"The Interaction of Structural and Semantic Biases in Coherence and Coreference"

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The Interaction of Structural and Semantic Biases in Coherence and Coreference

Hannah Rohde & Andrew Kehler

1. Goal
To test for an interaction of semantic and structural biases on comprehenders’ expectations about (i) next mention (coreference) and (ii) discourse direction (coherence).

2. Previous Work: Semantic Biases
Sentence completions: Strong bias in contexts with implicit causality (IC) verbs to re-mention the causally implicated referent (Caramazza, Grober, Garvey, Yates 1974; McKoon, Greene, Ratcliff 1993; inter alia). IC verbs increase expectation for an upcoming Explanation relation (as opposed to Occasion, Result, Violated Expectation, Parallel, etc.)

3. Previous Work: Structural Biases
Comparing story continuations with full-stop and pronoun-prompt conditions suggests that pronouns overlay a subject bias on coreference preferences (Stevenson et al, 1994; inter alia).

4. Story Continuation Experiment
Goal: Test interaction of semantic and structural biases by holding the propositional semantic content of a passage constant while varying the structural position of the causally-implicated referent. 2 x 2 Design: voice (active/passive) x prompt type (pro/no-pro)

Materials: 20 subject-biased IC verbs

(4) Prompt Type & Voice
a. Active_NoPro Amanda amazed Brittany. ____________.
   b. Active_Pro Amanda amazed Brittany. She ____________.
   c. Passive_NoPro Brittany was amazed by Amanda. She ____________.
   d. Passive_Pro Brittany was amazed by Amanda. She ____________.

Evaluation: judges annotated for next mention & continuation type

5. Predictions
Coreference
Semantic biases alone: Preference for causally implicated referent (Amanda)
   - Bias to subject (4a, 4b)
   - Bias to non-subject (4c, 4d)

Integrated semantic & structural biases: Stronger preference for causally implicated referent (Amanda) in (4b) than (4a) because Amanda is in subject position and pronoun introduces a subject bias. Weaker preference in (4b) than (4c) because Amanda is in the non-subject position but the pronoun introduces a subject bias.
   - (4a) Bias to subject Amanda
   - (4b) Increased bias to subject Amanda
   - (4c) Bias to non-subject Amanda
   - (4d) Reduced bias to non-subject Amanda

Coherence
Semantic biases alone: Preference for Explanations regardless of voice/prompt

Integrated semantic & structural biases: Stronger preference for Explanations in (4b) than (4a), but weaker preference in (4d) than (4c) because, in both cases, the pronoun shuffles discourse biases in favor of subject-based coherence relations.
   - (4a) Bias to Explanations
   - (4b) Increased bias to Explanations relative to (4a)
   - (4c) Bias to Explanations
   - (4d) Reduced bias Explanations relative to (4c)

6. Coreference Results

<table>
<thead>
<tr>
<th>Prompt Type &amp; Voice</th>
<th>Preference for Causally Implicated Referent (Amanda)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoPro_Active</td>
<td>73.9%</td>
</tr>
<tr>
<td>Pro_Active</td>
<td>74.6%</td>
</tr>
<tr>
<td>NoPro_Passive</td>
<td>58.8%</td>
</tr>
<tr>
<td>Pro_Passive</td>
<td>59.8%</td>
</tr>
</tbody>
</table>

7. Coherence Results

<table>
<thead>
<tr>
<th>Prompt Type &amp; Voice</th>
<th>Fewest Explanations in (4d): causally implicated referent is in non-subject position and pronoun shifts next-mention and coherence biases to subject.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoPro_Active</td>
<td>18.4%</td>
</tr>
<tr>
<td>Pro_Active</td>
<td>19.6%</td>
</tr>
<tr>
<td>NoPro_Passive</td>
<td>22.2%</td>
</tr>
<tr>
<td>Pro_Passive</td>
<td>23.9%</td>
</tr>
</tbody>
</table>

8. Conclusion
Even in contexts with strong semantic biases, the mere occurrence of a fully-ambiguous pronoun not only shifts interpretation biases toward the subject referent, but also influences comprehenders’ expectations about how the discourse will be coherently continued.