

## Language effects on spatial cognition? Cross-linguistic evidence and eye-tracking

In his typology Talmy [1] distinguishes two types of languages as a function of how they encode motion events: *Verb-framed* languages, such as Romance languages, where PATH is typically lexicalized in verbs leaving MANNER implicit or in the periphery, and *Satellite-framed* languages, such as Germanic languages, where PATH is encoded in adjuncts accompanying systematically MANNER verbs. The aim of the present paper is to examine whether such cross-linguistic variation has any impact on the ways in which speakers conceptualize crucial aspects of motion events, in order to address current debates in the literature concerning the relationship between general and language-specific determinants of spatial cognition [2, 3, 4].

More specifically, we investigate how speakers of two typologically different languages, English (N= 22) and French (N= 20), represent motion events in verbal and non-verbal tasks, as well as how they allocate attention to MANNER and PATH information while processing information about these events on-line. Three tasks were designed, all of which were coupled with an eye-tracking paradigm for further insights into on-line cognitive processing. Participants were randomly divided into two groups (hereafter 'verbal' and 'non-verbal' conditions). In the verbal condition, they first performed a production task (Figure 1) in which they described videos showing motion events that varied with respect to MANNER (WALK, RUN, JUMP, RIDE BICYCLE, RIDE SCOOTER, ROLLER SKATING) and PATH (UP, DOWN, ACROSS, ALONG, INTO, OUT OF). They then performed a categorization task (Figure 2) in which they saw a target video (e.g. a woman riding a bicycle into a building), then two variants that differed from the target with respect to PATH (choice 1: 'Manner-congruent', e.g. BICYCLE-OUT) or with respect to MANNER (choice 2: 'Manner-incongruent', e.g. SCOOTER-INTO). They had to choose which variant best matched the target. In the non-verbal condition, participants began the session with the categorization task, while simultaneously performing an interference task (syllable repetition) that prevented them from internally verbalizing the stimuli, which was followed by the production task.

Analyses show the following main results. First, verbalizations during the production task show the strong impact of language-specific factors. French speakers focused mostly on PATH information (lexicalized in the verb), while English speakers expressed both MANNER (in the verb) and PATH (outside of the verb). Second, in both groups the eye tracking data during production show a strong preference for the most Manner-salient areas (i.e. that included the Figure's legs) as opposed to least Manner-salient areas (i.e. that included the Figure's head). In addition, English participants performed more and longer fixations in the most Manner-salient areas as compared to French speakers. However, when participants paid attention to the least Manner-salient areas, they did so more in the French sample than in the English sample. Third, subjects' preferential choices during categorization show a language effect in the verbal version of the task, but not in the non-verbal version. In particular, in both conditions French participants relied more on PATH information when grouping events (Manner-incongruent criterion), while English participants do not show any particular preference (Manner-congruent or -incongruent). Finally, eye-tracking was consistent with subjects' choices during the categorization task, showing that French participants focused their attention more on PATH information (Manner-incongruent variants) than English speakers, especially in the verbal condition. This effect was observed particularly with items in which MANNER was most salient because it involved an explicit instrument (e.g. bicycle).

In conclusion, speakers are influenced by the properties of their language when describing and categorizing motion. However, this language effect is not observed to the same extent depending on the task, being most evident when the task explicitly involves language and least evident when the task is entirely non-verbal. In addition, variation in attention allocation suggests that visual behaviour is based on both general and language-specific constraints, thus supporting a 'moderate' view of linguistic relativity that allows for dynamic mutual interaction between language-specific and general cognitive factors.

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KEY WORDS: Motion events, Cross-linguistic variation, Production, Categorization, Eye movements

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Figure 1. Production task

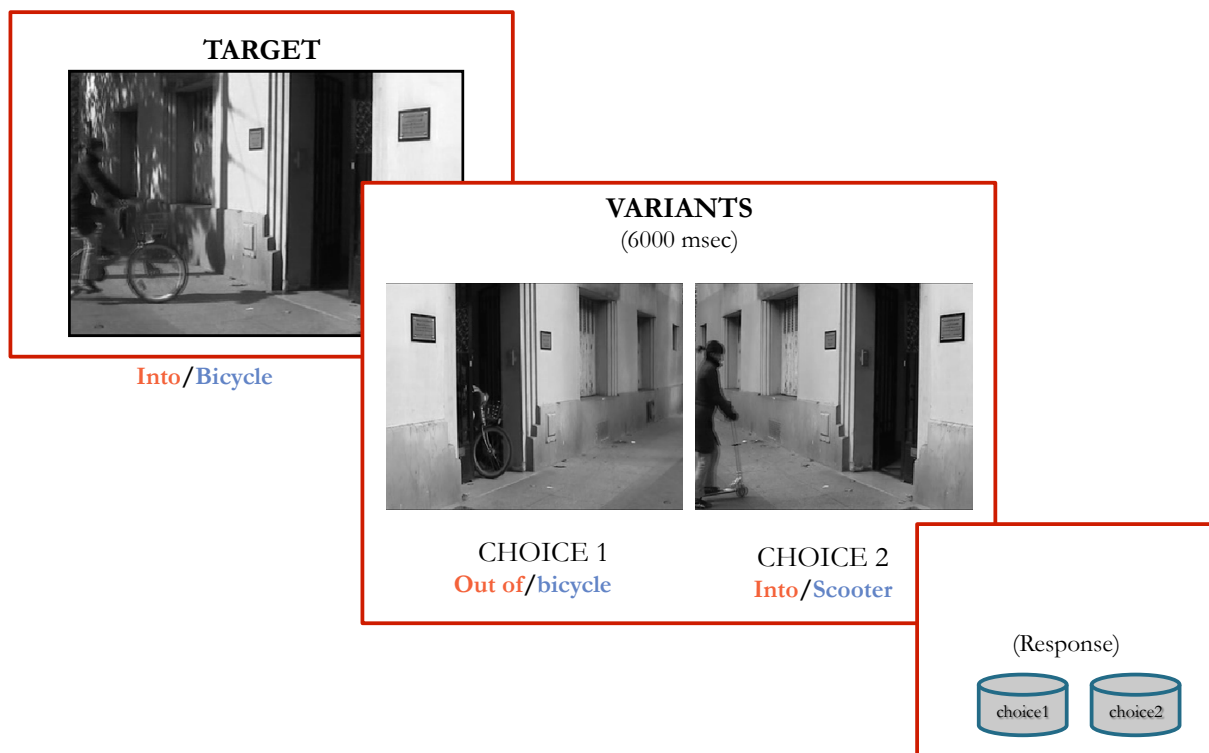


Figure 2. Categorization task