Syntactic priming disambiguates globally ambiguous sentences in language comprehension

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University of Rochester

LSA 1/10/09
**Syntactic priming**

Facilitation of a structural form due to previous use of that form.
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*The boy showed \([_{NP \text{ the teacher}}]_{NP \text{ the drawing}}\).*
Syntactic priming

Facilitation of a structural form due to previous use of that form.

*The boy showed* \[ _{NP \text{ the teacher}}[_{NP \text{ the drawing}}].

*The babysitter threw* \[ _{NP \text{ the ball}}[_{PP \text{ to the kids}}].
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The boy *showed* $[\text{NP the teacher}][\text{NP the drawing}]$.

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**Syntactic priming in sentence production**

Robust, long-lasting effects on choice of syntactic form.


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| ~ | give [the book][to the boy] |
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Syntactic priming in sentence comprehension

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<td>The nurse-Ag the priest-Pt pushes $\sim$ The nurse-Pt the priest-Ag pushes</td>
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“priming in comprehension versus production are at least quantitatively different--priming is weaker in comprehension than it is in production.

...in nearly every case, to observe priming within comprehension, some ‘boost’ is needed.”

~Pickering & Ferreira 2008
Why do comprehension and production differ?

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- Different mechanisms involved in constructing syntactic forms in production v. comprehension.
- Methodological differences in how priming is assessed.

When we look for syntactic priming in sentence comprehension in a way more parallel to how priming is measured in production, we find it.
Previous studies: Priming in locally ambiguous sentences

The horse raced past the barn fell.
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The horse raced past the barn fell.

- **main verb**
- **reduced relative**
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The intern given the important job flaked. prime

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main verb

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Why doesn’t this work? Potential problems

- With local ambiguity, readers do not choose the interpretation that the sentence gets--material later in the sentence disambiguates it $\rightarrow$ one correct parse.
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- Unlike typical syntactic priming experiment in sentence production: In a situation where either structural alternative yields an appropriate meaning (‘all else equal’), are speakers more likely to choose a previously used structure?
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- Unlike typical syntactic priming experiment in sentence production: In a situation where either structural alternative yields an appropriate meaning (‘all else equal’), are speakers more likely to choose a previously used structure?

- Instead, typical comprehension studies look for a decrease in reading time--a more indirect measure, and generally weaker than form choice.
Priming in globally ambiguous sentences

The FBI agent noticed the mirror on the wall with the crack.

high attachment

low attachment
The FBI agent noticed the mirror on the wall with the crack.

Priming in globally ambiguous sentences

- **High attachment**

- **Low attachment**
The FBI agent noticed the mirror on the wall with the crack.
Priming in globally ambiguous sentences

The kids were scared of the spider in the web with the fangs. The FBI agent noticed the mirror on the wall with the crack.
**Priming in globally ambiguous sentences**

The kids were scared of the *spider in the web with the fangs.*
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Procedure

- Participants read sentences phrase-by-phrase on a computer screen.
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- Globally ambiguous target sentences were preceded by unambiguous prime sentences (semantically disambiguated, 1/2 high attachment, 1/2 low attachment).
- Target sentences were followed by a two-choice question; the response indicated the participant’s parse of that sentence.
- 1/2 experimental trials (prime or target), 1/2 fillers
The kids
were
scared
the spider
the web
with
the fangs.
The FBI agent
noticed
the mirror
the wall
with
the crack.
What had a crack?

(a) the wall   (b) the mirror
Dependent measures

- Parse of target sentence--indicated by question response
- Reading time
Predictors

- Prime attachment site (Early closure/Late closure)
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- Prime-Target congruence (Congruent/Incongruent)
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RTs and Question responses were fitted to mixed-effects regression models with Subject and Item as random effects.
Results: question responses

- Main effect of preexisting attachment bias ($\beta=5.3$, SE=1.0, $p<.0001$): if an item has an Early Closure (high attachment) bias, it is more likely to be parsed with EC.
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- *Attachment bias x Prime attachment* interaction ($\beta=2.6$, SE=1.2, $p<.05$): EC-biased primes more effective when paired with highly EC-biased items.
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- Attachment bias x Trial number interaction ($\beta=.15$, SE=.08, $p=.05$): the influence of EC bias is stronger earlier in the experiment.
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- Attachment bias x Trial number interaction ($\beta=.15$, SE=.08, $p=.05$): the influence of EC bias is stronger earlier in the experiment.

- Prime attachment x Trial number ($\beta=.30$, SE=.08, $p<.0005$): LC primes become more effective as the experiment progresses (change in priming increases for more LC than EC primes).
Results: reading times

- Main effect of Prime-Target congruence ($\beta=280.3$, SE=101.3, $p<.01$): if the question response indicated a parse congruent with the prime, the ambiguously-attached PP was read faster.
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- Main effect of Attachment bias ($\beta=296.0$, SE=152.0, $p=.05$): strongly biased items tended to be EC-biased--these were read more slowly than unbiased items $\Rightarrow$ primes had a stronger effect on equally-biased items.
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- Prime-Target congruence x Prime attachment interaction ($\beta=295.9$, SE=150.6, $p=.05$): when the prime succeeded in affecting the parse of the ambiguous sentence, EC primes had a greater facilitative effect on RT than LC primes.
Conclusions

- Prior syntactic processing affects both interpretation and real-time processing of similar structures (even without lexical overlap).

- With a more level playing field between production and comprehension, the magnitude of syntactic priming effects are more comparable than previous studies have suggested.
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- Strong influence of preexisting attachment bias (item-specific).
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- Can get ‘overridden’ by new language experience: distribution of syntactic forms in input alters relative influence of prime types over the course of the experiment.

- Mechanism behind priming: how our ongoing experience processing syntactic forms (production and comprehension) is used to update processing biases.
Thank you!