

Theory of Mind

Evaluation and Clinical Applications

Allison Bean, M.S., CCC-SLP
Beth Walker, M.A., CCC-SLP/A
Karla McGregor, Ph.D., CCC-SLP

University of Iowa

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Theory of Mind

- What is it?
 - The ability to attribute mental states to yourself and others.
 - Intentions – Desires – Knowledge - Beliefs

Theory of Mind and Language

Language → Theory of mind

- Language is necessary for most theory of mind tasks

Theory of mind → Language

- Conceptual understanding comes first but is not demonstrated until language is developed enough to convey this understanding

Other variables → Theory of Mind + Language

- Theory of mind and language interact because both depend on other factors (Astington & Jenkins, 1999)
- Family variables (Ruffman et al., 1998; 2002)
- Cognitive variables (Ozonoff et al., 1991)

Why evaluate Theory of Mind?

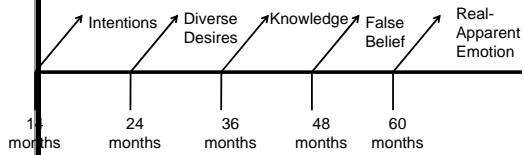
Theory of mind abilities may play a role in some of the areas that we target in intervention

- Semantics
 - We use vocabulary to talk about mental states that are unobservable: *think, know, believe*
- Syntax
 - Must be able to produce complement sentence structures to report on our mental states
 - *John thinks (that) the chocolate is in the cupboard*
- Pragmatics
 - Keeping track of listeners' and speakers' beliefs and intentions

Evaluating Theory of Mind

- Historically, theory of mind evaluated based on single construct: false belief
 - Thought of as a single achievement that emerges around age 4
- Currently, measure across a scale of development tasks (Wellman & Liu, 2004)
 - For example, understanding of desires (what one wants) emerges before understanding of beliefs (what one thinks)

Theory of Mind Development



Example of a theory of mind scale

Intentions	Point Following Inferring communicative intent through gaze following Inferring social intentions through actions
Desires	Diverse Desires Diverse Beliefs
Knowledge	Knowledge access
Beliefs	Content False Belief Location False Belief
Emotions	Belief emotions

Recognizing Intentions

- **Point following** (Carpenter et al., 1998)
 - An examiner calls the child by name. Once the child makes eye contact, the examiner points to an attractive toy to the side of child.
- **Inferring communicative intent through eye gaze** (Behne, Carpenter, & Tomasello, 2005)
 - Examiner indicates the location of a hidden toy through eye gaze.
 - Child infers that examiner is informing her about the location of the toy.

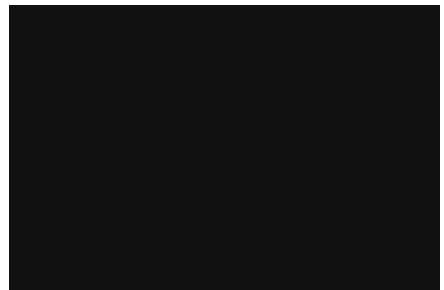
Inferring intent through eye gaze



Recognizing intentions

- **Inferring social intentions** (Parish-Morris et al., 2007)
 - Examiner attempts to perform intended action on an object but fails three times.
 - After third attempt, she says to the child "Can you help me?" and slides the objects toward the child.
 - Child is scored on whether he imitates the failed action, performs the intended action, performs a novel action, or does not respond.

Inferring social intentions



Diverse desires

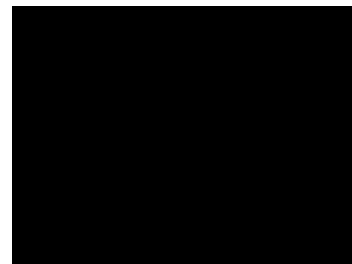
- Child determines that two people (self v other) can have different desires
 - Child shown a picture of a carrot and a cookie.
 - E: "Here is Bob. It's snack time so Bob wants a snack. Here are two different snacks – a carrot and a cookie. Which snack would you like best?"
 - Child chooses and E says, "That's a good choice, but Bob really likes carrots. He doesn't like cookies. He likes carrots best."
 - Target question: "Now it's time to eat. Bob can only choose one snack. Which snack will Bob choose? A carrot or a cookie?"

Diverse desires

Diverse beliefs

- Child determines that two people (self v other) can have different beliefs about the same object (Wellman & Bartsch, 1989)
 - Child shown picture with bushes and a garage.
 - E: "Here is Sarah. Sarah wants to find her cat. Her cat might be hiding in the bushes or it might be hiding in the garage. Where do you think the cat is – the bushes or the garage?"
 - Child chooses bushes: "That is a good idea, but Sarah thinks her cat is in the garage."
 - Target question: "Where will Sarah look for her cat? In the bushes or the garage?"

Diverse beliefs



Knowledge access

- Child sees what is in a box and determines (yes or no) if another person knows what's in the box
 - Child sees a plain box with a toy monkey inside. E says, "Here's a box. What do you think is inside the box?"
 - Box is opened. E: "It's a monkey inside!"
 - Child is shown a toy figure. E: "Katie has never seen inside this drawer. Here comes Katie. Does Katie know what is in the drawer?" (target question)
 - E: "Did Katie see inside this drawer?" (memory question)

Knowledge access



Contents false belief



Contents false belief

- Child judges another person's false belief about what is in a distinctive container
- Child sees a band-aid box with a toy pig inside.
 - E: "Here is a band-aid box. What do you think is inside the band-aid box?" E opens box and says, "It's really a pig inside."
 - Child sees a toy figure. E: "Mary has never seen inside this band-aid box. What does Mary think is in the box? Band-aids or a pig?" (target question)
 - E: "Did Mary see inside this box?" (memory question)

Location false belief

- Child judges how someone will search, given a false belief
- Child is shown a picture with a backpack and closet.
 - E: "Here is Pat. Pat wants to find his mittens. His mittens might be in his backpack or in the closet. Really, Pat's mittens are in his backpack, but Pat *thinks* his mittens are in the closet."
 - E: "Where will Pat look for his mittens? In his backpack or the closet?" (target question)
 - E: "Where are Pat's mittens really? In his backpack or in the closet?" (reality question)

Location false belief



Emotions

3 years	Can identify basic emotions and link them with situations that provoke them (Ruffman et al., 2002)
5 - 6 years	Child judges that a person's apparent emotion can differ from how they actually feel (Wellman & Liu, 2004)

Belief emotion

- Child judges how a person will feel, given a false belief (Harris et al., 1989)
 - Child sees an Oreos box with rocks inside.
 - E: "Here is an Oreos box and here is Molly. What do you think is inside the Oreos box?"
 - Child responds and doll says, "Oh, good. I love Oreos. They are my favorite snack. Now I'll go play."

Belief emotion

- Child sees the contents of box. E: “Oh no, there are really rocks inside and no Oreos!”
- E: “Let’s give Molly this box. How does Molly feel when she gets this box. Happy or sad?” (target question)
- E: “How does Molly feel after she looks inside the box? Happy or sad?” (emotion-control question)

Belief emotion



Hidden emotion

- E: “Here is a boy. The boy and his friends were playing. A girl teased the boy and the others all laughed. The boy did not laugh. But the boy did not want the others to see how he left.”
- E shows pictures of happy and sad faces. “How did the boy really feel when everyone teased him?” (real emotion question)

- “Why did he feel [happy/sad]?” (control question)
- “How did the boy try to look on his face when everyone teased him?” (apparent emotion question)
- “Why did he try to look [happy/sad]?” (control question)

Importance of Theory of Mind

- Theory of mind is a critical step in social-cognitive development.
- Theory of mind enables an individual to:
 - Make complex mental-state attributions
 - Engage in social and communicative games
 - Even engage in deception
- Theory of mind has important implications for everyday social interactions (Slaughter & Repacholi, 2003)

False Belief Understanding & Social Competence

- There is clear evidence that false belief understanding is related to some aspects of social functioning (for review see Astington, 2003)
 - Communication abilities
 - Imaginative abilities
 - Ability to resolve conflicts and maintain harmony and intimacy in friendships
 - Teacher ratings of global social competence
 - Peer-rated empathy and popularity

Special populations

- Autism
- Deafness
- Specific language impairment

Autism Spectrum Disorders

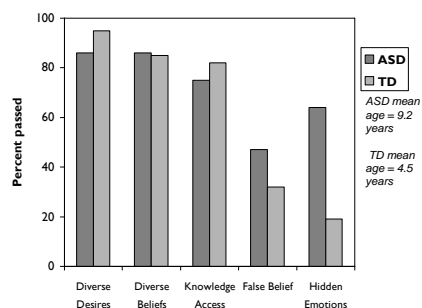
- Primary deficit is difficulty in attributing mental states (Baron-Cohen, 1989)
 - Theory-of-mind hypothesis of autism
 - Theory of mind deficit is universal and specific to individuals with autism
 - Arises from faulty development of social-emotional modules in the brain
- DSM-IV definition:
 - qualitative impairment in social interaction, communication, and restricted repetitive and stereotyped patterns of behavior, interests and activities

Autism Spectrum Disorders

Performance on theory of mind scale

- Demonstrate delays in theory of mind development, with false belief most difficult task for children with ASD (Peterson, Wellman, & Liu, 2005)
 - TD children pass false belief tasks ~ 4years,
 - ASD children need a verbal mental age of at least 11 years before passing a false belief task (Happe, 1995)
- Demonstrated a different developmental progression, compared to TD children and children with deafness

ASD - Performance on theory of mind scale (Peterson, Wellman, & Liu, 2005)



ASD - Relationship between theory of mind, social functioning, discourse & severity of autism

- Longitudinal investigation of children with a diagnosis of autism (ages 4-14, n=69) (Tager-Flusberg, 2003)

Social Functioning (Vineland)	<ul style="list-style-type: none"> • Daily Living Skills & Communication - Language only significant predictor variable • Socialization – theory of mind single best predictor
Discourse (spontaneous language sample)	<ul style="list-style-type: none"> • Reference to mental state talk significantly related to theory of mind performance • Topic maintenance, as measured by contingent responses, correlated with theory of mind even after controlling for general language
Severity of Autism (ADOS & ADI)	<ul style="list-style-type: none"> • No correlation

ASD & Theory of Mind: Summary

- Theory of mind development is delayed and follows a different pattern than TD children (Peterson, Wellman & Liu, 2005)
- In this population theory of mind skills are correlated with (Tager-Flusberg, 2003):
 - Socialization
 - Mental state talk
 - Topic Maintenance

Deaf Children

- Theory of mind delays are not unique to children with autism.
- Theory of mind delays are also found in children with severe sensory disabilities (e.g., congenital blindness, deafness) with normal intelligence and no significant social or cognitive markers of autism
 - False-belief performance delays found in vast majority of deaf children from hearing families

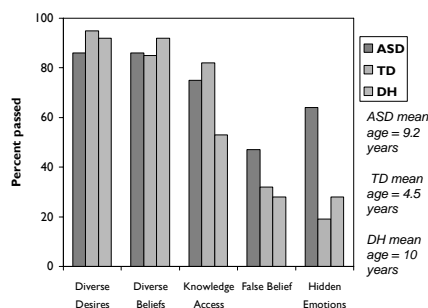
Deafness: False Belief Performance

- It is not deafness that predicts delays in theory of mind but deafness in conjunction with a hearing family (Peterson & Siegal, 1999; Peterson & Siegal, 2000)
 - Native signers perform as well as hearing children (Jackson, 2001; Peterson, 2004)
 - Deaf children from hearing families generally found to be delayed by ~ 3 years (Lundy, 2002)
- Input from communication partners: maternal sign proficiency and frequency of mental state verbs correlates with theory of mind (Moeller & Schick, 2006)

Deafness

- Performance on theory of mind scale
 - Unlike children with autism, theory of mind development is delayed in children who are late signers, but these children follow the same developmental sequence as hearing children (Peterson, Wellman, and Liu, 2005)

ASD - Performance on theory of mind scale (Peterson, Wellman, & Liu, 2005)



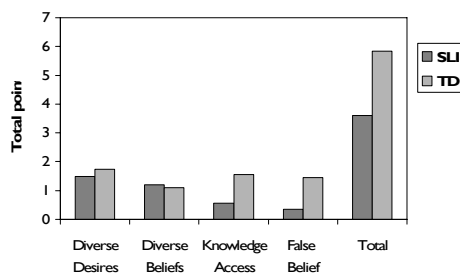
Deafness & Theory of mind Summary:

- Theory of mind delays are predicted by deafness in conjunction with a hearing family (Peterson & Siegal, 1999; Peterson & Siegal, 2000)
- Theory of mind is delayed but follows the same developmental pattern (Peterson, Wellman & Liu, 2005)
- Input from communication partners (Moeller & Schick, 2006)

Specific Language Impairment

- Performance on false belief (Miller, 2001)
 - When demands are low, children with SLI = same-age peers
 - When demands are high, children with SLI = younger, language-matched peers
- Mastery of sentence complementation predicts performance on false belief (Miller, 2004)

SLI - Performance on theory of mind scale (Farrant et al., 2006)



Theory of Mind in Clinical Populations

- Each population has delays in these tasks for different reasons
 - Autism
 - Executive function
 - Decreased attention to social partners
 - Deaf children
 - Language abilities
 - Family variables - decreased mental state talk and conversations
 - SLI
 - language demands

Why as clinicians should we care about theory of mind?

Theory of mind skills are related to areas that we target in intervention

- Imitation, pretence

Theory of mind has implications for everyday social interactions

- Discourse

We frequently work with populations who have delays in theory of mind

- Theory of mind gives us another window into the child's developmental abilities

What does thinking about theory of mind give us?

Pragmatics

- New ways to think about, assess and target pragmatics

Syntax

- A new way to train and assess complement generalization

Semantics

- The importance of mental state talk and a new way to assess generalization and understanding of mental state terms

Clinical Example

• Background

- Amy is 4 years old with a diagnosis of SLI
- You have been working on production of sentential complements by acting out stories and asking questions.

- Example : 1) Having Ernie kiss Big Bird
2) Then saying "Ernie says, 'I kissed Grover'."
3) What did Ernie say?

• What aspect of theory of mind is being trained?

Clinical Example II

• Background

- Joe is 7 years old with a profound hearing loss. Joe received a cochlear implant at age 5.
- In therapy you are targeting vocabulary, specifically mental state terms such as *think*, *know*, *believe*
- How can you assess his understanding of these terms using a theory of mind task?

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