Smashing new results on aspectual framing

How people talk about car accidents

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How do people describe events they have witnessed? What role does linguistic aspect play in this process? To provide answers to these questions, we conducted an experiment on aspectual framing. In our task, people were asked to view videotaped vehicular accidents and to describe what happened (perfective framing) or what was happening (imperfective framing). Our analyses of speech and gesture in retellings show that the form of aspect used in the question differentially influenced the way people conceptualized and described actions. Questions framed with imperfective aspect resulted in more motion verbs (e.g. *driving*), more reckless language (e.g. *speeding*), and more iconic gestures (e.g. path gesture away from the body to show travel direction) than did questions framed with perfective aspect. Our research contributes novel insights on aspect and the construal of events, and on the semantic potency of aspect in leading questions. The findings are consistent with core assumptions in cognitive linguistics, including the proposal that linguistic meaning, including grammatical meaning, is dynamic and grounded in perceptual and cognitive experience.

Keywords: Aspect, cognitive linguistics, semantics, framing, natural discourse, gesture, leading questions, mental simulation

1. Introduction

Imagine that you are in court. A man is being tried for reckless driving, and you saw the accident he was involved in about a month ago. After you are called to the witness stand, the judge asks whether you recognize the defendant, and you respond, "Yes". Next the judge asks whether he was the driver of a red 1970 Pontiac GTO, and you reply, "Yes". She then asks where you were when you witnessed the accident, and you report that you were standing at a bus stop. The judge tells you to do your best to remember what you saw. She asks, "What was happening?" After

pausing a moment, you report that you saw the driver race out of the parking lot and into the intersection, where he nearly hit a motorcycle and an SUV. You add that he proceeded to veer off the road and smash into a bus. This description would imply erratic, dangerous driving, and would no doubt have negative consequences for the driver. Would your description of the accident have been any different if the judge had asked you, "What happened?" instead of "What was happening?" The research reported in this article suggests that it very well could have been different.

People spend a lot of time talking about events they have witnessed in the past. In doing so, they integrate lexical items in a particular way to foreground or background temporal information. For instance, in talking about a rainstorm earlier in the day, a person could provide information about the duration of the storm by using language such as, "It rained all morning," or "It rained for a few minutes." The person could specify whether the event was continuous by using language such as, "It rained non-stop," or "It rained off and on." The same individual could also designate whether the action finished prior to the time of speaking by using language such as, "It finished raining," or "It is still raining." In discussing events, people rely on grammatical aspect, verbal markers that work in concert with tense, modality, and other systems, to express information about how events unfold over time (Comrie 1976). For instance, "It was raining," suggests that the rain continued for some time, and implies that it may even continue in the future. "It rained," suggests that the rain ended.

Much is known about how aspect is marked and how it functions as a system within and across languages. However, surprisingly little is known about how aspect influences the understanding of event descriptions in everyday language. The main issue addressed in this article is how *aspectual framing* can bias the way situations are conceptualized and communicated. First, we provide a brief overview of aspect. Second, we discuss a novel experiment that investigated aspectual framing in the context of describing vehicular accidents. Third, we discuss the implications of our results for cognitive linguistic theory and for language in the courtroom.

1.1 Aspect

Aspect provides information about how events unfold in time. It codes whether events last a relatively short time or a relatively long time, whether events are continuous or repeated, and whether events have finished or not (see Comrie 1976, Frawley 1992). A major distinction is made between *perfective* and *imperfective* in linguistic work on aspect. Simply stated, perfective aspect emphasizes the completion or entirety of an event, and imperfective aspect, the ongoing nature of the event (Comrie 1976, Dahl 1985). In describing past events, English speakers typically use the simple past tense form (VERB+*ed*) in formulating perfective

descriptions, as in *Roger studied semantics* or *Maria sold cars*, or the past progressive form (*was* VERB+*ing*) in formulating imperfective descriptions, as in *Roger was studying semantics* or *Maria was selling cars* (see Brinton 1988, Radden and Dirven 2007). In discussing past events, English speakers can also use perfect forms, such as *Roger has studied semantics* or *Maria had sold cars*.

Linguists have studied aspect extensively. There is a wealth of information on how aspect develops over time. It is fairly common, for example, for aspectual markers to grammaticalize from lexical items, including motion verbs (see Bybee, Perkins and Pagliuca 1994), and in some cases, from stative verbs (see Carey 1994, for discussion of how English *have* grammaticalized into a perfect marker). Much is known about how aspectual systems differ across languages. Some languages, such as Russian, for example, make a clear-cut distinction between perfective aspect and imperfective aspect (Bermel 1997) whereas others, such as English, do not (Brinton 1988, Radden and Dirven 2007).

Psycholinguists have paid less attention to aspect, and there are several reasons for this. First, many psycholinguists are interested in pinpointing the mechanisms that underlie language processing, especially sentence comprehension. As such, they focus on the comprehension of sentences as words are being concatenated in real time (see Clark 1997). Because aspect interacts with tense, modality, and other linguistic systems (see Dahl 1985), and because it functions at the level of discourse to some extent (see Hopper 1982), it is challenging to conduct straightforward psycholinguistic investigations. Second, the terminology that is used to characterize aspectual forms is inconsistent. A single aspectual form may be categorized in multiple ways (see Croft 2009, for enlightening discussion). Third, aspect can be marked grammatically and lexically, and this varies cross-linguistically. In English, for instance, a person may say, "I was driving last night," in which the past progressive form temporally extends the event, or "I continued driving last night," in which the word *continue* temporally extends the event (see Frawley 1992). Fourth, verb semantics partly determine which aspectual form is used and how it is interpreted. For example, imagine that you see a florist accidentally break a vase. In reporting the event later, it would be fine to say, "The florist broke a vase," because *break* is conceptualized as punctual, but odd to say, "The florist was breaking a vase." Conversely, it would be fine to say, "The florist made a lovely spring bouquet," and "The florist was making a lovely spring bouquet," because *make* can be construed as ongoing (see Comrie 1976, for comprehensive discussion of aspect and verb semantics).

Of the psycholinguistic work that has investigated aspect, there has been a strong interest in how it constrains the interpretation of situations. Several psychological studies have used narrative understanding tasks to examine how people create situation models. In brief, situation models are imagined "worlds" that can

be constructed from processing text or speech (e.g. reading a story), or from memory (e.g. remembering the route you used to take to school as a child, or the layout of a map you studied an hour earlier). These situation models include locations, characters, and objects (see Bower and Morrow 1990). People can imagine different types of motion through space, including motion that is slow or fast, or motion that transpires through a cluttered versus an uncluttered environment. And critically, the way the motion is simulated has consequences for how people recall information about the situation model (Matlock 2004). People can simulate different patterns of movement (e.g. unidirectional path, random), and this alone can influence spatial memory and expectations about future movement (Rapp, Klug and Taylor 2006). People can also update situation models by mentally shifting the locations or positions of objects or characters in a scene (e.g. Morrow, Bower, and Greenspan 1989), and they can readily switch perspective. For example, survey descriptions encourage a bird's eye perspective of a spatial domain, whereas route descriptions encourage a more subjective, ground-level perspective, which is ideal for navigation to a destination (Taylor and Tversky 1996). (For additional information on situation models, see Morrow and Clark 1988, Zwaan, Langston and Graesser 1995, and Zwaan, Maglianoand Graesser 1995.)

In seminal work on aspect and situation models, Magliano and Schleich (2000) used narrative comprehension experiments to investigate how aspect constrains the construction of situation models. Their research focused on how aspect influences the foregrounding and backgrounding of event details. Participants in their study read short passages that contained a critical sentence with a verb phrase marked with imperfective aspect (e.g. *was delivering*) or perfective aspect (e.g. *delivered*). Following these critical sentences were three additional statements that reported events that were either concurrent with or subsequent to the situation that was described by the critical sentence. The way people processed the critical situation was probed by measuring the time it took them to verify whether or not a situation (expressed by the critical sentence) appeared in the passage they had read earlier (e.g. *deliver baby*). These verb phrases were presented immediately after the critical sentence or after the three subsequent sentences. The results showed that after reading the critical sentence and three subsequent sentences, people were quicker to identify the verb phrases that had been in the prior text when those phrases had been marked with imperfective aspect (versus perfective). Their findings suggest that imperfective aspect can increase the prominence of an action (more foregrounding) more than perfective aspect even though the event was objectively the same. (For related work, see Carreiras, Carrido, Alonso and Fernández 1997.)

In other groundbreaking research, Madden andZwaan (2003) investigated the way aspect constrains the understanding of events in situation models. Participants

in their study viewed pictures of events that appeared to be in progress or that appeared to have just completed. Participants then had to indicate whether the pictures matched verbal descriptions that included imperfective or perfective aspect. For instance, participants viewed a picture of a person kneeling next to a fireplace, in which the person is still building the fire or has just ignited the fire. Then they had to decide whether accompanying descriptions such as "made fire" (perfective) or "was making a fire" (imperfective) matched. On average, participants were quicker to match pictures of completed actions (versus incomplete actions) with perfective descriptions, but no slower or quicker to match pictures of completed actions (versus incomplete actions) with imperfective descriptions. In brief, these results suggest that imperfective aspect constrains the understanding of a situation by encouraging the reader to take an internal perspective, and as such, it enables greater attention to details of actions. In contrast, perfective aspect gives an external viewpoint of a situation, and encourages focus on the end state of the situation. (Related work is reported in Madden and Therriault 2009.)

In other pioneering behavioral work on aspect and situation models, Morrow (1985) explored how imperfective and perfective descriptions of motion events affect how people conceptualize movement through imagined scenes. Participants in the experiment had to study the layout of the rooms in a house, and then read a short passage about a person moving from a Source location to a Goal location in the house. The sentences in the passage included a translational motion verb (e.g. *walk*) marked with either imperfective or perfective aspect as well as a Source location (e.g. *kitchen*) and a Goal location (e.g. *bedroom*), as in *John was walking from the kitchen to the bedroom* or *John walked from the kitchen to the bedroom*. Participants often located the character described as moving on the path somewhere between the Source room and Goal locations after reading imperfective motion statements, but in the Goal room after reading perfective motion statements. The results suggest that imperfective aspect draws attention to the unfolding details of a situation, whereas the perfective aspect draws attention to the terminus or resulting phases of a situation.

Anderson, Matlock, Fausey and Spivey (2008) further investigated the role of aspect in conceptualizing motion events but they introduced a method that allowed them to pinpoint where and how motion transpires. They used a (computer) mouse-movement study to examine movement along a path in response to either imperfective or perfective verb phrases. In the study, participants were shown a large picture of a path on the computer screen. The path started at the lower part of the screen, and ended at a destination (e.g. a school, hospital, park) on the same screen, and next to the picture was a small static silhouette character, for instance, a man who appeared to be jogging (e.g, slightly bent leg and arm in front, slightly bent leg and arm in back). Participants heard a sentence

that described the character moving and arriving at the destination (e.g. *Tom was jogging to the woods and then stretched when he got there* [imperfective] and *Tom jogged to the woods and then stretched when he got there* [perfective]). All imperfective and perfective versions of this sentence included translational motion verbs, such as *jog, ride,* and *hike* and a *to* + location phrase about the destination. As soon as participants heard the description, they clicked on the character and placed it in the scene to match the description they heard. On average, participants moved the character along the path toward the destination more slowly with imperfective motion descriptions. Similar results were obtained in a follow-up study by Anderson, Matlock and Spivey (2010) with improved stimuli and a broader range of sentences and situations. The results of these studies suggest that imperfective aspect reflects greater attention to the ongoing process of motion toward a destination.

The behavioral studies summarized above provide good insights into how aspect constrains the way people conceptualize events in the situation models they construct and update. In particular, imperfective descriptions encourage an internal viewpoint by drawing attention to the ongoing state of events, at least more than perfective descriptions do (see Madden and Ferretti 2009 for additional discussion). Because these results are consistent with the aspectual patterns that linguists have observed in many languages, they may initially seem unremarkable. Semanticists know, for example, that imperfective aspect expands the temporal window of a situation because it is associated with unbounded, ongoing events in its basic construal (see Frawley 1992, Radden and Dirven 2007, Talmy 2000). From this, it follows that people might infer more time permits more action. Still, what happens when the time periods in imperfective and perfective descriptions are identical, as in *John was reading for an hour* versus *John read for an hour*? Is more action still inferred with the imperfective? Such questions are worth investigating because they may lead to even deeper insights into how people produce and understand aspect in everyday language.

Recent work on aspect investigated this very issue. In a study by Matlock (2011), participants did a sentence completion task. They completed a sentence that began with one of two adverbial clauses, either "When John walked to school" (perfective) or "When John was walking to school" (imperfective). On average, participants mentioned more actions in their main clauses when framed with imperfective information (e.g. *When John was walking to school, he felt sick and went home*) versus perfective (e.g. *When John walked to school, he got a hamburger on the way*). In a second study, on aspect and telic verbs,[1] participants read the statement, *John was painting houses last summer* or *John painted houses last summer*, and answered the question, "How many houses?" On average, they estimated more houses were painted with the imperfective statement. In a third experiment,

on aspect and atelic verbs, participants read the statement, *John was driving last weekend* or *John drove last weekend*, and answered the question, "How many hours?" Overall, they provided longer driving time estimates in response to the imperfective statement. The results of these experiments suggest that more action is conceptualized in a given time period with imperfective aspect.

This current work further explores the role of aspect in the interpretation of event descriptions. It is known that one of the main jobs of aspect is to establish a temporal window in which a set of actions or states occurs (Li and Shirai 2000). Clearly, this is important. However, it is also useful to consider other ways that aspect contributes to everyday language processing, including how it shapes inferences about type and amount of action in a given time period. It is also important to explore how aspect can shape thought and communication in natural discourse. Toward this end, we constructed an experiment that resembles a police interview after witnessing a car crash. Participants in our study were shown video clips of vehicular accidents and asked to report what *was happening* (imperfective framing) or what *happened?* (perfective framing). Their responses were analyzed for speech content, including number of motion verbs and reckless driving phrases, and gesture content, including number of iconic gestures which are depictive of actions and other key elements in descriptions.

2.   Experiment

In our experiment, participants watched videotaped recordings of vehicular accidents, and were asked, "What was happening?" (imperfective framing) or "What happened" (perfective framing). The main goal was to investigate how different aspectual framings in the question would influence participants' descriptions. We predicted that imperfective framing would lead to more verbiage about motion because imperfective aspect draws attention to action details, and that it would lead to more verbiage about reckless driving.

We were also interested in how aspectual framing might affect non-verbal communication. Gestures are important to everyday conversation because they facilitate lexical access (Krauss, Morrel-Samuels and Colasante 1991) and contribute semantic content (e.g. McNeill 1992), including metaphorical content (e.g. Cienki and Mueller 2008, Cooperider and Núñez 2009, Chui 2011). Gestures plays a role in coordinating joint activities (Clark and Krych 2004), describing abstract objects (Bavelas et al. 1992) and abstract systems, such as time (Núñez and Sweetser 2006) and mathematics (Núñez 2009). Gestures also facilitate reasoning and learning (Goldin-Meadow 2003, Goldin-Meadow, Cook and Mitchell 2009, Schwartz and

Black 1996). Gestures can be categorized along various dimensions, depending on semantic domain, purpose, and level of analysis (see Kendon 2004, McNeill 2000).

Gesture researchers often make a distinction between *beat gestures* and *iconic gestures*. Beat gestures convey no semantic information per se. They are brief, rhythmic hand movements that regulate speech and facilitate lexical access (see Krauss 1998). For instance, in talking to a colleague, you start to recommend a good pizza restaurant. You say, "You should try… uh…" and while struggling to recall the restaurant's name, you produce two quick circular gestures that help you remember. You blurt out, "Cheeseboard!" In contrast, iconic gestures *do* convey semantic information. They provide information about manner and direction of motion in addition to information about objects, including shape, size, and position (McNeill, 2007). For instance, in talking about the pizza restaurant, you say, "Sometimes they hand you a free baguette." While uttering this statement, you make a path gesture away from the body, loosely depicting the action of handing an object to someone else.

2.1 Participants, materials, and methods

Twenty-two University of California, Merced, undergraduate students volunteered to serve as experimental participants (17 women, 5 men). All received extra credit in a cognitive science or psychology course. All were proficient speakers of English, either native speakers of English or bilinguals with dominant English experience. All had normal or corrected vision.[2]

After signing a consent form, participants entered a small lab room, where they were asked to stand in front a computer that sat on a small table. A video camera, which was affixed to a tripod, was positioned about four feet from participants. Participants read a set of instructions that were displayed on the computer screen before the experiment, and pressed a key on the keyboard to begin. Participants were alone during the experiment, and debriefed once they had finished. Most individuals took 10 to 15 minutes to complete all six videos.

Participants were randomly assigned to either the perfective condition or to the imperfective condition. Participants in the imperfective condition read these instructions: "In this study, you will watch short videos of actions. After each one, you will be asked what was happening. Your job will be to simply tell the video camera what was happening in everyday English. This is not a test and there is no right or wrong way to report what was happening. Press the space bar to continue." In addition, a brief instruction appeared after each scenario, and asked participants, "What was happening?" Participants in the perfective condition were presented with the same instructions except "what was happening" had been replaced with "what happened".

The videos were taken from Youtube.com, and each was edited to play for about 30 seconds. They were randomly ordered for each participant, and played without sound. Each video showed vehicles in accidents or near accidents, for instance, a car crashing into a tow truck on the side of the road. Table 1 provides an overview of each scenario.

Table 1. List of the videotaped scenes that served as stimuli

Scene #	Description of scenes
Scene 1	A car speeding down the freeway sidewipes a van, which then smashes into a truck, causing it to crash into the center divide.
Scene 2	A person hops on a moped, and topples over after riding only a few feet.
Scene 3	A truck spins out of control on an icy road, and barely avoids hitting nearby vehicles.
Scene 4	A pair of monster trucks are racing. One flips over, destroying a sign and two police cars before exploding.
Scene 5	A car suddenly crashes into a tow truck that is parked on the side of the road.
Scene 6	A police car is pursuing a truck, which eventually swerves off the road and crashes into the underside of an overpass.

3.   Results

3.1   Speech

First, we did preliminary analyses on verbal responses. We started by examining the number of words generated in the two conditions. We compared number of words produced in descriptions in the context of imperfective framing to the number of words produced in the context of perfective framing.[3] There was no reliable difference (Perfective M=41.15, SD=16.78, Imperfective M=39.09, SD=22.64), $t(130)$=.59, p=.55. We then examined whether aspect would affect number of perfective and imperfective verb phrases generated. Participants in the perfective condition generated about the same number of perfective and imperfective phrases (Perfective M=1.24, SD=.91, Imperfective M=1.36, SD=1.43), $t(130)$=1.48, p=.14, and so did participants in the imperfective condition (Perfective M=3.95, SD=2.40, Imperfective M=3.32, SD=2.56), $t(130)$=-.58, p=.56. In sum, varying the aspectual form in the question did not result in notable differences in number of words or type of aspect produced in accident descriptions.

Second, we were interested in motion descriptions because they would serve as a good measure of how much action was conceptualized in a situation. We analyzed frequency of basic translational motion verbs, including *drive, come*, *go*, and

turn. Analysis here and elsewhere included finite and non-finite verbs as well as first and third person. An example of a description with the motion verb *drive* was, "I think a car was just driving". An example of a description the motion verb *come* was, "Another car came from the highway". As shown in Figure 1, participants who were asked to report what was happening (imperfective framing) produced proportionally more motion verbs in their descriptions (M=2.32, SD=1.38) than participants who were asked to report what happened (perfective framing) (M=1.73, SD=.91), t(130)=-2.91, p=.004. In this case, aspectual framing resulted in reliable differences in participants' descriptions. Specifically, imperfective framing led to proportionally more motion verbs.

Third, we compared number of non-motion verbs in the two conditions. These included verbs that did not explicitly express motion, such as *decide, call, think,* and *see*. An example of *decide* was, "So a news lady decided to try and ride a scooter …". An example of *call* was, "The police officer called for ambulances". As shown in Figure 2, participants produced fewer non-motion verbs when asked to report what was happening (M=3.95, SD=2.95) than when asked to report what happened (M=5.33, SD=3.18), t(130)=2.58, p=.01. These results show that aspectual framing differentially influenced the number of non-motion verbs that participants mentioned. In particular, imperfective aspect elicited fewer non-motion verbs than did perfective aspect.

Fourth, we analyzed mentions of reckless driving. Phrases were coded as reckless if they suggested dangerous driving. Examples include: "The truck was speeding", "He tried to cut off the car next to him", and "She was swerving".[4] As shown
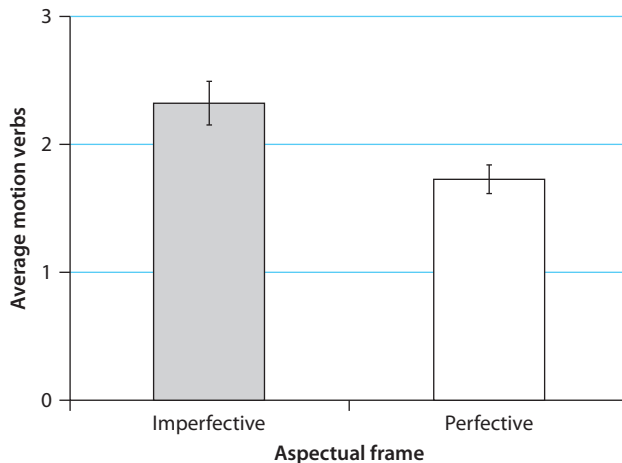

Figure 1. Imperfective framing resulted in more motion verbs per description (video) than perfective framing. (Error bars in this graph and elsewhere represent +/- 1 standard error around their respective means.)
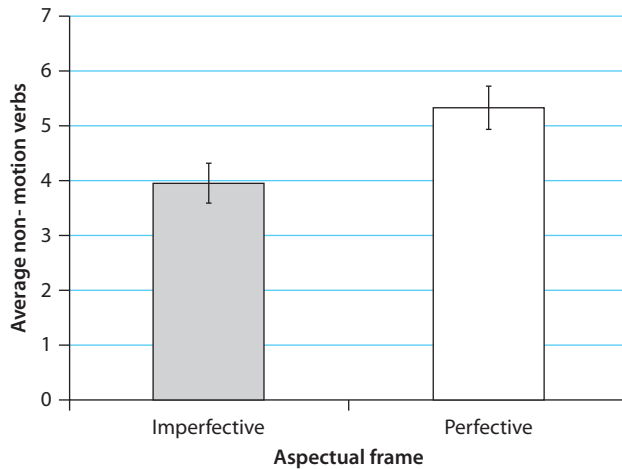
Figure 2. Imperfective framing elicited fewer non-motion verbs per description (video) than perfective framing.

in Figure 3, participants produced more reckless driving phrases with imperfective framing (M=3.26, SD=3.97) than with perfective framing (M=1.78, SD=2.05), $t(130)$=-2.69, p<.008. Once again, aspectual framing had an effect. In this case, imperfective framing biased people to focus more on reckless details of driving.

Based on our verbal data, we see that aspectual framing influenced our participants' descriptions of accidents in systematic, predictable ways. Individuals who were asked to describe what was happening (imperfective framing) generated more motion verbs and reckless driving phrases, but fewer non-motion verbs than
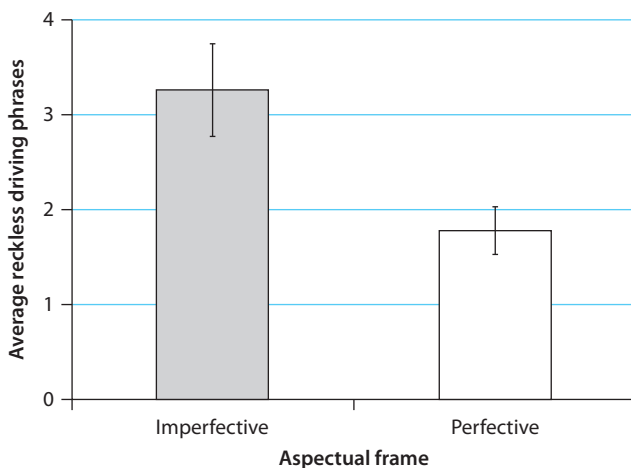

Figure 3. Imperfective framing resulted in a greater number of reckless driving phrases per description (video) than perfective framing.

did individuals who were asked to describe what happened (perfective framing). Importantly, there was no difference in the number of words produced overall, or in the type of aspectual form produced in the two conditions, suggesting that the aspectual framing influenced semantic content, not lexical quantity.

3.2 Gesture

First, we compared number of gestures produced in the two conditions. Participants in the perfective framing condition produced about the same number of gestures as participants in the imperfective framing condition (Perfective $M=3.06$, $SD=3.99$, Imperfective $M=3.74$, $SD=3.70$), $t(130)=-1.02$, $p=.31$. No significant difference was observed.

Next, we compared number of iconic gestures generated by participants. A gesture was coded as iconic if it had semantic content, and depicted one of the following: shape of an object (e.g. two hands next to each other to show two cars side by side), shape of a path of motion (e.g. show a circular motion to show somebody spinning out), or shape of an event outcome (e.g. raise hands and arms to show an explosion).[5] As shown in Figure 4, participants articulated more iconic gestures with imperfective framing ($M=2.65$, $SD=2.63$) than with perfective framing ($M=1.14$, $SD=1.76$), $t(130)= -3.88$, $p<.001$.

We were also interested in how aspectual framing would influence the production of beat gestures. A hand movement was coded as a beat gesture if it carried no obvious semantic meaning, for instance, flicking the hand when stating, "Okay, in the video…" Participants produced fewer beat gestures in the imperfective
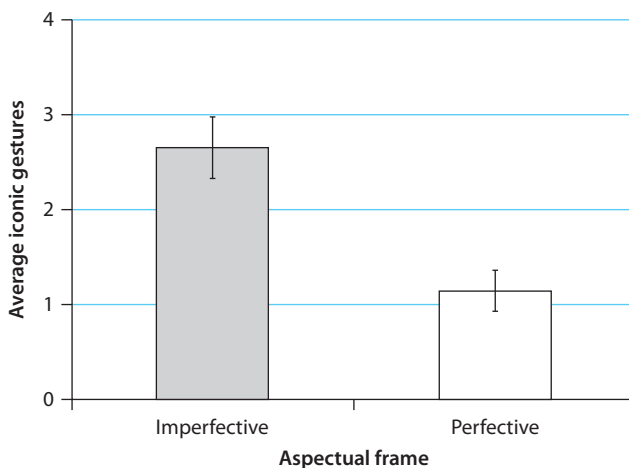

Figure 4. Imperfective framing resulted in more iconic gestures per description (video) than perfective framing.
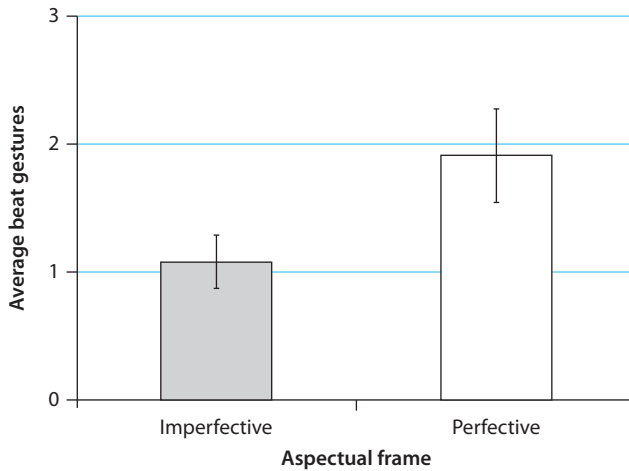
Figure 5. Imperfective framing resulted in fewer beat gestures per description (video) than perfective framing.

condition (M=1.08, SD=1.69) than in the perfective condition (M=1.91, SD=2.96), t(130)= 1.99, p<.05, as shown in Figure 5.

The gesture results are in line with the verbal results. They show that aspectual framing systematically influenced the way participants gestured while describing accidents. Individuals responding to imperfective questions produced proportionally more iconic gestures and fewer beat gestures than did individuals responding to perfective questions.[6] No difference was observed in the average number of gestures in the two conditions, suggesting that aspectual framing had an effect on type and form of gesture, not quantity.

4.   General discussion

Despite a rich, comprehensive literature on aspect in linguistics, its role in reporting past events is still poorly understood. In particular, little is known about how aspect biases the way people formulate thoughts and generate utterances about dangerous or emotionally charged events they have witnessed firsthand. Of special interest here was aspectual framing. We used a naturalistic task to explore how people would spontaneously talk about car accidents in response to an open-ended question that included imperfective or perfective aspect. Participants first viewed videotaped car accidents, and then were asked to explain what happened or what was happening. As predicted, this instructional manipulation resulted in consistent differences as to how actions were reported. Mainly, imperfective framing

yielded more action details, evidenced by more motion verbs, more reckless driving language, and more iconic gestures. We also found that imperfective framing resulted in fewer non-motion verbs and fewer beat gestures. No differences were observed for number of words, number of gestures in the two conditions. Neither was there a difference in imperfective and perfective forms generated.

The results of our experiment suggest that imperfective framing led people to pay more attention to action details in formulating their descriptions. One feasible explanation for this resides in perceptual simulation, an embodied, perceptually-grounded mechanism that drives much of our everyday reasoning. Simply stated, simulations are re-activations of patterns that are anchored in past perceptual and motor experiences (see Barsalou 1999, Glenberg 1997). A rapidly growing body of behavioral studies has shown that simulations are involved in many facets of everyday thought, including concept formation (Barsalou 1999), reasoning about physics (Schwartz and Black 1999), reasoning about spatial relations (Richardson, Spivey, Barsalou and McRae 2003, Spivey and Geng 2001), and conceptualizing abstract domains, such as time (Boroditsky and Ramscar 2002, Matlock, Ramscar and Boroditsky 2005). In addition, neuroscientific research provides substantial evidence to suggest that people readily simulate action (Gallese 2005, Jeanerrod 1996). For instance, when people observe others performing an action (e.g. watch a person grasp an object), activation in their motor areas unfolds in a manner that is consistent with how it would occur if they were performing the very action themselves (Rizzolatti and Sinigaglia 2008). Similarly, when people view static images of humans in motion (e.g. look at a photograph of a person who appears to be throwing a ball), motion perception areas are activated, and they simulate the experience of seeing the action (Kourtzi and Kanwisher 2000). And psycholinguistics research supports the idea that simulation figures into linguistic processing. It is known, for example, that simulation is involved in understanding literal language (Glenberg 1997, Pecher and Zwaan 2005) as well as non-literal language, including conceptual metaphor (Gibbs 2006b, Gibbs and Matlock 2008) and fictive motion (Matlock 2004, Richardson and Matlock 2007). Despite mounting evidence for this, many language theorists continue to maintain the position that linguistic processes do not include simulation. Rather, linguistic processes are typically characterized in terms of specialized modules, and thus, as largely blind to perceptual and motoric information, including simulated versions of perception and action. Meaning is viewed as a byproduct of syntactic form, and in some cases, is achieved through executive control (see Fodor 1975, Jackendoff 2002). (For comprehensive discussion of anti-embodied approaches to language, see Barsalou 2008, Gallese and Lakoff 2005, Gibbs 2006a, and Pecher and Zwaan 2005).

Recent work has begun to explore aspect and simulation. Some studies compare the way actions are conceptualized with imperfective aspect versus perfective

aspect (see Matlock 2010, 2011). Thus far the results indicate that imperfective aspect affords rich simulations of events by drawing attention to details of events as they unfold in time, and that perfective aspect has less potential for rich simulation of action details because it emphasizes the completion of an entire event. (See Bergen and Wheeler 2010, Huette, Winter, Matlock and Spivey 2012, Madden and Therriault 2009, Narayanan 1995, for compatible research.) Critically, in the results reported here, imperfective framing led to the encoding of more action per situation than did perfective framing. In thinking about what was happening just moments earlier in a video they viewed, people "played back" many rich action details. In simulating these details and formulating their descriptions, they provided reliably more motion verbs, reckless language, and iconic gestures. In contrast, perfective framing resulted in weaker, less vivid simulations, which gave rise to fewer action details in speech and gesture, but more time for non-motion verbs and beat gestures. (For supporting work on simulation and gesture, see Hostetter and Alibali 2008.) Another, not incompatible explanation for our results is that people took an internal perspective with imperfective framing and an external perspective with perfective framing (see Madden and Zwaan 2003, McNeill, 2003). An internal perspective would mean greater access to action details than an external perspective would, and this could result in more motion verbs, more reckless driving phrases, and more iconic gestures.

This work on aspectual framing contributes new insights to research on language and eyewitness testimony. To date, much of the work on language in the courtroom has focused on lexical content, and ignored grammatical content (see Loftus and Palmer 1974). Based on the findings reported here, it is reasonable to assume that aspectual framing may be useful in the courtroom. Attorneys, for example, could ask questions with imperfective aspect to implicate criminal intent or emphasize the magnitude of immoral acts. This could potentially help sway jurors or judges, and result in considerably longer jail sentences and larger fines. Support for this line of reasoning comes from related work on the influence of aspectual framing in political messages. In Fausey and Matlock (2011), participants read a brief passage about a senator who exhibited undesirable behavior in the past, and then answered questions, including whether they thought the senator would be re-elected and about their degree of confidence about their decision. When the senator's actions were described using imperfective aspect, such as *was taking hush money from a prominent constituent*, participants were more confident that he would not be re-elected than when his actions were described with perfective aspect, such as *took hush money from a prominent constituent*. Imperfective aspect also resulted in higher dollar estimates in responses about the amount of hush money taken.

Our findings are consonant with cognitive linguists' claims about the semantics of aspect and event construal. Lakoff (1987) argues that utterances are not the concatenations of fixed or autonomous words that "live" in an idealized monolithic lexicon (see also Clark 1997). Rather, they are grounded in human perceptual and motoric patterns of experience. On this view, aspect, and other linguistic systems associated with events naturally emerge from these embodied interactions. From this, it follows that imperfective aspect reflects the way humans view and enact actions that are ongoing, repeated, or habitual. Similarly, Langacker (1987, 1990) argues that the semantic import of grammatical systems, including grammatical aspect, is anchored in perceptual and cognitive experience. In this case, the distinction between imperfective and perfective aspect is motivated by differences in dynamic conceptualization, the way conceptual structure develops during linguistic processing. Imperfective framing resonates with Langacker's (1987) sequential scanning, in which component states of a situation are scanned serially, and perfective framing with summary scanning, in which component states are scanned in a single gestalt (see Broccias & Hollmann 2007 for insightful discussion). In a similar way, Talmy (1985, 2000) views language as a cognitive system that draws on other cognitive systems, especially visual perception. He argues for a common conceptual capacity that unifies seemingly disparate realizations of linguistic form (e.g. lexical versus grammatical) within a language and across multiple languages. On Talmy's view, the basic distinction between imperfective versus perfective is in keeping with that of mass versus count nouns (see also Langacker 2000). From this, it makes sense that our participants conceptualized and articulated more action with imperfective framing than with perfective framing.

Our results are also in line with some non-cognitive linguistic work on aspect, including the more foundational semantic characterizations of imperfective and perfective aspect, useful in typological or comparative analyses. For example, Comrie (1976) argues that imperfective aspect emphasizes an internal perspective of a situation, and that perfective aspect emphasizes a global perspective. Given this, it follows that when people take an internal perspective, they will devote much attention to action details, but if they take a more global perspective, they will not. It is unclear, however, how our results can inform or resonate with generative linguistic approaches to aspect and event descriptions. Work on the semantics of aspect in natural discourse is limited even though there is some research on aspectual shifts (e.g. Smith 1991).

The current study sheds new light on the role of aspect in natural discourse, specifically, its power to influence the way past events are reported. Many issues remain. It would useful to run a similar experiment on aspectual framing with speakers of languages that have notably different aspectual systems, such as Finnish, Spanish, Indonesian, and Russian. This would lead to an even better

understanding of how aspectual framing influences retelling, and how the effect may be across languages. It would be informative to investigate aspectual framing in even more natural situations, for example, interactions with two or more people engaged in a problem-solving task (e.g. Clark and Krych 2004). It may also be informative to conduct studies that pinpoint when and how gestures occur relative to speech in the context of aspectual framing (e.g. path gesture with motion verb). The duration of gesture strokes is known to be longer in imperfective descriptions than in perfective descriptions (Duncan 2002), but more work could lead to an even better understanding of the temporal dynamics of aspect in gesture. It could also be informative to run studies on aspectual framing and gesture with humans and avatars in interactive virtual learning environments (see Huang, Matthews, Matlock and Kallmann 2011, Huette, Huang, Kallmann, Matlock and Matthews 2011, for research on motion capture and gesture). It would also be worthwhile to assess the utility of aspectual framing in a variety of social domains, including doctor-patient interactions and teacher-student interactions.

Far more work can be done on aspectual framing. For now, however, we can say that aspect was playing, is playing, and will continue to be playing a vital role in shaping how we think about and talk about everyday events.

Acknowledgements

Notes

1. Telic verbs imply a goal and end state. Atelic verbs do not.

2. An additional eight individuals participated, but their data were not analyzed because of technical problems during recording, or because they maintained a posture that did not allow for gesture (e.g. leaned on the table the entire time). Because gesture and speech are tightly coupled in retelling, the best course of action was to conduct analyses on data from the 22 individuals who produced gestures that could be viewed and coded.

3. In this and the other analyses, we used an independent *t*-test to compare six different scores for each of the 22 participants in the two conditions. Hence, there were 132 data points, and 130

degrees of freedom. Results were also significant for univariate analyses with scene (video) as a fixed factor.

4. The first and third authors coded the reckless driving phrases independently, and agreed 92 percent of the time. Discrepancies were resolved by using half the first author's codings, and half the third author's codings.

5. The second and fourth authors independently coded all gestures by type, and were in agreement about 90 percent of the time. Discrepancies were resolved by judgment of the first author.

6. Two gestures in the data set were neither iconic nor beat. They occurred when participants pointed at the computer screen. These were not analyzed because they accounted for less than 1 percent of the data.

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