The semantics and pragmatics of belief reports in preschoolers

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SALT 22
Main Claim

• 3-4 year olds have adult-like syntactic/semantic representations of ‘think’, contrary to previous claims [e.g. Johnson & Maratsos (1977), Diessel & Tomasello (2001), de Villiers & Pyers (2002), Perner et al. (2003)]

• Non-adult-like interpretations arise from a failure to use **pragmatic cues** to choose the appropriate interpretation in context.
I'm putting this cupcake in the fridge, so NOBODY TOUCH IT!!!

Yeah, right.

Valentine

Jeff
She'll never find it in the back of the cupboard!
When Valentine comes back, where will she look for the cupcake?

Adults/5-year-olds:

Because that’s where she left it!

3-4 year-olds:

Because that’s where it is!

[Wimmer & Perner 1983, and many others; for review: Wellman et al. 2001]
Where does Valentine think the cupcake is?

Adults/5-year-olds:

[Image of a refrigerator]

3-4 year-olds:

[Image of a door]

[e.g. de Villiers & Pyers 2002, Perner et al. 2003]
Valentine thinks that the cupcake is in the fridge.

<table>
<thead>
<tr>
<th>Adults/5-year-olds:</th>
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<tbody>
<tr>
<td>TRUE</td>
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She thinks that because that’s where she put it.

Because the cupcake is in the cupboard.

[Sowalsky, Hacquard & Roeper 2009]
Generalization

When interpreting ‘think’, young children seem to evaluate the complement clause with respect to the actual world.

Valentine thinks that the cupcake is in the fridge.
Question

How do children represent the meaning of ‘think’ during the period when their behavior is non-adult-like?
Outline

• Hypotheses
  – Non-linguistic difficulty with false belief
  – Semantic mis-representation
  – Pragmatic difficulty
• Experiment 1: 4-year-olds
• Experiment 2: 3-year-olds
• Conclusions
Traditional explanation

• Children have a non-adult-like interpretation of ‘think’ because they have a non-adult-like concept of belief. (e.g. Perner et al. 2003)

• Motivations:
  – Poor performance on false belief tasks
  – Earlier mastery of other attitude verbs, e.g. ‘want’ (}
Rethinking the conceptual explanation

• Recent evidence from more implicit measures suggests that infants as young as 13 months understand false beliefs. [e.g. Onishi & Baillargeon 2005, Song et al. 2008, Southgate et al. 2007]

• Individual children can demonstrate their understanding implicitly, while still failing “explicit” (verbal) tasks. [Clements & Perner 1994]
Linguistic hypotheses

• Syntactic/semantic misrepresentation

• Pragmatic difficulty
Semantic misrepresentation

• Children have an incorrect representation of the meaning of ‘think’, such that they always evaluate the complement with respect to the actual world.
  
  – Ignore ‘think’
    The cupcake is in the fridge. → FALSE
  
  – ‘think correctly’
    Valentine thinks correctly that the cupcake is in the fridge. → FALSE
Pragmatic difficulty

• Children have an adult-like semantic representation for ‘think’, BUT

• They often fail to grasp the relevance of belief in context.

• Over-use a “parenthetical” interpretation of ‘think’
Parenthetical ‘think’

- Complement clause carries main point of utterance
- Main clause ‘think’ serves a kind of evidential function

A: Why is Jeff late for our meeting?
B: He’s playing with his iPad, I think.

   Valentine thinks he’s playing with his iPad.

Parentheticalal ‘think’

• Parenthetical uses of attitude verbs are much more frequent than mental state uses in adult speech
  [Diessel & Tomasello 2001]

• Children’s early productions of ‘think’ are parenthetical or formulaic
  [Shatz et al. 1983, Bloom et al. 1989, Diessel & Tomasello 2001]
Pragmatic difficulty

Over-use of parenthetical interpretation is consistent with:

- Adult-like representations and understanding of licensing conditions, but non-adult-like “parsing” of contexts (i.e., understanding of QUD)
- Adult-like representations, but non-adult-like understanding of licensing conditions
- Non-adult-like representations
Experiment 1: 4-year-olds

- Truth value judgment task
  - Story with animated video
  - Target sentence uttered by puppet

- 32 children
  - aged 3;10-4;5 (mean 4.0)
  - 16 boys
Experiment 1: Example
Experiment 1: Design

• Story manipulation:
  – Knowledge

knowledge vs. ignorance
Experiment 1: Design

• Story manipulation (between subjects):
  – SEEKERS → affects relevance of belief

1 seeker vs. 2 seekers

QUD: Where is Swiper? Will Dora find him?

QUD: Which seeker is right? What is each seeker’s guess?
Experiment 1: Design

• Sentence manipulation:
  – **BELIEF TYPE**
    
    *True Belief*: Boots thinks…
    
    *False Belief*: Dora thinks…

**Note:** **BELIEF TYPE** is unknown in the *ignorance* condition.
Experiment 1: Design

• Sentence manipulation (counterbalanced across scripts):
  – **Sentence Truth:**
    
    **True**: Dora thinks that Swiper is behind the toybox.
    
    **False**: Dora thinks that Swiper is behind the curtain.
Predictions

• Non-linguistic difficulty with false belief:
  – Less difficulty in the *ignorance* condition.
  – No difference between 1 and 2 *seeker* conditions (or more difficulty with 2 *seekers* because of increased complexity).
Predictions

- Semantic misrepresentation
  - No better than chance in the *ignorance* condition, where truth of complement clause cannot be evaluated.
  - No difference between 1 and 2 seeker conditions.
Predictions

- **Pragmatic difficulty:**
  - No better than chance in the *ignorance* condition, where truth of complement clause cannot be evaluated.
  - More adult-like in stories with 2 *seekers*, because of increased salience/relevance of belief.
Experiment 1: Results

1 seeker (n=16)

Proportion correct responses

Condition

True Belief  False Belief  Ignorance
Experiment 1: Results

Lower accuracy in **ignorance** compared to **true belief** condition
Experiment 1: Results

Consistently higher accuracy across conditions in the 2-seeker stories.
Experiment 1: Summary

• Difficulty when the truth of the complement clause is unknown (*ignorance* condition) → Difficulty is linguistic, not conceptual

• Performance is influenced by contextual factors: More adult-like across all conditions in the 2-seeker stories compared to 1-seeker stories. → Difficulty is at least partially pragmatic
Pragmatic difficulty

Over-use of parenthetical interpretation is consistent with:

• Adult-like representations and understanding of licensing conditions, but non-adult-like “parsing” of contexts (i.e., understanding of QUD)
• Adult-like representations, but non-adult-like understanding of licensing conditions
• Non-adult-like representations
Experiment 2: 3-year-olds

- Simplified stories
- Target sentences presented as questions
- Only 2-seeker stories
- Design:
  - **Sentence Truth:**
    - true vs. false
  - **Belief Type:**
    - true belief vs. false belief vs. ignorance
Questions

No difference when target sentence is presented as declarative vs. as question.

(n = 16)
(n = 15)
Experiment 2: 3-year-olds

- Simplified stories
- Target sentences presented as questions
- Only 2-seeker stories
- Design:
  - Sentence Truth: true vs. false
  - Belief Type: true belief vs. false belief vs. ignorance
Experiment 2: Design

Sample sentences

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Parenthetical hypothesis

Parenthetical use of ‘think’ is only licensed when the belief report is true.

[Context: Valentine thinks that Jeff is home sick, but B knows he’s actually playing with his iPad.]

A: Why is Jeff late for our meeting?

B: # Valentine thinks he’s playing with his iPad. # He’s playing with his iPad, according to Valentine.
Parenthetical hypothesis

• If children’s parenthetical interpretation of ‘think’ is the same as adults’, they should not be able to interpret ‘think’ parenthetically when the sentence is false.

• Children should correctly reject false sentences, even in the false belief condition
Experiment 2: Results

Higher accuracy with false sentences in FB condition.
Experiment 1: Results

4 year-olds show a similar asymmetry, but with higher accuracy overall.
## Experiment 2: Design

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# Experiment 2: Design

![Diagram of a bedroom scene with a bed, a toy box, and a curtain]

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Experiment 2: Results

- When the sentence is *true*, accuracy is highly influenced by complement truth.
- When the sentence is *false*, accuracy is less influenced by complement truth.
Experiment 2: Results

- More adult-like when the complement truth is *unknown*.
- May take this as a cue that the intended interpretation is not parenthetical.
Summary of results

• 3-year-olds (and 4-year-olds):
  – Respond based on truth of complement clause when the sentence is *true*
  – Correctly reject sentences that are *false*, regardless of the complement clause.

• 4-year-olds:
  – Strongly influenced by a contextual manipulation affecting the relevance of belief
Conclusions

• 3-4 year-olds have an adult-like representation of ‘think’ available to them

• They have a non-adult-like understanding of the relevance of belief in context
  – Leads to inappropriate uses of the parentheticalical interpretation.
Conclusions

• A non-conceptual explanation for the delay in adult-like interpretations for ‘think’ compared to ‘want’: the parenthetical reading is available for ‘think’, but not ‘want’.
Future directions

• What other factors influence children’s use of context?
  – Can we “turn on/off” the parenthetical reading with other manipulations?

• What happens in languages that have evidentials? Or other types of belief report verbs?
Future directions

• On-going work:
  – Comparisons to other attitude verbs (Kate Harrigan)
  – Investigation of the role of syntactic distribution in learning semantic classes (Aaron White, Rachel Dudley)
Thanks!

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