and language of instruction. *Language and Cognitive Processes, 22,* 689–699.

Baayen, H. (2008). *Analyzing linguistic data: A practical introduction to statistics using R*. New York: Cambridge University Press.

Baddeley, A. D., & Hitch, G. (1974). Working memory. In G. H. Bower (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 8) (pp. 47–89). New York: Academic.

Beck, S., & Snyder, W. (2001). Complex predicates and goal PP's: Evidence for a semantic parameter. In A. H.-J. Do, L. Dominguez, & A. Johansen (Eds.), *Proceedings of the 25th Boston University Conference on Language Development* (pp. 114–122). Somerville: Cascadilla Press.

Berlin, B., & Kay, P. (1969). *Basic color terms: Their universality and evolution*. Berkeley: University of California Press.

Billman, D., & Krych, M. (1998). Path and manner verbs in action: Effects of "skipping" or "existing" on event memory. *Proceedings of the Cognitive Science Society, 20,* 156–161.

Billman, D., Swilley, A., & Krych, M. (2000). Path and manner priming: Verb production and event recognition. *Proceedings of the Cognitive Science Society, 22,* 615–620.

Bohnemeyer, J., Eisenbeiss, S., & Narasimhan, B. (2001). Event Triads. In S. C. Levinson & N. Enfield (Eds.), *Manual for the field season 2001* (pp. 100–114). Nijmegen: Max Planck Institute for Psycholinguistics.

Bohnemeyer, J., Eisenbeiss, S., & Narasimhan, B. (2006). Ways to go: Methodological considerations in Whorfian studies on motion events. *Essex Research Reports in Linguistics, 50,* 1–20.

Boroditsky, L. (2001). Does language shape thought? English and Mandarin speakers' conceptions of time. *Cognitive Psychology, 43,* 1–22.

Brown, A., & Gullberg, M. (2008). Bidirectional crosslinguistic influence in L1-L2 encoding of Manner in speech and gesture: A study of Japanese speakers of English. *Studies in Second Language Acquisition, 30,* 225–251.

Cook, V. J., Bassetti, B., Kasai, C., Sasaki, M., & Takahashi, J. A. (2006). Do bilinguals have different concepts? The case of shape and material in Japanese L2 users of English. *International Journal of Bilingualism, 10,* 137–152.

Erlam, R. (2006). Elicited imitation as a measure of L2 implicit knowledge: An empirical validation study. *Applied Linguistics, 27,* 464–491.

Finkbeiner, M., Nicol, J., Greth, D., & Nakamura, K. (2002). The role of language in memory for actions. *Journal of Psycholinguistic Research, 31,* 447–457.

Gennari, S. P., Sloman, S. A., Malt, B. C., & Fitch, W. T. (2002). Motion events in language and cognition. *Cognition, 83,* 49–79.

Gentner, D., Imai, M., & Boroditsky, L. (2002). As time goes by: Evidence for two systems in processing space time metaphors. *Language & Cognitive Processes, 17,* 537–565.

Gullberg, M. (2011). Thinking, speaking, and gesturing about motion in more than one language. In Pavlenko A. (Ed.) *Thinking and speaking in two languages* (pp. 143-169). Multilingual Matters.

Gullberg, M., & Indefrey, P. (2003). *Language background questionnaire. Developed in the dynamics of multilingual processing*. Nijmegen, Max Planck Institute for Psycholinguistics.

Heider, E. R. (1972). Universals in color naming and memory. *Journal of Experimental Psychology, 93,* 10–20.

Imai, M., & Gentner, D. (1997). A crosslinguistic study of early word meaning: Universal ontology and linguistic influence. *Cognition, 62,* 169–200.

Kita, S., & Özyürek, A. (2003). What does cross-linguistic variation in semantic coordination of speech and gesture reveal? Evidence for an interface representation of spatial thinking and speaking. *Journal of Memory and Language, 48,* 16–32.

Lai, V. T. (2002). *The Processing of Temporal Perspectives in Mandarin Chinese*. Unpublished MA thesis.

Lai, V. T. (2005). Language experience influences in the conceptualization of time metaphor. *Proceedings of the II Conference on Metaphor in Language and Thought* (pp. 1–16) Rio de Janeiro: Universidade Federal Fluminense.

Levelt, W. J. M. (1996). Perspective taking and ellipsis in spatial descriptions. In P. Bloom, M. A. Peterson, M. F. Garrett, & L. Nadels (Eds.), *Language and space* (pp. 77–107). Cambridge: MIT Press.

Levin, B., & Rapoport, T. (1988). Lexical subordination. *Papers from the Twenty Fourth Regional Meeting*, *Chicago Linguistic Society* (pp. 275–289). Chicago: University of Chicago Press.

Levin, B., & Rappaport Hovav, M. (1999). Two structures for compositionally derived events. Proceedings of SALT 9, Cornell Linguistics Circle Publications, Cornell University, Ithaca, NY, pp. 199-223.

Levin, B., & Rappaport Hovav, M. (1995). *Unaccusativity: At the syntax–lexical semantics interface*. Cambridge: MIT Press.

Levinson, S. C. (1996). Relativity and spatial conception and description. In J. J. Gumperz & S. C. Levinson (Eds.), *Rethinking linguistic relativity* (pp. 177–202). Cambridge: Cambridge University Press.

Levinson, S. C., Kita, S., Haun, D. B. M., & Rasch, B. H. (2002). Returning the tables: Language affects spatial reasoning. *Cognition, 84,* 155–188.

Li, P., & Gleitman, L. (2002). Turning the tables: Language and spatial reasoning. *Cognition, 83,* 265–294.

Loftus, E., & Palmer, J. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior, 13,* 585–589.

Lucy, J. A. (1996). The scope of linguistic relativity: An analysis and review of empirical research. In J. J. Gumperz & S. C. Levinson (Eds.), *Rethinking linguistic relativity. Studies in the social and cultural foundations of language, No. 17.* (pp. 37–69). Cambridge: Cambridge University Press.

McGlone, M. S., & Harding, J. L. (1998). Back (or forward?) to the future: The role of perspective in temporal language comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 24,* 1211–1223.

Narasimhan, B. (2003). Motion events and the lexicon: The case of Hindi. *Lingua, 113*(2), 123–160.

Papafragou, A., Massey, C., & Gleitman, L. (2002). Shake, rattle, 'n' roll: The representation of motion in language and cognition. *Cognition, 84,* 189–219.

Papafragou, A., Hulbert, J. C., & Trueswell, J. (2008). Does language guide event perception? Evidence from eye movements. *Cognition, 108,* 155–184.

Pederson, E. (1995). Language as context, language as means: Spatial cognition and habitual language use. *Cognitive Linguistics, 6,* 33–62.

Pederson, E., Danziger, E., Wilkins, D., Levinson, S., Kita, S., & Senft, G. (1998). Semantic typology and spatial conceptualization. *Language, 74,* 557–589.

Slobin, D. I. (1987). Thinking for speaking. Proceedings of the thirteenth annual meeting of the Berkeley linguistics society (pp. 435–444), Berkeley Linguistics Society, Berkeley.

Slobin, D. I. (1996a). From "thought and language" to "thinking to speaking". In J. J. Gumperz & S. C. Levinson (Eds.), *Rethinking linguistic relativity* (pp. 70–96). Cambridge: Cambridge University Press.

Slobin, D. I. (1996b). Two ways to travel: Verbs of motion in English and Spanish. In M. S. Shibatani & S. A. Thompson (Eds.), *Grammatical constructions: Their form and meaning* (pp. 195–220). Oxford: Clarendon Press.

Slobin, D. I., & Hoiting, N. (1994). Reference to movement in spoken and signed languages: Typological considerations. Proceedings of the twentieth annual meeting of the Berkeley linguistic society (pp. 487–505), Berkeley Linguistics Society, Berkeley.

von Stutterheim, C., & Nüse, R. (2003). Processes of conceptualization in language production: Language-specific perspectives and event construal. *Linguistics, 41,* 851–881.

Talmy, L. (1985). Lexicalization patterns: Semantic structure in lexical forms. In T. Shopen (Ed.), *Language typology and syntactic description 3: Grammatical categories and the lexicon* (pp. 57–149). Cambridge: Cambridge University Press.

Talmy, L. (2000). *Toward a cognitive semantics: Typology and process in concept structuring* (pp. 21–146). Cambridge: MIT Press.

Talmy, L. (2007). Lexical typologies. In T. Shopen (Ed.), *Language typology and syntactic description volume 3, grammatical categories and the lexicon* (pp. 166–168). Cambridge: Cambridge University Press.

Whorf, B. L. (1956). *Language, thought, and reality*. Boston: MIT Press.

Wilkins, D. P. & Hill, D. (1995). When GO means COME: Questioning the basicness of basic motion verbs. *Cognitive Linguistics, 6,* 209–259.

Zubizarreta, M. L & Oh, E. (2007). *On the syntactic composition of manner and motion*. Cambridge: MIT Press.