Integrating Real-world Event Knowledge and Grammatical Aspect Information during Event Comprehension

Sarah Hye-yeon Lee & Elsi Kaiser (University of Southern California)
sarahhl@usc.edu

Tracking of object states as they undergo change (e.g. intact onion → chopped onion in an event of chopping an onion) is a fundamental mechanism in event comprehension (e.g. [1]). In this work, we investigate how *grammar (grammatical aspect)* and *non-linguistic event knowledge* interact to modulate comprehenders' mental representations of object states.

Grammatical aspect An event described in perfective aspect (e.g. *Kim dropped …*) evokes a completed event representation with focus on the event's endpoint, whereas imperfective aspect (e.g. *Kim was dropping …*) evokes an ongoing event representation, highlighting the inceptive/intermediate phases. During online comprehension, this has consequences for mental representations of object states. In particular, perfective aspect drives attention to state change: Given perfective sentences, images depicting resultant states (aspect-object state match) were evaluated in more detail (e.g. [5]) and were processed faster. (e.g. [3]))

Event knowledge Event comprehension is also guided by our prior knowledge about how events normally take place in the real world (e.g. [4]). We, for example, know that a wine glass is likely to break when it is dropped, but that a plastic cup is unlikely to break when it is dropped. In this study, we investigate the role of grammatical aspect in processing descriptions of events in which (a) the object can be *expected* to undergo change-of-state (e.g. dropping a wine glass) and (b) the object is *not expected* to undergo change-of-state (e.g. dropping a plastic cup), according to real-world event knowledge.

Research questions (a) How does grammatical aspect constrain object state representations? (b) How does event knowledge modulate the effect of grammatical aspect?

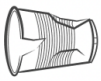
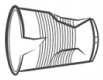
Experiment (2x2x2; 24 targets, 32 fillers) Participants (N=114) read event descriptions in (a) imperfective (e.g. *Kevin was dropping …*) or (b) perfective aspect (e.g. *Kevin dropped …*), word by word (self-paced). The critical object word was replaced with an image ('rebus sentence paradigm'; e.g. [2]) of an object that is either (a) expected (e.g. a wine glass) or (b) unexpected (e.g. a plastic cup) to undergo the depicted change-of-state as a result of the action. The image depicted the object in its (a) intact (original) or (b) changed (resultant) state. The depicted change(s) were not entailed by verb semantics but were (highly or minimally) inferable from event knowledge (Table 1). RTs to each word/image were recorded.

Predictions (a) In line with previous findings, we predict that perfective aspect will focus comprehenders' attention on state change. (b) Focusing on state change will have different consequences for events in which the depicted change is expected vs. unexpected. With expected-change events, processing of changed state images will be faster in perfective aspect (when there is a match between the nature of the grammatical aspect and the object state) than in imperfective aspect. With unexpected-change events, attentional focus on state change will aggravate the slowdown associated with seeing an unexpected changed state, so RTs will be slower in perfective aspect than in imperfective aspect.

Results (Fig.1) When processing *intact* object state images, aspect and change-expectedness did not modulate RTs. However, when processing *changed* object state images, the effect of grammatical aspect was modulated by change-expectedness (change-expectedness * grammatical aspect interaction: $|t|=2.085$, $p=0.037$). In conditions where change was *expected*, the changed-state image was processed *faster* in *perfective* sentences than in *imperfective* sentences ($|t|=2.59$, $p=0.019$). However, in conditions where change was *unexpected*, the changed-state image was processed *slower* in *perfective* sentences than in *imperfective* sentences ($|t|=2.30$, $p=0.031$).

Discussion We add to the body of work showing that comprehenders use grammatical aspect to constrain and guide event representations and activations of object states. Crucially, we show that the effect of grammatical aspect is modulated by event-related expectations rooted in real-world knowledge. We conclude that general semantic knowledge about real-world events interacts with episodic information introduced in the local linguistic context (e.g. grammatical aspect) during online language processing.

Table 1. Example stimuli (2 x 2 x 2: Grammatical aspect x Event type x Object state)

imperfective aspect	change expected	intact state	Kevin was dropping the  at the busy bar.
		changed state	Kevin was dropping the  at the busy bar.
	change unexpected	intact state	Kevin was dropping the  at the busy bar.
		changed state	Kevin was dropping the  at the busy bar.
perfect aspect	change expected	intact state	Kevin dropped the  at the busy bar.
		changed state	Kevin dropped the  at the busy bar.
	change unexpected	intact state	Kevin dropped the  at the busy bar.
		changed state	Kevin dropped the  at the busy bar.

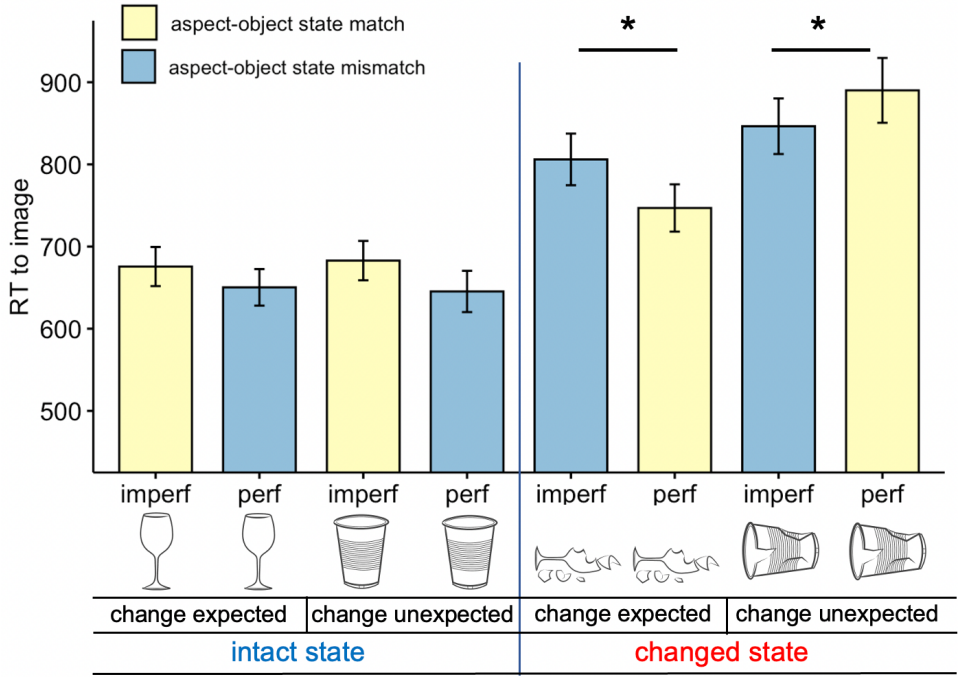


Figure 1. Mean RTs at the image position by condition (Error bars show +/- 1 SE)

References: **[1]** Altmann & Ekves, Psychological Review, 2019; **[2]** Madden & Therriault, The Quarterly J of Experimental Psychology, 2009; **[3]** Madden-Lombardi et al., PLoS One, 2017; **[4]** McRae et al., Memory & Cognition, 2005; **[5]** Misersky et al., Cognition, 2021.