Language, culture and cognition

This series looks at the role of language in human cognition – language in both its universal, psychological aspects and its variable, cultural aspects. Studies focus on the relation between semantic and conceptual categories and processes, especially as these are illuminated by cross-linguistic and cross-cultural studies, the study of language acquisition and conceptual development, and the study of the relation of speech production and comprehension to other kinds of behaviour in a cultural context. Books come principally, though not exclusively, from research associated with the Max Planck Institute for Psycholinguistics in Nijmegen, and in particular the Language and Cognition Group.

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Event Representation in Language and Cognition

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10 Talking about events*

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1 Introduction

People, in common with other creatures, need to identify recurrences in the world in order to thrive. Recurrences, whether in space or time, provide the stability and predictability that enable both understanding of the past and effective action in the future. Recurrences are often collected into categories and, in humans, named. One crucial category, and set of categories, is *events*, the stuff that fills our lives: preparing a meal, cleaning the house, going to the movies. Event categories are an especially rich and complex set of categories as they can extend over both time and space and can involve interactions and interrelations among multiple people, places, and things. Despite their complexity, they can be named by simple terms, a *war* or an *election* or a *concert* and described in a few words, *folding the clothes*, *rinsing the dishes*, or *tuning the violin*. People have an advantage over their non-verbal relatives in that language can facilitate learning categories and serve as a surrogate for them in reasoning. What are the effects of naming or describing over and above identifying categories? And what do the descriptions reveal about the categories? Here, we examine some of the consequences and characteristics of language for familiar categories, events, and the bodies that perform them.

2 What language can do

Language, like many cognitive tools, plays many roles in our cognitive and social lives. One role is to carve out entities in continuous space and time so that they can be referred to in their absence. Carving out some entities and not others calls attention to those that are named and focuses attention on the features that distinguish and characterize them. Yet another role of language is to allow abstraction, to go beyond features in the world that can be readily perceived and pointed out to describe those not readily observable in the world,

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notably functional, conceptual, or other abstract features. Functional features, if given in perception at all, are less immediate than the perceptual cues that signal things in the world: color, shape, or kinds of action. Consider, for example, the features that characterize furniture or food. Although one can point to examples of furniture or food, it is difficult to point to their functional properties, which might be enhancing people's comfort or providing nutrients to the body. Such features are often not knowable simply from seeing a static object, that is, they may not be afforded by the object. Knowing them depends on other information: sometimes using the object or seeing it in use, but sometimes learning about it in other, more formal ways. When that information is activated, it can change how the stimuli are perceived and encoded by calling attention to the aspects of the stimuli associated with that more abstract information. For furniture for example, that the dimensions are appropriate for the human body. In the case of events, watching someone perform an organized set of actions allows immediate perception of the actions of the body and the objects involved in the actions, but the goals or purposes or causal implications of the actions must be inferred. Goal achievement may be associated with specific actions, such as putting one object part down and picking up another. These informative actions, however, may not be as salient as other actions not associated with goal completion. In the case of bodies, the body parts that are perceptually salient may not be the same as those that are functionally important. The research to be discussed on body schemas and event parsing suggests that language can call attention to abstract, functional features of bodies and events, and that doing so reorganizes perception of them.

The events of concern are representative of the everyday events performed by people, the sorts of events that fill the needs of the day: preparing meals, going shopping, and cleaning the house. Such events can be viewed as a partonomy, hierarchically organized sets of parts, consisting of higher-level goals, such as cleaning the house, which can be decomposed into lower-level goals, such as vacuuming the floor, doing the dishes, and washing the clothes, which in turn can be decomposed to even lower-level goals (e.g., Bower, Black, and Turner 1979; Schank and Abelson 1977; Zacks and Tversky 2001). Even mundane events such as these are rich and complex, not just because they have temporal and spatial contexts, but also because they involve the body, typically interacting with objects. In fact, when observing these kinds of events, people describe them as sequences of actions of the body on objects (Zacks, Tversky, and Iyer 2001). Hence, we first turn to people's concept of the body, and the effects of naming on that concept.

3 Body schemas

Bodies, like other objects, take space in the world and have characteristic shapes, parts, sizes, and behaviors. This is an outsider's view of the body. As humans, we also have an insider's view of bodies, a view we lack for other objects. We know what bodies and their parts feel like and what bodies can do from the inside, from sensory and kinesthetic information and motor experience. Does this insider perspective affect our schemas of our bodies? Both behavioral and neuropsychological research suggests that bodies are treated differently from objects. In a striking set of studies, apparent motion of an object with respect to a body was interpreted differently from apparent motion with respect to another object (Chatterjee, Freyd, and Shiffrar 1996). Apparent motion of a stick was more likely to be perceived as going through an object but going around a body. Perceiving a stick going through an object violates physical laws, but perceiving a stick moving through the body violates not only physical laws but also laws of body mechanics. Neuropsychological research also suggests that body schemas are special. For example, a patient with right hemisphere damage involving the basal nuclei suffered from personal neglect of the left side of his body, without any impairment to knowledge of the space beyond his body (Guariglia and Antonucci 1992).

Underlying a body schema is knowledge of body parts, their spatial relations and their behaviors or functions. The project reported here investigated body schemas using a part verification task (Morrison and Tversky 2005). The stimuli were realistic renderings of (male) bodies in various poses and orientations. Across cultures, there is some commonality in what body parts get named, especially those named with primary rather than derived names (Andersen 1978; Brown 1976), suggesting that certain parts are more important or salient than others. The body parts selected were those commonly named across cultures: head, chest, back, arm, hand, leg, and foot. Two kinds of experiments were designed to assess the impact of appearance and function in retrieving information about bodies. In the name-body experiments, participants saw the name of a body part, and then a realistic rendering of a body in one of many postures and orientations with a part indicated by a small circle. In the body-body experiments, participants saw pairs of bodies in different orientations with the same or a different part indicated. In each case, participants responded "same" or "different" depending on whether the indicated parts were the "same." The data of interest were the times to verify the various body parts.

3.1 *Theories of body part verification times*

Research on objects suggests three different theories that could account for part verification speed, based on size, contour discontinuity, or significance. The size theory receives support from studies of imagery that have shown that larger parts are verified more quickly than smaller ones in images (Kosslyn 1980). The explanation offered is that in scanning an image, as in scanning a scene, larger things are more quickly detected than smaller ones. Thus, a

theory derived from imagery would predict that larger parts would be verified faster than smaller ones. The part discontinuity theory receives support from studies of object recognition and cognition. Objects can be identified from their contours (e.g., Rosch *et al.* 1976; Palmer, Rosch, and Chase 1981). It has been proposed that objects are recognized by their parts (Biederman 1987). This may be in part because discontinuities in object contours, their shapes, are excellent cues to object parts (Hoffman and Richards 1984). Object parts are not only salient in perception, they are central to the understanding of objects and their functions (Tversky and Hemenway 1984). Perceptually salient parts tend to be functionally significant ones, and the parts themselves often suggest their behaviors or functions. The legs, seat, and backs of chairs are bounded by contour discontinuities, and are regarded as salient parts and serve separate essential functions. Like size, sharp changes in contour are thought to catch the eye. A theory consonant with this approach would predict that parts with greater contour discontinuity would be verified faster than those with less contour discontinuity.

The part significance theory receives support from research on the role of parts in categorization. Parts proliferate in people's listing of attributes for objects described at the basic level, the level of choice in reference, the level of *table* and *apple* in contrast to the superordinate level of *furniture* and *fruit* and the subordinate level of *kitchen table* or *Fuji apple*. Tversky and Hemenway (1984) suggested that parts are at once features of appearance and of function, providing a link between them. On the appearance side, the legs of a table are relatively large and yield discontinuities of contour. On the function side, the legs of a table serve to support the table top at a convenient height. In fact, parts rated as highly significant seemed to be both perceptually salient and functionally significant, making it difficult to separate the role of perceptual salience from that of functional significance in objects. For bodies, a crude index of functional significance is the relative proportion of territory in the sensorimotor cortex, well-known from the popular diagram of a large-handed, small-backed homunculus representing relative cortical areas devoted to sensation and motor control of bodies (Penfield and Rasmussen 1950). Another is the two-point discrimination threshold on the skin, though it reflects only the sensory side of the body (Weinstein 1968).

For the common body parts considered here, the three theories make different predictions for verification times. According to the image theory, back and chest should be relatively fast as they are large parts, whereas hand and foot should be relatively slow as they are small. According to the part discontinuity theory, hand, head, arm, leg, and foot should be relatively fast as they are relatively discontinuous, and chest and back should be relatively slow. Finally, according to the part significance approach, head, hand, and chest should be relatively fast with back and leg relatively slow. In an independent study, head, hand, and chest were rated as more significant body parts than back and leg. Note that the predictions from part discontinuity and part significance theories are highly similar. This is not surprising, as part significance has inputs both from perceptual salience, which correlates with part discontinuity, and from functional significance. Remember that for objects, perceptual salience and functional significance are themselves correlated. The sensory and motor cortex homunculi, while not identical, are nevertheless similar.

3.2 *Significant body parts: names evoke function*

Now we can interpret the data from the two experimental tasks, one comparing a named part to a part highlighted on a body, and the other comparing two bodies with highlighted parts (Morrison and Tversky 2005). Image size, derived from imagery theory, can be quickly dismissed, as larger parts were verified more slowly than smaller ones in both tasks. In contrast, part discontinuity and part significance did correlate with verification times. For the name-body comparison, part significance was the best predictor, but for the body-body comparisons, part discontinuity was the best predictor. There was quantitative as well as qualitative evidence for this. The correlation between verification time and part significance was higher (though not significantly so, given the limited range and high correlations between the indices) for the name-body comparison, and the correlation between verification time and part discontinuity was higher (though not significantly so) for the body-body comparison. As noted earlier, these two theories predict highly correlated rankings of the parts. One important qualitative difference separates them: *chest* is high in significance though low in contour discontinuity. For the name-body comparison, *chest* is second in speed only to head, whereas for the body-body comparison, *chest* is slow, second-to-last. Salience and significance ratings by independent judges confirmed these differences.

Why is part discontinuity, a perceptible feature, the best predictor for body-body comparisons, but part significance, a conceptual feature, the best predictor for name-body comparisons? The body-body task can be done purely perceptually, comparing the highlighted parts directly with no need to access part name or part meaning. Perceptual salience of parts in the form of contour discontinuity should facilitate those comparisons. In contrast, for the name-body task, the name must be understood in order to know which part to search for on the body. Understanding a name appears to arouse functional features as well as perceptual ones. Naming, in the case of bodies, arouses features not immediately available from perception, features that depend on knowing how the parts of the body function. Naming reorganizes the perception of body parts. Let us now turn to the roles bodies serve in events, and to language used in describing and understanding events.

4 Event schemas

Events can be regarded as temporal analogs of objects, though the analogy, like most analogies, is incomplete. In philosophical treatments, events are distinguished from activities and states in that events have intentions or goals. They refer to achievements or accomplishments. *Running* is an activity but *running a race* is an event. Whereas activities and states are homogenous, achievements and accomplishments are not; they have natural beginnings and they culminate in natural endings (Vendler 1957; see also the introduction and papers in Casati and Varzi 1996). Like objects, events are perceived to have parts. Just as object parts extend in space, event parts extend in time. Event parts turn out to be distinguished by sharp breaks in activity contours just as object parts are distinguished by sharp breaks in spatial contour (Hard, Recchia, and Tversky ms.; Tversky, Zacks, and Hard 2008; Zacks 2004; Zacks *et al.* 2009). In the classic restaurant example, the overall goal, going to a restaurant, consists of subgoals such as entering, registering, being seated, reading the menu, and ordering. That people, even very young ones, have top-down knowledge of goals and subgoals for common events is well-documented (e.g., Bower, Black, and Turner 1979; Schank and Abelson 1977; Zacks and Tversky 2001).

Understanding everyday events. Is the hierarchical structure in people's knowledge of events also present in their on-line perception of events? How does describing events as they unfold affect perception of them? To examine these questions, we turned first to familiar everyday events (Zacks, Tversky, and Iyer 2001). Events can be loosely classified into those that have no human agency, such as hurricanes or volcanic explosions, events that involve a single person, and events that involve more than one person. Because we were interested in human action and the roles of goals and intentions in event segmentation, we restricted ourselves to events involving people. For simplicity, and to enable laboratory studies, we chose events involving a single person, taking a limited amount of time, and occurring in a single place. Undergraduates rated events chosen from previous research and other sources on frequency and familiarity. From these, we selected two familiar events, making a bed and doing the dishes, and two unfamiliar events, fertilizing a plant and assembling a saxophone, and filmed them from a single viewpoint in the scene.

First, we examined how observers segmented events as the events unfolded, how they described them as they unfolded, and how describing the event segments affected on-line perception of them. The descriptions provided insight into how events are segmented and interpreted. Observers viewed the films twice. As they viewed, they pressed a key when, in their judgment, one segment ended and another began, a procedure adopted from Newtson (1973). For one viewing, they were asked to select the largest units that made sense; for the other viewing (in random order), they were asked to select the smallest units that made sense. Half of the observers described what happened in each segment as they segmented, and half segmented silently. All participants segmented a practice film depicting ironing a shirt before segmenting the experimental films. One question of interest was whether observers perceived the ongoing action as hierarchical. Hierarchical encoding was assessed by measuring how well fine-unit boundaries coincided with coarse-unit boundaries for each participant. The obtained degree of hierarchical encoding was compared to the appropriate null models.

There are a number of bases on which people could segment activity on different scales. One natural hypothesis is that viewers segment fine units in a more bottom-up way, based on salient physical features (Newtson and Engquist 1976) and segment coarse units in a more top-down way, based on abstract features related to the goals of the actor, social relationships, or personality traits. Another proposal is that segmentation in this task is not a direct perceptual process at all, and the kinds of computations that lead to segmentation at different levels bear little relationship to each other (Cohen and Ebbesen 1979). Alternatively, segmentation in this task may reflect viewers' attempts to make sense of what they are watching, and they do this by integrating the perceived activity into a coherent representation of the intentions and goals of the actor in the observed event. Such integration would require thinking about hierarchical relationships between goals and subgoals.

The data supported the last alternative. There was greater hierarchical segmentation than would be expected by chance; that is, fine units were nicely bookended by larger ones (Zacks, Tversky, and Iyer 2001). More significant for the present discussion, this was affected by language use: describing led to a greater degree of hierarchical structure. This is particularly interesting because those who described as well as segmented performed two attention-demanding tasks, which could have competed with each other and resulted in greater disorganization of segmentation. Such a finding supports the view that in order to describe an activity, speakers generally need to think about how larger events relate to the sub-event ones that make them up. However, this does not appear always to be the case. In subsequent studies, this effect has not been observed, and in older adults the reverse has been found (Hard, Tversky, and Lang 2006; Kurby *et al.* 2008). In future research it will be important to establish the exact circumstances under which describing increases or decreases hierarchical segmentation; for now, the important conclusion is that describing an activity affects how it is segmented.

Next, we asked why describing increased the degree of hierarchical encoding of events. Similar to the effects of naming on the perception of body parts, we offer an explanation dependent on the power of words to arouse functional, abstract features of viewed things. Inspecting the language used in the

descriptions supports this view. Although participants could have described the events as activities or movements of the body, such as "she raised her left arm" or "he bent at the waist," they did not. While true, such language seems awkward, inappropriate, uninformative, and improbable. Such simple descriptions of motion, as shall be seen, are invoked for describing events that are not readily understood, such as exotic mating rituals in birds or insects or movements of geometric figures (Hard *et al.* 2006), but is aberrant for recognizable human events. In describing coherent comprehensible sequences of actions, as in learning them, what is important is what is accomplished, not the specific movements that accomplish it. For the everyday events observed here, the language described goals and subgoals, completed actions by actors on objects rather than activities of the actors or changes of locations of objects. In order to describe events, then, participants appear to consider the goals of the actions they are watching, features not given directly in the perceptual input. To provide such descriptions requires viewers to think about the higher-order goals of the actor and the relations of the subgoal structure to the higher-order goals.

So, as for naming body parts, speaking about events appeared to evoke more abstract representations of them. Language elicited functional features, features containing information about the goals and subgoals of the actions underlying the events. In the case of these complex everyday events, this functional information served to produce a tighter organization of the perceptual information, leading to greater alignment of fine and coarse event boundaries. Just as names reorganize perception of bodies, describing events reorganizes perception of events.

Qualitative differences between coarse and fine units. Talking does more than *affect* perception and cognition. It also *reflects* perception and cognition. The language of the descriptions provides insight into how events are interpreted as they happen. The vast majority (96%) of the play-by-play descriptions were actions on objects. The few exceptions were "she enters" or "he exits" (notably, events by feet, or translocations, not by hand).

Revealingly, the descriptions of coarse and fine event units differed qualitatively. Consider one person's protocol for coarse segmentation of "making a bed": "walking in; taking apart the bed; putting on the sheet; putting on the other sheet; putting on the blanket." Now the fine units for the coarse unit "putting on the sheet": "unfolding sheet; laying it down; putting on the top end of the sheet; putting on the bottom; straightening it out." This example suggests what subsequent analyses supported: that at the coarse level, events are punctuated by objects or object parts; that is, new coarse units are typically indicated by a new object or object part. At the fine level, events are punctuated by articulated actions on the same object, so objects are described less precisely. One measure of language use illuminates that observation: ratings of generality or specificity of the words by new participants. According to these ratings, nouns – that is, the objects referred to – were more variable and specific at the coarse level than at the fine level. The language people use when they talk about events as they observe them, then, reveals how they perceive and organize events in their minds, as actions on objects. The actions described are accomplishments, typically goals and subgoals, parts of a larger goal. Observers organize action at a coarse level by objects, so that each coarse unit involves a different object or object part; similarly, they organize fine units by actions on those objects.

For the kinds of events that fill our lives, then, describing both affects and reveals perception and cognition. Describing events as they unfold organizes perception of them around people's actions on objects, on the goals and subgoals of their actions. These kinds of events, making beds and doing the dishes, involve complex actions coordinating objects with different parts of the bodies. As such, they contrast with the simpler events of translocation, of entire bodies moving from one place to another in space. We have termed the former *events by hands* and the latter, *events by feet* (Tversky, Lee, and Zacks 2004). Translocations can often be represented quite simply, as paths and turns at landmarks, though sometimes manner of motion is perceived and communicated as well. However, because of the simplicity of the action, language may not serve to organize perception of translocations. The next project describes research on abstract unfamiliar events of translocation.

Understanding translocations. So far, we have investigated everyday events that are more or less familiar to viewers, events performed primarily by complex movements of the arms, hands, and upper bodies, directed by the eyes. Viewers perceive these ongoing events hierarchically. Providing a play-by-play description of each segment while segmenting yielded greater hierarchical organization, suggesting that articulation of top-down knowledge of function organizes perception according to indicators of goal/subgoal structure. Even though these events varied in familiarity, all were somewhat familiar so that their goal/subgoal structure was easily described by observers.

How are abstract, novel events, whose goals and subgoals are difficult to discern, segmented and described? Does describing organize perception for events that are primarily translocations? To study this, we turned to a film used in a classic experiment by Heider and Simmel (1944). They showed participants a film of three geometric figures moving around in a minimal background. According to Heider and Simmel, participants perceived the actions in the film as a social, goal-directed scenario, one character bullying and chasing two smaller ones, the smaller ones taunting the bully and finally thwarting him. This scenario, which we have called the *chase scenario*, was translated into a computer animation and shown to viewers along with a second animation, modeled on "hide and seek." As before, all viewers segmented the videos into coarse and fine units, on alternate viewings. Familiarity was varied by having half the viewers segment the films on first viewing and half after five viewings. Half of each familiarity group described the action in each segment as they segmented, and half segmented silently. Causality was also varied, by presenting the films forwards or backwards, counterbalanced across conditions (Hard *et al.* 2006). The presumption was that presenting the films backwards would disrupt perception of the causal relations between the actions.

Importantly, after only a single viewing of the films, the play-by-play descriptions of the event segments revealed that, contrary to previous claims, viewers did not perceive the events as a sequence of sensible goal-related actions. After a single viewing, more than 90% of the descriptions were of movements, such as, "move," "rotate," and "change direction." This dropped to around 75% after five viewings. By contrast, after five viewings, around 70% of the protocols contained intentional verbs, such as "chase," "hide," and "talk," whereas after a single viewing, only 40% of the protocols contained intentional verbs (descriptions could contain both motion and intention). After five viewings, forward events were described more intentionally than backwards ones. Thus, familiarity can have a strong influence on event understanding.

Intriguingly, although familiarity increased intentional understanding of the films, in these cases it had no effect on hierarchical organization. Nor did describing or direction of viewing. In fact, the degree of hierarchical organization as well as the specific event unit boundaries were highly consistent across all conditions and across individuals as well. This suggests that for these events, not the complex interactions of many body parts that characterized the earlier work, but rather events consisting primarily of simple paths of motion with very little manner of motion, the perceptual information in the stimulus was sufficient for segmentation. Top-down interpretations did not facilitate segmentation for this type of event; rather, the motion itself seemed to drive segmentation. A detailed analysis of the motion features in the films supports that interpretation. The films were coded for types of movement in one-second bins: *start*, *turn*, *rotate*, *contact object*, and *change speed*. Those bins coinciding with segment boundaries had significantly more movement changes than those that did not coincide with segment boundaries. Moreover, coarse segment boundaries were associated with more movement changes than fine segment boundaries. There were no qualitative differences between coarse and fine units, only quantitative ones.

Note that these events were highly abstract. Unlike the films of everyday events, these films did not show full-bodied characters interacting in space. Rather they used point-like figures to stand for the characters and the motion consisted of paths of movement and jiggling of the characters. As such, these results should be seen as qualifying the previous findings for everyday events rather than contradicting them. For paths of motion, translocations of entire bodies, the dominant motion is stop, start, change of direction, and change of speed. These simple, salient changes are all that is needed for segmentation and for hierarchical organization. The perceptual information seems to be sufficient for excellent hierarchical segmentation, even in the absence of understanding of intentions and goals. For everyday events that consist of complex interactions of arms, hands, head, body, and legs with objects in the world, thinking about the goals and subgoals does improves hierarchical segmentation by focusing it on the relevant parts of the action. Describing activates that thinking.

5 Talk and thought

Of all the categories people acquire, events are arguably the most important. They are important because they fill our lives and fulfill – or obstruct – our needs. Especially important are events enacted by people. These are events that we need to understand in order to learn them and in order to react to them. These events, even the mundane, such as preparing meals or assembling furniture, are nevertheless intricate interactions of people's bodies with objects that take place over time. Here, we asked two of those Big Questions that make cognitive science exciting: How do people perceive and understand the events of their lives? Does language affect perception? We presented research on bodies and events that showed that language affected their organization in perception. For bodies, names bias perception toward organization based on abstract function rather than organization based on perceptual salience. Specifically, when cued by a named body part, functionally important body parts were more rapidly verified in a picture of a body, but when cued by a picture of a body with a part highlighted, perceptually salient body parts were more rapidly verified. For events, segmentation of ongoing events into coarse and fine units was more tightly hierarchically organized when observers described each event segment as they segmented than when observers merely segmented. Specifically, when describing, and as confirmed by the descriptions, observers' segmentation of events into parts and subparts became more closely aligned with goals and subgoals.

These effects of language on perception are quite different from the kinds of effects observed in eyewitness memory (Loftus 1980 [1996]). In those studies, participants watched a slide show or film of an accident or disturbing event. Later they were asked a long list of questions about the incident. For some participants, the questions presupposed information contradictory to what had been viewed. For example, the slide show might have shown a stop sign but the question presupposed a yield sign. In the memory tests, many participants who had received the contradictory information selected the information later presupposed rather than what they had viewed. This is a classic interference effect in memory (e.g., Tversky and Tuchin 1989), where the same cue is associated with different responses, and the responses conflict, sometimes one

winning out, sometimes the other, sometimes neither, as when we draw a blank searching for someone's latest phone number or where we parked the car.

Instead, these effects of language on perception seem closer to the effects of language on thought that the Whorfians or neo-Whorfians have explored (e. g., Boroditsky 2003; Levinson 2003; Slobin 1996a; Whorf 1956). For example, speakers of languages that use both left-right-front-back and north-south-east-west frames of reference to refer to objects in space tend to organize a spatial array of nearby objects around their own left-right. On the other hand, speakers of languages that only use a north-south-east-west absolute reference frame also organize nearby objects using that absolute reference frame (Levinson 1996). Speakers of languages restricted to absolute reference frames are also better oriented when moving around in space (Levinson 2003). To explain these kinds of effects, Slobin proposed that the way language affects thought is by focusing attention on certain features of the world rather than others. The present results are consistent with that analysis, that language calls preferential attention to some aspects of experience at the expense of others. In the present cases, the shift in focus of attention is from more perceptual features to features that are more functional or abstract.

Language can cause shifts of attention that have other cognitive consequences. The influences of language that we have found occur within a language and within an individual. They broaden Slobin's suggested mechanism for the Whorfian effects from "while speaking" to "while perceiving" and "while remembering," and from "the dimensions of experience that are enshrined in grammatical categories" to dimensions of experience "enshrined" in semantic categories and schemas. But more than that, the results highlight how language serves as a cognitive tool, a tool that can guide and craft perception, thought, and action. As such, simple describing is an elementary form of teaching.