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Title

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 31(31)

ISSN

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Publication Date

2009

Peer reviewed

The role of language in eye-witness memory:
Remembering who did it in English and Japanese

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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 Japanese speakers' descriptions of intentional and accidental events, as well as their memory for the causal agents of these events. While both groups of speakers used agentive language to describe intentional events, English speakers described accidents using more agentive language than did Japanese speakers. Similarly, English and Japanese speakers remembered intentional agents equally well but diverged in their memory for accidental agents, with better accidental agent memory in English than in Japanese. These results extend recent findings from a similar paradigm examining causal agent language and cognition in speakers of English and Spanish (Fausey & Boroditsky, submitted). It appears that patterns of language use shape how people interpret and remember causal events.

Introduction

During President Obama's recent swearing-in ceremony, the delivery and repetition of the presidential oath deviated from protocol so much that a do-over was carried out the next day. According to one journalist's account of the errors, "*The main problem was that the word 'faithfully' had floated upstream in the constitutional text*" (Liptak, 2009). To English ears, such non-agentive language sounds evasive. Agentive language like "*Chief Justice Roberts misplaced a word in the oath*" (Zeleny, 2009), sounds more like a typical English description, even for accidental events. Is this preference for agentive accident descriptions universal across languages? If not, do non-linguistic patterns of causal cognition also vary across speakers of the world's languages?

In this paper, we examine causal language and cognition in speakers of English and Japanese. We find that speakers in each linguistic community talk about and remember intentional events in similar ways, but differ in how they talk about and remember accidental events. Our results contribute to a growing set of findings that suggest correspondences between patterns in causal language and in causal cognition.

Language and event cognition. Recent research has provided clear evidence of cross-linguistic differences in how people think about colors (e.g., Roberson & Hanley, 2007; Winawer et al., 2007), space (e.g., Levinson, Kita, Haun & Rasch, 2002; McDonough, Choi, & Mandler, 2003), and objects (e.g., Boroditsky, Schmidt, & Phillips, 2003; Imai & Gentner, 1997; Lucy, 1992), among other domains. However, research on the role of language in event cognition, specifically the manner of motion, has provided mixed results (e.g., Billman & Krych, 1998; Gennari, Sloman, Malt & Fitch, 2002; Gentner & Loftus, 1979; Loftus & Palmer, 1974; Papafragou, Massey, & Gleitman, 2002). In this paper we examine the role of language in a different aspect of events: agentivity in causal events.

The domain of causal events provides a rich testing ground for a specific linguistic relativity hypothesis: Talking about causal agents improves memory for causal agents. Linguistic descriptions can guide attention to the parts of events that are described and habitually talking about certain elements of events repeatedly directs attention to those elements. As a result, people may deploy attention in language-consistent ways even when they don't overtly describe events (Boroditsky, Ham, & Ramscar, 2002; Slobin, 1996). In this paper, we examine whether people whose language environments include more agentive language remember causal agents better than people whose language environments include less agentive language.

Causal agents in language and cognition: English and Spanish. In a recent investigation by Fausey and Boroditsky (submitted; henceforth referred to as F&B), English and Spanish speakers viewed videos of intentional and accidental events, were then tested on their memory for the agents of these events, and later described the events. Results revealed that English and Spanish speakers described intentional events similarly, using mostly agentive language. For accidental events, however, English speakers used more agentive language than Spanish speakers did. In Spanish, accidents were often described with non-agentive expressions using *se*, as in "*Se rompió un huevo*" (*An egg cracked*) and "*Se abrió el paraguas*" (*The umbrella opened*). Results from the non-linguistic memory task mirrored the patterns in language. English and Spanish speakers remembered the agents of intentional events equally well, but English speakers remembered the agents of accidents better than Spanish speakers did.

In F&B's second study, English speakers were primed with either agentive or non-agentive language and then attempted to remember causal agents. People who were exposed to agentive language in the separate priming task remembered agents better than those exposed to non-agentive language. These results suggest that patterns of

language use can shape how people interpret and remember causal events.

Causal agents in language and cognition: Japanese. F&B's initial study was motivated by linguistic analyses that had suggested that Spanish speakers focus on event outcomes more often than English speakers do and that Spanish speakers also frequently use non-agentive language to signal accidentality (Filipovic, 2007; Maldonado, 1992; Martinez, 2000; Slobin & Bocaz, 1988). Linguistic analyses of Japanese have also suggested that the frequency of non-agentive expressions may be higher in Japanese than in English, making Japanese an interesting extension of F & B's previous findings.

Verbs are thought to be especially salient in Japanese and typical verb forms in Japanese may differ from typical verb forms in English. For example, Teramura (1976) noted that even when an event involves someone who could be described as a causal agent (e.g., "*He dropped the pen*"), it is often more natural in Japanese to describe such events using non-agentive expressions like "*PEN-ga ochiteshimatta*" ("*The pen dropped, unfortunately*"), or even sentences that include only a verb like "*ochiteshimatta*" ("*dropped, unfortunately*"). In a recent study, Fukuda and Choi (2006) reported that the intransitive usage bias in Japanese appears to be strong enough to influence early language learning such that Japanese speaking children start producing intransitive verbs before transitive verbs, which contrasts with patterns seen in English speaking children. Verbs may be especially salient in Japanese because nouns and pronouns in Japanese are often optional and inferred from context (Fernald & Morikawa, 1993). The form of the verb may therefore be a potent cue for how to frame an event.

Agentive and non-agentive language in Japanese. Alternatives to simple transitive event descriptions can take many forms in English and in other languages. In this research, we focus on transitivity contrasts like "*He popped the balloon*" versus "*The balloon popped*". In Spanish, this kind of non-agentive expression is marked by using *se* (e.g., "*Se rompió el globo*"). In Japanese, we focus on non-agentive expressions marked by a combination of the intransitive form of the verb and the particle "ga" attached to the affected object.

In Japanese, two different verbs are often used for the transitive and intransitive description of the same action. These two verbs often share the same stem. One example is *waru/wareru* 割る／ 割れる (*to break*). An agentive use would be 卵を割った (*Tamago-wo watta / (I) broke the egg*). A non-agentive use would be 卵が割れた (*Tamago-ga wareta / (The) egg broke*). Other verbs in Japanese have the same form for both transitive and intransitive uses, and the presence of "ga" marks the non-agentive expression. One example is *hiraku* 開く *(to open)*. An agentive use would be 彼がドアを開いた *(Kare-ga DOA-wo hiraita / He opened the door*) and a non-agentive use would be ドアが開いた *(DOA-ga hiraita/ (The) door opened*).

In this study, we aimed to find out how English and Japanese speakers talk about and remember intentional and accidental events. We used the same paradigm as F&B, with new video stimuli.

Videos in this study featured Japanese actors, in contrast to the Caucasian actors featured in the videos used by F&B. In cross-cultural research about attention to human agents, one necessarily confronts potential challenges in interpreting memory patterns due to cross-race recognition effects (e.g., Malpass & Kravitz, 1969) – in many cases, either the exact stimuli or the "same race" status is held constant across the two groups, but not both at the same time. In the current paradigm, such concerns may be minimal because all participants attempt to remember agents for two kinds of events and the relationship between these kinds of events within each community is of interest. That is, the design permits analysis of main effects as well as a predicted interaction across communities. In this study, we sought to extend our understanding of English speakers' memory patterns by testing them using different video stimuli than used by F & B and also to examine Japanese causal description and memory patterns using stimuli most likely to invoke natural processing.

In this paper, we compared English and Japanese speakers' descriptions and memory for intentional and accidental events. Participants first completed a simple control memory task. This task was unrelated to event cognition and served as a baseline measure of memory performance. We then showed English and Japanese 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.

Experiment: Who did it and what happened?
Participants

49 English speakers (Stanford University; 33 female, Mean age = 19.06 years) and 70 Japanese speakers (Keio University, Jochi University, Tokyo Kogyo University, Surugadai Law School, all in Tokyo, Japan; 34 female, Mean age = 20.94 years) received course credit or were paid for their participation. Participants were selected to be age 25 or younger and functionally monolingual.

English speakers reported learning only English before age 12 and did not currently use another language. Exposure to English in Japan is almost inevitable, including in school before age 12. Thus, we selected Japanese speakers based on their self-rated proficiency speaking and understanding English. Using a 5-point scale in which 5 indicated "native-like", Japanese speakers who rated themselves as 3 or lower for an English proficiency measure were included.

General study set-up

Text materials. Participants read instructions and other text in either English or Japanese. English and Japanese texts were developed simultaneously, and all Japanese text was verified by a native Japanese-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 measure of memory performance unrelated to causal events. In addition to serving as a baseline memory measure, this task also helped acclimate 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 in which they described the events they had seen in the agent memory task. Importantly, participants did not describe any events until *after* the memory task. Each task is described in more detail below.

Part A: Object-orientation memory

Materials, Design and Procedure

45 color drawings were used (courtesy of Michael J. Tarr, Brown University, http://www.tarrlab.org/). During encoding, participants saw pictures of 15 objects (e.g., *chair*, *trumpet*) presented on a computer screen one at a time for two seconds each. Each object appeared in one of three possible orientations, counterbalanced across participants. Participants were instructed to pay attention to the images and were told that their memory would be tested. They received no information about which aspect of the stimuli would be tested.

After the encoding phase, participants were given a brief distracter task (counting the number of white squares (11) on a 4x4 grid of black and white squares), followed by the memory test. For the memory test, participants were shown the three possible orientations of each object and asked to indicate which one they had seen previously. 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

Video materials. Intentional and accidental versions of 16 unique events were videotaped (Table 1), one set for the encoding phase and another set for the test phase. For the encoding phase, videos of eight events (both intentional and accidental versions) featured one actor in a white shirt and videos of another eight events (both intentional and accidental versions) featured a different actor in a black shirt. For the test phase, videos featured a third actor in a red shirt in both the intentional and accidental versions of all 16 events. This made for a total of 64 videos. The same silent videos served as stimuli for both English and Japanese speakers.

Table 1: Events.

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

Note. Events are listed in the order of most agentive to least agentive accident descriptions in Japanese.

Encoding. During the encoding phase, participants viewed 16 videos each showing a different event. Half of the videos featured the actor in the white shirt, half the actor in the black shirt, and half of the videos showed intentional actions and half showed accidental actions. Which events were presented in the intentional or accidental versions was counterbalanced across participants. Videos were presented in one of two pseudo-random orders that ensured that no more than three videos of the same agent or the same intention appeared in a row.

The 16 videos in the encoding phase were presented sequentially, with a 1200 millisecond pause between videos. Participants were instructed to pay attention to the videos and were told that their memory would be tested, but were not given any extra clues about what would be tested. After viewing all 16 videos, participants were instructed to count to 10 as a brief distracter task.

Test. Recognition memory test trials consisted of a probe video followed by still photos of the two agents from the encoding phase (Figure 1). In the probe videos, a third actor appeared as the causal agent of the same events that had been presented during the encoding phase. For example, if a participant had seen the "accidental balloon popping*"* event during encoding, they would see this same event acted by the new agent in the test phase. For each probe video, participants were asked, "*Who did it the first time?*" (「最初に誰がそれをしましたか？」)[1] and responded by pressing a key associated with the side of the screen of either the *white-shirt man* or the *black-shirt man*. Participants were tested only on the events they had seen during encoding, presented in a different pseudo-random order from the encoding phase, and received no feedback.

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[1] 45 participants received this wording; 25 participants received the wording 「第一回目に誰がそれをしましたか？」 We used the second phrasing after discussions with several native Japanese speakers revealed differing opinions about the best translation for the English question. Question wording did not interact with patterns of memory for intentional versus accidental agents and so data were pooled.

Figure 1: Example agent memory test trial.

Table 2: Example accident descriptions.

	Agentive	Non-agentive
Japanese	黒い男性が鉛筆を折った。	えんぴつが折れた。
	(The black male broke the pencil.)	(The pencil broke.)
	男の人が本をとじた。	本が急に閉じました。
	(The man closed the book.)	(The book suddenly closed.)
English	He broke his pencil.	A guy was writing and his pencil broke.
	A sitting man is surprised when he closes his book.	The person's open book closed.

Part C: Causal event descriptions

Materials, Design and Procedure

After participants completed the agent memory task, they were again shown the same 16 videos they had seen during encoding and this time were asked to provide a linguistic description for each video. In each description trial, participants viewed a video and were then prompted to answer the question "*What happened?*" (「何がおこりましたか？」) English speakers typed their responses and Japanese speakers either typed or wrote their responses at their own pace and received no feedback.

Results

We first report the results of the event description phase of the study, and then the memory results.

Seventeen participants were excluded from analyses for one of the following reasons: (a) chance performance on the control memory task (3 Japanese), (b) a z-score greater than |2| on the Memory Difference Score (Intentional Memory minus Accidental Memory) (4 English, 4 Japanese), or (c) a z-score greater than |2| on the Description Difference Score (Intentional Descriptions minus Accidental Descriptions) (2 English, 4 Japanese). The Difference Scores were the basis for the analyses of interest in this study, and we wanted to be sure that outliers did not drive any observed cross-linguistic differences.

Results: Event Descriptions

Description coding. 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 would be *"He popped the balloon"*. Descriptions were coded as non-agentive if the change-of-state event was described intransitively. A canonical non-agentive description would be *"The balloon popped"*. In Japanese, non-agentive descriptions were characterized by an intransitive verb as well as the particle "ga" with the affected object (e.g., 「風船が割れてびっくりした。」, *Balloon-ga popped*-intransitive *was surprised*). Some non-agentive descriptions in each language took the form "*Someone was doing X and then Y happened*", in which the agent was linguistically separated from a change-of-state event that was described intransitively.

Across all participants, 2.94% of the descriptions did not describe the event and were excluded from analyses. All descriptions were coded by two independent raters, with high point-to-point reliability (95.93% English, 93.75% Japanese). Disagreements were resolved upon discussion. See Table 2 for example agentive and non-agentive accident descriptions in English and Japanese.

Agentive vs. Non-agentive language use. Because these data were not normally distributed, we report nonparametric analyses (Mann-Whitney U and sign test). Intentional events were described equally agentively by both English and Japanese speakers (English Median = 100%, Japanese Median = 100%, $U = 1176.00$, $p = .398$). Accidental events were described more agentively by English speakers than by Japanese speakers (English Median = 75.00%, Japanese Median = 62.50%, $U = 889.00$, $p = .01$) (Figures 2 and 3).

We computed a difference score for each participant as the proportion of intentional events described using agentive language minus the proportion of accidental events described using agentive language. Speakers in both communities used more agentive language to describe intentional events than to describe accidental events (English $p < .001$, Japanese $p < .001$), but this distinction was more pronounced for Japanese speakers (Median = 37.50%) than for English speakers (Median = 25.00%), $U = 908.00$, $p = .014$.
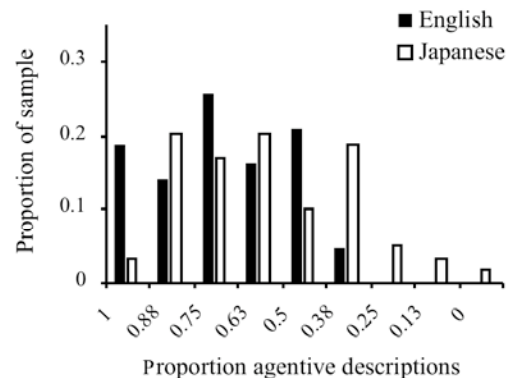

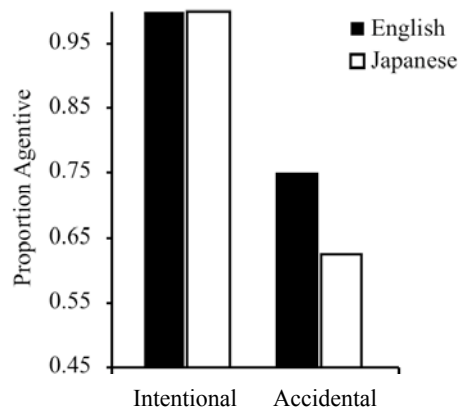Figure 2: Within-language variation in accident descriptions.

Figure 3: Causal event descriptions in English and Japanese. Median proportion agentive descriptions is plotted.

Figure 4: Causal agent memory in English and Japanese. Mean proportion correct is plotted; error bars are 1 SEM.

In addition to these differences, there were also some similarities in how English and Japanese speakers described events. The within-language pattern of variation in accidental event descriptions was consistent across the two language groups, $rho = .82$, $p < .001$. 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. The cross-linguistic difference in accident descriptions, however, was consistent across events, $p = .035$ (sign test).

To sum up, English speakers and Japanese speakers described causal events differently. While speakers in each 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 Japanese speakers. Answers to the question *"What happened?"* vary by linguistic community when describing accidents.

Results: Memory for object orientations

English speakers ($M = 69.61$, $SE = 2.17$) showed marginally better memory for object orientations than did Japanese speakers ($M = 64.86$, $SE = 1.75$), $t(100) = 1.72$, $p = .088$. One reason may be that English speakers were more familiar with computerized studies in laboratories and knew what to expect, while Japanese speakers "warmed up" during this task. We included people's control memory score as a covariate in analyses of memory for agents.

Results: Memory for causal agents

Mirroring the pattern of event descriptions, English and Japanese speakers remembered intentional agents equally well but diverged in their memory for accidental agents (Figure 4). A repeated-measures 2x2 ANOVA with event type (Intentional, Accidental) as a within-subjects factor and language group (English, Japanese) as a between-subjects factor revealed a reliable interaction between event type and language group $F(1,99) = 5.79$, $p = .018$ and no main
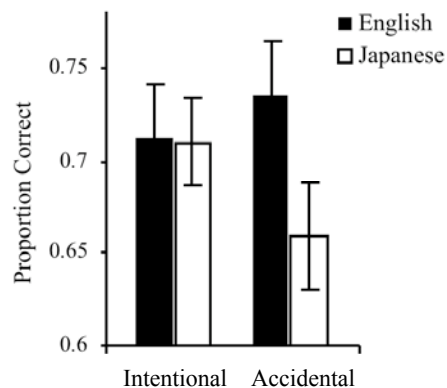
effects. Numerically, intentional agents were remembered well by both English ($M = 71.22$, $SE = 2.87$) and Japanese ($M = 70.98$, $SE = 2.39$) speakers. Accidental agents, however, were better remembered by English speakers ($M = 73.55$, $SE = 2.83$) than by Japanese speakers ($M = 65.89$, $SE = 2.83$).

Discussion

English and Japanese speakers remembered the agents of intentional events equally well. However, they differed in their memory for the agents of accidental events, with English speakers remembering accidental agents better than Japanese speakers. Accidents were also the locus of differences in language use across the two communities, with English speakers more likely to describe accidents saying "*He did it*" than were Japanese speakers.

General Discussion

In this study, English speakers and Japanese speakers used agentive expressions to talk about intentional events and remembered intentional agents equally well. When it came to accidents, however, cross-linguistic differences in both language and memory were observed. English speakers described accidents using more agentive language than Japanese speakers did and also remembered agents of accidents better than Japanese speakers did. Importantly, these memory patterns were observed in a task that participants completed *before* they had used any language to describe the events.

Cross-linguistic differences in memory patterns were localized to a particular kind of event (accidents). Given other findings about cross-cultural differences in attention (e.g., Masuda & Nisbett, 2001), other patterns of results might have been predicted. For example, global differences in Japanese and English speakers' attention – such as relative attention to context versus focal objects – might have led to overall lower memory for causal agents in

Japanese speakers compared to English speakers. Cross-linguistic differences in noun and pronoun use (with lower frequency in Japanese compared to English) might also have resulted in overall lower agent memory in Japanese speakers. Instead, we found evidence for memory differences only for those events in which patterns of *action* descriptions also differed. Thus, this study refines our understanding of cross-cultural differences in attention to events and suggests that patterns in verb use may be one mechanism that drives these differences (see F&B Study 2 for evidence that changing the agentivity of the local linguistic context changes people's memory for causal agents).

This study (a) replicates patterns of memory for agents of intentional and accidental events in English speakers with a new stimulus set, (b) extends evidence for cross-linguistic variation in non-agentive language use, adding to our understanding of usage biases in causal event descriptions across the worlds' languages, and (c) replicates previous findings that accident descriptions covary with memory for accidents, extending evidence for this pattern to another linguistic community.

Causal agents in English, Spanish and Japanese. Fausey and Boroditsky (submitted) reported a novel cross-linguistic phenomenon about causal cognition. They found that compared to English speakers, Spanish speakers were less likely to talk about agents of accidents and also less likely to remember the agents of accidents. The data reported here suggest that Japanese language and cognition patterns also contrast with those of English speakers.

Causal cognition happens in linguistic contexts: people talk about the causal events that they observe. Together, these studies suggest that language can shape how people interpret and remember causal events.

Acknowledgments

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