Syntactic priming disambiguates globally ambiguous sentences in language comprehension
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Introduction
Syntactic priming is the facilitation of a structural form due to the previous use of that form. For example, after producing a double object structure like (1), speakers are more likely to re-use the same structure (2a) than a structural alternative (2b).

(1) The boy showed [the teacher] [the drawing]
   a. The baby sister throw [the kids] [the ball]
   b. The baby sister throw [the ball] [the kids]

Unlike in language comprehension, syntactic priming in production is robust, and has been shown using a variety of experiment types and structures. This has lead to the suggestion that representations or mechanisms underlying construction of syntactic forms differ in production and comprehension. Instead, we suggest that methodological differences in how priming is assessed in production and comprehension are largely responsible for this asymmetry.

Syntactic priming in Sentence Production
In production studies, speakers typically select from two structural alternatives, like (2a) and (2b).

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Structural alternatives have:
- equivalent message content
- same lexical items
- equivalent thematic relationships
- differ only in syntactic form

In the absence of other factors strongly biasing the speaker toward one structure or the other, the prime has a relatively strong effect on the structure produced.

Syntactic priming in Sentence Comprehension
In comprehension, syntactic priming experiments involve assessing the effects of a prime structure on the processing of sentences with temporarily structural ambiguities. After reading an unambiguous reduced relative sentence (3), the processing of (4) should be facilitated:

(3) The intern given the important job failed. [88-biased prime]
(4) The horse raced past the barn fell. [temporally RV/RM ambiguity]

However, this setup pits structural priming against other constraints that strongly affect the parsing of a sentence as it unfolds (see MacDonald et al. 1994, MacRae et al. 1999; 2000).

- thematic fit among verb and arguments (‘horse’ as agent/patient of ‘race’)
- relative frequency of syntactic configuration ‘race’ in a main clause vs. a BC
- relative frequency of verb form (‘raced’ as a past tense verb vs. a passive participle)

Given these factors, it is unsurprising that structural priming has a relatively weak effect.

Syntactic priming in Comprehension: Lexical boost
When priming is observed in comprehension, it often requires repeating the verb from prime (5) to target (6) (Branigan et al. 2000; Arau et al. 2007; Tooley et al. 2009).

(5) The landscape observed by the tourists was beautiful. [RR-biased prime]
(6) The children observed by the parents were well-behaved. [MV/RR ambiguity]

With lexical repetition, the reader is biased toward one structure not only by the prime sentence’s structure, but also by previous use of the verb in a syntactic configuration, and previous use of the verb in a particular verb form. Studies that do find priming without lexical repetition (Scheepers & Crocker 2004; Thomadhi & Snedeke 2005) have in common with production studies that priming does not have to overturn the combined effects of other constraints.

Syntactic priming with globally ambiguous sentences
In the current study, we use globally ambiguous sentences like (5), where a sentence-final prepositional phrase (underlined) is ambiguously attached.

(7) The FBI agent noticed the mirror on the wall with the crack.

High Attachment: ‘with the crack’ attaches high in the structure, modifying ‘mirror’
Low Attachment: PP attaches low, modifying ‘wall’

Unlike with temporary ambiguity, both structural alternatives yield a well-formed meaning, allowing the reader to choose a structure without competing with other lexical biases.

Materials - Methods
- Participants read sentences phrase-by-phrase on a computer screen.
- Each globally ambiguous target sentence was preceded by a semantically disambiguated prime sentence.
- A two-choice question indicated the participant’s parse of the target sentence.

Results: Proportion congruent responses
RTs and Question responses were fitted to mixed-effects regression models with Subject and Item as random effects.

- Main effect Attachment Bias (β=-5.3, SE=1.0, p<.0001): a high Attachment bias was more likely to be parsed as a high attachment structure.
- Attachment Bias – Prime Structure interaction (β=-2.6, SE=1.2, p<.05): High Attach primes more effective when paired with High Attach-biased items.
- Attachment Bias – Trial interaction (β=-15, SE=0.8, p=.05): Influence of High Attachment bias became weaker as trials progressed – Primes inconsistent with the overall structural bias were less effective in the experiment.

Low Attachment primes became more effective over trials: change in priming increased more for Low Attachment than High Attach primes as trials progressed (β=-30, SE=0.8, p<.0001)

Results: Reading times
The prime structure also affected RTs on the ambiguously-attached PP.

- Main effect Prime/Target Congruence (β=280.3, SE=101.3, p<.01): trials where the parse was incongruent with the prime had longer RTs.
- Main effect Attachment Bias (β=-296.0, SE=152.0, p=.05): Strongly High Attached biased items were read more slowly than unbiased items - primes had a stronger facilitative effect on equally-biased items.
- Prime Incongruent responses read more quickly for Low Attachment than for High Attachment primes (β=-295.9, SE=150.6, p=.05): when the prime succeeded in affecting the parse of the target, High Attach primes had a greater facilitative effect on RT than Low Attach primes.

Conclusions
- Prior syntactic processing can affect the interpretation and processing of structurally similar sentences, even without lexical overlap between prime and target sentences.
- Pre-existing, item-specific attachment bias strongly influenced how target sentences were parsed. Changes in the effectiveness of each prime type across trials suggest this item-specific bias can be overridden by exposure to a new distribution of syntactic biases.
- In our experiment, High and Low Attachment were about equally likely. This altered the relative influence of High and Low Attachment prime structures over the course of the experiment, supporting the idea that less frequent structures have a greater affect on subsequent language processing than more frequent ones.
- Furthermore, the fact that the initially more effective Low Attachment primes are disambiguated with respect to the prime language strongly suggests that the effects observed are not due to lexical properties of particular items, but instead reflect priming of syntactic representations.

References