Pragmatic influences on 3- and 4-year-olds’ interpretation of ‘think’

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Main Claim

• 3-year-olds have acquired adult-like syntactic/semantic representations of ‘think’ (earlier than previously claimed) [e.g. Johnson & Maratsos (1977), Diessel & Tomasello (2001), de Villiers & Pyers (2002), Perner et al. (2003)]

• Non-adult-like interpretations arise from **pragmatic difficulty** choosing the appropriate interpretation in context.
I'm putting this cupcake in the fridge, so NOBODY TOUCH IT!!!

Yeah, right.
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.

**Adults/5-year-olds:**

TRUE

She thinks that because that’s where she put it.

**3-4 year-olds:**

FALSE

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.

→ Adult “parenthetical” interpretation?
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: Valentine thinks he’s playing with his iPad.

Parenthetical ‘think’

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

A: Why is Valentine upset with Jeff?
B: She thinks he’s playing with his iPad [instead of coming to the meeting].

Parenthetical ‘think’

- Parenthetical uses of attitude verbs are much more frequent than mental state uses in adult speech
  - I don’t think we should touch that ok?
  - I think I should tickle you.

- Children’s early productions of ‘think’ are parenthetical or formulaic

[Shatz et al. 1983, Bloom et al. 1989, Diessel & Tomasello 2001]
Parenthetical ‘think’

Why do children end up with parenthetical-like interpretations in inappropriate contexts?
What goes wrong?

Concept

Semantic representation(s)

Understanding of context and speaker intention

Context-appropriate interpretation
Pragmatic hypothesis

- Concept
- Semantic representation(s)
- Understanding of context and speaker intention
- Context-appropriate interpretation

The diagram illustrates the process of pragmatics, where a concept is understood, leading to a semantic representation. However, understanding context and speaker intention is necessary for an appropriate interpretation.
Semantic hypothesis

Understanding of context and speaker intention

Concept

Semantic representation(s)

Context-appropriate interpretation
Semantic hypothesis

Children’s syntactic/semantic representation forces them to 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
Conceptual hypothesis

- Concept
- Semantic representation(s)
- Understanding of context and speaker intention
- Context-appropriate interpretation

**Note:** The diagram indicates a conceptual hypothesis with arrows showing the flow of understanding from concept to semantic representation, and then to context-appropriate interpretation. However, there is a red 'X' indicating that there might be a critical flaw or challenge in this process.
Conceptual hypothesis

Children lack an adult-like concept of belief.

Motivations:
• Poor performance on false belief tasks
• Earlier mastery of other attitude verbs, e.g. ‘want’

[e.g. Perner et al. 2003]
Evidence against the conceptual explanation

• Infants as young as 13 months show understanding of false beliefs in implicit measures.
  [e.g. Onishi & Baillargeon 2005, Song et al. 2008, Southgate et al. 2007]

• Individual children demonstrate “implicit” understanding while still failing “explicit” (verbal) tasks.
  [Clements & Perner 1994]
Our experiments

- Experiment 1: 4-year-olds
  Compare pragmatic, semantic, and conceptual hypotheses.

- Experiment 2: 3-year-olds
  More fine-grained test of truth conditions
Experiment 1

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

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

knowledge vs. ignorance
Predictions: Knowledge

• **Conceptual Hypothesis:** *Ignorance* should be easy, because there’s no conflict with the child’s beliefs.

• **Semantic & Pragmatic Hypotheses:** *Ignorance* should be difficult, because the truth of the complement clause cannot be determined.
Experiment 1: Design

1 seeker vs. 2 seekers

QUD: Where is Swiper?  QUD: Which seeker is right?

→ affects relevance of belief in context
Predictions: Seekers

• **Pragmatic Hypothesis:**
Children should be more adult-like with 2-seeker stories, because the relevance of belief is heightened compared to 1-seeker stories.

• **Semantic & Conceptual Hypotheses:**
No difference based on number of seekers.
Experiment 1: Design

True Belief: Boots thinks…

False Belief: Dora thinks…

Note: BELIEF TYPE is unknown in the ignorance condition.
Predictions: Belief Type

- All hypotheses predict that *False Belief* will be more difficult than *True Belief*
Design

• Within subjects: **KNOWLEDGE x BELIEF TYPE**
  – 3 trials/condition → 12 trials total

• Between subjects: **SEEKERS**
  – 16 subjects/condition

• Counterbalanced:
  – Target response
  – Characters, locations, etc.
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.

4-year-olds (n=32)

Seekers
1 (n = 16)
2 (n = 16)
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
Experiment 2: Goals

• Can 3-year-olds also evaluate belief descriptions under some circumstances?

• Is the pattern of children’s judgments consistent with the adult parenthetical interpretation?
Experiment 2: 3-year-olds

- Simplified stories
- Only 2-seeker stories
- Target sentences presented as questions
- 20 children
  - Aged 3;2-3;6
  (mean 3;4)
Experiment 2: Design

• **Complement Clause Truth:**
  
  *true vs. false vs. unknown*
  
  → Parenthetical interpretation, but not belief report, should be sensitive to complement truth.

• **Sentence Truth:**
  
  *true vs. false*
  
  → Parenthetical interpretation should be blocked for false sentences.
Parenthetical use of ‘think’ is only licensed when the belief report is true.

[Context: Valentine thinks that Jeff is home sick, but Bob knows he’s actually playing with his iPad.]
Ann: Why is Jeff late for our meeting?
Bob: # Valentine thinks he’s playing with his iPad.
## Experiment 2: Design

<table>
<thead>
<tr>
<th>Sample sentences</th>
<th>SENT. TRUTH</th>
<th>COMP. TRUTH</th>
<th>BELIEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does Boots think that Swiper is behind the curtain?</td>
<td>T</td>
<td>T</td>
<td>TB</td>
</tr>
<tr>
<td>Does Dora think that Swiper is behind the toy box?</td>
<td>T</td>
<td>F</td>
<td>FB</td>
</tr>
<tr>
<td>Does Boots think that Swiper is behind the curtain?</td>
<td>T</td>
<td>?</td>
<td>n/a</td>
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</tr>
</tbody>
</table>
Parenthetical hypothesis

• If children have adult-like licensing conditions for their “parenthetical” interpretation, they should not interpret ‘think’ parenthetically when the SENTENCE is false.

→ Children should correctly reject false sentences (even in the false belief condition!).

→ Children should be influenced by COMPLEMENT TRUTH in true sentences.
Puffin3 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.
Higher accuracy with *false* sentences in FB condition.
Summary of results

• 3-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.
Pragmatic hypothesis

- Concept
  - Understanding of context and speaker intention
  - Context-appropriate interpretation
- Semantic representation(s)
  - Appropriate interpretation
On-going work

- Testing 3- and 4-year-olds on the same task

- Testing alternative explanations for the 1-seeker/2-seeker asymmetry
On-going work

Attitudes @ UMD:
• Desire verbs*
• Factivity
• Syntactic cues to verb meaning

*Kate Harrigan’s poster on Friday: *Is desire really easier than belief?*
Thanks!

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