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Authors
Fausey, Caitlin M.
Boroditsky, Lera

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English and Spanish Speakers Remember Causal Agents Differently

Caitlin M. Fausey (cmfausey@psych.stanford.edu)
Lera Boroditsky (lera@psych.stanford.edu)
Department of Psychology, 450 Serra Mall, Bldg 420
Stanford, CA 94305 USA

Abstract

Does language play a role in how people interpret and remember causal events? One source of variation in causal event descriptions is agentivity, such as the difference between *"She broke the vase"* (agentive) vs. "*The vase broke"* (non-agentive). In this paper, we examined English and Spanish speakers' descriptions of intentional and accidental events, as well as their memory for the causal agents of these events. While both groups of speakers described intentional events using agentive language, English speakers described accidents using more agentive language than did Spanish speakers. Similarly, English and Spanish speakers remembered intentional agents equally well but diverged in their memory for accidental agents, with better accidental agent memory in English than in Spanish. Spanish-English bilingual descriptions and memory resembled that of Spanish monolinguals, both when tested in Spanish and in English. Further, to test the causal nature of linguistic context, we primed English speakers with either agentive or non-agentive language. English speakers who were exposed to agentive language remembered causal agents better than those exposed to non-agentive language. It appears that patterns of language use shape how people interpret and remember causal events.

Introduction

Imagine that a guest at your cocktail party accidentally brushes against a flower vase and the vase ends up in pieces on the floor. When asked about what happened, it would be natural in English to say "*She broke the vase*". Agentive expressions like these are canonical in English (Bates, Friederici, Wulfeck, & Juarez, 1988), even when describing accidental events. In fact, descriptions that avoid mentioning an agent can come across as evasive, such as Reagan's famous "*Mistakes were made*".

In this paper we investigated the extent to which this tendency to use agentive language differs between English and Spanish. We also examined the role that linguistic descriptions play in shaping English and Spanish speakers' memory for causal events. In particular, we compared English and Spanish speakers' descriptions of intentional and accidental events. We find that Spanish speakers more strongly distinguish between intentional and accidental events in linguistic descriptions than do English speakers. For example, though both Spanish and English speakers describe intentional events using agentive language, Spanish speakers are less likely than English speakers to describe accidents agentively. These results are consistent with suggestions from linguistic theory (Maldonado, 1992) as well as with previous elicitation work (Martinez, 2000; Slobin & Bocaz, 1988). Does this difference in language lead to other cognitive differences between the two groups? For example, if Spanish speakers are less likely to mention agents in their descriptions of accidental events, are they also less likely to remember who the agents were?

Recent research has provided evidence of cross-linguistic differences in how people think about colors (Roberson & Hanley, 2007; Winawer et al., 2007), space (Levinson et al., 2002), and objects (Boroditsky, Schmidt, & Phillips, 2003; Imai & Gentner, 1997; Lucy, 1992), among other domains. Research on the role of language in event cognition, however, has provided more mixed results (e.g., Billman & Krych, 1998; Gennari, Sloman, Malt & Fitch, 2002; Papafragou, Massey, & Gleitman, 2002). In this paper we examine a new aspect of events: agentivity in causal events.

The domain of causal events provides a rich testing ground for a novel linguistic relativity hypothesis: Talking about causal agents improves memory for causal agents. We hypothesize that patterns in language use may guide attention to those parts of events that are typically talked about (Boroditsky, Ham, & Ramscar, 2002; Slobin, 1996), so that habitually talking about a certain element of events may strengthen memory for that element. People whose language environments include more agentive language may remember causal agents better than people whose language environments include less agentive language.

Note that language use may influence cognition via multiple mechanisms. Language may act at a "local" level such that the immediate linguistic context of any behavior influences the behavior. Over time, accumulations of many instances of integrating linguistic and non-linguistic information may sufficiently shape a cognitive system at a "global" level such that people with different histories of language use attend to different aspects of their world even when not using language. In this paper we first present evidence that there is a cross-linguistic phenomenon to explain, then present direct evidence for a "local" linguistic mechanism, and finally suggest follow-up studies that will help to even better understand the nature of the reported cross-linguistic differences in causal event cognition.

In the studies reported in this paper, we compared English and Spanish speakers' descriptions and memory for accidental and intentional events. In all studies, participants first completed a simple control memory task. This task was unrelated to event cognition and served as a baseline measure of memory performance. In Experiment 1 we then showed English and Spanish speakers videos of intentional and accidental events. After viewing the events, participants were tested on their memory for the agents of these events. After the memory test, participants viewed the videos again and provided a verbal description for each video.

In addition to examining language and memory patterns of monolingual English speakers and monolingual Spanish speakers, we also examined these patterns in bilinguals who had a lifetime of experience using both languages. In Experiment 2, we tested whether local linguistic environment influences memory for agents. We primed one group of English speakers with agentive language, and another group with non-agentive language. We then tested both groups on the same event memory task used with English and Spanish speakers in Experiment 1. This second experiment more directly tests whether patterns in language play a causal role in shaping attention to events.

In combination, Experiments 1 and 2 test for a novel cross-linguistic difference in causal event cognition.

Experiment 1: Who did it and what happened?

Participants

63 monolingual English speakers (Stanford University), 87 monolingual Spanish speakers (Universidad de Chile), and 38 Spanish-English bilinguals (University of California, Merced) received course credit or were paid for their participation. Half of the bilinguals completed the experiment in English and half in Spanish.

Monolingual participants reported learning only their native language before age 12. All bilinguals reported learning both languages before age 12, with early mean ages of first exposure (Spanish M = 2 years, English M = 4.7 years). Bilinguals reported high proficiency speaking and understanding both languages, with mean ratings for all measures above 4.4 on a scale in which 5 indicated native-like proficiency. Bilinguals reported an average of 30 percent current daily language use in Spanish.

General study set-up

Text materials. Participants read instructions and other text in either English or Spanish. English and Spanish texts were developed simultaneously, and all Spanish text was verified by a native Chilean-English bilingual.

Design and procedure. All participants did three tasks:

A. Object-orientation memory: The first task was a control memory task that assessed participants' memory for object orientations. This was designed to be a baseline measure of memory performance unrelated to causal events. In addition to serving as a baseline memory measure, this task also helped accustom participants to computerized memory tests.

B. Causal agent memory: The second task presented participants with videos of causal events and tested their memory for the agents of those events.

C. Event descriptions: Finally, participants completed an event description task during which they were asked to provide verbal descriptions of causal events. Importantly, participants did not describe any events until *after* the memory task, nor was any causal language included in other materials. Each task is described in more detail below.

Part A: Object-orientation memory

Materials

45 color drawings were used in this task. The drawings showed 15 different objects (e.g., *chair*, *motorcycle, trumpet*), each in 3 different orientations: facing right, facing left, or facing forward.

Design & Procedure

During encoding, participants were shown pictures of 15 different objects. Each object was shown in one of three possible orientations: facing right, facing left, or facing forward. Which objects appeared in which orientations was counterbalanced across participants. Pictures were presented on a computer screen one at a time, and each image remained on the screen for two seconds. Participants were instructed to pay attention to the images and were told that their memory would be tested. Participants received no information about which aspect of the stimuli would be probed during the memory test.

After the encoding phase of the task, participants were given a brief distracter task. They were shown an image comprised of black and white squares and asked to count the number of white squares. After this brief distracter task, they were tested for their memory for the orientations of the objects they had seen at encoding.

At test, participants were shown all three possible orientations of each object seen at encoding. For each object, the participants' task was to indicate which of these three orientations of that object they had seen at encoding. Participants completed this test at their own pace without feedback. One random ordering of learning and test trials was presented to all participants.

Part B: Causal agent memory

Materials

Videos. Videos of 16 unique events were prepared (see Table 1). Three white male adults acted as agents in an intentional version and an accidental version of each event. The same silent videos served as stimuli for both English speakers and Spanish speakers. The actors in the videos were typical in appearance for both the US American and Chilean societies.

Table 1: Events.

Stick sticker	Close drawer	Knock cups
Drop keys	Open umbrella	Crack egg
Break pencil	Rip paper	Crumple can
Let go balloon	Spill water	Turn off light
Pop balloon	Knock box	Open door
	Close book	

Design

Learning phase. During the learning phase, participants viewed 16 videos. Each video was a unique event, in which one of two male agents appeared. A man wearing a blue shirt acted as the agent in eight events and a different man wearing a yellow shirt acted as the agent in the other eight events. Each male appeared as the agent in four intentional events and in four accidental events.

Across participants, each particular event featured the same actor as the agent (e.g., the *blue-shirt* man was always the agent in the balloon popping videos), but half of the participants viewed the intentional version of the event while the other half viewed its accidental counterpart.

Videos were presented in one of two pseudo-random orders, counterbalanced across participants. These pseudo-random orders ensured that no more than three videos of the same agent or same intention appeared in a row. The 16 videos in the learning phase were presented sequentially, with a one-second pause between each video. Participants saw each video only once.

Distracter phase. After viewing 16 videos, participants were instructed to count to 10. Pilot testing revealed that a longer delay period between learning and test resulted in chance performance for agent memory in this paradigm.

Test phase. Each trial of the recognition memory test consisted of a probe video followed by a picture of both agents that had appeared during the learning phase (i.e., *blue-shirt guy* and *yellow-shirt guy*; see Figure 1). In each probe video, an unfamiliar man wearing a green shirt appeared as the causal agent of the same events that had been presented during the learning phase. For example, if a participant had seen the "accidental balloon popping" event during learning, s/he would see this same event acted by the new agent in the test phase. After viewing the probe video, participants were asked, "*Who did it the first time?*" ("*¿Quién lo hizo la primera vez?*") and responded by mouse-clicking on one of the two agent pictures (either the blue-shirt guy or the yellow-shirt guy). Participants were only tested on the events they had seen during the learning phase. For example, if a participant had seen the accidental balloon popping at learning, they would only be tested on the accidental balloon popping and not on the intentional version of the same event.

As in the learning phase, test videos were presented in one of two new pseudo-random orders, counterbalanced across participants.

Procedure

As in the object-orientation memory study, participants were instructed to pay attention to the videos and were told that their memory would be tested. Participants were not given any extra clues about what aspects of the events they should pay attention to. Participants received no feedback during the memory test.

Part C: Causal event descriptions

Materials, Design and Procedure

Each participant described exactly the same videos s/he had seen during the learning phase of the agent memory study. In each description trial, participants viewed a video and were then prompted to answer the question "*What happened?*" ("*¿Qué pasó?*"). Participants typed their responses to these questions and received no feedback.

Figure 1: Example agent memory test trial.

Results

We first report the results of the event description phase of the study, and then the results of the memory experiments. In all studies we first compare the monolingual English speakers to the monolingual Spanish speakers. We then report the analyses for the Spanish-English bilinguals and compare them to both the English monolinguals and the Spanish monolinguals.

Results: Event Descriptions

Description coding. Each participant described eight intentional events and eight accidental events. Descriptions were coded as agentive if the sentence mentioned the causal agent in a transitive sentence that described the change-of-state event. A canonical agentive description is *"He popped the balloon"*. Descriptions were coded as non-agentive if the change-of-state event was described intransitively, without an agent. A canonical non-agentive description is *"The balloon popped"*.[1] Most of the Spanish non-agentive sentences were marked by the clitic *se*. Across all participants, 4.5 percent of all descriptions did not describe the event and were excluded from analyses.

Agentive vs. Non-agentive language use. English speakers and Spanish speakers described intentional events similarly but diverged in their descriptions of accidental events. Intentional events were described agentively by both English speakers (M = 96.9) and Spanish speakers (M = 95.0), $t(148) = 1.23$, $p = .22$. Accidental events, however, were described more agentively in English (M = 79.2) than in Spanish (M = 62.5), $t(148) = 5.03$, $p < .001$. The interaction between language group and event type was reliable, both across participants $F(1,148) = 18.19$, $p < .001$, and across events $F(1,15) = 15.27$, $p = .001$. Table 2 presents some non-agentive accident descriptions.

[1] Some non-agentive descriptions took the form, "*Someone was doing X, and then Y happened*". These were coded as non-agentive because the change-of-state event was linguistically separated from the agent and described using an intransitive verb form.

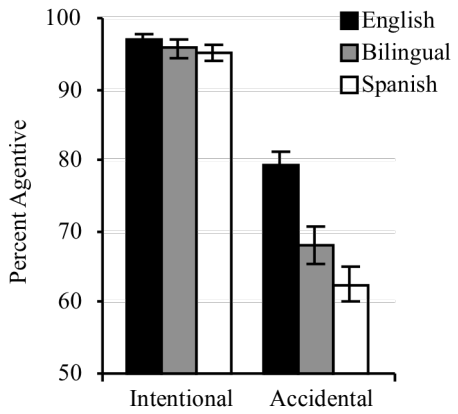

Figure 2: Event descriptions in English and Spanish.

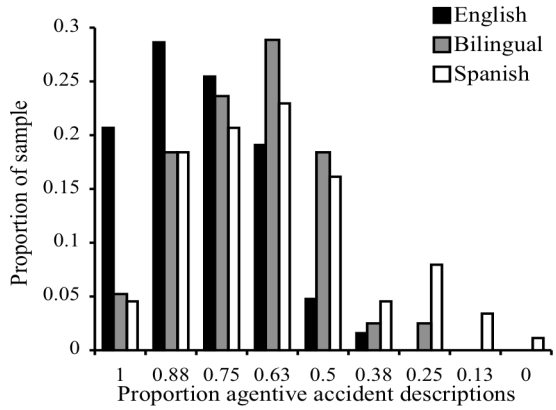

Figure 3: Within-language variation in accident descriptions.

The within-language pattern of variation in accidental event descriptions was consistent across the two language groups ($r(14) = .94$, $p < .001$). For example, in both linguistic communities speakers were more likely to use agentive language when describing the egg-breaking event than when describing the pencil-breaking event. This suggests that speakers in both communities were sensitive to properties of the affected objects in the events.

Bilingual description patterns did not vary by task language.[2] Subsequent analyses therefore considered the bilingual sample as a whole. Like both English and Spanish monolinguals, bilinguals described intentional events using predominantly agentive language (M = 95.7). Bilingual accident descriptions (M = 68.1) were most similar to those of Spanish monolinguals, differing reliably from English speakers, $t(99) = 3.37$, $p = .001$, but not from monolingual Spanish speakers, $t(123) = 1.35$, $p = .18$ (see Figure 2).

Figure 3 illustrates the variation in agentive accident descriptions *within* each linguistic community. The distributions reveal a progressive shift to greater proportions of non-agentive accident descriptions from English monolinguals, to Spanish-English bilinguals, to Spanish monolinguals.

To sum up, English speakers and Spanish speakers described causal events differently. While speakers in each monolingual and bilingual community described intentional events using agentive language, they differed in their descriptions of accidental events. When describing accidents, English speakers used more agentive language than did Spanish speakers and Spanish-English bilinguals. Answers to the question *"What happened?"* vary by linguistic community when describing accidents.

[2] A trend to use more agentive language when describing accidents in English (M=73.0) than in Spanish (M=63.2), $p = .07$, suggests that more data may increase power to detect an effect of local linguistic context. Ongoing research will help to address this issue.

Table 2: Example non-agentive descriptions.

Spanish
De la nada, se le partió el lápiz en dos.
(Out of nowhere, the pencil split in two on him.)
Iba a guardar algo y el cajón se cerró.
(He was going to put something away and the drawer closed.)
English
His pencil broke.
The drawer closed.

Results: Memory for object orientations

English speakers and Spanish speakers did not differ in their memory for the orientation of objects (M = 77.9, and 75.5, respectively), $t(148) = 1.15$, $p = .25$. It is reassuring that the two groups are well-matched on memory performance in this control task. Bilinguals (M = 83.5) showed better object memory than did Spanish speakers, $t(123) = 3.23$, $p = .002$, and English speakers, $t(99) = 1.98$, $p = .05$. Though there is no obvious explanation for this bilingual advantage, it suggests that bilinguals were engaged in the experiment and mitigates against any hypotheses about impaired memory for agents.

Results: Memory for causal agents

Mirroring the pattern of event descriptions, English and Spanish speakers remembered intentional agents equally well but diverged in their memory for accidental agents (see Figure 4). Intentional agents were remembered well by both English (M = 80.4) and Spanish (M = 78.5) speakers, $t(148) = .69$, $p = .49$. Accidental agents, however, were better remembered by English speakers (M = 82.3) than by Spanish speakers (M = 74.1), $t(148) = 2.87$, $p = .005$. The interaction between language group and event type was reliable, $F(1,148) = 4.29$, $p = .04$.

Spanish-English bilinguals patterned like Spanish monolinguals. They remembered intentional agents (M = 75.9) as well as did English speakers $t(99) = 1.32$, $p = .19$ and Spanish speakers, $t(123) = .77$, $p = .45$. Their memory for accidental agents (M = 68.8) differed reliably from that of English monolinguals, $t(99) = 3.53$, $p = .001$, but not from that of Spanish monolinguals, $t(123) = 1.47$, $p = .15$.

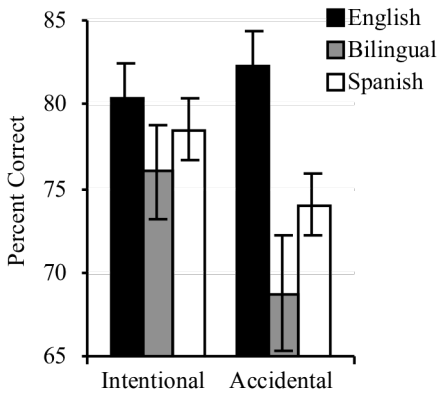

Figure 4: Causal agent memory in English and in Spanish.

Discussion

English and Spanish speakers remembered causal agents in a pattern consistent with their causal event descriptions. Both groups of monolingual speakers had similarly strong memory for agents of intentional events, but English speakers remembered accidental agents better than did Spanish speakers. Bilinguals, who described causal events like Spanish monolinguals, also showed a selective impairment in memory for accidental agents. Even though the bilinguals in this study reported high proficiency in English and are university students who spend most of their day in English contexts, early exposure and current use of Spanish may promote a less agentive perspective on accidental events than English monolinguals seem to have.

Note that it is not the case that Spanish monolinguals and Spanish-English bilinguals had poorer memory than English monolinguals overall. All groups of speakers showed similar memory patterns for object-orientation as well as for intentional agents. Only accidental events were described and remembered differently across communities. These findings suggest that the way people talk about causal events is related to what people remember about these events. But what is the nature of this relationship? Does the way people talk shape the way they think?

An important question in all cross-linguistic research is whether patterns in language play a causal role in shaping thinking. While linguistic performance and memory performance appear tightly linked in Experiment 1, these results alone do not demonstrate that language *per se* shapes people's attentional patterns. There are many differences between the cultural experiences of Spanish and English speakers, and so more direct tests of a linguistic mechanism are needed to conclude that the memory differences observed in our first study may be attributed to language.

To test more directly whether manipulating patterns in language can change what people remember about events, we conducted Experiment 2. In Experiment 2, we primed English speakers with either agentive or non-agentive language in an unrelated task before they completed the same event memory task as used in Experiment 1. If patterns in language bias people's attention in encoding events, then being exposed to non-agentive language should lead to less sharp memory for agents than being exposed to agentive language.

Experiment 2: Priming

Participants and general study set-up

60 English speakers (32 agentive prime, 28 non-agentive prime) received course credit or were paid for participation.

English speaking participants completed 3 tasks. First, all participants were tested on the same control object-orientation memory task as used in Experiment 1. Then, all participants completed the linguistic priming task described below. After the linguistic priming task, participants completed the same causal event memory task as used in Experiment 1. All of the procedures and materials were identical to those of Experiment 1 with the exception of the insertion of the priming task.

Priming Task Materials

Sentences. Participants in each condition listened to 24 sentences, either all agentive (e.g., *She burned the toast*) or all non-agentive (e.g., *The toast burned*). No verbs that could describe actions in the agent memory task were used. All sentences were recorded by a female native English speaker and presented via computer speakers.

Images. While listening to each sentence, participants viewed an image that contained two pictures: the beginning and the end state of the affected object. For example, people who heard *She burned the toast* or *The toast burned* viewed a screen with a piece of bread on the left and a burned piece of bread on the right. The end-state picture appeared on the left in 12 images and on the right in 12 images.

Priming Task Design and Procedure

During the priming task, participants saw 24 images, each accompanied by a sentence that played when the image appeared. Participants were instructed to click on the picture that the sentence described, making the task and correct response identical in each prime condition. Stimuli were presented in random order. After this exposure, participants were given a surprise recall test and asked to write down as many sentences as they could remember. After completing this priming task, participants continued on to complete the same event memory task as used in Experiment 1.

It is important to note that this priming manipulation does not distinguish between accidental and intentional events. Either all prime sentences were agentive or all prime sentences were non-agentive for a given participant. As such, this manipulation is predicted to influence attention to agents in general, not to agents of a particular kind of event. If the patterns in one's linguistic environment shape patterns of attention, then directly manipulating the local linguistic environment in this way should modulate English speakers' memory for causal agents.

Results

Participants in each prime condition remembered object orientation (the control task) similarly well. If anything, people in the non-agentive condition remembered objects marginally better (M = 78.1) than did people in the agentive condition (M = 71.5), $t(58) = 1.91$, $p = .06$. As predicted, participants primed with agentive language showed better memory for agents (M = 78.3) than those primed with non-

agentive language (M = 70.9), $t(58) = 1.73$, $p < .05$ (one-tailed).[3]

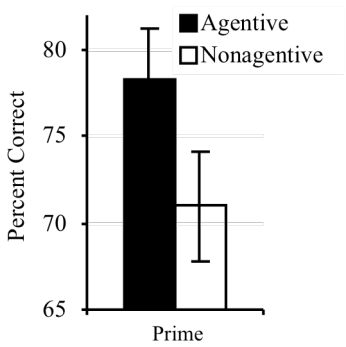

Figure 5: Memory for agents following linguistic primes.

Discussion

English speakers' memory for causal agents in an agentive language context resembled their unprimed memory pattern from our first experiment. When the local linguistic environment consisted of non-agentive language, however, they showed impaired memory for agents. These results suggest that non-agentive language shifts attention away from the agents of causal events.

General Discussion

How do people talk about and remember causal events? After witnessing an intentional event, both English speakers and Spanish speakers answered the question *"What happened?"* by talking about the causal agent. By contrast, English speakers described accidental events more agentively than did Spanish speakers. In a recognition memory task, English and Spanish speakers remembered intentional agents equally well but English speakers remembered accidental agents better than did Spanish speakers. Spanish-English bilinguals behaved like Spanish monolinguals, suggesting that experience with a less agentive language than English shifts descriptions and memory away from accidental agents. Further, English speakers were sensitive to a direct manipulation of linguistic context and remembered agents better after hearing agentive language than non-agentive language. Together, these results suggest that language use shapes our attention to and memory for causal agents.

How people integrate linguistic and non-linguistic information is an important piece of the puzzle of human event cognition. The present results provide evidence that language use shapes memory for causal agents.

Acknowledgments

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[3] There was no main effect of event type, $F(1,58) = .002$, $p = .97$, and no interaction of prime by event type, $F(1,58) = .09$, $p = .78$.

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