Children’s interpretation of ‘think’

- Suppose Mary left her keys on the kitchen table, but while she was out of the room, John put them away in a drawer.

1. Mary thinks her keys are on the table.
   - Adults: TRUE
   - 3-year-olds: FALSE

Question: Why are children’s interpretations of ‘think’ non-adult-like?
- Non-adult-like concept of belief
- Non-adult-like linguistic representation

Experiment: Design & Materials

- Question: How do children represent ‘think’ linguistically?
- Goal: Determine the truth conditions (for 4-y.o.) of sentences like (1) by eliciting truth-value judgments in different contexts.

Each trial consists of a story in an animated video, followed by a sentence uttered by a puppet.

In each story, the seeker and a distractor hide and a seeker guesses the location of the hidden item based on a visual clue.

Timecourse of Development

Conceptual development

Language development

- Understand that actions are influenced by FB (nonverbal looking-time paradigm: [1, 2])
- Anticipate actions based on FB, (eye-tracking paradigm: [3, 4])
- Cannot use FB to make verbal predictions about behavior, (traditional FB tasks: [5])
- Use FB to infer referent of a novel word, [5]
- Use FB to make verbal predictions about behavior, [6]
- First productions of ‘think’, usually formulaic or parenthetical (7, 8)
- Difficulty representing false complements of attitude verbs (memory for complements: [9])
- Can represent false complements of some attitude verbs, [9]
- First productions of ‘think’ as a belief report, (7, 8)

Sample Sentences

<table>
<thead>
<tr>
<th>FB conditions are consistent with screenshot above</th>
<th>Sent.</th>
<th>Comp.</th>
<th>Belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dora thinks that Boots is behind the door.</td>
<td>T</td>
<td>F</td>
<td>FB</td>
</tr>
<tr>
<td>Dora thinks that Boots is under the bed.</td>
<td>T</td>
<td>F</td>
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</tbody>
</table>

- Between-subjects factor:
  - SEEKERS: 1 vs. 2
- The relevance and salience of belief in the story is increased in the 2-seeker condition, since the two seekers have conflicting beliefs.
- Within-subjects factors (3 trials/condition):
  - KNOWLEDGE: whether the child saw the HIDER hiding (knowledge vs. ignorance)
  - SENTENCE TRUTH (of target sentence): true vs. false
  - Complement clauses: true vs. false, (corresponds to true belief vs. false belief)

Semantics of ‘think’

2. A: Where are the keys?
   - B: Mary thinks they’re on the table.

- Parenthetical uses of ‘think’ (e.g. B’s response in (2))
- Complement clause carries the main point of the utterance [10-11]
- Main clause ‘think’ serves a main of evidential function [12]
- Parenthetical uses vastly outnumber mental state uses in adult speech, [8]
- Complement clause is evaluated with respect to…

Normal use: the main-clause subject’s beliefs
Parenthetical use: the actual world

Hypotheses & Predictions

- ‘Think correctly’
  - ‘think’ = ‘think correctly’
  - ‘Think’ is most frequently used in the context of correct beliefs.
  - Preschool-aged children have domain-general difficulties processing conflicting representations.

- Belief Conflict
  - Adult-like ‘think’
  - Intrusion of own beliefs when evaluating others’ beliefs
  - Only accept sentences where both whole sentence and complement clause are true in the actual world.
  - Difficulty with FB stories, where character’s belief conflicts with child’s.
  - No difficulty in Ignorance condition.

- Parenthetical Interpretation
  - Overuse parenthetical interpretation
  - Adult-like ‘think’ may or may not be available
  - Difficulty in Ignorance condition (no basis to judge complement clause)
  - Sentences are infelicitous when main clause is false → more difficulty!

Results

- 4-y.o. have an adult-like representation of ‘think’.
- They often fail to deploy that representation unless the context makes belief especially relevant/salient.
- The pattern of judgments is most consistent with a parenthetical interpretation of ‘think’.
- Children may tend to misconstrue the Question Under Discussion unless the relevance of belief is particularly highlighted.

- Next steps: Adult-like representations of ‘think’ may be in place earlier than previously assumed; we’re testing 3-year-olds next.

Children’s judgments were more adult-like for the 2-seeker than the 1-seeker stories across all conditions.

- High accuracy in TB stories.
- Below chance in FB stories.
- At chance in Ignorance condition.