

# **Spatial representations in language and thought**

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## **Abstract**

The linguistic expression of space draws from and is constrained by basic, probably universal, elements of perceptual/cognitive structure. Nevertheless, there are considerable cross-linguistic differences in how these fundamental space concepts are segmented and packaged into sentences. This cross-linguistic variation has led to the question whether the language one speaks could affect the way one thinks about space – hence whether speakers of different languages differ in the way they see the world. This chapter addresses this question through a series of cross-linguistic experiments comparing the linguistic and non-linguistic representation of motion and space in both adults and children. Taken together, the experiments reveal remarkable similarities in the way space is perceived, remembered and categorized despite differences in how spatial scenes are encoded cross-linguistically.

## **Introduction**

The linguistic expression of space draws from and is constrained by basic, probably universal, elements of perceptual/cognitive spatial structure. As is well known, the representation of space is a fundamental human cognitive ability (Pick & Acredolo 1983; Stiles-Davis, Kritchevsky & Bellugi 1988; Emmorey & Reilly 1995; Hayward & Tarr 1995; Newcombe & Huttenlocher 2003; Carlson & van der Zee 2005), and appears early in life (Pulverman, Sootsman, Golinkoff & Hirsh-Pasek 2003; Casasola, Cohen & Chiarello 2003; Casasola & Cohen 2002; Quinn 1994; Pruden, Hirsh-Pasek, Maguire, Meyers & Golinkoff 2004).

Nevertheless, there are considerable cross-linguistic differences in how these fundamental space components are segmented and packaged into sentences. This cross-linguistic variation has led to the question whether the way space is encoded cross-linguistically affects the way space is perceived, categorized and remembered by people who speak different languages (Bowerman & Levinson, 2001; cf. Whorf, 1956). The goal of this paper is to address this question focusing on two strands of empirical work.

## **Motion events**

The first set of studies we will review focus on a comparison of the linguistic and nonlinguistic representation of motion in speakers of English and Greek. These two languages differ in the way they encode the trajectory, or path,

and the manner of motion (cf. Talmy, 1985): English includes a large class of manner of motion verbs (*strut, stroll, sashay*, etc.) which can be freely combined with adverbs, particles or prepositional phrases encoding trajectory information (*away, into the forest, upwards*, etc.). By contrast, Greek mostly expresses motion information in path verbs (*beno* ‘enter’, *vjeno* ‘exit’, *perno* ‘cross’, *pao* ‘go’, etc.) combined with prepositional phrases or adverbials which further specify path (*sto spiti* ‘into the house’, *makria* ‘away’, etc.). Greek does have a substantial inventory of manner verbs (*xorevo* ‘dance’, *trexo* ‘run’, *pleo* ‘float’, etc) but their distribution is constrained by what we will call a ‘boundedness constraint’: most manner verbs cannot combine with a modifier which denotes a bounded, completed path (*\*To puli petakse sto kluvi*) unlike their English counterparts (*The bird flew into the cage*). This constraint leads to higher use of path verbs in Greek compared to English. A similar constraint is found in several languages (Aske 1989; Jackendoff 1990; Slobin & Hoiting 1994; Levin & Rapoport 1988) and has led commentators to conclude that manner of motion is less salient as a verb grammaticalization feature in languages such as Greek.

In our own work (Papafragou, Massey & Gleitman 2002, 2006), we have confirmed the Manner/ Path asymmetry in the description of motion scenes by Greek- versus English-speaking children and, much more strongly, for Greek versus English-speaking adults. The very same studies, however, revealed no differences in the English- and Greek- speaking subjects’ memory of path or manner details of motion scenes. Further experiments showed that, despite the asymmetry in verbally encoding motion events, English and Greek speakers did not differ from each other in terms of motion event categorization. More recent studies compared on-line inspection of motion events by Greek- and English-speaking adults using eye-tracking methodology (Papafragou, Hulbert & Trueswell, 2006). Taken together, the experiments reveal remarkable similarities in the way motion is perceived, remembered and categorized despite differences in how motion scenes are encoded cross-linguistically.

### **Spatial frames of reference**

The second set of experiments focuses on the linguistic description of location and orientation (Li, Abarbanell & Papafragou, 2006). We study the spatial abilities of speakers of Tseltal, a Mayan language which lacks projective terms for *left* and *right*. Unlike English or other familiar languages, Tseltal speakers use absolute terms equivalent to north/south/east/west to locate objects in small-scale space (Levinson, 1996). As a result of this gap in linguistic resources, Tseltal speakers have been claimed not to use left-right distinctions in their habitual reasoning about

space (Pederson, Danziger, Wilkins, Levinson, Kita, & Senft, 1998; but see Li & Gleitman, 2002 for critical discussion).

Our experiments test the use of left/right concepts in Tseltal speakers and compare them to absolute systems of spatial location and orientation (Li et al., 2006). We find that Tseltal speakers, when given implicit cues that body-centered (left-right) distinctions are needed to solve a spatial task, use these distinctions without problems. On certain tasks, performance with such body-centered distinctions is better than performance with absolute systems of orientation which correspond more closely to the preferred linguistic systems of encoding space in Tseltal. These results argue against the claim that left-right distinctions are dispreferred or less salient in Tseltal spatial cognition. We take this as another demonstration of the independence of spatial reasoning from linguistic (encoding) preferences. We conclude that the linguistic and non-linguistic representations of space, even though correlated, are distinct and dissociable.

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