Comprehenders Pre-Activate Only the Best Sentence Completion

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Main Questions

1. When comprehenders anticipate what will be said next, how many predictions do they make for each upcoming word?
2. What kind of learning takes place when a speaker selects a word for production?

Background

Prediction
- Listeners and readers generate predictions about upcoming speech and text (e.g., Van Berkum et al., 2003; Wechs et al., 2005, 2004)
- How broad are these predictions? Do comprehenders predict one word or several?

Productions
- In the cumulative semantic interference (CSI) task, subjects name pictures from several semantic categories (clothing, animals, etc.)
- Each (e.g.) article of clothing named slower than at the previous ordinal position

Paradigm: CSI + Sentence Context

Bare condition: Picture naming in isolation

Sentence condition: Picture naming after high-cloze sentences (Griffin & Bock, 1998)
- Average cloze probability: 0.86

Models of CSI

Howard et al. (2006) & Belke (2013): CSI arises from competition during word selection
- More non-target or less target activation → More competition → More CSI

Oppenheimer et al. (2010): Error-driven learning
- Only more non-target activation → More error → More reweighting → More CSI

How many words do people predict?

<table>
<thead>
<tr>
<th>Competition models</th>
<th>Oppenheimer et al. (2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One word (Target)</td>
<td>RT: Faster</td>
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<tr>
<td></td>
<td>CSI: Faster</td>
</tr>
<tr>
<td>Multiple words</td>
<td>RT: Faster†</td>
</tr>
<tr>
<td></td>
<td>CSI: Less</td>
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</tbody>
</table>

* Assumption: predicting a word boosts its activation at selection.
† But slower RTs means CSI relative to one-word predictions.

Experiment 1

Participants: 80 UCSD students
Materials: 94 pictures (60 critical)
- 12 categories (5 pictures each)
Design: Pict named bare or after sentences
Results (analyzed using mixed-effects models):

Discussion:
- Significant CSI effects in both conditions
- Equivalent in size (no interaction: t < 1)

Experiment 2

Motivation for Experiment 2:
(a) High-cloze sentences may obviate need to evaluate picture before naming
(b) Easier to identify pictures benefit more from high-cloze sentence context
- Solution: Familiarization phase

Participants: 60 UCSD students

Results:

Discussion:
- Replicates Exp. 1 (no interaction: t < 1)
- Effect of sentences: Faster RTs, same CSI
- Can’t be explained by competitive models
- Can be explained by Oppenheimer et al. if sentences only boost target word

Experiment 3

Motivation for Experiment 3:
- Competitive models could explain data by assuming sentence trials → more learning
- If true, naming shirt should be slower if sock was previously named on a sentence trial than on a bare trial

Participants: 80 UCSD students
Design: Same as Navarrete et al. (2010, Exp. 3)
- Conditions mixed within each category

Results from trials that were comparable to Exps. 1-2:

Discussion:
- Replicates Exps. 1-2 (no interaction: t < 1)
- In Exps. 1-3, 114/219 Ss (52.1%) had a larger CSI effect for bare than sentence trials - no different from chance (p = .59)
- No effect of category context: shirt is slower equally when sock is previously named on a bare or sentence trial
- Competitive models can’t account for data

Conclusions

1) In the current study, comprehenders pre-activated only a single word — the best completion — for each sentence.
2) Speakers tune their language systems via error-based learning to prepare for future acts of production.

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