Adaptation of Gap Predictions in Filler-Gap Dependency Processing

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INTRODUCTION

Goal of the Study: Examine the limits of syntactic adaptation by testing a structure, i.e., filler-gap dependencies, in which probabilistic information & other cognitive constraints (i.e., memory demands) are put in conflict.

Syntactic Adaptation
• Manipulating the input distribution can alter biases in ambiguity resolution → favor an a priori unlikely structure, processing difficulty of this structure diminished [1-3]

(1) The experienced soldiers warned ... about the dangers before the midnight raid. main verb about the dangers conducted the midnight raid. reduced relative

Memory constraints on filler-gap dependency processing
• Filler-gap dependency processing
• Active completion of filler-gap dependencies → gap predicted in first possible syntactic position (i.e., the direct object position) without bottom-up evidence [eg, 4]

Main Question: Do participants adapt when the input is skewed toward later dependencies (i.e., PP-gaps) despite the bias to complete dependencies early imposed by memory?

CORPUS ANALYSIS OF POST-VERBAL ARGUMENT GAP POSITIONS

<table>
<thead>
<tr>
<th>Corpus</th>
<th># Lines</th>
<th>Object Gaps</th>
<th>Preposition Gaps</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CallHome [6]</td>
<td>28,967</td>
<td>1,790</td>
<td>612</td>
<td>2,402</td>
</tr>
<tr>
<td>Switchboard [7]</td>
<td>44,696</td>
<td>1,159</td>
<td>226</td>
<td>1,385</td>
</tr>
<tr>
<td>Total</td>
<td>73,663</td>
<td>2,949 (77.9%)</td>
<td>838 (22.1%)</td>
<td>3,787</td>
</tr>
</tbody>
</table>

• Both corpora of naturalistic conversations between adults
• Includes argument wh-questions (who, what, which, whom) & relative clauses

RESULTS: TEST BLOCK

First Fixation Duration

<table>
<thead>
<tr>
<th>Group</th>
<th>Exposure Block</th>
<th>Test Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP-gap</td>
<td>24 NP-fronting filled gap sentences</td>
<td>24 target pairs + 48 fillers</td>
</tr>
</tbody>
</table>

Eye-tracking Experiment

Participants: 40 native English speakers from the JHU community

Stimuli: Filled gap sentence pairs [4,8] (3)

a. NP-fronting: The book that the famous non-fiction author Verb wrote | Filled Gap, the article | Spillover about | ___ was named for an explorer.

b. PP-fronting: The book about which the famous non-fiction author Verb wrote | Filled Gap, the article ___ | Spillover was | named for an explorer.

Two Block Design:

<table>
<thead>
<tr>
<th>Group</th>
<th>Exposure Block</th>
<th>Test Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>24 fillers</td>
<td>24 target pairs + 48 fillers</td>
</tr>
</tbody>
</table>

Predictions:
• If syntactic adaptation effects > memory driven bias toward shorter dependencies...

Discussion & Conclusion

Main Findings: As in ambiguity resolution, predictions for a priori likely gap positions (i.e., object gaps) can be diminished by an input favoring a later gap (i.e., PP-gaps).

Significance
• Syntactic adaptation effects extend outside ambiguity resolution to gap predictions
• At least in this case, probabilistic information in the input can override memory constraints favoring shorter dependencies
• Because structural probabilities as derived from the input statistics can affect gap predictions, memory constraints cannot be the sole explanation for the preference for early completion of filler-gap dependencies

Future work
Experiment 1: Are participants actively prediction a gap in the prepositional phrase? Filled Preposition Gap Sentences
(4) The carcass that the male lion ate by the water’s edge was attracting scavengers.

Experiment 2: Do participants adapt to the input distribution when it is presented during a separate experiment?

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</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>24 NP-fronting filled gap sentences</td>
<td>24 target pairs (plausibility mismatch) + 48 fillers</td>
</tr>
</tbody>
</table>

Experiment 3: Can children (5ys) use the distribution of gap positions in their productions to strengthen their object gap predictions during comprehension?

References: