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## Blocking causal interpretations between juxtaposed propositions: experimental evidence

Understanding what allows comprehenders to draw causal connections between events is central to understanding how a discourse is made coherent. Juxtaposed propositions are regularly ambiguous between causal and non-causal interpretations. In (1), the mayor's election can be interpreted as having caused the riot, as having preceded but not caused the riot, or as one of two unrelated facts about the world.

- 1) The mayor was elected. There was a riot.
- 2) Because the mayor was elected, there was a riot.

Causal connections can be left implicit as in (1) or made explicit via an overt marker like the connective *because* in (2). Models of discourse coherence (e.g., Asher & Lascarides, 2003; Kehler, 2002) distinguish between causal and non-causal relations but assume that, in the absence of an overt connective, the inference of such relations depends largely on real-world knowledge and the ability to reason about the speaker's intended message. For example, the causal reasoning associated with so-called IMPLICIT CAUSALITY verbs guides the establishment of coherence: Passages with such verbs favor causal relations (e.g. a verb like *congratulate* raises questions about the reason for the congratulations in a way that *babysit* does not; Kehler, Kertz, Rohde, & Elman, 2008). As such, the real-world knowledge triggered by a verb's lexical semantics influences coherence. Little work, however, has addressed the role of a sentence's syntactic marking in the inference of causal connections. In this paper, we move beyond coherence-signaling connectives and the lexical semantics of verbs to explore effects from the syntactic clause-marker *that*.

Bjorkman (2010) proposes that in embedded contexts like (3), the presence of an overt complementizer can block causal interpretations. The complementizer does not alter what is said (semantics) or what is meant (pragmatics) by each of the embedded propositions; it merely changes the syntactic form. We test experimentally whether the presence/absence of a complementizer affects the inference of causality.

- 3) The newspaper reported that the mayor was elected and (that) there was a riot.

*Experiment.* In 32 sentences like (3), we manipulated the presence/absence of the second *that*. The two propositions were always embedded under a complement-taking verb like *report* and were designed to be ambiguous between causal and non-causal interpretations (i.e., the election causing or not causing the riot). Fillers used connectives to explicitly signal causal (*because*) or non-causal (*despite, unrelated to*) readings. Forty participants, recruited through Amazon Mechanical Turk, were asked to indicate on a 1-5 scale how likely the first embedded clause was to have caused the second ("definitely not causally related" ... "definitely causally related").

*Results.* After excluding two participants whose ratings on the fillers indicated they failed to understand the task, the results confirmed that the presence of *that* at the beginning of the second embedded clause significantly lowered causal interpretations ( $p < 0.05$  in a mixed-effects model).

Our findings provide experimental support for Bjorkman's claim about the effect of complementizers on causality. It suggests that models of causal reasoning in discourse processing should incorporate cues from sentences' surface form, alongside cues from lexical, semantic, and pragmatic sources.