SPACE AND LANGUAGE TYPOLOGY:

ENCODING MOTION ACROSS LANGUAGES

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Abstract

Linguistic systems encode spatial information in strikingly different ways. Talmy (2000) classified languages into two families depending on whether they are *verb-framed* (e.g. Romance) vs. *satellite-framed* (e.g. Germanic). However, some languages seem harder to fit into these two categories, e.g. serial-verb languages have been described as 'equipollent' systems (Slobin 2004), other languages as 'parallel' systems. In addition, languages within a given family differ in important respects that may have some implications for typology. The present study examines descriptions of motion events that were elicited in controlled situations across several languages (English, French, Russian, Chinese, Greek) in order to discuss appropriate typological classification for these languages. Results show that the locus of Path information is only one dimension to be taken into account for a proper typological classification of languages and suggest that the typological status of languages should be seen as part of a continuum rather than in terms of a dichotomy.

1. Introduction

Although human spatial cognition is traditionally described as universal, linguistic systems encode spatial information in strikingly different ways. This variability includes asymmetries in the salience of different information components (e.g. Path and Manner for motion events) as a result of the typical structures in which they are encoded (e.g. lexical or grammatical). This paradox raises fundamental questions for language typology which have further implications for researchers who investigate the relationship between language and cognition. More precisely, linguistic diversity has revived questions about whether and how language may affect our construal of events and provide a window onto the cognitive processes that may underlie this conceptualization process.

Our aim here is to investigate typologically different languages in order to contribute to these debates. We first discuss previous typological work that focused on cross-linguistic diversity in the expression of motion (Section 1.1) and revisit some specific typological issues with particular attention to five languages: French, English, Russian, Chinese, Greek (Section 1.2). On this basis, we propose a number of hypotheses concerning how native speakers of this language should choose to express motion events most frequently in a broad cross-linguistic perspective (Section 1.3). We then present the experimental framework of our study (Section 2) and the results that emerged from it (Section 3). The discussion leads to some tentative conclusions that point to future research directions bringing together typological and cognitive implications in the broader context of the debates concerning the language-thought interface (Section 4).

1.1 Motion across languages and theories

Talmy's typology

Modern lexical-typological research concerning the expression of motion is currently most often associated with the lexicalization typology proposed by Leonard Talmy (1985, 2000, 2009). It should be noted at the outset that this proposal was foreshadowed by earlier writings that had made similar observations in one or several languages (particularly Germanic vs. Romance) and formulated some conclusions concerning the mechanisms of conceptualization in human languages, with particular attention to the expression of motion events (Bergh, 1948; Vinay & Darbelnet, 1958; Tesnière, 1959; Wandruszka, 1971). However, Talmy has provided the most complete account of these phenomena that systematizes the semantics of motion on the basis of a very wide survey of linguistic systems across the world. He first observed that languages typically conflate *Motion* with different components of motion events, e.g. with the *Manner* of motion in English but with its *Path* in Spanish, as in (1) and (2).

(1) The bottle floated into the cave.

(2) *La botella entró a la cueva (flotando)*

'The bottle entered the cave (floating).'

Talmy's recent framework (2000, 2009) further classifies constructions that describe motion according to whether they lexicalize *Path* in verbs or in *satellites* (or possibly in both), defining satellites as "the grammatical category of any constituent other than a noun-phrase or prepositional phrase complement that is in a sister relation to the verb root." Examples include verb particles (as in English), verb prefixes (as in Latin, Russian, Greek, German), verb complements (as in Chinese), incorporated nouns (as in Caddo, e.g. 'water-enter'), and affixes (as in Atsugewi). Most importantly for our purposes here, Talmy proposes a major distinction

between two types of languages. *Satellite-framed* languages (e.g. Germanic) lexicalize the *Manner* of motion in the verb (e.g. *to run, to crawl, to fly…*), using particles or prepositions (e.g., *in(to), across, away, up/down…*) to express *Path* within one compact structure, e.g. (3). In contrast, *verb-framed* languages (e.g. Romance) lexicalize *Path* in the verb stem (e.g., *entrer* 'to enter', *traverser* 'to cross', *partir* 'to leave', *monter/descendre* 'to ascend/descend'…), leaving *Manner* information implicit or placing it at the periphery of the sentence, for instance by means of gerunds (e.g., *en courant* 'by running') or of adverbials (e.g., *à quatre pattes* 'on all fours'), e.g. (4).[1]

    (3) a.   *He*   *ran*   *into*   *the house /*   *He ran in.*

 b. *He*   *crawled*   *across*   *the street /* *He crawled across.*

        Figure   Manner   Path   Ground

    (4) a.   *Il*   *est entré*   *dans la maison* *en courant.*

              Figure   Path   Ground   Manner

              (Lit. 'He entered at the house by running.')

      b.   *Il*   *a traversé*   *la rue*   *à quatre pattes.*

              Figure   Path   Ground   Manner

           (Lit. 'He crossed the street on all fours.')

Slobin's 'Thinking for Speaking' hypothesis

Taking Talmy's typology as a starting point, Slobin (1996a, 2004) examined the expression of motion in controlled narrative productions elicited in 21 languages.[2] As predicted, speakers of V-framed languages express Path in verbs and provide less detail about Manner, while

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[1] Some exceptions to this pattern occur, e.g. remnants of satellite-like verbal prefixes from Old French (see Kopecka, 2006).

[2] Narratives are based on a wordless picture book entitled *Frog, where are you ?* (Mayer, 1969) which has been since used in numerous studies of narrative discourse and development across different languages.

speakers of S-framed languages use a large variety of Manner verbs frequently combined with one or more satellites expressing Path. Slobin (1996b) further probed into the cognitive implications of such differences and put forth a 'thinking for speaking' hypothesis according to which speakers of different languages should not attend to different components of motion events (*Path, Manner*, *Figure*, *Ground*) to the same extent because their language does not make them equally salient.

More precisely, speakers seem to differentially attend to two types of components: those that can be perceived and are 'objectively' always present in the event (for ex. *Path*), which have consequences for dealing with the external world, and those that are linguistically 'subjective' and relevant to the event but cannot be read off as easily from the perceived event (e.g., distinctions pertaining to *Manner*, *Aspect*, *Definiteness*, *Voice*). Talmy's typology is about the way 'objective' aspects of a motion event are encoded (lexicalization of Path criterion). The latter more 'subjective' distinctions correspond to categories that are obligatorily marked in the language but may not be as accessible in our non-linguistic representations as function of our native language because, when communicating, we construe situations in terms of those dimensions that are most privileged in our own language. Several experimental studies have confirmed the existence of differences in how speakers encode *Manner* and *Path* components across languages (Choi & Bowerman, 1991; Slobin, 1991, 1996a, b, 2004, 2006; Hickmann, et al. 2009) and have suggested that these cross-linguistic differences are already in place during very early stages of acquisition (Berman & Slobin, 1994; Naigles et al., 1998; Bowerman & Choi, 2003; Allen et al., 2007).

Previous studies (e.g. Zlatev & Yanklang, 2004) further show that languages differ along multiple parameters: (a) the core schema of the 'objective' aspects of motion, (b) the presence or absence of co-event adverbials, (c) boundary-crossing constraints, (d) the number of Path segments per clause, (e) the relative diversity and frequency of Manner verbs, (f) ground

specification, (g) event granularity across clauses, and (h) the expression of scene setting. This multidimensional set of factors leads Slobin (2004) to reject Talmy's dual distinction as such and to propose revisions to this typology in order to take into account differential patterns concerning all of the above parameters. Thus, he proposes a third class of *equipollently-framed languages* (Slobin 2004) that include several types of languages: languages with serial verb constructions (e.g., Thai, Mandarin Chinese) in which a Manner verb is often expressed together with a Path verb, languages with bipartite verb constructions (e.g., Algonquian and Hokan), and languages with Manner preverb + Path preverb + verb (e.g., Jaminjungan languages).

There are two ways to envisage Talmy's typology: either it is about the locus of Path information, which can be expressed in the verb (V) or in satellites (S); or it is about what is or is not characteristically encoded in descriptions of motion events (e.g., Manner). In its simplest form, the first approach tends to impose discrete distinctions, simply localizing Path in V or in S. The second approach is more flexible and leaves room for gradual distinctions. Since Manner of motion is typically missing from motion descriptions in V-framed languages but typically co-expressed in S-framed languages, Slobin proposes that languages be put on *a cline of Manner salience* ranging from languages with *low* vs. *high Manner salience*. In the former case, a slot is available for Manner, which is expressed for example in the main verb in S-languages, in the first element of serial-verb constructions in languages such as Chinese, in Manner morphemes such as in verbs, coverbs or ideophones in bipartite languages. In the latter case, Manner is subordinated to Path or left out altogether.

1.2 Revisiting Typology

In order to examine Talmy's dichotomy in light of Slobin's proposed cline, the present study focuses on a number of languages some of which present predominant V-framing vs. S-framing properties (French vs. English or Russian, respectively), although some notable differences exist within a given type (e.g., English vs. Russian), while others present more complex patterns that do not fit as easily into these two language types (Chinese, Greek). We begin with a brief summary of key properties of Russian, Chinese and Greek which will then be compared to French and English in our analyses below.

Russian

Russian is considered to be a clear S-framed language in which the main verb or verb stem typically expresses Manner and satellites express Path. Generally, satellites in Russian take the form of verbal prefixes that are typically combined with verbs roots (one prefix attached to one verb stem).[3] As a result, if Russian speakers want to describe a series of different Paths which all pertain to one Manner, they have to add separate Path elements (e.g. verbs or prepositions) to the prefix-verb complex. Earlier studies of Russian (Slobin 2005, using translations of Tolkien's Hobbit) have shown that Manner information is highly salient and very frequently expressed together with Path information by even more types of Manner verbs in this language as compared to English. Unlike English and some other S-languages, however, Path can be expressed not only in prefixes but also in Path verbs, such as those concerning vertical motion, that are frequently used in additional clauses. Thus, Russian provides different solutions to represent motion, only some of which are similar to satellite-framed languages, while others are more similar to verb-framed languages. In addition, Russian differs from English in that its prefixes not only express spatial information, but also

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[3] Two prefixes may be attached to a single verbal root, but the first one expresses non-spatial information (e.g. the prefix *po-* distributes sub-events of a complex event in *Po-pere-delat'* 'to do many things one after the other'). Double prefixation did not occur in our corpora.

aspectual information (Fontaine, 1983; Krongauz, 1998; Veyrenc, 1980). Although spatial representation in English can contribute to structuring temporal-aspectual information, both Russian prefixes and verbs make a strong contribution to the encoding of aspect. For example, prefixes contribute to the marking of temporal boundaries and their properties interact with verb semantics, including in relation to motion verbs the inherent content of which comprises information about both Manner and directionality or goal-orientation (e.g. *lezt'* [Manner-climb/Path-dir] 'climb in some direction and/or towards some goal'). Our hypothesis was that the above differences in the functions may lead to a difference in the patterns of use of both verbs and satellites across Russian and English.

Chinese

Talmy's typology views Chinese as a satellite-framed language. Chinese typically expresses motion with serial verbs constructions in which the first element expresses Manner of motion, while the second and third elements express Path information as in example (5). According to Talmy, the second and third elements are akin to satellites, as indicated in the translation (5a), as they form a closed class (only seven of which can be in second position and only two in final position) and express the same types of Path information as English satellites (up, down, across, into, etc.). However, as suggested by Ji (2009), one could argue that the second/third elements are verbs rather than satellites, as indicated in the translation (5b). In this respect, note that Chinese has very little morphology that would allow a clear categorization of these elements into different word classes (as verbs or satellites). Arguments supporting the latter point of view are that these elements can and do frequently occur on their own as separate main verbs, as illustrated in (6). Contrary to English Path verbs, such verbs also do not have any stilted feeling attached to them and are very frequent in everyday speech. Given the

unclear status of the second/third elements, Slobin proposes to view Chinese as an equipollent language in which Path and Manner are expressed by elements of equal status.

(5) Xiao haizi   pa-guo-le   malu

   a. Little child *crawl across* LE   road.

   b. Little child *crawl-cross* LE   road.

(6) Xiao haizi   *guo* LE   malu

   Little child   *cross* LE   road.

Greek

For some authors, Greek is a clear verb-framed language (Papafragou et al., 2006; Selimis, 2007). However, Talmy (2000) views Greek as a *parallel* system of conflation that can equally manifest structures of both V- and S-languages. According to this view, Greek speakers can switch to either system as follows: using a V-pattern, they can lexicalise Path in a bare verb[4] leaving Manner implicit or peripheral, as in (7); using an S-pattern, they can also express Manner in non-bare verbs followed by additional spatial adverbials and locative or directional elements that are equivalent to English Path satellites, as in (8). Yet a further sub-pattern exists within Greek as a result of verbal prefixes that share properties of satellites in S-framed languages, as illustrated in (9). Although such examples are interpreted in the literature as being similar to (7), they differ from them in that the verbal complex can be decomposed into a prefix expressing Path and a verb root expressing Manner and/or sheer motion (the verb *veno* 'to walk, to go').[5] Such examples, then, may provide evidence for an

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[4] We distinguish non-bare verbs which are accompanied by locative or directional elements from bare verbs which lack such arguments (Engberg-Pedersen & Trondhjem, 2004; Slobin, 1996b).

[5] The verb *veno* encodes Manner (roughly 'to walk') although it becomes a 'lighter' verb (roughly unmarked 'to go') when combined with a Path prefix and when the prefix-verb complex is accompanied by additional Manner elements in the periphery (eg. *trehontas* 'running', see example 9).

additional prefixed S-framed sub-system in Greek that may influence how native speakers describe motion events.

(7)   V-framed pattern

Efyge   trehontas   (pros ta pano)

Path   Manner   Path

Left   running   (to-upwards)

'He left running upwards'

(8)   S-framed pattern

Etrekse   mesa   s-to spiti

Manner Path

Ran   into   to-the house'

'He ran into the house'

(9)   S-framed prefixed pattern

Anevike trehontas

Ana[prefix]-veno[Manner V-root] treho[Manner V-gerund]

Path   Manner/Motion   Manner

up-walked/went   running

'He ascended running'

1.3 Rationale: Hypotheses and predictions

The present study analyses verbal responses about motion events that were elicited in a controlled experimental situation from speakers of French, English, Russian, Chinese and Greek in order to determine the extent to which and the ways in which language properties might influence how speakers perform the same task.

Some specific predictions were made. First, all language groups were expected to represent Path information as frequently, regardless of the means used to do so, but cross-linguistic differences were expected with respect to whether and how they would express Manner information. Thus, it was expected that speakers should add *Manner* more frequently in their language was S-framed (English, Russian) than if it was V-framed (French). For example, English descriptions should contain *Manner* verbs combined with other devices marking *Path* (such as Path particles), whereas those in French should mostly contain *Path* verbs but fewer other devices and/or less expression of Manner. Second, the existence of a system of prefixes in Russian led to the additional prediction that some differences should nonetheless occur between English and Russian. In particular, Russian should show a pattern that is intermediate between English and French as one cannot combine one Manner or Manner+Path verb with multiple markings of Path, so that Path elements, including Path verbs, should occur more frequently than in English. Finally, detailed analyses of Chinese and Greek aimed at contributing to debates concerning the typological status of these languages. For Chinese the aim was to determine the role of complex verb constructions with respect to its V- vs. S-framed properties. For Greek the aim was to examine several proposals concerning its status as a clear *V-framed* system, as a parallel V- and S-framed system, and/or as a language that comprises an *S-framed prefixed* sub-system in addition to V- and basic S-framed properties.

2. Method

2.1 Participants

The study included a total of 60 native speakers of each of the languages examined (12 for French, 12 for English, 12 for Chinese, 14 for Greek, 10 for Russian). All participants were above 18 years of age and had no reported deficit of any kind. They were asked to fill out a sociolinguistic questionnaire the aim of which was to ensure that they could be considered as 'monolinguals' according to several criteria (for example, no substantial knowledge of another language and no stay in another country for longer than six months).

2.2 Materials and procedure

The materials in all language groups comprised a set of 12 stimuli that showed voluntary motion events. These stimuli consisted of animated drawings showing characters (humans and animals in diverse settings) performing displacements in different Manners (e.g., walking, swimming, climbing) along three types of Paths (up, down, across) (cf. Hickmann et al. 2009).[6] A second set of stimuli was also used with all participants, this time focusing on caused motion events. In these stimuli, an agent performed an action that caused (by *pulling* or *pushing*) the motion of an object in two different Manners (*rolling* or *sliding*) and along four different Paths (*up, down, into* and *across*) (cf. Hendriks et al., 2008; Hickmann & Hendriks, 2010). This second set of stimuli will only be discussed below in relation to the Chinese data, since substantially different results across voluntary vs. caused motion only emerged in this language.

Participants were seen individually in a quiet room. They were shown the stimuli one by one and asked to tell "what happened" to a naive interlocutor. The task began with a training item that served to familiarize the subjects with the task before the actual testing started.

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[6] Up/down events were both presented successively within a given item (e.g. a bear climbing up then down a tree), except for Greek participants who saw a slightly different version in which each scenario was split into two separate items (one for 'up' and one for 'down').

2.3 Coding and analysis

Our general prediction was that speakers should produce structures that are based on the features of their language and therefore that they should focus to different extents on Manner information. More specifically, analyses examined two aspects of the responses: the types of information selected for expression (*focus*) and the means whereby this information was expressed (*locus*). For this purpose, all responses were coded with respect to any element that provided Manner and/or Path information, specifically main verb roots and any other device outside of the verb, such as verbal prefixes, particles, prepositions, adverbials (hereafter *verbs* vs. *other devices*). Responses in all languages were thereby grouped into four types depending on their focus, i.e. depending on whether they expressed only Manner (M-responses), only Path (P-responses), both types of information (MP-responses) or neither (rare 0-responses).[7] And in each case they were analyzed as to the locus of this information, i.e. whether Manner and/or Path were expressed in verb roots vs. other devices.

For Russian particular attention was placed on prefixes that could be defined as productive in relation to autonomous verb stems (for more details, see Iakovleva, in preparation). For Chinese and Greek, additional coding procedures were followed. In both cases, given the properties of these languages and the questions addressed about them, a double coding was performed in order to provide the most "neutral" analyses of these corpora. In Chinese (see Ji, 2009), the second and third elements in serial verb constructions were coded once as verbs and once as satellites, as illustrated in (10) with *shang* ('ascend' or 'up').

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[7] Rare 0-responses included static utterances as well as uses of neutral motion verbs such as English *go* alone or only with a general location.

(10) *Xiao ren pao-**shang**-le shan qu*

Xiao ren	pao	**shang**-LE	shan	
Little guy	run [V-Manner]	ascend [V-Path]-ASP	hill	(V-coding)
Little guy	run [V-Manner]	up [Sat-Path]-ASP	hill	(S-coding)

In Greek (see Soroli, 2010, in preparation), the V-coding did not differentiate prefixed and plain verb forms, while the S-coding decomposed prefixed verb forms into a verbal root and a satellite-like verbal prefix. As a result, verbal prefixes were treated as part of the verb in the V-coding, but not in the S-coding, as illustrated in (11) with *aneveno* (prefix *ana-*, verb root *veno*).

(11) *Aneveni trehontas*

Aneveni	*trehontas*	
ascend [V-Path]	run [Vgerund-Manner]	(V-coding)
up[Pref-Path]-walk/go[V-Manner]	run [Vgerund-Manner]	(S-coding)

3. Results

We first discuss results for English and French that most comfortably fit the dichotomy proposed by Talmy. We then compare Russian to English in order to determine whether the particular properties of these two S-framed languages have implications for speakers' event representations. Finally, we turn to the remaining two languages, Chinese and Greek, which do not seem to fit the dichotomy as comfortably for different reasons.

3.1 English and French

The responses of the English and French native speakers are summarized in Figure 1 which shows the types of information that were expressed in verbs vs. other devices in these two languages. The English data show the pattern expected for S-framed languages: speakers typically expressed both Manner and Path, systematically encoding Manner in verbs and Path in satellites as in (12). The French picture is less straightforward. As expected, French verbs mainly expressed Path which was frequently the only information provided other than the ground, as in (13). However, other devices outside of the verb also expressed Manner and/or Path as in (14). In addition, some verbs simultaneously lexicalized both Path and Manner (specifically in the verb *grimper* 'to climb-upward' as in (15)). Hence, this system is more opaque than the one in English, which shows a strikingly transparent complementary distribution of Manner vs. Path information in verbs vs. satellites respectively.

(12)　　　There's a caterpillar crawling up the leaf

　　　　　[*Manner* in the verb, *Path* in satellite]

(13)　　　C'est un singe qui monte à l'arbre

　　　　　[*Path* in the verb, no *Manner*]

　　　　　'It's a monkey who is going up [lit. =ascending] the tree'

(14)　　　Le bébé a traversé la route en marchant à quatre pattes

　　　　　[*Path* in verb, *Manner* in Other]

　　　　　The baby crossed the road walking on all fours.

(15)　　　L'ours a grimpé à l'arbre pour accéder à la ruche

　　　　　[*Path+ Manner* in verb]

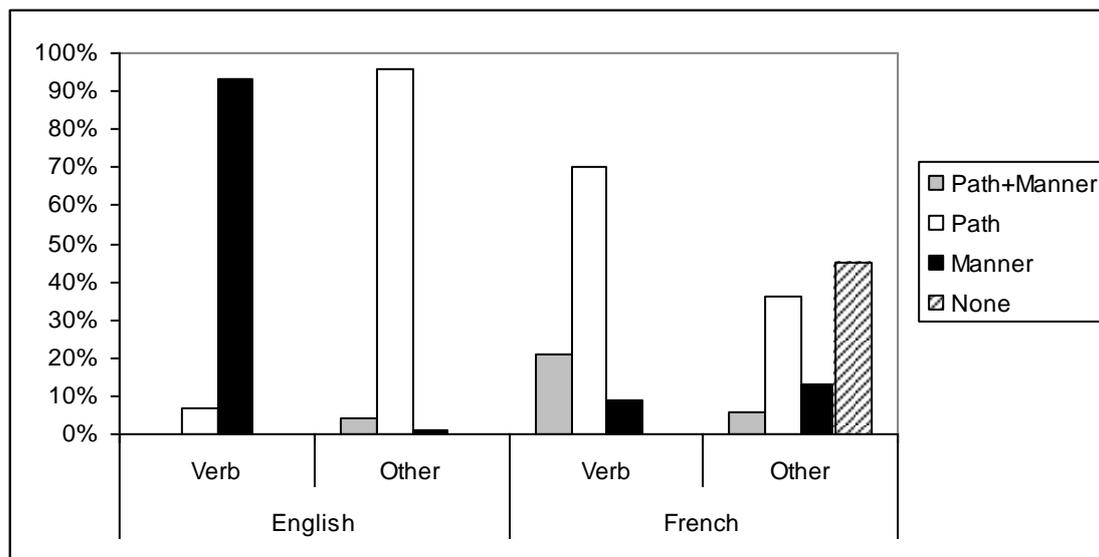　　　　　'The bear climbs up the tree to get to the beehive.'

Fig 1. Voluntary motion in English and French: types of information expressed in verbs vs. other devices

3.2. Russian

As expected, Russian speakers frequently encoded both Manner+Path overall. However, although they did so more frequently than French speakers (V-framed), the proportion of such utterances was less important than in English (S-framed). In addition, more structural variation was observed in Russian as compared to English as the result of the specific devices encoding each component across event types. In particular, two types of responses were frequent: speakers either focused on Path alone through the use of Path-verbs (*spustit'sja* 'to descend' in (16), *zabrat'sja,* 'to ascend' in (17)) or they simultaneously lexicalized both components using directional Manner+Path-verbs (*polzti* 'to crawl-dir' in (18), *lezt'* 'to climb-dir' in (19)) to which they prefixed a satellite also marking Path. In both cases additional elements such as Path prepositions sometimes further elaborated Path information outside of the verb.

(16)   Myška s-pustila-s'

'The mouse descended'

(17)   Kot za-bral-sja na stolb.

'The cat ascended [on] the poll'

(18)   Rebënok pro-polz.

child [Pref-Path]across-crawl[Root-Manner/Path-dir](past)

'The child crawled across'

(19)   Koška za-lezla na stolb.

cat [Pref-Path]za-climb[Root-Manner/Path-dir](past) on-acc-dir poll

'The cat climbed [on] the poll'

Figure 2 shows the resulting distribution of information across verbs vs. other devices. A comparison of these data with those displayed for English (see Figure 1 above) shows a notable difference with respect to verbs. In particular, whereas English verb roots predominantly express Manner, Russian verb roots do so less frequently and encode more often either Path alone or Path+Manner. This pattern is more typical of French than it is of English, despite the fact that Path verbs remain more frequent in French and Manner+Path verbs are more frequent in Russian. As for additional devices outside of the verb root, they typically encoded Path as in English. In summary, then, Russian seems to share some properties with both S-framed and V-framed languages.
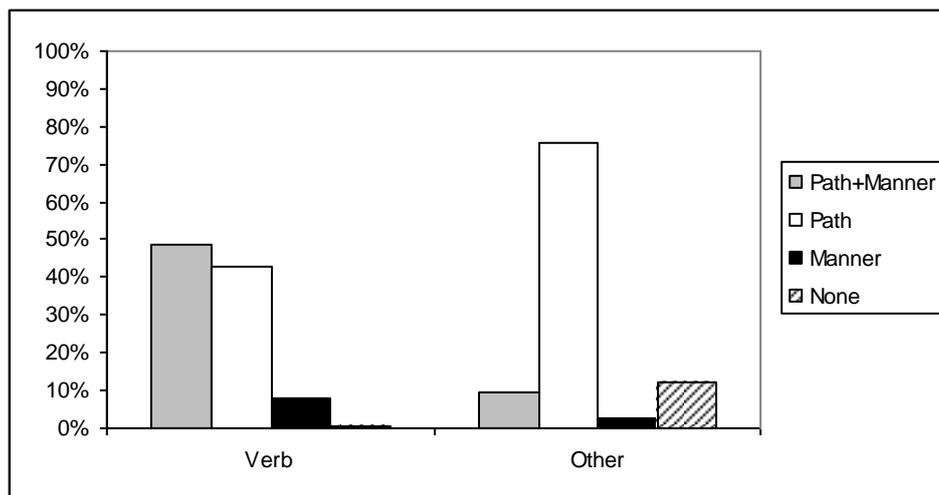
Fig 2. Voluntary motion in Russian: types of information expressed in verbs vs. other devices

3.3. Chinese: a serial verb language

Recall that a double coding was performed on the Chinese data, according to which elements after the first position in verb compounds were coded once as verbs (V-coding) and once as satellites (S-coding). The results of both analyses are shown in Figure 3. Chinese speakers clearly expressed both Manner and Path in this task. Moreover, as predicted by Talmy's classification of this language as S-framed, Chinese looks like English with the S-coding (see Figure 1). However, with the V-coding, Chinese serial verb constructions actually mostly encode both Manner+Path together in verbs, while less information is expressed elsewhere.
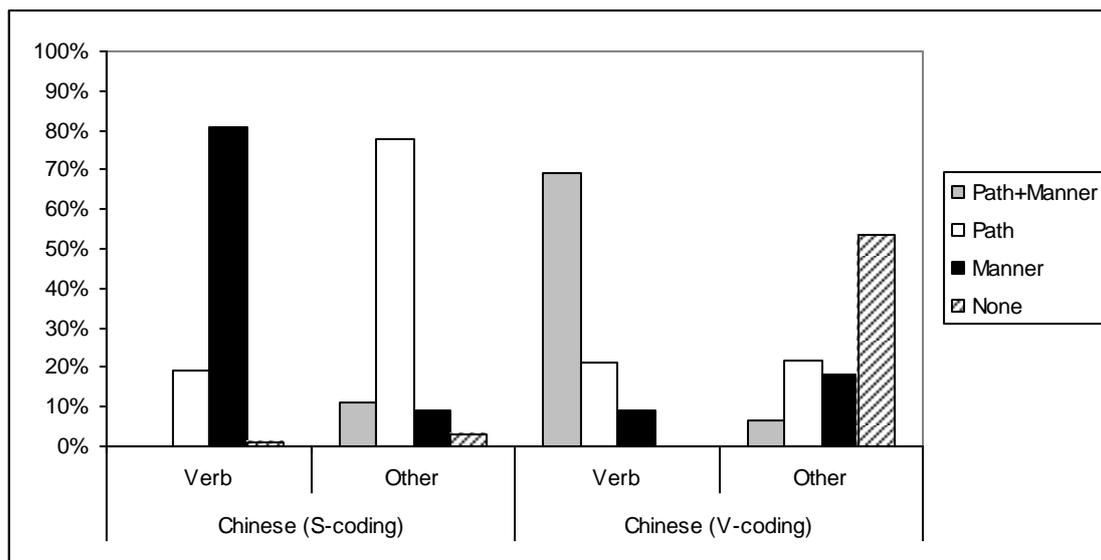
Fig. 3. Voluntary motion in Chinese: types of information expressed in verbs vs. satellites

(2nd and 3rd elements of verb compounds coded as satellites in S-coding and as verbs in V-coding)

Another interesting result concerning Chinese is the fact that two very different response patterns were observed in the expression of voluntary vs. caused motion. Analyses of responses in the caused motion task take into account not only the Path and Manner of motion but also its cause, furthermore distinguishing between two ways of encoding this information: Cause itself, i.e. the expression of an external force as the source of motion (as in 'he *makes* [cause] the ball roll [Manner of object] down [Path] the hill') and the Manner of causing motion (e.g. 'he *pulls* [cause + agent's action] the toy car up [Path] the hill'). As a result, a total of five semantic components can be expressed for each experimental item (Cause, Agent's Action, Path, Manner of object's motion, Manner of agent's motion). Examples (20) and (21) show the two most typical structures used for this task in Chinese. Example (20) is a BA construction, in which the coverb *ba* preposes the object in front of the verb, thereby allowing the serial verb to take on a causal meaning. Example (21) shows a second pattern in which Cause and Agent's Action are expressed in a subordinated –ZHE clause, thereby leaving the main verb (ascend) free for the expression of Path of motion.

(20) Xiaohai ba   qiu   tui-xia   shan

boy   BA   ball   push-descend/down hill

'The boy pushed the ball down the hill'

(21) Xiaohai la zhe   xiao qiche   shang-LE   shan

boy   pull-ZHE   little car   ascend-ASP hill

'The boy went up the hill pulling the toy car'

Figure 4 shows the results concerning the caused motion task. The pattern observed in this task is very much like the one in French (V-framed), in which all types of semantic information can be expressed in verbs or in other linguistic means, rather than the one in English (S-framed), irrespective of S- or V-coding. In summary, then, Chinese looks like a verb-framed language in the caused motion task and like a satellite-framed language in the voluntary motion task. Overall, then, Chinese shows truly equipollent (Slobin) or parallel-framed (Talmy) properties.
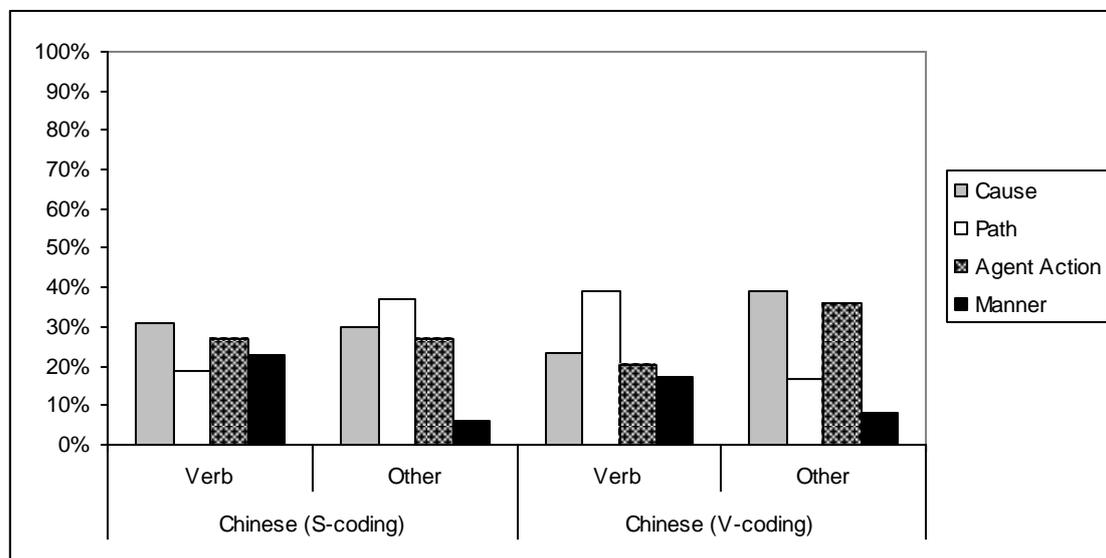
Fig. 4. Caused motion in Chinese: types of information expressed in verbs vs. satellites

(2nd and 3rd elements of verb compounds coded as satellites in S-coding and as verbs in V-coding)

3.4 Greek

Recall that the Greek data were also coded twice, considering verbal prefixes once as satellites (S-coding) and once as part of the verb (V-coding). The results are displayed in Figure 5. Overall, according to the V-coding, Greek speakers expressed mostly Path both in the verb and in the periphery. In contrast, the S-coding showed a preference for using Manner verbs together with other devices expressing Path (prefixes, adverbials). A comparison of these Greek data with those displayed for French and English (Figure 1 above) highlights two points. First, the V-coding clearly results in fewer Greek verbs encoding Manner or Path+Manner as compared to French. Second, although the S-coding showed a main preference for Manner verbs as in English, Path verbs were more frequent in Greek as compared to English.
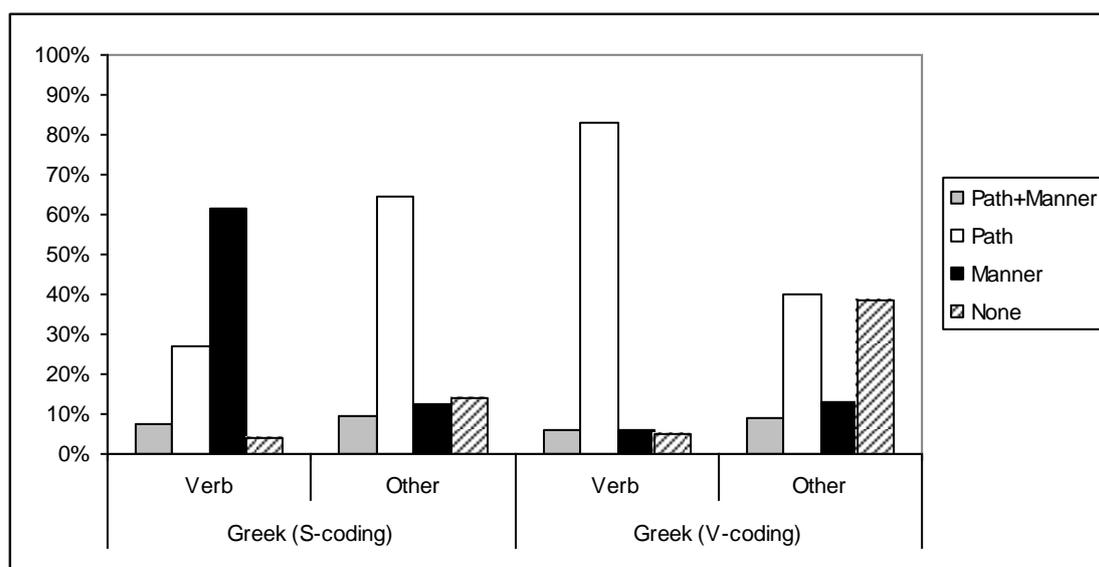
Fig. 5. Voluntary motion in Greek: types of information expressed in verbs vs. other devices.

(Verbal prefixes coded as satellites in S-coding and part of verbs in V-coding)

4. General Discussion

This paper compared controlled productions about motion events elicited in five languages: one V-framed language (French), one S-framed language (English), another S-framed language which presents different properties as compared to English (Russian), and two languages the status of which is unclear or debated in the previous literature (Chinese, Greek).

Our first aim was to compare two predominantly S- and V-framed systems (English, French) in light of Talmy's and Slobin's proposals. The results confirm the contrasting typological status of these two languages. English speakers systematically use Manner verbs with Path satellites, while French speakers use Path verbs and do not express Manner as frequently. However, French presents a system that is more opaque than expected in that speakers use a variety of means (verbs and other devices) to express different types of information (Manner, Path) about motion. This aspect of the French data is in sharp contrast to the English data that show a strikingly transparent system organized around a complementary distribution of information between verbs and satellites.

Our second aim was to compare a language (Russian) that provides a rich system of verbal prefixes to another S-framed system (English) in which the nature of satellites differs in important ways. The results in this respect show that Russian verb roots differ from those in English in that they express Manner alone less frequently, either conflating Manner with Path lexically in directional verbs or expressing Path alone. Thus, although Russian has been included among satellite-framed languages, it actually differs in important ways from English, on the one hand, but also from verb-framed languages such as French, in that it frequently expresses Path in verbs, in satellites or in both, thereby occupying an intermediary position between these two families.

Our third aim was to compare clearly S-framed and V-framed systems (English, French) to two other systems (Chinese, Greek) whose typological status is less clear. With respect to Chinese, it was found that this language patterns like English (S-framed) when the task

required describing voluntary motion, but like French (V-framed) when descriptions concerned caused motion. Two factors account for this finding. First, the expression of two types of semantic information, i.e., Manner and Path can be easily realised in one single serial verb which can be either V-coded or S-coded, resulting in the findings for voluntary motion. Second, however, when more than two semantic components need to be expressed (caused motion task), Chinese offers a variety of structures, including subordinate ZHE structures, that allow information to be distributed not only in the main serial verb, but also in subordinated (serial) verbs.

As for Greek, our analyses aimed at disentangling different ways of viewing this language, i.e. as clearly V-framed (like French), as clearly S-framed (like English), as a parallel V and S system, or as comprising a prefixed S-system (like Russian). The data show evidence for two systems, one V-framed and one S-framed, although each differs to some extent from those observed in English and French. The V-framed sub-system of Greek shows a focus on Path that is even more predominant than in French. Furthermore, its S-framed sub-system is less focused on Manner as compared to English. These findings might be viewed as indicating an overall preference for Path in Greek, thus leading to interpret this language as a clear V-framed system (Papafragou et al., 2006). However, the double coding of Greek provides some evidence for the possible existence of an S-prefixed sub-system where Manner is expressed in verb roots and Path in prefixed elements. As a consequence, this evidence does not support the description of Greek as a parallel system in which V-framed and basic S-framed co-exist with equal importance (Talmy, 2000). It is possible that Greek simultaneously presents three sub-systems (V-framed, basic S-framed, and prefixed S-framed), the relative weight of which remains to be further determined.

It should be noted here that the typological properties discussed above resulted in responses that displayed different levels of semantic density as a function of speakers'

language. More specifically, our analyses of the corpora included a third type of measure, not explicitly discussed above, that concerned the number of semantic components expressed in response to each item.[8] The rationale for this measure was the following: because speakers of S-languages were expected to express both Manner and Path, the hypothesis was that their response density should be higher than the one observed for speakers of V-languages, who were expected to focus predominantly on Path. Following these predictions, density was indeed higher in English than in French, and this result held for both voluntary motion events (where only two components could be expressed) and caused motion events (where many more were available for expression, for more details see Hendriks et al., 2008; Hickmann & Hendriks, 2010). Greek and Russian were both intermediary between French and English in this respect. Thus, response density in Russian was higher than in French but lower than in English and it varied in Greek with the type of coding, being higher with the S-coding (roughly equivalent to English) than with the V-coding (roughly equivalent to French). Most importantly, turning to Chinese, semantic density showed interesting and unexpected results that complement the ones discussed above for information focus (what was expressed) and locus (where/how it was expressed). Although Chinese patterned like French with respect to locus in descriptions of caused motion events, it patterned like English with respect to semantic density in descriptions of both types of events (voluntary and caused motion). That is, density was much higher in Chinese than in French in both tasks, and it was even higher than in English in the caused motion task. The latter result raises a possible additional problem for classification, as this third measure does not align with the measures of focus and locus.

In summary, then, although a two-way classification of languages as V-framed vs. S-framed may be suited for some languages (e.g. French and English), it seems to be less

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[8] Semantic density was a more informative measure in relation to the caused motion task, where at least five semantic components could be selected for expression, than for the voluntary motion task, where only two could be potentially expressed.

appropriate to account for others (Russian, Chinese, Greek). For example, when the second and third elements of Chinese serial verb constructions are coded as satellites, this language looks V-framed with one type of motion event (caused motion), but S-framed language with another type (voluntary motion). As for Greek, it seems to present yet a different pattern, since some of its utterances seem to be V-framed, others S-framed, and a yet third group seem to belong to an S-framed sub-system comprising Path prefixes.

One way to solve this problem might be to create new language categories with each new type of system, e.g. to add two new classes to V-framed and S-framed languages in order to accommodate serial verb languages and Greek and/or to add sub-types within the V- or S-type, e.g. to accommodate for the properties of S-framed languages such as Russian or Greek. At least two arguments can be raised against such a solution. At first glance, a solution that consists of adding types or subtypes with each new problematic language seems to be rather *ad hoc* and insufficiently economical from a theoretical point of view. At least, it becomes then an entirely empirical question to determine how many such types and sub-types will emerge across languages of the world and to justify the existence of each one on the basis of comparable evidence. Clearly, the more classes turn out to be necessary, the less useful the typology will be ultimately. Second, depending on the features that are taken into account (locus, focus, density), languages may be better viewed either as S-framed or as V-framed. Hence, they either cannot be categorized at all or they have to be categorized into new groups for each type of phenomenon, despite the fact that all of these phenomena are closely related to each other within the universe of motion events. Following Slobin (2004), we would rather propose that languages should be placed on a cline that goes from V- to S-framed languages and that could perhaps account for important as well as more subtle differences among languages.

Finally, the results of this typological study have some implications for current debates concerning the language-thought interface and could make an important contribution to these debates in the future. In particular, linguistic analyses based on controlled methodologies, such as the one that was used in the present study, can yield comparable databases across a number of languages, thereby making it possible to put forth fine-grained and realistic hypotheses concerning the cognitive implications of typological properties. A central question that could be addressed on the basis of such data concerns the extent to which typological constraints on speakers' utterances, such as the ones discussed above, have a deeper impact on their non linguistic representations beyond language production.

This question can be framed within the controversy that presently opposes at least three different views of human cognition across different disciplines in the cognitive sciences: theories that consider human cognition and language to be entirely distinct and autonomous (Chomsky, 1975; Pinker, 1989; Gleitman & Papafragou, 2005); those that assume some version of cognitive determinism according to which properties of the human cognitive architecture strongly constrain language use and acquisition (e.g. various strands since *princeps* writings such as Piaget, 1930; Clark & Clark, 1978); and those that have revived a Whorfian position according to which language properties influence cognition (Lucy, 1992; Pederson et al., 1998; Boroditsky, 2001; Bowerman & Levinson, 2001; Hickmann et al., 2009; Slobin, 2004).

It may well be that some of the above positions will turn out to be more or less plausible depending on the number of differences that are yet to be found across languages. For example, focusing exclusively on the representation of motion events for now (but other language domains clearly have to be also taken into account), an important empirical question will be to determine whether languages 'only' differ with respect to the eight parameters listed above (section 1.1) or if more research shows the need to take into account a myriad of

additional parameters. In the latter case, one may have to come to the conclusion that universals constitute but a small part of human language and cognition, while language-specific properties may have a more important impact on conceptual representations than had be previously considered (Evans & Levinson, 2009).

Finally, these questions are also relevant for language acquisition research. In particular, if cognitive universals are the determining factors driving language acquisition, one would expect all children learning their first language to initially start out expressing similar spatial concepts. If, however, typological factors influence spatial cognition, one would expect children to start out with language-specific ways of expressing and understanding motion from the very start. Early studies concerning the acquisition of spatial language indeed seemed to have uncovered the cognitive underpinnings of language acquisition: children across all languages seemed to start out expressing similar concepts in similar orders, for example when acquiring markers of spatial relations (Johnston, 1985; Johnston & Slobin 1979). However, a growing body of research (e.g. Choi & Bowerman, 1991; Bowerman & Choi, 2001) has now gathered quite some evidence that children from a very young age on seem to be very attuned to the specific linguistic patterns of their mother tongue.

Regardless of whether we are examining mature native speakers or children acquiring language, however, the most important challenge for future research will be to test whether typological differences affect behaviours beyond language use, in order to really measure the extent to which language and thought are deeply related in a cross-linguistic framework (Gennari et al., 2002; Papafragou et al., 2008). Ongoing research is presently developing such tools by means of combined uses of verbal and non-verbal measures, including tasks tapping categorization or memory, all coupled with an eye-tracking paradigm (Soroli & Hickmann, in press, in preparation). If differences in such behaviours were to be found across languages, it

may then become possible to sustain non-circular claims concerning typological constraints on human cognition.

Concluding Remarks

In conclusion, although Talmy's typological work on the expression of motion has been an extremely productive and exciting starting point for a thorough typology of languages in the world, detailed analyses of some languages and/or attention to multiple facets of motion events is necessary to pursue this line of research. In this perspective, the diversity with which languages of the world represent motion events is perhaps best interpreted in terms of a cline, rather than in terms of a dichotomy. It is suggested here that such as solution is perhaps more likely to allow us to take into account multiple aspects of motion, as well as both massive and subtle differences in how languages express them. In this light, new methodologies also become necessary to find ways of measuring whether and how such differences across linguistic systems may have an impact on human cognition above and beyond language use and language acquisition.

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