The use of theory of mind in pronoun resolution: An eye-tracking study

Citation for published version: Sturt, P & Kwon, N 2015, 'The use of theory of mind in pronoun resolution: An eye-tracking study'.

Link: Link to publication record in Edinburgh Research Explorer

Document Version: Publisher's PDF, also known as Version of record

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Background

Language comprehension often requires reasoning about mental states of others (i.e., Theory of Mind: ToM).

This experiment examines the use of ToM in pronoun resolution.

Is ToM used immediately to constrain a pronoun’s antecedent?

Or, is there an early stage where ToM information is ignored?

Related work: Counterfactuals

Ferguson & Sanford (JML, 2008) examined plausibility effects in real-world or counterfactual contexts:

- **Counterfactual:**
  - If cats were vegetarians, . . . families could feed their cats a bowl of carrots/fish . . .
- **Real world:**
  - If cats are hungry, . . . families could feed their cats a bowl of carrots/fish . . .

Initial processing difficulty for real-world violation, regardless of context

Suggests that counterfactual information ignored in early processing.

However, cf. Nieuwland (2012): ERP study showed similar plausibility effects for both real and counterfactual worlds

Experimental Information

- 40 items/participants
- Eye-tracking during reading (Eyelink 1000)
- Stimuli
  - 40 Short narratives with false belief manipulation
  - Gender-match manipulation on pronoun to probe pronoun assignment

True Belief condition

Carol and Patrick submitted their scripts to the production team.

The production team decided to produce Patrick’s screenplay. After the production team had made the decision, we informed him that he had been chosen to work with the producer and Carol had not. He was interested to hear that the producer had chosen **him** over the other promising screenwriters instead.

False Belief condition

Carol and Patrick submitted their scripts to the production team.

The production team decided to produce Patrick’s screenplay. After the production team had made the decision, we playfully misled him to believe that he had been chosen to work with the producer and Carol had not. He was interested to hear that the producer had chosen **her** over the other promising screenwriters instead.

Results: Initial Processing

**Results: General Processing Measures**

- **First Pass Time** at pronoun region “him over”
  - Match x Belief, F1+, F2**

- **Go past** time at spill-over region “the other”
  - Match x Belief, F1*, F2*

- **Total Time** at pronoun region “him over”
  - Match x Belief, F1***, F2***

Summary

- No sign of an early stage where ToM information is ignored:
  - At the earliest points where gender affected processing, it interacted with belief
  - Gender × belief interaction found in first-pass measures

- Main effect of gender-matching was not found in absence of interaction

- However, gender-matching effect for true-belief condition was larger than for false-belief condition

- Suggests either less certainty in false-belief condition, or ToM information may be ignored in some trials.

**Results: Spill-over**

**Results: Initial Processing**

**Supported by Global Research Network grant, funded by the Korean Government**

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