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Demanding an Explanation: Implicit Causality Biases in Discourse Interpretation
Hannah Rohde & Andrew Kehler

Abstract

Problem: Previous passage-completion studies report strong biases regarding who will be mentioned next following implicit causality (IC) verbs with a 'because' prompt. However, these biases are reduced/eliminated with a full-stop prompt.

1. Goal
To clarify the effects of IC biases on discourse interpretation by distinguishing (i) next-mention biases and (ii) biases toward upcoming coherence relations.

2. Previous work on Implicit Causality
Passage completions: strong IC bias to particular referent with 'because' prompt (Caramazza, Grober, Garvey, Yates 1974; McKoon, Greene, Ratcliff 1993, inter alia).

(1) a. IC-1 John annoyed Mary because ___________ . [bias to NP1-John]
b. IC-2 John scolded Mary because ___________ . [bias to NP2-Mary]
c. Non-IC John babysat Mary because ___________ . [mixed biases]

However, next-mention bias reduced/eliminated with full stop prompt (Au 1986, inter alia)

(2) a. IC-1 John annoyed Mary ___________ . [bias to NP1-John]
b. IC-2 John scolded Mary ___________ . [bias to NP2-Mary]
c. Non-IC John babysat Mary. ___________ . [mixed biases]

What role does 'because' have?
- Modifying salience of event participants directly (Stevenson, Knott, Overlander, & McDonald 2000)
- Signaling an Explanation coherence relation (Hobbs 1979, Kehler 2002)

3. Using coherence to modulate next-mention biases
We generalize Rohde, Kehler, & Elman’s (2007) pronoun model to next mention: Biases towards upcoming coherence relations (CRs) combine with biases for which event participant will be mentioned again, conditioned on coherence

(3) \( P(\text{next-mention} = \text{referent}) = \sum P(\text{CR}) P(\text{next-mention} = \text{referent}|\text{CR}) \)

\[ P(\text{CR}=\text{Explanation}) = 1 \text{ with 'because'}, \text{ but } P(\text{CR}=\text{Explanation}) < 1 \text{ in full stop} \]

Next-mention bias, \( P(\text{next-mention} | \text{Explanation}) \), is predicted to remain constant across Explanations – with both 'because' and full stop Explanations.

4. Story continuation experiment
2 x 3 design: verb type (IC vs. Non-IC) x continuation type (full stop vs. because vs. dialog prompt – dialog results not discussed here)

Materials: 40 IC verbs (20 IC-1, 20 IC-2) and 40 Non-IC verbs

Evaluation: judges annotated for next mention & coherence relation

5. Results
Next-mention biases were statistically indistinguishable when only 'because' prompts and freely generated Explanations were considered

\( F(1,70)=0.8822, p<0.3026; F(1,70)=0.8822, p<0.3026 \)

Because next-mention bias reduced/eliminated with full stop prompt

6. IC-1 Results

\[ P(\text{next-mention} = \text{NP1} | \text{'because'}) \approx P(\text{next-mention} = \text{NP1} | \text{Explanation}) \]

7. IC-2 Results

Again, next-mention biases statistically indistinguishable when only Explanations are considered 'because' (or freely generated)

\( F(1,36)=1.4598, p<0.2348; F(1,36)=1.4598, p<0.2348 \)

8. Non-IC Results

Again, next-mention biases statistically indistinguishable when only Explanations are considered 'because' (or freely generated)

\( F(1,61)=0.982, p<0.3438; F(1,61)=0.982, p<0.3438 \)

9. A new IC bias

IC verbs create an expectation regarding the direction the discourse is likely to take – specifically a bias towards an upcoming Explanation

Findings for full stop prompt: IC verbs yield more Explanation continuations than do Non-IC verbs

10. Conclusions

Like Rohde et al.’s results, overall statistics reveal a consistent system of stronger biases once coherence relations are conditioned on.

In contrast to previous results:
- Connective alone does not affect referent salience – mediated by coherence
- There are actually two strong biases that differentiate IC and Non-IC verbs:
  - \( P(\text{CR}=\text{Explanation}) \) is high for IC-1 and IC-2
  - \( P(\text{next-mention} = \text{NP1} | \text{Explanation}) \) is high for IC-1 and low for IC-2

The presence of a second bias had gone unnoticed because previous studies had not categorized their data by coherence.

References


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