When is a spatula just a spatula?: Investigating the link between observed events and the online interpretation of verb-instrument biases

Research in sentence processing has revealed that verb information (such as argument structure and aspect) as well as practical knowledge of the event denoted by the verb play a key role in online sentence processing, and guide interpretation from its earliest moments (Trueswell, Tanenhaus, and Kello, 1993, Garnsey, Perlmutter, Myers and Lotocky, 1997, Altmann and Kamide, 1999, inter alia). However, the means by which this information comes to be associated with a verb, and why some subset of information comes to be represented grammatically within the verb's argument structure is relatively less studied. This is due in part to the fact that by the time college sophomores arrive in the psycholinguistic lab, their lexical representations are fully formed, and we cannot directly query the experiences or linguistic input that gave rise to them. The key to the relationship between experience of events and language and the verb information that governs the course of sentence processing lies in observing speakers' experience of verb events as well as their moment-by-moment understanding of the sentences that contain them.

We present a new methodology for investigating the connection between concepts and their grammaticalization. In this experiment, an initial phase of video exposure to multiple tokens of a target event paired with its denoting novel "verb" is followed by a self-paced reading task in which the newly learned verbs are embedded in English sentences. By varying the nature of the tokens viewed during video exposure, we can alter the underlying "concept" of the verbs, and during the second phase, measure the effect of this manipulation on participants' processing of constructions containing that verb. In this first use of this methodology, our primary question concerned whether the semantic argument structure that participants associated with the new verb would directly reflect each individual participants' summarized experience of video tokens of the verb viewed during the initial exposure phase.

In particular, we investigated whether participants generated a semantic argument for the role of "instrument" as a reflection of their video exposure. Koenig, Mauner and Bienvenue (2003) suggest that participants of an action (such as the instrument that was used to carry out the action) become represented as part of the semantic argument structure only in cases where they are conceptualized as obligatory to performing that action. McRae and colleagues (Ferretti, McRae and Hatherell, 2001, McRae, Ferretti and Amyote, 1997) suggest that inclusion within a verb's argument structure is more gradient, and can be traced to the degree of association between the action and that participant; that is, it is directly linked to particular instances of exposure to both the particular action, and utterances containing the verb denoting that action.

Method: Native speakers of English participated in both phases of the experiment. During the first phase, participants viewed videos of novel events. Each event was labeled with the phrase, "this video shows the verb "to X,"" thus exposing the participant to a novel verb denoting that event without providing information that would reveal the preferred syntactic environment of that verb. Participants saw ten tokens of each new event type and its verb. All event types were biased with respect to the likelihood of instrument usage: for four of the new verb/event types, instrument usage was highly likely, occurring in eight of the ten tokens of the videos; another

four verb/event types within the experiment were presented with instruments only twice. The event types and verbs assigned instrument or non-instrument biases were counterbalanced across participants.
In a second phase of the experiment, the new verbs were fitted into English sentences presented in a self-paced reading study. Participants read sentences containing the new verbs as in examples 1 and 2 below.

1. What did the receptionist fleek the chocolate donut with during the coffee break at the office? [wh-shifted construction]
2a. The zookeeper fleeked the baby bird with some tweezers and fed it vitamins. [VP-attached prepositional phrase]
2b. The zookeeper fleeked the baby bird with growth problems and fed it vitamins. [NP-attached prepositional phrase]

Following self-paced reading, participants completed a rating task in which the judged the likelihood of each novel verb occurring with an instrument.

Results: The final rating task showed that participants had conceptually encoded the presented instrument biases of the actions; Instrument-biased verbs were rated significantly more likely to involve an instrument than were the non-instrument biased verbs ($t_1(18)=5.23$, $p<.001$, $t_2(7)=6.61$, $p<.001$). However, this learning was not reflected in reading patterns, as there were no differences in reading times as a function of whether the novel verb had been introduced with an instrument bias or not. This result parallels others in the literature in which participants demonstrate knowledge in an offline task yet effects of the knowledge do not appear in reading patterns (e.g. Pearlmutter & MacDonald, 1995, Waters and Caplan, 2004).

A pattern of this sort could emerge from several different causes, which are being pursued in subsequent studies. One possibility is that this verb bias information is not used in online processing and thus emerges in only later offline tasks. This explanation, however, runs contrary to a multitude of findings in online sentence processing literature (see above), and is thus highly undesirable. A second possibility is that the exposure phase was not sufficient for adequate learning of the verb information to the degree necessary to modulate online processing (Pearlmutter & MacDonald offer a similar explanation for their effects). Thirdly, the observed results may indicate that while the video tokens may support an association between instruments and verbs, the conditions for representation of the instrument within the verb's lexical entry have not yet fully been met. Thus, one would not expect to see an influence of these participants on online reading times. Koenig et al. suggest that to become part of a verb's semantic argument structure, and event participant must be Obligatory. Since this was never the case for instruments within the context of the actions presented here, one could argue that they never qualified as the kind of information that becomes available during online processing. However, since verbs such as *poke* have been observed to behave in ways consistent with a lexically-encoded instrument (despite the ubiquity of finger-poking events), this explanation merely shifts the focus from discovering which event participants to become lexically encoded to discovering which event participants are perceived as Obligatory.

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