

Priming Abstract Modal Mechanisms in Modals with Causatives

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Motivation. It's debated whether causatives contain a modal component [5, 6, 9] or not [3, 7]. Any semantic theory must capture the fact that obligation and permission interpretations are associated with causatives shown here with a cancellation test, "*Jane made George go to the store, ?but he didn't have to.*" To account for this [9] provides a modal analysis of causatives, in which *made* universally quantifies over possible situations, entailing necessity, which is also entailed by strong deontic modals, such as *had to*. If causatives and modals share core meaning, and priming effects can target shared meaning, then **it's possible the shared modal necessity conveyed by causative *made* and deontic modal *had to* can be targeted with priming.** Here we tested the hypothesis that strong causatives and deontic modals in English share a necessity entailment using priming in a **sentence recall task (SRT)** [2, 4, 8]. Our results show that ***had to* can be primed by *made* despite their structural differences, suggesting that causatives and deontic modals indeed share the same core meaning and that priming can arise from the shared meaning.**

Background. In English there are differences between causatives such as *made* and deontic modals such as *had to*: *made* yields actuality entailments, *had to* doesn't; *made* takes a small clause as argument, *had to* doesn't. Yet modal meanings arise with causative sentences, shown in the example above. Similar cancellation tests have shown the inability to cancel deontic meaning in causative sentences cross-linguistically, such as in Serbian, Japanese, Yu'pik, and Italian [5, 6]. Causatives and modals are semantically similar in that they can vary in strength. For causatives: *cause* vs. *allow*, for modals: *necessity* vs. *possibility*, and they have similar entailment patterns between strength: *cause* entails *allow*, and *necessity* entails *possibility*. For [9] the modal interpretation is available with causatives because they convey modal necessity in the case of *cause* and possibility in the case of *allow*, entailing the respective obligation and permission. These similarities between *made/had to* motivate the hypothesis that both expressions share core meaning. We use priming to test this hypothesis.

Design. To observe whether people could be primed to produce a *had to*-sentence after uttering a *made*-sentence, we tested sentence production in a priming experiment using the SRT. In each trial participants (n=48) were asked to read aloud and memorize two sentences, one of which they were asked to recall later given a cued prompt, an uninflected verb that appeared in the to-be-recalled sentence (Fig. 1). Sentences appeared as either *had to*-sentences (modal), *made*-sentences (causative), or in the simple past (control). For critical trials (n=24), target sentences were in the simple past, prime sentences were either a *made*-sentence (n=12) or in the simple past (n=12), and people were asked to recall the target (Fig. 1). Of the 72 total trials, 36 of them contained a *had to*-sentence, meaning people were biased to insert *had to* during recall. If *made* indeed primes *had to*, we should observe that the rate of ***had to* production should be higher when the prime sentence contains *made*, compared to when the prime is a control sentence** where no causative or modal expressions are involved.

Results. During recall people inserted *had to* after uttering a *made*-sentence 47.4% of the time, and after uttering a control sentence 41.3% of the time (Fig. 2). A maximally-structured mixed effects logistic regression model [1] suggests that **the rate of *had to*-insertion after uttering a *made*-sentence is significantly higher than the rate of *had to*-insertion after uttering a control sentence ($p = 0.037$).** This replicates a prior, similarly designed, pilot experiment with less statistical power ($p = 0.08$). **Conclusion.** The results of the current study suggest that *made* and *had to* share some core meaning as hypothesized by [6,7,9], and that priming can be used to target high-level representations used when processing *made*, *had to*. Our results show that abstract semantic representation can be primed using the standard psycholinguistic method and contribute to the methodological and theoretical progress of understanding semantic processing and its effect on language production.

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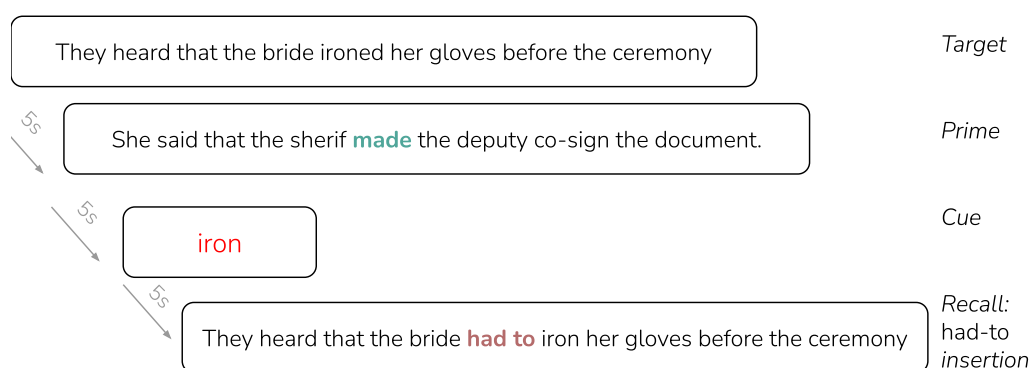


Figure 1. Example of critical trial

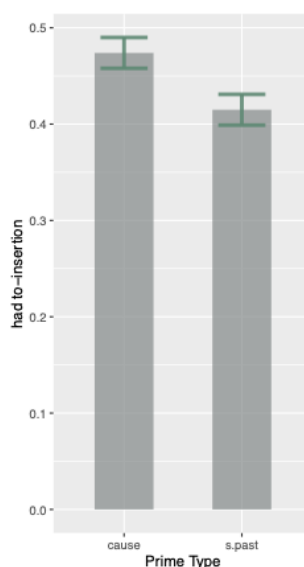


Figure 2. *Had-to* insertion for causative and control conditions