

Psych 56L/ Ling 51: Acquisition of Language

Lecture 16 Language & Cognition II

Announcements

Review questions available for language and cognition

Be working on HW3 [due 3/11/14]

Remember to do the extra credit

Please fill out course evaluations for this class

“Neo”-Whorfian question

Language as a Toolkit: Does language **augment our capacity for reasoning and representation** (and thereby determine our perception of the world)?



Also sometimes referred to as “**language as augmenter**”
(Wolff & Holmes 2010)

Theory of mind



Sarah thought that Hoggle had betrayed her.

sentential complement



The **embedded sentence** (also called a sentential complement here) encodes the contents of Sarah's mind.

The 'truth value' of the embedded sentence cannot be evaluated with respect to this world. It must be evaluated with respect to Sarah's mental world (what Sarah thinks).

What if a child didn't know this?

What you need to know to evaluate the truth value of these statements

Syntactic Knowledge: you know that some verbs (*think, believe, say, ...*) can take sentential complements

Social Cognitive Knowledge: you know that other people can have a false belief

Bridge: you know that there is a connection between this syntactic form and the expression of potentially false beliefs

Which comes first, social or syntactic knowledge?

Usual Pattern: Social/Conceptual ---> Linguistic

Whorfian: Linguistic ---> Social/Conceptual

A little problem...

How do you measure children's understanding that other people can have false beliefs?

(abstracted away from their linguistic ability to represent false beliefs)



False belief task (Unseen displacement)

The child is introduced to two puppets, Sir Didymus and Ambrosius.



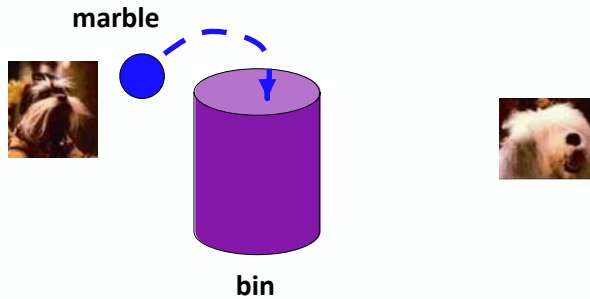
Sir Didymus



Ambrosius

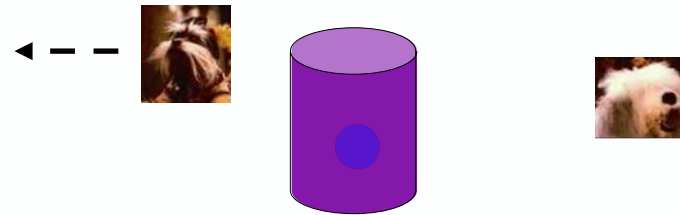
False belief task (Unseen displacement)

While playing, Sir Didymus puts a marble into a bin and then goes outside (the puppet disappears under the table, for example).



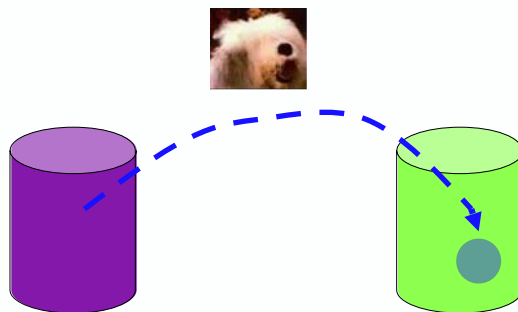
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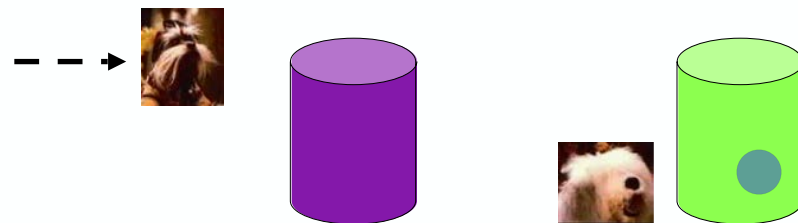
False belief task (Unseen displacement)

When Sir Didymus is not around, naughty Ambrosius changes the location of the marble. He takes it out of the bin and puts it in a different bin.



False belief task (Unseen displacement)

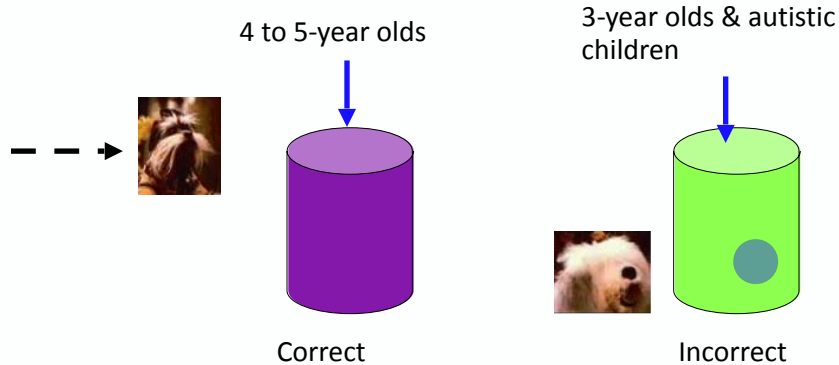
Some time later Sir Didymus comes back and wants to play with his marble. Children are then asked the critical question:
Where will Sir Didymus look for his marble?



False belief task (Unseen displacement)

Some time later Sir Didymus comes back and wants to play with his marble. Children are then asked the critical question:

Where will Sir Didymus look for his marble?



False belief task (Unexpected Contents)

http://www.youtube.com/watch?v=8hLubgpY2_w



If we're looking for a language connection...

At what age do children start talking about thoughts/beliefs? At what age do children first begin to use sentential complements?

2-year-olds talk a lot!

- ... about what they did, what they want
- ... about what others do
- ... possibly about what others say
- not about what others think

If we're looking for a language connection...

At what age do children start talking about thoughts/beliefs? At what age do children first begin to use sentential complements?

Children's comprehension of sentential complements

"Sir Didymus said he bought peaches. But look! He really bought oranges. *What did Sir Didymus say he bought?*"

3-year-olds: oranges (reality, not mental state)

4-year-olds: peaches (key into "*say that*")

If we're looking for a language connection...

At what age do children start talking about thoughts/beliefs? At what age do children first begin to use sentential complements?

At around four years of age, children understand that mental verbs can take a whole sentence as their object (a complement)

Sir Didymus thought *that the shampoo was the toothpaste*.

And the embedded sentence can be FALSE from the child's point of view, but TRUE for Sir Didymus.

Once the child has this capacity, *he can represent two worlds: his own, and someone else's mental world*.

This usually coincides with children's production of mental state verbs.

Testing typically developing children

De Villiers & Pyers 2002: Measures of comprehension and production of sentential complements far more *correlated* with children's performance on false belief tasks than any other linguistic measure.

Causation? Unclear.

"In every case, children who passed false beliefs gave us evidence that they had productive command of complementation."



How exactly do children learn that connection?

One idea

- Difficult to observe: someone else's thoughts
- Easier to observe: what people say
"She *said* that she ate the peach."
- Children will sometimes hear sentences like this in a context where there is overt evidence to suggest that the embedded proposition is false.
- Children can use evidence from verbs like *say* to generalize to verbs like *think* and *believe*

How exactly do children learn that connection?

One idea

- Syntactic Knowledge: you know that some verbs can take sentential complements
- Bridge: you know from *hearing communication verbs and from observing the world while hearing them* that there is a connection between this syntactic form and the expression of *potentially false propositions*.
- Having learned this connection from communication verbs, you then generalize that since mental verbs also take sentential complements, their sentential complements must also potentially be false.
- Social Cognitive Result: Therefore you can contemplate other (mental) worlds.

Testing the connection in other ways and in other populations

What if you train children on communication verbs that take sentential complements? Do they improve on false belief tasks?

What if you make children use mental state verbs that take sentential complements? Do they improve on false belief tasks?

Test development in deaf children who are language-delayed vs. not

Test other primates (who are non-verbal)

Training children on communication verbs

Hale & Tager-Flusberg 2003: Children who were trained on sentential complements (“say that...”) **did well on both sentential complement tests and false belief tasks**. However, children **trained only on false belief tasks also did well on false belief tasks**.

Familiar implication: Sentential complements **not required**, just **extraordinarily helpful**.

Making children use mental state verbs

Ornaghi, Brockmeier, & Grazzani Gavazzi 2011: During a 2-month period of intervention, children were read stories enriched with mental lexicon items. After listening to a story, the experimental group took part in language games and conversations aimed at stimulating children to use mental terms. Four-year-olds improved on false belief understanding - even though they hadn't been trained on false belief tasks. However, the control group also improved (just not as much).

Familiar Implication: Mental state verbs can be **helpful** for thinking about false beliefs, but they're **not necessarily required**.

Testing deaf children (delayed vs. non-delayed language)

de Villiers & de Villiers 2003: Oral deaf children (who are language-delayed) with normal IQ and active social intelligence are significantly delayed in false belief tasks. Performance on both verbal and non-verbal false belief tasks are delayed to the same degree. **Best predicted by sentential complement production with verbs of communication or mental state**, not just by general language ability.

Implication?: **Language (specifically sentential complements) required for success on false belief tasks**. (Maybe no one trained them explicitly on false belief tasks?)

Testing deaf children (delayed vs. non-delayed language)

Pyers & Senghas 2009: Tested two groups of learners of Nicaraguan Sign Language (NSL).

Group 1 (older): Learned an early form of NSL

Group 2 (younger): Learned a later form of NSL

Main difference: Group 2 knew many more **signs for mental state verbs like *think* and *know*** than Group 1

Results: **Group 2 did much better** on false belief tasks than Group 1, despite being younger.

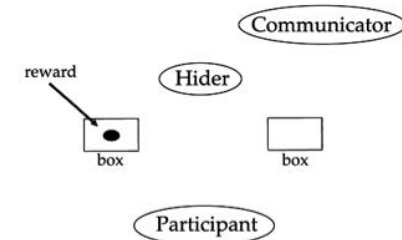
Implication?: **Language (specifically mental state verbs that take sentential complements) required for success on false belief tasks.** (Maybe no one trained them explicitly on false belief tasks?)

Testing other primates (who are non-verbal)

Call & Tomasello 1999: Used the same test for both children and great apes (though the great apes needed many more trials)

Main Test:

Communicator watches the Hider hide a reward in one of two containers and then leaves the room. The Hider switches the containers. The communicator returns and indicates which container has the reward. Participants are asked to locate the reward.



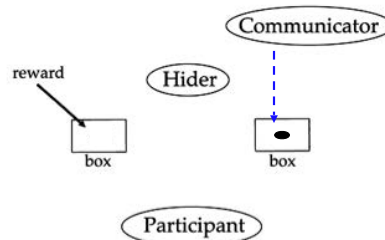
Testing other primates (who are non-verbal)

Call & Tomasello 1999: Made sure to check competency in skills needed to successfully perform the task (other than understanding of false belief)

Understanding of Indication

Behind barrier, Communicator watches Hider place reward in bucket. Communicator indicates bucket to participants.

(Do you understand that the Communicator picks out the location of the reward?)



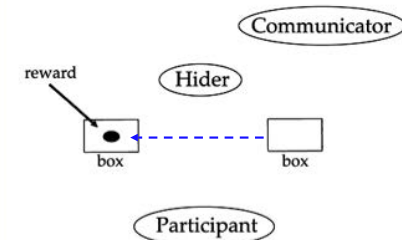
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Visible Displacement

Communicator indicates reward's location. Hider opens the container and moves the reward.

(Do you understand that the reward moves?)



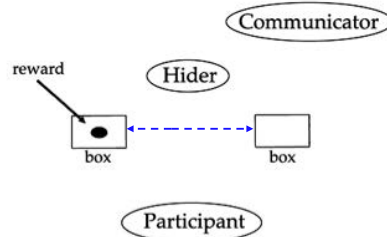
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Invisible Displacement

Same as visible but containers are switched and participants do not see the object

(Do you understand that the containers can switch places, and that means what's in them switches places, too?)



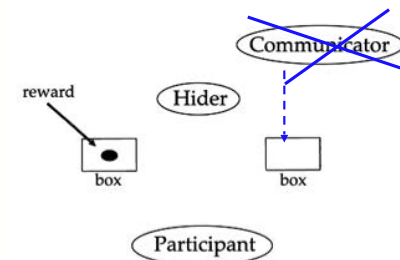
Testing other primates (who are non-verbal)

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Ignoring Communicator

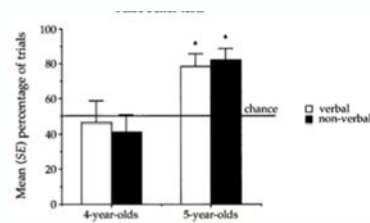
Hider hides reward. Communicator leaves. Hider switches buckets. Communicator returns and indicates bucket with reward (the wrong container)

(Do you understand the communicator can be ignored, because he may not be right?)



Testing other primates (who are non-verbal)

Call & Tomasello 1999: Children do the same on the standard verbal task and this non-verbal equivalent. (Though it takes a five-year-old to pass.)



Testing other primates (who are non-verbal)

Call & Tomasello 1999: **Great apes fail spectacularly**, even though they pass all the preliminary control tasks.

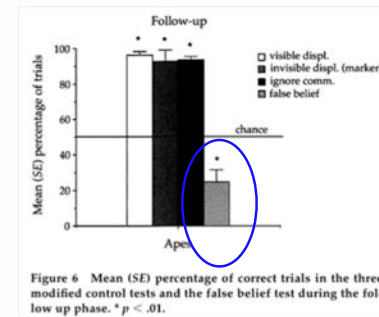


Figure 6 Mean (SE) percentage of correct trials in the three modified control tests and the false belief test during the follow up phase. * $p < .01$.

Implication: Having language (or a language-enabled brain) seems necessary. (Though maybe no one trained the apes on false belief tasks?)

Theory of mind: Link to language is...?

Additional evidence from Baillargeon, Scott, & He 2010:

2-year-olds can pass a false belief task when they are tested indirectly.

How do we test them indirectly? We can gauge their spontaneous responses (as assessed by looking time) to events they are shown. Baillargeon et al. 2010 argue that this is an easier task than requiring the children to answer a question directly using language.

Familiar implication: Language is extraordinarily helpful but not explicitly required.

Baillargeon, Scott, & He 2010

Familiarization trials

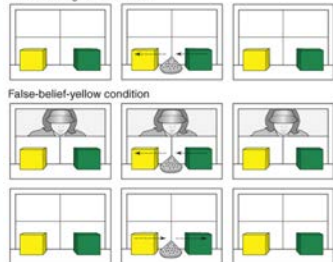


Familiarization:

In trial 1, a toy stood between a yellow and a green box; a female agent entered the apparatus, played with the toy briefly, hid it inside the green box, and then paused, with her hand inside the green box, until the trial ended. In trials 2 and 3, the agent reached inside the green box, as though to grasp her toy, and then paused.

Baillargeon, Scott, & He 2010

Belief-induction trial

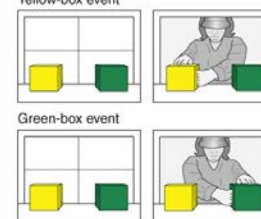


Belief Induction:

In the belief-induction trial, the toy either moved from the green to the yellow box in the agent's absence (false-belief-green condition) or moved to the yellow box in the agent's presence but then returned to the green box after she left (false-belief-yellow condition).

Baillargeon, Scott, & He 2010

Test trial



Testing:

In the test trial, the agent returned, reached inside either the yellow box (yellow-box event) or the green box (green-box event), and then paused.

In each condition, the infants expected the agent to reach where she falsely believed the toy to be hidden, and they looked reliably longer when she reached to the other location instead.

Theory of mind: Link to language is...?

Language is useful for cognitive off-loading? Perhaps when children are tested directly on false belief tasks (that is, required to show their knowledge with language), having mental state verbs in their linguistic repertoire allows them to easily encode what's going on. Then, it's easier to do the task, which requires more mental work than tasks where children are tested indirectly.

But the jury is still out...(remember that the great apes were tested without language, as were the four- and five-year-olds in the Call & Tomasello 1999 study).

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): We often use mental state verbs (especially *think*) to indicate how certain we are about something (sometimes this is called a **parenthetical endorsement**).

Where did Lily go?
Lily is in the forest, **I think**.

Who stole the bracelet?
Hoggle thinks that Sarah is the thief.

Studies of children's spontaneous utterances suggest that this is the most common way children under age 4 use mental state verbs.

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): Notably, in parenthetical endorsements, the complement is the focus of the communication, and is **usually assumed to be true (to some degree)**.

Where did Lily go?
Lily is in the forest, I think.

Who stole the bracelet?
Hoggle thinks that Sarah is the thief.

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): Children could assume in standard false belief tasks that the **mental state verbs are being used as parenthetical endorsements**.

Where did Lily go?
Lily is in the forest, I think.

Who stole the bracelet?
Hoggle thinks that Sarah is the thief.

In that case, it makes sense to assume the sentential complement is true (to some degree) – which is **precisely how to fail a standard false belief task**.

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): This would mean that if children are made aware that **the beliefs themselves are being questioned** (which is what the mental state verbs refer to), they should do better at passing false belief tasks.

What does Hoggle think?

Hoggle thinks that Sarah is the thief.

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): This is precisely what Lewis et al (2012) found when they tested 4-year-olds. **4-year-olds improved their performance 44% when the belief (of the characters in the story) was made more salient.**

What does Hoggle think?

Hoggle thinks that Sarah is the thief.

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): **This suggests that young children know quite a bit about how to use language to encode mental states of others** – it's just that they have difficulty adjusting to atypical uses of mental state verbs. (Remember: Most of the time, 4-year-olds use them as parenthetical endorsements, not as literal statements of belief. Some false belief tasks test children explicitly with the literal statement of belief.)

Who took the bracelet?

Hoggle thinks that Sarah is the thief.

parenthetical endorsement:

Sarah is the thief = TRUE to some degree.

Reasonable response: *Yeah, I think so too.*

Theory of mind: Link to language is...?

Another idea (Lewis, Hacquard, & Lidz 2012): **This suggests that young children know quite a bit about how to use language to encode mental states of others** – it's just that they have difficulty adjusting to atypical uses of mental state verbs. (Remember: Most of the time, 4-year-olds use them as parenthetical endorsements, not as literal statements of belief. Some false belief tasks test children explicitly with the literal statement of belief.)

What is Hoggle thinking?

Hoggle thinks that Sarah is the thief.

literal statement of belief:

Sarah is the thief = UNKNOWN.

Reasonable response: *Yeah, he often thinks that.*

Theory of mind: Link to language is...?

Evidence that language is necessary for adults to pass false belief tasks:

Newton & de Villiers 2007

Adults doing verbal shadowing fail false belief tasks, but adults doing rhythm shadowing can still pass them. This suggests adults unconsciously rely on language when reasoning about theory of mind.

Theory of mind: Link to language is...?

Evidence that language isn't always so necessary for adults to pass false belief tasks – it may have more to do with working memory:

Dungan & Saxe 2012

When the verbal and rhythm shadowing are matched with respect to their demands on working memory, adults struggle to pass false belief tasks no matter which kind of shadowing they're doing.

Theory of mind: Links to executive function

Executive function (conscious, goal-directed thought, including working memory) has been shown to correlate with children's performance on theory of mind tasks (Carlson, Koenig, & Harms 2013).

Idea: Children must be able to suppress their own internal representations of events before they can reflect accurately about the mental states of others.



Theory of mind: Links to executive function

Executive function (conscious, goal-directed thought, including working memory) has been shown to correlate with children's performance on theory of mind tasks (Carlson, Koenig, & Harms 2013).

Specific evidence:

(1) Training studies of executive function lead to improved false belief performance (Kloo & Perner 2003).

(2) Individual differences in executive function predict the extent to which children benefit from direct theory of mind training (Benson et al. 2013)

Language & cognition: Recap

Neo-Whorfianism is a variant of Whorfianism that believes language augments thought, so we can think more complex thoughts.

For theory of mind, we have seen evidence for cases where language seems to enable more complex thought - or at least to enable it to happen more easily.

It seems in many cases that language is like a hammer – it's a really good tool (and probably better than a shoe) for getting the (cognitive) job done. But that doesn't necessarily mean the job can't get done without it.



Questions?



You should be able to answer all the questions on the language & cognition review questions, and all the questions on HW3.