

Establishing the Language Foundation for Developing a Theory of Mind (ToM)

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While definitions vary, there is general agreement that Theory of Mind (ToM) involves recognizing that others have sensations, desires, knowledge, thoughts, and beliefs, and that these are products of each individual's unique experiences. What happens in others' minds plays an important role in explaining their behavior. Over the past decade, researchers have increasingly recognized the importance of language for the development of ToM (Astington & Baird, 2005; J. de Villiers, 2007).

Determining whether someone has fundamental ToM abilities typically involves testing whether they can comprehend another's *false belief* (e.g., Farrant, Maybery, & Fletcher, 2012). In one classic false belief test, an *unseen displacement* or *changed-in-location* task, a character puts an object in a specific location, then leaves. A second character arrives and moves the object to another location. Subjects are then asked where the first character will look for the object upon returning. Neurotypically developing children under the age of four usually answer with the object's actual location, being unable to process the concept and consequences of a false belief. After the age of around four children answer that the character will look where s/he originally put the object and hence where s/he (falsely) believes it to be. In an *unexpected contents* false belief task, subjects are shown a familiar container, e.g., a Crayola box. The experimenter then opens the container to show subjects that it really contains something unexpected such as rocks. A character is introduced and subjects are asked what s/he will think is in the box. In variants of this task, subjects are sometimes asked what they know is in the box and what they thought was in the box before they were shown.

Deficits in ToM are pervasive in students with Autism Spectrum Disorders (ASD). Deficits are also common among students who are deaf or hard of hearing and students with specific language impairments. For this reason, speech-language pathologists increasingly recognize the importance of helping their students develop ToM. Key to the development of ToM are robust language skills, with syntactic ability being an especially strong predictor of success (Paynter & Peterson, 2010; Tager-Flusberg & Joseph, 2005). Students must master the semantics and syntax of verbs that represent subjective states beginning with verbs of perception (i.e. *seeing, hearing, smelling, tasting, feeling*).

Research has shown a strong relationship between children's linguistic ability and their understanding of mind. Jill and Peter de Villiers (2003; 2005; 2007; 2009) have argued that false belief understanding critically depends upon the syntax of sentential complementation. Children do not pass false belief tests until after they have acquired mental verbs with sentential complements (*Grandma thinks that Amy is feeding the dog*). Before children can begin to understand the mental verbs of cognition (i.e., *know, think*) that are necessary for passing tests of false belief they must first understand their own and others perceptions. Children must understand that other people can see, feel, taste, hear, and smell. A progression of prerequisite language skills, which can guide our intervention practices has been described based on data across studies and longitudinally (Wellman, Fang, & Peterson, 2011). To succeed at false belief tasks, students must pass through the following current theory and research-based progression:

1. **Master verbs of perception (i.e. see, hear, smell, taste, feel) in various contexts**

Fundamental to ToM is an appreciation of how others come to possess information through the five senses. In the early stages of ToM development, children must come to understand that sensory perception leads to knowledge (Schmidt & Pyers, 2011). Even neurotypically developing three year old children have difficulty recognizing the origins of their modality-specific knowledge (O'Neill & Chong, 2001). Teaching the semantics and syntax of verbs of perception is thus an important foundational step in the development of ToM.

2. **Understand verbs of intention/desire (e.g. want, need)**

These are among the earliest developing verbs that can take an *irrealis* complement; i.e., a complement that refers to that which is currently not so, not happening, or absent. The verb *want* is a very early developing example. Understanding that others have *wants* and *needs* is important to understanding behavior.

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Language for Theory of Mind™ (ToM) 1: Understanding Others' Perceptions, Wants, & Needs*

The *Optimized Intervention*® expert system automatically adjusts the instructional level of support based on students responses. Three different instructional levels are used:

Beginning uses pre-trial instruction, cueing to the correct response, and knowledge of the correct response (KCR) following a response either through reinforcement or corrective feedback

Intermediate includes pre-trial instruction & KCR

Advanced presents a trial with no antecedent instruction but does provide KCR

Feedback for correct responses varies according to instructional level. For incorrect responses feedback is always the same as antecedent instruction regardless of level.

Modules Training Verbs of Perception & Intention/Desire with Examples:

Module 1: Perceptions & Actions

In this Module, students learn to discriminate between sense perceptions and actions thus learning the difference between external observable events and internal ones.



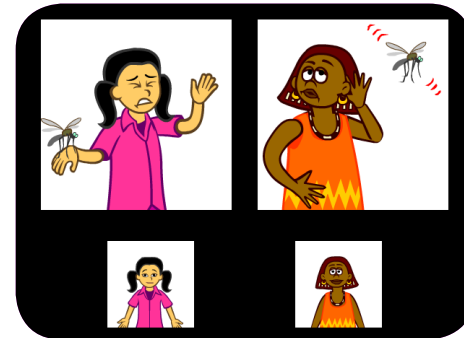
Who sees the piñata?

Feedback for Correct Responses:

(Level 1+2) "Yes! Grandma sees the piñata! She sees it with her eyes!"
 (Level 3) "Yes! Grandma sees the piñata with her eyes!"

Module 2: Comparing Sense Verbs

Students must discriminate between senses thus learning to interpret others' differing perceptions.



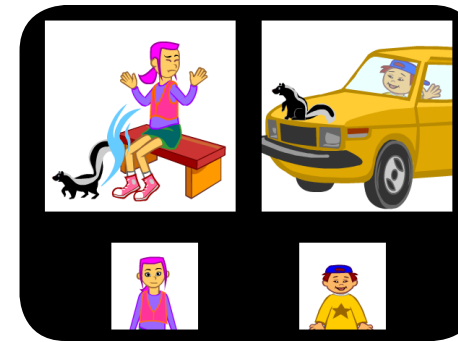
Who hears a mosquito?

Feedback for Correct Responses:

(Level 1) "Yes! Mrs. Lopez hears a mosquito! She hears it with her ears!"
 (Level 2) "Yes! Mrs. Lopez hears a mosquito with her ears!"
 (Level 3) "Yes! Mrs. Lopez hears a mosquito and Sophie feels a mosquito!"

Module 3: Who Senses/Doesn't Sense

Students must distinguish between a character who is and one who is not experiencing a particular perception. Using visual perception as an example, the student must recognize that: (a) seeing is a *sense*; (b) that it is a *particular* sense involving gaze direction; that (c) the *end point* of the gaze is what is seen; and (d) when one's gaze is directed elsewhere or blocked in some way, a specific visual stimulus may not be perceived.



Who smells the skunk?

Feedback for Correct Responses:

(Level 1+2) "That's right! Lisa smells the skunk!"
 (Level 3) "Yes! Lisa smells the skunk but Matt doesn't!"

Module 4: Who Perceives What

Students must determine which character is perceiving a particular object or event. This is prerequisite to comprehending that people often have access to different information leading to differing perceptions.



Who sees the cat dancing?

Feedback for Correct Responses:

(Level 1+2) "Yes! Baby Ethan sees the cat dancing!"
 (Level 3) "That's right! Baby Ethan sees the cat dancing and Officer Wilson sees the cat sleeping!"

Module 5: Wants/Needs+Infinitival To

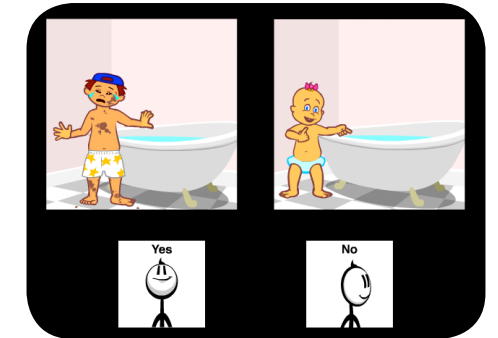
Students must choose who does or does not want or need to do something. They must also answer *Yes/No-Questions* related to similar events. The highly structured training of these language forms is a starting point for providing the cognitive framework needed to process and talk about *irrealis* concepts. In this activity students also learn that just because someone needs something to happen doesn't necessarily mean they want it to or vice versa.



Who needs to take a bath?

Feedback for Correct Wh-Question Responses:

(Level 1+2) "Good! Baby Lily needs to take a bath because she's dirty!"
 (Level 3) "Good! Baby Lily needs to take a bath but she doesn't really want to."



Does Matt need to take a bath?

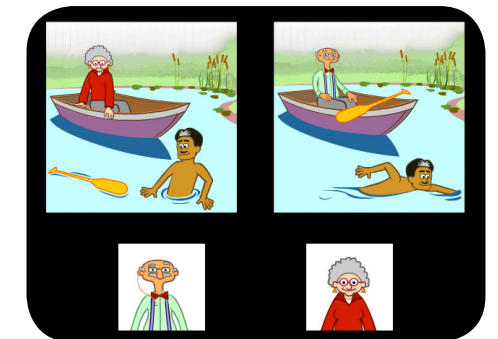
Note that in the Yes/No trial the roles are swapped.

Feedback for Correct Responses:

"Good! The answer is yes! Matt needs to take a bath because he's dirty!"

Module 6: Wants/Needs Someone To

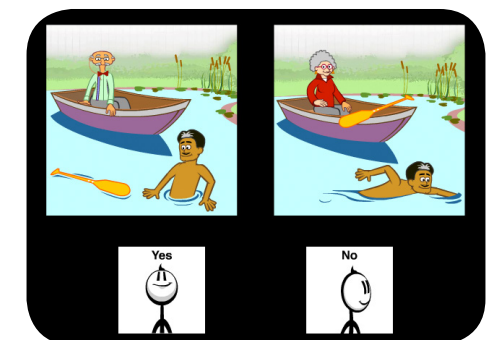
Students choose who does or does not want or need someone to do something. They must also answer *Yes/No-Questions* related to similar events. This Module builds on the previous one by adding a level of complexity.



Who needs Mr. Lopez to get the paddle?

Feedback for Correct Responses:

(Level 1+2) "Good! Grandma needs Mr. Lopez to get the paddle because she can't reach it!"
 (Level 3) "Good! Grandma needs Mr. Lopez to get the paddle! She wants to go to shore and she needs the paddle to get there!"

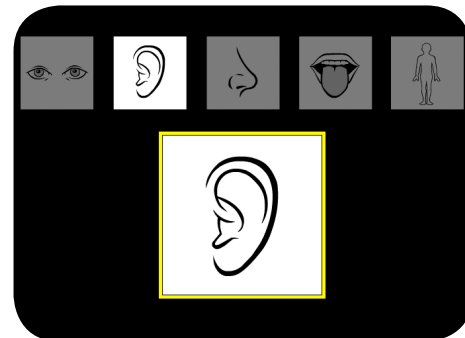


Does Grandpa need Mr. Lopez to get the paddle?

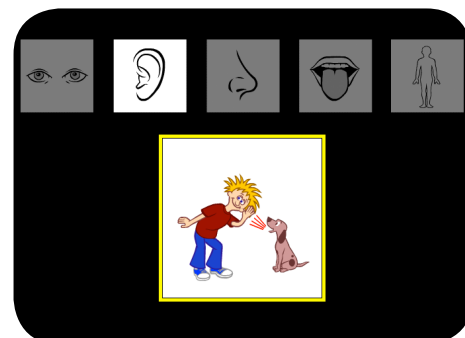
Feedback for Correct Responses:

"Good! The answer is yes! Grandpa needs Mr. Lopez to get the paddle because he can't reach it!"

Before training on the first module, students are introduced to the five sense verbs.



We hear with our ears.



Jack hears the dog. He hears it with his ears.

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3. **Have command over verbs of communication (e.g. say, tell, ask) with sentential complements**
Verbs such as *say*, *tell*, and *ask* are critical to the development of ToM. They can be used to demonstrate the syntax of sentential complements using concrete content and without the added cognitive burden of inference or irrealis reference (as with cognitive verbs like *know* and *think*). They can also be used in ways that provide explicit evidence that a sentential complement can be false (when “what was said” is known to be false), even though the sentence taken as a whole is true (e.g., *John said that there was a unicorn in the yard*). Given these features, it has been suggested that children with ASD may need to rely more heavily on verbs of communication (e.g., what was said overtly) as a means to represent or understand what is in other people’s minds (e.g., Tager-Flusberg & Joseph, 2005).
4. **Learn verbs of cognition (e.g., know/don’t know, think, believe) with sentential complements**
These verbs (e.g., *know/don’t know*, *think*, *believe*, *guess*, *forget*, *remember*) obviously have a critical role in ToM. Verbs of cognition and their associated sentential complements tend to be late developing in all children. This presumably is at least in part because the knowledge, beliefs, and ideas to which these verbs relate are not readily apparent – other than in their representations in language. As such, their referents must be inferred from behaviors that may be inexplicable on the basis of the ostensive context alone.
5. **Master verbs of cognition with complements that are false (False Beliefs)**
Once a child grasps that one can have a false belief, and that a factual sentence with the verb *think* can have a complement that is false (*She thought she saw a unicorn*), the foundation is provided for comprehending false beliefs and understanding their behavioral consequences. Children do not arrive at this stage without having developed a firm grasp of the syntax that supports false beliefs, and which may provide a mental “scaffold” sufficient to support mental computations involving false beliefs (de Villiers & de Villiers, 2009).

Language provides an important scaffold to understanding others’ minds and how their thoughts and beliefs influence their behavior. Give your students the language foundation to develop an adult-like ToM. Even if some students don’t develop an adult ToM, providing them with the language foundation described herein will assist them in navigating the world.

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