

The relationship between priming and linguistic representations is mediated by processing constraints.

Commentary on Branigan, H. & Pickering, M., “An experimental approach to linguistic representation.” *Behavioral and Brain Sciences*, 40.

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Abstract: Understanding the nature of linguistic representations undoubtedly will benefit from multiple types of evidence, including structural priming. Here, we argue that successfully gaining linguistic insights from structural priming requires us to better understand (1) the precise mappings between linguistic input and comprehenders' syntactic knowledge; and (2) the role of cognitive faculties such as memory and attention in structural priming.

Branigan and Pickering provide a strong argument that structural priming (and priming paradigms more generally) may provide a useful avenue to better understand the nature of linguistic representations. We wholeheartedly agree that structural priming can yield useful insights about individuals' underlying linguistic representations. However, just as insights from metalinguistic acceptability judgments require us to understand how these judgments are made, insights from priming paradigms require us to understand the processes underlying structural priming – specifically, how priming can be influenced by online processing and cognitive constraints.

To understand structural priming, we first need to understand the precise mappings between linguistic input (prime sentences) and comprehenders' syntactic knowledge. There is now considerable evidence that comprehenders' parses do not always reflect the input veridically. Instead, parses reflect comprehenders' recent experiences, prior beliefs, and predictions of upcoming linguistic material (review: Traxler 2014). Critically, these factors not only influence sentence interpretation, but also influence syntactic parses themselves. An important question, then, is “What aspects of the parsing process influence patterns of structural priming?”

On one hand, there is evidence that structural priming reflects comprehenders' *eventual* parses, which may be the result of correction or reconstruction of the original linguistic input. For example, structural priming can occur from isolated verbs: Verbs that occur only, or mostly, in one construction can prime that construction (Melinger & Dobel 2005). However, counterintuitively, structural priming also can occur from sentences with *missing* verbs (e.g., *The waitress*

the book to the monk), and such priming has a similar magnitude to priming from well-formed primes (e.g., *The waitress gives the book to the monk*; Ivanova et al. 2017). These data suggest that comprehenders can reconstruct missing verb categories as well as missing post-verbal syntactic constituents, and these reconstructed representations give rise to priming effects. Structural priming even can reflect apparent corrections of parses that would result in implausible scenarios. That is, after implausible double-object datives such as *The waitress gave the book the monk*, speakers can be primed to produce *prepositional datives* and not double objects as might be expected based on a syntactic analysis alone (Slevc & Momma 2015). These data suggest that non-syntactic factors such as plausibility can influence a comprehender's final parse, thus changing or even reversing expected patterns of structural priming. Crucially, in all three examples, priming effects appear to reflect listeners' final parses rather than the structure of the original input.

On the other hand, structural priming can reflect intermediate aspects of parsing, such as erroneous abandoned partial analyses, instead of, or in addition to, the intended and presumably eventual parse. For example, an incomplete sentence fragment that is subsequently corrected to another syntactic structure still can produce structural priming. That is, speakers were more likely to describe a picture with a prepositional dative after hearing a sentence fragment that started as a prepositional dative but was corrected to a transitive (e.g., *The mechanic is giving the new part... uh... is recognizing the new part*) than after a fragment starting as a double-object dative and corrected to a transitive (Slevc & Ferreira 2013). Similarly, participants completed more sentences as transitives after temporarily ambiguous sentences such as *While the man was visiting the children who were surprisingly pleasant and funny played outside* than after identical sentences disambiguated by a comma (van Gompel et al. 2006). Importantly, the priming effects observed in these studies reflected temporarily suboptimal or erroneous parses that arose from the processing demands of online parsing.

Of course, structural priming reflects active processing even in the absence of errors or temporary ambiguity. Thus, the role of underlying cognitive faculties is a second aspect of structural priming that deserves more investigation. One such

faculty is attention: Priming effects are greater when primes are directly attended (e.g., when a comprehender is addressed directly in a dialogue) compared to when she or he is not directly addressed (e.g., when a comprehender simply overhears a conversation). This result suggests that the depth of processing of a prime sentence directly affects the magnitude of priming (Branigan et al. 2007). A second relevant faculty is working memory. Although there is evidence that structural priming effects can be long lasting (e.g., Bock & Griffin 2000; Kaschak et al. 2011) and may reflect implicit learning rather than short-term maintenance (e.g., Chang et al. 2006), working memory nonetheless has been implicated in structural priming. Ivanova et al. (2013) found that increased working memory demands during the *production* of target picture descriptions reduced priming (at least for datives in a picture description paradigm; note that priming the presence/absence of the complementizer *that* in a recall paradigm was unaffected by memory load). These data suggest that attention and memory demands can influence priming effects, although we still know very little about these influences.

These examples illustrate that the relationships among linguistic input, syntactic knowledge, and structural priming are indirect and mediated by processing constraints. This does not undermine the usefulness of structural priming to shed light on linguistic representations. It does suggest, however, that more work is needed to understand how specific task and stimuli details affect both parsing and structural priming. Of course, processing dynamics influence metalinguistic acceptability judgments as well (e.g., Lau & Ferreira 2005), and so it will be important to compare how processing demands affect these different paradigms. More generally, structural priming (like any method) has both advantages and limitations. We agree with Branigan and Pickering that it can be a useful tool to investigate the nature of linguistic representations, but we also caution that this tool still requires careful work to unpack the processes underlying our tendency to reuse recently experienced structure.

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