Testing error-based learning models of structural priming: Context and tense bias effects

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Three experiments tested whether structural priming is due to error-based learning. Error-based learning models (Chang et al., 2006; Jaeger & Snider, 2013) claim that structural priming occurs when a comprehender incorrectly predicts upcoming structure. When the predicted structure is inconsistent with the actual sentence structure, structural activation is adjusted, resulting in priming. This explanation of structural priming contrasts with models that assume that structural priming is due to residual activation of the prime structure or of processes involved in producing it (Bock, 1986; Pickering & Branigan, 1998; Reitter et al., 2011).

Until now, research has focused on verb bias effects, generally showing that the less frequently a structure is used with a verb, the more strongly it primes that structure (Bernolet & Hartsuiker, 2010; Jaeger & Snider, 2013, but see Ivanova et al., 2013 for counterevidence). This is consistent with the idea that less predictable structures prime more strongly. However, it may also be explained by residual activation models, assuming that a single prime has a larger effect on structures that the language user has rarely encountered (and that therefore have a very low baseline activation). We therefore manipulated structural biases in different ways.

In Experiments 1 and 2, we used a context manipulation. Participants read aloud PO/DO primes (1a-d) followed by a target (2) that they completed. The first clause in the primes resulted in either a new-given or given-new order in the PO/DO. According to error-based accounts, comprehenders should frequently make prediction errors in primes (1a, 1d) because the structure does not have the preferred given-new order, whereas they should predict the given-new structures in (1b, 1c) correctly. Therefore, priming should be stronger in (1a, 1d).

PO prime:	{(1a) *After the politician was questioned,* (1b) *After the petition was signed*}*,* *the activist handed it to the politician.*
DO prime:	{(1c) *After the politician was questioned,* (1d) *After the petition was signed*}*,* *the activist handed him the petition.*
Target:	(2) *The tourist handed …*

A pretest with primes cut off after the verb (*handed*) showed a bias towards PO/DO structures with a given-new order. However, contra error-based learning predictions, structural priming was no stronger after new-given (13% priming, $p < .05$) than given-new primes (13%, $p < .05$) in Experiment 1. Experiment 2 showed the same pattern when the pronouns were replaced by full noun phrases.

In Experiment 3, we investigated prediction biases by manipulating the verb's tense in transitive (1a, 1b) and intransitive (1c, 1d) structures (Van Gompel et al., 2012).

Transitive prime:	*When the doctor* {(1a) *was supervising*, (1b) *had supervised*} *the trainees, he was kind.*
Intransitive prime:	*When the doctor* {(1c) *was supervising*, (1d) *had supervised*}, *he was kind.*
Target:	*Although the teacher* {(2a) *was supervising*, (2b) *had supervised*} …

A pretest with the primes cut off after the verb (*supervising/ed*) showed a clear bias towards transitive completions after a pluperfect tense (1b, 1d) and an intransitive bias after a progressive tense (1a, 1c) (Frazier et al., 2006). In contrast, the structural priming experiment showed no tense prediction bias effect: Priming was equally strong regardless of whether the prime structure was consistent (28% priming, $p < .05$) or inconsistent (26%, $p < .05$) with the tense prediction bias.

In sum, we found no evidence that prediction errors due to either context or tense biases affected structural priming. Instead, the results are more consistent with residual activation models, which assume that structural predictability does not affect structural priming.