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 (Carraher, 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 Brittany. She ran a marathon last year.
b. Amanda babysat 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) Pronoun Types
a. Amanda amazed Brittany. She
b. Amanda amazed Brittany. She

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

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.
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.
- Weak preference in (4b) than (4a) because Amanda is in the non-subject position but the pronoun introduces a subject bias.
- Bias to subject Amanda
- Bias to non-subject Amanda
- Reduced bias to non-subject Amanda

Coherence

Semantic biases alone: Preference for Explanations regardless of voice/prompt
- Bias to Explanations
- Bias to next-mention Explanation relative to (4a)
- Reduced bias Explanations relative to (4c)

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-based coherence relations.
- Bias to Explanations
- Reduced bias Explanations relative to (4a)
- 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/IC than no-IC
[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’)
[Interruption: 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)=73.45, p<0.001

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.

References


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