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The Interaction of Structural and Semantic Biases in Coherence and Coreference

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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*).

(1) *Effect of verb on coreference*
a. **Amanda** amazed Brittany because **she** *ran a marathon*.
b. Amanda scolded **Brittany** because **she** *was misbehaving*.

→ IC verb (and speakers' causal reasoning and event knowledge) influence coreference, yielding bias to re-mention Amanda in (1a) and Brittany in (1b)

Story continuations: Strong bias in IC contexts to continue the discourse with a sentence describing the cause of the IC event (Rohde & Kehler 2008).

(2) *Effect of verb on coherence*
a. Amanda amazed$_{IC}$ Brittany. *She ran a marathon last year*.
b. Amanda babysat$_{NonIC}$ Brittany. *Brittany's mother is grateful*.

→ 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).

(3) *Prompt Types*
a. Amanda amazed Brittany. <= bias to re-mention Amanda
b. Amanda amazed Brittany. She <= stronger bias to Amanda

→ Presence of a pronoun increases bias that subject is being re-mentioned

References
Garvey, C., & A. Caramazza. (1974). Implicit causality in verbs. Linguistic Inquiry 5.459–464.
McKoon, G., S. Greene, & R. Ratcliff (1993). Discourse models, pronoun resolution, and the implicit causality of verbs. Journal of Experimental Psychology 19:5.1040–1052.
Rohde, H. & A. Kehler (2008). Demanding an Explanation: Implicit causality biases in discourse interpretation. Poster presented at the 21st CUNY.
Stevenson, R., Crawley, R., & Kleinman, D. (1994). Thematic roles, focusing and the representation of events. Language and Cognitive Processes, 9, 519-548.

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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)

Task: write natural continuation for context sentence and prompt

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. _____.
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)

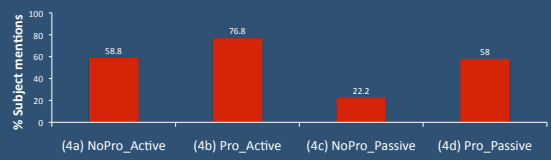
Integrated semantic & structural biases: Stronger preference for causally implicated referent (Amanda) in (4b) than (4a) because Amanda is in subject position and pronoun introduces a subject bias. Weaker preference in (4d) than (4c) because Amanda is in the non-subject position but the pronoun introduces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

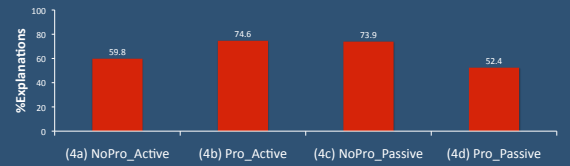


Semantic bias: Overall preference for causally implicated referent
[Effect of voice: F(1,40)=22.88, p<0.001; F(1,19)=73.45, p<0.001]

Structural bias: Overall preference for subject is higher w/pronoun than no-pro
[Effect of prompt: F(1,40)=43.12, p<0.001; F(1,19)=63.39, p<0.001]

Interaction of biases: Passive pronoun-prompt condition (4d) yields a reduced preference for the causally implicated referent (away from the non-subject 'Amanda' in 'Brittany was amazed by Amanda')
[Interaction: F(1,40)=7.08, p<0.05; F(1,19)=6.38, p<0.05]

7. Coherence Results



→ Fewest Explanations in (4d): causally implicated referent is in non-subject position and pronoun shifts next-mention and coherence biases to subject.
[No effects of voice or prompt]
[Crossover Interaction: F(1,40)=18.46, p<0.001; F(1,19)=25.82, p<0.001;
Active pairwise: F(1,40)=4.73, p<0.05; F(1,19)=6.11, p<0.05;
Passive pairwise: F(1,41)=20.18, p<0.001, F(1,19)=9.56, p<0.01]

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.