Tutorial

Developmental Relationships Between Language and Theory of Mind

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Purpose: This tutorial is intended to inform readers about the development of theory of mind (understanding of mental states) and to discuss relationships between theory of mind and language development.
Method: A narrative review of selected literature on language and theory of mind is presented. Theory of mind is defined, and commonly used measures of theory of mind are described. Developmental relationships between language and theory of mind in typical and atypical populations are discussed. Literature-based suggestions for clinical assessment and intervention are provided, using a hypothetical case study.
Conclusions: The article serves as an introduction to current research about language and theory of mind, and emphasizes their interdependence in development. Implications of the relationships between theory of mind and language development for language assessment and intervention are discussed, and an argument is made that taking theory of mind into account will help clinicians enhance children's communication and language development.

Key Words: cognition, normal language development, language disorders, autism spectrum disorders

An appreciation of others' thoughts, feelings, knowledge, and wishes, or a "theory of mind," is essential for competent communication. Without a theory of mind, I may give you too much information, or too little; I may hurt your feelings, confuse you, or bore you. With a theory of mind, I can judge what you need and want to know. In typical development, theory of mind is so closely coupled with the development of communication and language that we often do not recognize their interdependence. In children with developmental disorders, however, deficits in language and/or theory of mind may draw closer attention to the relationships between them. This tutorial will describe how language and theory of mind development are related in typical and atypical development, and it will suggest ways that clinicians may apply this knowledge in working with children with language disorders of various etiologies.

This tutorial presents selected theoretical and empirical results that will help to sketch the current state of knowledge in the field and its relevance for clinicians. Even though the scope of the article is limited to research on language and theory of mind, it is not feasible to do a thorough review, as the literature on theory of mind is vast and has far-reaching implications for many aspects of social, cognitive, and linguistic development. The publications cited here will provide a point of entry into the literature for the reader who wishes to learn more. First, a definition of theory of mind is provided, along with a brief overview of its developmental course, and a description of tasks that are often used to assess theory of mind. Next is a review of ways in which theory of mind and language are thought to influence one another in development, and an overview of the role of language in theory of mind assessment. Evidence regarding theory of mind and language in atypical populations is described. In the final section, some clinical implications of the literature are suggested and illustrated with a hypothetical case study.

What Is a Theory of Mind?

Theory of mind refers to an understanding of mental states—such as belief, desire, and knowledge—that enables us to explain and predict others' behavior. Consider the following scenario. I make some cookies and bring them to work. I show my coworker, George, that I am putting the cookies in my desk drawer and invite him to help himself anytime. A little later, I notice a couple of ants crawling near my desk and decide to move the cookies to a high shelf. That afternoon, on my way to the mailroom, I see George headed toward my office. I say, "They're on the shelf." I have effortlessly computed that George wants a cookie but because he incorrectly believes the cookies are in the drawer, he will fail to find them; if I tell him where "they" are, I will change his belief, enabling him to fulfill his desire for a cookie. I can explain and predict George's behavior in terms of his mental states, because I have a theory of mind. This sort of reasoning

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is complex when made explicit, yet we do it all the time, with little or no conscious reflection. Developmental evidence, however, suggests that such thinking is not automatic for young children, who must develop a number of skills in order to reach the adult level of competence in understanding of mental states.

Precursors of Theory of Mind

Theory of mind is a broad construct that is reflected in many kinds of knowledge and skills. It is not all-or-none. Like language, theory of mind develops over time, building from foundational, precursor skills to a sophisticated understanding of how mental states and behavior interact. Precursors of theory of mind include joint attention, appreciation of intentionality, recognition that different people have different perspectives, use of mental state words, and pretend play. An approximate timeline is shown in Table 1.

Joint attention, defined by Morales et al. (2000) as "the capacity of an infant to coordinate her attention with a social partner vis-à-vis an object or event" (p. 283), is considered to be an early-developing component of theory of mind (Tomasello, 1995). By 9 months, infants begin to share with another person the experience of attending to something (Carpenter, Nagell, & Tomasello, 1998) and, according to Tomasello (1995), come to understand that others intend for the infant to pay attention to a specific aspect of an object or event. Any given object or event has an infinite number of characteristics that can be commented on. A communicative act demonstrates the communicator's intention to single out a very small subset of these characteristics for the listener to focus on. The understanding of this intentional property of communication comes to fruition in the use of words, which are used to pick out particular aspects of an object or event, such as *red,* or *ball,* or *fast* (Tomasello, 1995). It is logical, as argued by Tomasello, that joint attention, because of its role in appreciation of intentional communication, is a precursor of theory of mind; however, as will be discussed below, the connection currently has more theoretical than empirical support.

In the preschool years, children begin to learn that different people may have different interpretations of the same object, depending on perspective (Flavell, Everett, Croft, & Flavell, 1981). For example, when two people are facing one another across a table, a picture that is flat on the table will appear right-side up to one and upside down to the other (Flavell et al., 1981). Children also learn that not everyone likes or wants the same things (Flavell, Flavell, Green, & Moses, 1990; Repacholi & Gopnik, 1997). The understanding that perspectives can differ is essential for successful communication; a communicator has an intention to take a certain perspective on an object, but not necessarily the same perspective as the listener.

During the 3rd year of life, young children begin to talk about mental states. Their early use of mental state terms suggests less than full comprehension of the terms' mental implications, as children use phrases such as "I think" as an equivalent of "maybe," and "Know what?" to initiate a conversation (Shatz, Wellman, & Silber, 1983). The use of mental state terms gradually becomes more truly mentalistic, unambiguously referring to the thoughts, beliefs, and feelings of oneself and others (Bartsch & Wellman, 1995; Shatz et al., 1983).

Children begin to engage in pretend play as early as the 2nd year of life, and it has been argued that pretend play is an important component of theory of mind development because it requires one to "decouple" a representation of reality (e.g., a wooden block is a car) from reality itself (Leslie, 1987, 1994; see below for further discussion of representations). Few studies have examined longitudinal relationships between pretend play and theory of mind development. Youngblade and Dunn (1995) found that acting out roles in pretend play at age 2;9 (years;months) predicted false belief performance at 3;4, even when language (measured by mean length of utterance [MLU]) was controlled. Astington and Jenkins (2000), however, found that none of their measures of pretend play (total amount of pretending, joint planning of pretend, and explicit assignment of roles) predicted theory of mind performance, although theory of mind predicted later joint planning and role assignment. Astington and Jenkins's participants ranged in age from 2;10 to 3;9 at the beginning of the study and were tested three times over a 7-month period. Given the conflicting results of these studies, further research is needed to explicate the relationship between pretend play and theory of mind in development.

Assessing Theory of Mind

Children enter the preschool years with many skills to form a foundation for theory of mind. Between 3 and 5 years of age, further important developmental changes in theory of mind

TABLE 1. Approximate developmental timeline of some aspects of theory of mind, with illustrative references.

Age	Aspects of theory of mind
6–12 months	• Joint attention, including gaze and point following, and alternation of gaze between person and object (Bruinsma et al., 2004; Carpenter et al., 1998)
	• First words (Tomasello, 1995)
13–24 months	• Recognize intentionality in others as demonstrated in word use (Tomasello, 1995)
	• Recognize that others have desires different from one's own (Repacholi & Gopnik, 1997)
	• Early pretend play (Leslie, 1987)
30–36 months	• Begin to use mental state terms with truly mentalistic functions (Bartsch & Wellman, 1995)
	• Increasingly sophisticated pretend play (Youngblade & Dunn, 1995)
37–48 months	• Increasing ability to understand how things look from another's perspective (Flavell et al., 1981)
	• Begin to understand sentence complements (de Villiers & Pyers, 2002)
49–60 months	• Consistently pass false belief and appearance-reality tasks (Wellman et al., 2001)

take place (see Table 1). Children begin to understand that our minds do not simply mirror reality, but that we actively construct representations of reality. These representations may change within an individual as new information is received, and they may differ across individuals, depending on the information each person has access to (Astington, 1993; Bartsch & Wellman, 1995). Importantly, mental representations sometimes fail to represent reality accurately. In the example of George and the cookies, George has constructed a representation of reality based on seeing me put the cookies in the drawer. This representation becomes false, or inaccurate with regard to reality, when I move the cookies. George does not have access to this information. By telling George the current location of the cookies, I give him information that enables him to revise his representation of reality.

Several methods have been used to assess the ability to distinguish between representation and reality. One commonly used method is the appearance-reality task (Flavell, 1992). This task uses deceptive objects, that is, objects whose appearance belies their true nature. For example, a child is shown a sponge painted to look like a rock. Before being allowed to touch it, the child is asked what it is, and she says that it is a rock. Then she is encouraged to touch and manipulate the object, and when asked, she says that it is a sponge. Two test questions are then asked: "What does it look like?" and "What is it, really and truly?" Three-year-olds usually give the same answer to both questions, either saying that it looks like and is a rock, or that it looks like and is a sponge. Four-year-olds are usually able to answer the two questions differently (and correctly), saying that the object looks like a rock but is a sponge.

Researchers have also focused on preschoolers' growing understanding of false belief—in other words, the understanding that a person may have a belief (or representation) that is different from reality and will act in accordance with that belief. Two types of tasks often used to assess false belief understanding at this age are change of location and unexpected contents. In a typical change of location task, a doll named Sally places a ball in a basket, then leaves. A second doll moves the ball to a box in Sally's absence. The child is asked where Sally thinks the object is. Three-year-olds usually answer incorrectly, saying that Sally thinks the ball is in the box. Four-year-olds usually answer correctly, saying that Sally thinks the ball is in the basket. In order to succeed on the task, a child must recognize that Sally's representation of the world (ball in basket) has become false, and that she will act in accordance with that representation, or belief, rather than in accordance with current reality, or what the child knows to be true. Descriptions of change of location tasks can be found in Astington and Jenkins (1999), Miller (2001), and Wimmer and Perner (1983), to name just a few.

In a typical unexpected contents task, the child is shown a crayon box. The child is asked what she thinks is in the box, and she answers, "Crayons." The experimenter opens the box and shows the child that it actually contains paper clips. The experimenter then closes the box and asks the child, "What did you think was in the box before we opened it?" Three-year-olds usually say that they thought there were paper clips in the box. The experimenter also asks, naming one of the child's friends, "If your friend came in here and saw this box, what would he think is in it?" Again, 3-year-olds usually say that the friend will think the box contains paper clips. Four-year-olds usually answer both the questions about their own prior belief and their friend's belief correctly. Examples of unexpected contents tasks can found in Farrar and Maag (2002) and Gopnik and Astington (1988).

The basic forms of the change of location task and the unexpected contents task have been varied in many ways, in order to determine what parameters affect children's performance. In change of location, control questions are usually asked to make sure the child remembers where the ball (or other object) was placed initially, and where it ended up. Some parameters that are varied in both tasks include the wording of the questions, whether the transformation in location or contents was presented as a "trick," and in the change of location task, whether the protagonist is a real person as opposed to a doll or puppet. According to Wellman, Cross, and Watson (2001), such manipulations have little impact on the age at which children succeed on false belief tasks. The finding that children become able to pass false belief tasks consistently at around 4 to 5 years of age is a robust one (see Table 1).

As children grow older, more complex false belief tasks can be used to assess theory of mind. The traditional change of location and unexpected contents tasks measure understanding of first-order false belief—that is, understanding one person's belief. Second-order false belief involves a person's belief about someone else's belief (Perner & Wimmer, 1985). For example, suppose that before work, my husband and I agree that in the afternoon, we will meet at Pine Park to see a rugby game in which our friend Leon is playing. After I get to work, Leon tells me that the game has been moved to Oak Park. I have meetings the rest of the day and do not have a chance to call or e-mail my husband about the change. Meanwhile, unknown to me, Leon bumps into my husband at lunch and tells him of the location change. At the end of the day, I try to call my husband, but it is too late. He has already left home, and I have our cell phone. Where will I go to meet him—Oak Park or Pine Park? The reader with a mature theory of mind will easily solve this second-order false belief problem: I will go to Pine Park, falsely believing that my husband has a false belief about the location of the rugby game. Stories such as this, sometimes accompanied by pictures or an enactment with toy figures, form the basis for assessing second-order false belief understanding.

Language and Theory of Mind in Development

Throughout the first few years of life, the development of language and theory of mind are interwoven in complex ways. Infants engage in joint attention and demonstrate appreciation of others' intentions within the context of communicative acts. Toddlers begin to use mental state terms in increasingly more mentalistic ways and engage in pretend play. Young children begin to understand that different people have different access to information and different desires. They listen to and participate in conversations in which people predict and explain behavior in terms of desires, beliefs, and feelings. This section of the tutorial describes some ways that language and theory of mind interact in development.

Both language and theory of mind undergo rapid and dramatic developmental changes during the first 5 years of life, but so do other domains; therefore, the temporal association is not enough to support the hypothesis that language and theory of mind are related. There are reasons, however, to expect development in language and theory of mind to be related. As noted at the beginning of the article, successful communication requires an appreciation of the mental states of the interlocutor. Theory of mind is necessary for communication through language, but language may in turn offer a way to learn about theory of mind.

One reason language is important for theory of mind development is that mental states are unobservable. We may be able to learn the meaning of a word like *run* by observing what happens when the word is said, but we certainly cannot learn the meaning of a word like *think* by observing what happens when it is said (Gleitman, 1990). Thinking, knowing, liking, wanting, and so on are internal activities or states that do not have reliable behavioral correlates. Language, therefore, is a crucial source of information about what mental state terms mean (Gleitman, 1990). The information available about mental state terms comes from their roles in the grammatical and semantic systems of a language (e.g., the types of sentences in which they occur) and from their roles in the pragmatics of a language (e.g., when parents say things like "Your brother is mad because he thought it was his turn"). This section describes some of the empirical evidence linking language and theory of mind development. It should be noted that most of the data come from English-speaking children and their families. Cross-linguistic and cross-cultural research in language and theory of mind is limited, but growing (e.g., Lohmann & Tomasello, 2003; Perner, Sprung, Zauner, & Haider, 2003; Shatz, Diesendruck, Martinez-Beck, & Akar, 2003; Tardif, Wellman, & Cheung, 2004).

Relationships Between Language Exposure and Theory of Mind

A number of studies have suggested that children's theory of mind development is influenced by their exposure to talk about mental states. Ruffman, Slade, and Crowe (2002) found that mothers' talk about mental states predicted children's later theory of mind performance, as did the children's language ability. Children's earlier theory of mind performance, however, did not predict later mental state talk by mothers, suggesting a causal role for mothers' talk about mental states in their children's theory of mind development. It is not only mothers who may play a role in theory of mind development. Dunn, Brown, Slomkowski, Tesla, and Youngblade (1991) found that theory of mind understanding at 40 months was correlated with engagement in family talk about feelings and causality, and cooperative interaction with a sibling, at 33 months. There is evidence that children with siblings are advantaged in theory of mind development (e.g., Jenkins & Astington, 1996; Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996; Perner, Ruffman, & Leekam, 1994; Peterson, 2000), presumably because of the opportunities for discourse and experiences related to others' thoughts and feelings that siblings provide.

Further evidence that is consistent with a role for family talk in the development of theory of mind comes from deaf children of hearing parents who are late learners of sign language. Woolfe, Want, and Siegal (2002) found that late signers (who learned sign language in school) performed more poorly on a theory of mind task than native signers. The authors argued that late-signing deaf children do not have as many opportunities for family discourse as hearing children of hearing parents, or deaf children of deaf parents, and hence fewer opportunities to learn about mental states through conversation. Overall, then, evidence from typical and atypical development suggests that opportunities to listen to and engage in conversations about mental states contribute to the development of theory of mind.

Joint Attention, Language Development, and Theory of Mind

In recent years, researchers and theorists have increasingly emphasized the role of joint attention in the development of both theory of mind and language (Moore & Dunham, 1995; Sigman & Ruskin, 1999). The ability to respond to adult bids for joint attention has been found to be associated with vocabulary development in children with typical development (e.g., Carpenter et al., 1998; Morales et al., 2000; Morales, Mundy, & Rojas, 1998), as well as in children with autism spectrum disorder, Down syndrome, and developmental delay (Sigman & Ruskin, 1999). Rollins and Snow (1998) found that the ability to engage in joint attention was associated with grammatical development in both children with typical development and children with autism. Children with autism spectrum disorder exhibit early deficits in joint attention, and this seems to be a crucial aspect of their communicative deficit (e.g., Bruinsma, Koegel, & Koegel, 2004; Rollins, Wambacq, Dowell, Mathews, & Reese, 1998; Sigman & Kasari, 1995; Sigman & Ruskin, 1999).

For children with typical development learning their first words, it is easiest to learn an object label when an adult provides a name for an object that is already the child's focus of attention (Tomasello & Farrar, 1986). By 18 months, however, an infant with typical development can monitor what an adult is attending to when the adult utters a new word, and form hypotheses about the word's meaning accordingly—even if the adult's focus of attention is different from the child's (Baldwin, 1995).

Charman et al. (2000) noted that, although the relationships between joint attention and language and between language and theory of mind have been taken as indirect evidence that joint attention is related to later theory of mind development, direct evidence of such a relationship was lacking. In a sample of 13 children with typical development, Charman et al. found that a measure of joint attention (shifting gaze between an adult and an interesting toy) at 20 months was positively correlated with theory of mind performance at 44 months. Thus, there is a substantial body of evidence supporting joint attention as a precursor of language development, and a logical connection between joint attention and theory of mind via language; however, further investigation of a direct relationship between joint attention and theory of mind is needed.

Mental State Terms

Since the early days of research on theory of mind, investigators have examined children's use of language for evidence of mental state understanding. Shatz et al. (1983) studied the emerging use of mental state terms by toddlers. They found that cognition terms such as *know, think, mean, forget,* and *guess* were first used by children between 2;4 and 2;8; however, examination of the contexts in which these words were used suggested that they did not have true mental state functions, but occurred in the routinized phrase "I don't know" or were used to manage discourse (e.g., "Know what?" to initiate conversation or take a conversational turn).

Terms expressing desire may be among the first to be used with a truly mentalistic function. Bretherton and Beeghly (1982) found that by 2;4, more than half of the children in their sample applied the desire terms *want* and *need* to both self and others, and Bartsch and Wellman (1995) observed genuine reference to desire soon after the second birthday. By comparison, Bartsch and Wellman (1995) found that *think* and *know* were not used as true mental state terms before 2;7. True mental state functions for cognition words were not observed by Shatz et al. (1983) before 2;6. Both Shatz et al. and Bartsch and Wellman relied on analysis of surrounding context to identify genuinely mentalistic use of mental state terms. The most convincing mentalistic uses are contrastive uses. These uses contrast someone's mental state with reality, contrast one's mental state with one's own prior mental state, or contrast someone's mental state with someone else's mental state (Bartsch & Wellman, 1995; Shatz et al., 1983). An example from Bartsch and Wellman (1995, p. 46), produced by a child at age 3;8, is "I thought I could rip the papers off, 'cept it doesn't have any paper." Evidence that mastery of mental state language is related to theory of mind comes from an experimental study by Moore, Pure, and Furrow (1990), which showed that 4-year-olds' understanding of the relative certainty implied by the verbs *think* and *know* was related to their false belief performance.

General Language Ability

In a seminal study following children from age 3;4 to 3;11, Astington and Jenkins (1999) measured theory of mind and administered the Test of Early Language Development (Hresko, Reid, & Hammill, 1981). Astington and Jenkins found that scores for syntax, but not for semantics, predicted later performance on theory of mind measures. The reverse was not true; earlier theory of mind performance did not predict later language scores. Expressive and receptive scores were combined in these analyses, but when expressive and receptive syntax were examined separately, their predictive value was similar.

Further studies have confirmed that language predicts later theory of mind, but they have cast doubt on the unique importance of syntax. Farrar and Maag (2002) obtained parent report measures of vocabulary size and expressive grammatical complexity, as well as MLU, when children were 27 months old, then measured theory of mind at age 4 years, using appearance-reality, unexpected contents, and change of location tasks. They found that vocabulary and MLU predicted theory of mind performance, but grammatical complexity was not a predictor when they controlled for vocabulary. Ruffman, Slade, Rowlandson, Rumsey, and Garnham (2003) compared measures of syntax and semantics at age 3 as predictors of theory of mind performance at ages 3½, 4, and 5½. Ruffman et al. found that semantic ability accounted for unique variance in understanding of belief, but syntactic ability did not account for additional variance.

It seems clear that language and theory of mind performance are related, and that language is a better predictor of theory of mind than the reverse. It is less clear what aspects of language development predict theory of mind development, as some studies show a greater influence of semantics, and others show a greater influence of syntax. Some researchers have focused on a particular syntactic construction as a key influence on theory of mind.

Sentence Complements and False Belief

It has been suggested that a specific aspect of syntax, rather than syntactic ability in general, is crucial for false belief understanding. The hypothesis proposed by J. de Villiers and colleagues (de Villiers & de Villiers, 2000; de Villiers & Pyers, 2002) posits that understanding of sentence complement structures is necessary for children to be able to understand false belief. An example of a sentence complement structure is "Lucy thinks the moon is made of green cheese." The sentence as a whole may be true even though the sentence embedded within it ("the moon is made of green cheese") is false. The truth value of the entire sentence is independent of the truth value of the embedded sentence. Only certain verbs allow this type of construction, including mental verbs such as *think, believe,* and *guess,* and communication verbs such as *say* and *tell*. Until children understand that "Lucy thinks the moon is made of green cheese" can be true while "the moon is made of green cheese" is false, they have no way to represent false beliefs and therefore must fail false belief tasks. In a longitudinal study, de Villiers and Pyers (2002) found that the ability to understand sentence complements predicted false belief performance 3 to 4 months later.

Both mental verbs and communication verbs were examined by de Villiers and Pyers (2002), and that study suggested that communication verbs serve as a bootstrap for sentence complement mastery. The truth value of the embedded complement in sentences with communication verbs can often be verified. If a child hears "Mom said we're having chicken for dinner" but then is served hamburgers instead, she has verifiable evidence that the truth value of the embedded sentence is independent of the truth value of the entire sentence. This understanding will generalize to mental verbs, which use the same structure.

Language Intervention and False Belief

One way to test what kinds of language experiences lead to false belief understanding is through intervention. Hale and Tager-Flusberg (2003) found that providing 3- to 4-year-old children with training on sentence complements improved false belief performance as much as direct training on false

belief tasks. Training on false belief, however, did not result in improved understanding of sentence complements. Lohmann and Tomasello (2003) also found that sentence complement training resulted in better false belief performance. Furthermore, false belief improved following training with discourse about deceptive objects that did not include sentence complements. In Lohmann and Tomasello's study, the most improvement was found when training included both sentence complements (with either mental or communication verbs) and experience with deceptive objects. The results of these two studies suggest that sentence complement comprehension training is sufficient, but not necessary, for improved false belief understanding in preschoolers with typical development.

Interventions emphasizing discourse about mental states and false beliefs have had some success. Appleton and Reddy (1996) had children view videos in which someone has a false belief and discuss them with an experimenter. The children in the training group improved more on false belief tasks than a control group who had storybooks read to them by the experimenter. Guajardo and Watson (2002) used book reading as training, where the experimenter read each child books including mental state references, discussed the mental state aspects with the child, and encouraged acting out of the story. Guajardo and Watson found more false belief improvement for the training group than a no-training control group. Peskin and Astington (2004) also used book reading as training, but they edited the books to make the mental state content either explicit or implicit. Although the group that was exposed to the explicit books improved more on the use of mental state terms, the group that was exposed to the implicit books improved more on a task requiring explanation of a character's false belief. Both groups improved on prediction of false belief (change of location and unexpected contents tasks), but neither outperformed the other.

Summary

The majority of the evidence pertaining to relationships between language development and theory of mind is correlational in nature; therefore, it is premature to say that certain language and communication experiences or milestones are necessary for theory of mind development. Nonetheless, a picture is emerging of complex interdependencies between language and theory of mind, beginning in infancy with joint attention and appreciation of intentionality, and continuing as toddlers begin to use mental state terms in increasingly mentalistic ways. Young children listen to and participate in conversations in which people predict and explain behavior in terms of desires, beliefs, and feelings. Language skills grow and support a developing theory of mind, while at the same time, the increasingly sophisticated theory of mind makes it possible to engage in meaningful communication. Moving beyond correlational analyses, evidence from intervention studies suggests that certain language experiences result in improved false belief performance.

Language in Theory of Mind Assessment

No doubt it will have occurred to the reader that considerable language ability is required simply to participate in standard theory of mind tasks. This potential artifact has not gone unnoticed by researchers, and many experimental manipulations have been used to reduce or remove the language demands of false belief tasks. These language demands may come from the syntactic complexity of the test question, the pragmatics of the test question, or the overall language comprehension required to follow the experimenter's explanation.

In false belief tasks, the crucial data point is the children's response to a test question. This question is usually a sentence complement construction, such as "Where does Sally think the ball is?" It seems possible that the complexity of the sentence complement could tax the resources of the children, leading them to answer in a way that does not reflect their actual understanding of false belief. In response to this line of reasoning, a common change to the procedure is to manipulate the phrasing of the test question, asking (in change of location tasks) "Where will Sally look for the ball?" In their meta-analysis, Wellman et al. (2001) found that this change did not affect the age at which children succeed on the tasks.

The "look" question, however, raises potential problems of its own with regard to discourse pragmatics. Siegal and Beattie (1991) focused on this issue, using false belief stories (enacted using toy figures in a dollhouse) similar to change of location tasks, such as "Jane wants to find her kitten. Jane thinks her kitten is in the kitchen. Jane's kitten is really in the bathroom. Where will Jane look for her kitten?" (p. 3). They reasoned that the question "Where will Jane look for her kitten?" could be interpreted as "Where will Jane have to look for the kitten in order to find it?" leading to the error of choosing the kitten's current location. Therefore, the researchers asked, "Where will Jane look first for the kitten?" and found that children performed more accurately in this condition.

Rewording the question to reduce ambiguity has also been tried in unexpected contents tasks. In such tasks, children are shown the true contents of a deceptive container and then asked what they had thought was in the container. Lewis and Osborne (1990) hypothesized that children might not interpret the question as being about their earlier belief state. If this was true, performance should be improved by adding temporal specificity to the test question. After eliciting the child's guess as to the contents of a candy container and then showing the child the actual contents (a pencil), Lewis and Osborne asked one of three questions: "What did you think was in the box?" or "What did you think was in the box when the top was still on it?" or "What did you think was in the box before I took the top off?" Three-year-olds were more accurate when the question included the *before* phrase.

Lewis and Osborne's (1990) results suggest that increasing syntactic complexity does not negatively affect performance of children with typical development if it clarifies the test question. Two studies of children with specific language impairment (Miller, 2001, 2004) have tested the hypothesis that false belief competence might be masked in performance by the difficulty of understanding the test question. For these children, asking "Where will Sally look for the ball?" resulted in better performance relative to age-matched controls than "Where does Sally think the ball is?" Younger controls matched for language comprehension did not benefit from the change in the test question.

Some language demands of false belief tasks are not easy to categorize as syntactic or pragmatic. False belief tasks often include a narration by the experimenter, which may be fairly elaborate; see Wimmer and Perner's (1983) change of location task involving Maxi and his chocolate for an example. Some researchers have attempted to minimize the language demands of false belief tasks by creating less verbal or nonverbal versions. De Villiers and de Villiers (2000) developed a task that used pictures to depict a change of location scenario and required the child to choose a surprised facial expression for the protagonist who, unaware that a desired object had been moved, looked for it in its original location. Typically developing 3- and 4-year-old children performed no better on this task than on a traditional, more verbal task. The task was also given to a group of orally educated deaf children with language delay, ranging in age from 5 to 10 years. These children performed worse on the less verbal task than a comparable verbal task. Reducing the language demands of the task did not improve performance.

Call and Tomasello (1999) developed a nonverbal false belief task that could be used with chimpanzees and, with minimal adaptation, preschoolers. In the task, an adult experimenter gave visual cues to the location of a sticker. The children were unaware of the sticker's true location, but information was available that should tell them that the adult had a false belief about the location. Therefore, if they understood false belief, the children should look elsewhere for the sticker. Performance on the nonverbal task was comparable to a verbal version.

In summary, simplifying the language used in false belief tasks sometimes results in improved performance, but a completely nonverbal task is no easier than a verbal one for children with typical development (Astington & Baird, 2005; Astington & Jenkins, 1999). The role of language demands in false belief may be more complex for children with language disorders (Miller, 2004). Accordingly, it is important to be careful how we assess theory of mind. The performance of some children can be enhanced by manipulating the language used in theory of mind tasks, although it seems clear that the robustness of general developmental trends in theory of mind is not merely an artifact of how the tasks are presented.

Theory of Mind and Communication Disorders

Some clinical populations with communication disorders have already been mentioned in the review of research on language and theory of mind. Children with autism spectrum disorder are the most intensely studied clinical population in the theory of mind literature, and other populations are often included as comparison groups, including children with mental retardation (e.g., Fisher, Happé, & Dunn, 2005; Happé, 1995; Tager-Flusberg, 2000) and children with specific language impairment (e.g., Gillott, Furniss, & Walter, 2004; Perner, Frith, Leslie, & Leekam, 1989; Tager-Flusberg & Joseph, 2001; Ziatas, Durkin, & Pratt, 1998). The results of such studies generally show that children with developmental disorders other than autism spectrum disorder perform better on theory of mind tasks, but not necessarily at age-appropriate levels.

A few studies have examined children with language deficits directly, to address questions about the relationships between language and theory of mind. Peterson and Siegal (1995) and de Villiers and de Villiers (2000) have studied deaf children with and without early exposure to sign language. Those without early exposure have language deficits and perform poorly on false belief tasks. Studies that have focused on theory of mind in children with specific language impairment (Bishop, 1997; Farmer, 2000; Miller, 2001, 2004; Shields, Varley, Broks, & Simpson, 1996; van der Lely, Hennessey, & Battell, 1999) have found that those whose language problems did not include pragmatic deficits performed at or near age levels on theory of mind. In all of these studies except those of Miller (2001, 2004), however, the children were well past preschool age.

Tager-Flusberg (2000) argued that the false belief performance of children with autism spectrum disorder is related to language ability in ways that may be unique. Grammatical ability may be more important for theory of mind in children with autism spectrum disorder (see also Fisher et al., 2005). As suggested earlier, there is some evidence that sentence complements play a key role in the development of false belief abilities. Tager-Flusberg suggested that sentence complements may be even more important for children with autism spectrum disorder, who build on communication verbs and the complement structures in which they appear as a way to achieve success on false belief tasks. Because they lack insight into mental states, children with autism spectrum disorder may use sentence complements with communication verbs to bootstrap an understanding of similar structures with mental state verbs. This hypothesis is consistent with de Villiers and Pyers's (2002) finding that in children with typical development, understanding of sentence complement structures with communication verbs was a better predictor of false belief performance than sentence complements with mental verbs. Children with autism spectrum disorder, however, may rely more heavily on communication verbs. Johnston, Miller, and Tallal (2001) found evidence that the use of communication verbs may be a strength for children with specific language impairment also. Analyzing spontaneous language samples, Johnston et al. found that children with specific language impairment produced no more cognitive state predicates than younger, language-matched controls, but did produce more predicates about communication events (e.g., *say, tell, point*).

Clinical Implications

Theory of mind begins early, as children share joint attention with adults and begin to talk about mental states. As toddlers become preschoolers, they become able to understand that people have mental representations of the world based on experience, that these representations may sometimes be false, and that behavior is driven by these representations. In concert with these changes in theory of mind, children are also becoming more sophisticated language users, and indeed much of what children know about the relations of mental states to behavior may derive from their exposure to, and engagement in, conversations.

What does all this mean to clinicians as they work with children? First and foremost, clinicians must be aware that theory of mind helps form the foundation for communication

that is not merely instrumental—a way of fulfilling needs and wants—but involves a rewarding exchange of ideas, feelings, and information. The relationship between language and theory of mind is a two-way street, however. Conversations provide a crucial context for learning about the mind, and if children's communication disorders limit their ability to engage in, and benefit from, such conversations, theory of mind development is at risk, and with it, further communicative development. In addition, there is evidence that complex syntax, especially the sentence complement structure, provides an important tool for thinking about false belief. Language and theory of mind build on one another; therefore, theory of mind can be a concern not only for children with autism spectrum disorder, who are known to be at risk for both language and theory of mind deficits (Baron-Cohen, Tager-Flusberg, & Cohen, 2000), but also for children with specific language impairment, mental retardation, or general developmental delay.

Although few standardized instruments exist for the evaluation of theory of mind and related skills, the research literature offers some directions for assessment and intervention. In most cases, these directions are founded on inferences from correlational studies, rather than direct evidence from intervention experiments, although some intervention data are available. This section suggests ways clinicians may assess some precursor and component skills of theory of mind, and addresses possibilities for intervention. It is not unreasonable to ask why speech-language pathologists should take the time to assess theory of mind at all. One answer is that speech-language pathologists treat the whole child. Just as they concern themselves with cognitive skills, such as memory, that are separate from language but closely related to it, they should consider the development of theory of mind, which is distinct from language but at the same time deeply interconnected with it. As will be demonstrated in the hypothetical case study below, by understanding a child's theory of mind abilities, the clinician can select appropriate language goals that are also likely to promote theory of mind development.

Joint Attention

For children who are very young developmentally or chronologically, observation of behavior is important to determine whether the child is able to follow an adult's attentional lead, make a bid for the adult's attention, or engage in joint attentional episodes by alternating gaze between an object and an adult. Gaze following can be assessed by sitting opposite the child, making eye contact, and then looking toward a target located to the side, while looking interested and/or vocalizing (e.g., gasping or calling the child's name). Observe whether the child follows a clinician's or a parent's gaze and how long it takes. Carpenter et al. (1998) and Morales et al. (2000) provide excellent descriptions of methods for assessing joint attention.

Published instruments are available that include assessment of joint attention. The Communication and Symbolic Behavior Scales and Communication and Symbolic Behavior Scales Developmental Profile (Wetherby & Prizant, 1993, 2002) are norm-referenced, using standardized procedures to observe and elicit communicative behaviors. The Early Social Communication Scales (Mundy et al., 2003; Seibert, Hogan, & Mundy, 1982) also provide a standardized method for observation of joint attention. A few studies have investigated intervention for joint attention with children with autism spectrum disorder, with some success. For example, Rollins et al. (1998) described a naturalistic approach in a case study, whereas Whalen and Schreibman (2003) used a behavior modification approach.

Mental State Terms

Spontaneous language samples can be used to determine whether a child is talking about mental states. Many children's picture books include reference to mental states (Cassidy et al., 1998; Dyer, Shatz, & Wellman, 2000). Cassidy et al. examined 317 children's books and found that 78% contained references to internal states such as thinking, knowing, feeling, wanting, and so on; 34% contained references to false belief. Book reading, then, can provide ample opportunities for talk about mental states.

Lack of a vocabulary to talk about mental states may limit children's theory of mind development and communication. Just as shared reading of children's literature may provide a way to assess the use of mental state terms, it may also be a good way to increase use of mental state terms. Peskin and Astington (2004) edited the text of six picture books so that the theory of mind elements were either explicit or implicit. Four-year-olds were exposed to either the explicit or implicit theory of mind books approximately 72 times on average over a period of 4 weeks. Following intervention, the group exposed to the explicit theory of mind books produced more mental state terms in a story-telling task.

Earlier, evidence was reviewed showing that the everyday talk about mental states that takes place in families is associated with theory of mind development. Intervention studies using such talk as a treatment would be needed to determine whether the association is causal in nature. No such studies have been done; however, it seems likely that conversations about mental states and their relation to behavior would be appropriate as a component of intervention. Such conversation might be easily incorporated in pretend play, or in the everyday routine of a preschool setting, where there is lively interaction among peers as well as between adults and children.

False Belief and Appearance-Reality Tasks

This tutorial has described several commonly used theory of mind tasks: appearance-reality, change in location, and unexpected contents, as well as (for older children) second-order false belief. The basic tasks are summarized, along with some common variations where appropriate, in Table 2. Sources that describe the tasks in more detail are also provided. Use of these tasks should enable clinicians to better understand their clients' theory of mind abilities. As the traditional forms of these measures have significant language demands, clinicians should be cautious in assessing children with atypical language development. Although nonverbal versions of false belief tasks do not seem to confer an advantage (Astington & Jenkins, 1999; Call & Tomasello, 1999;

TABLE 2. Summary of theory of mind tasks with variations, performance expectations by age, and references.

Task description and variations	Age expectation for typical development	References
Appearance-reality		
E shows C an object, such as a sponge painted to look like a rock, and allows C to handle it, discovering its true nature. E asks C: (a) "What is this, really and truly? Is it really a sponge or really a rock?" (b) "What does it look like to your eyes? Does it look like a sponge or does it look like a rock?"	Below chance performance at 3 years, improving to near-perfect performance by 5 years.	Flavell, 1992; Gopnik & Astington, 1988
Variation: E shows C a white object such as a fish-shaped paper cutout. Fish is placed behind a colored filter, removed, and replaced behind the filter. E asks C: (a) "What color is the fish, really and truly? Is it really white or really blue?" (b) "What color does it look like to your eyes? Does it look white or does it look blue?"		Flavell, 1992
Unexpected contents		
E shows C a container that indicates its contents, such as an egg carton. E asks C what is in container. C names expected contents. E reveals actual contents, such as pencils. To check memory, E asks C what is in box. E asks C: (a) "What did you think was in here?" (b)" If I close this up and show it to [someone else], what will he/she think is in here?"	Below chance performance at 3 years, improving to near-perfect performance by 5 years.	Astington & Jenkins, 1999
Variation: Change wording of test questions. (a) "What did you think was in here before I opened it?" (b) "If I close this up and show it to [someone else], what will he/she think is in here before I open it?"	Expect better performance using variation.	Lewis & Osborne, 1990
Change of location		
E introduces C to puppet who likes to play with small toy. Two dissimilar containers are available. Puppet places toy in container A and exits. E moves toy from container A to container B, replacing lids (E may encourage C to help). To check memory, E asks C where the toy was placed by puppet and where the toy is now. E asks C, "Where does the puppet think the toy is?"	Below chance performance at 3 years, improving to near-perfect performance by 5 years.	Miller, 2004
Variation 1: Change wording of test question. "Where will the puppet look for the toy?" or "Where will the puppet look first for the toy?"	Expect somewhat better performance in younger children and children with language impairment using Variation 1.	Miller, 2001; Siegal & Beattie, 1991
Variation 2: Present scenario as narrative, with or without figures or illustrations.		Wimmer & Perner, 1983
Second-order false belief		
E presents a narrative, supported by figures or illustrations. Example: Big Bird and Elmo see a balloon seller in the park. Elmo goes home to get money. Big Bird witnesses balloon seller moving to school playground, then goes home. Elmo looks out window and sees balloon seller at school playground. Later, Big Bird goes to Elmo's house and is told he went to buy a balloon. E asks C, "Where does Big Bird think Elmo is?"	Better than chance performance starting at 6 years, improving over next 3 to 4 years.	Perner & Wimmer, 1985

Note. E = experimenter; C = child.

de Villiers & de Villiers, 2000; Miller, 2004), there is some evidence that children with specific language impairment are sensitive to the phrasing of the test question in a change of location task (Miller, 2001, 2004).

It was noted earlier in this article that language appears to be a better predictor of theory of mind than the reverse. Therefore, speech-language pathologists may want to implement intervention activities that serve the dual purpose of building language competence (especially in the areas of sentence complement structures, mental state and communication terms, and understanding and telling stories) and enhancing theory of mind abilities. A handful of training studies with typically developing 3- and 4-year-old children have shown that different types of language experiences resulted in improvement on false belief tasks. Hale and Tager-Flusberg (2003) and Lohmann and Tomasello (2003) demonstrated that training on sentence complement structures led to better false belief performance. Lohmann and Tomasello also showed that using sentence complements to talk about the nature of deceptive objects (e.g., a pen that looks like a flower) led to improvement beyond the effect of sentence complements alone. There was no difference in the results whether mental or communication verbs were used in the sentence complements. There is also empirical support for discourse-based interventions, using books or videos (Appleton & Reddy, 1996; Guajardo & Watson, 2002; Peskin & Astington, 2004).

A number of studies have investigated training for children with autism spectrum disorder to improve the understanding

of mental states (e.g., Bell & Kirby, 2002; Ozonoff & Miller, 1995; Steerneman & Huskens, 1996; Wellman et al., 2002). Usually, these studies have been focused on improving false belief performance or recognition of emotion and have not examined how language change might be a cause or effect of change in theory of mind. Chin and Bernard-Opitz (2000), however, trained 3 high-functioning children with autism on conversational skills (e.g., topic maintenance, turn taking) and measured their performance on false belief tasks. There was evidence of improved conversational skills for 2 of the children, but they did not succeed in passing false belief tasks.

Hypothetical Case Study

Description of a hypothetical case may make the recommendations for assessment and intervention more concrete. Charlie is a boy age 6;2 whose language development is at approximately a 3-year-old level with an MLU in morphemes of 3.8. Genetic syndromes (e.g., fragile X) have been ruled out, but some mild autism-like signs have been noted, such as sensitivity to loud noises, some repetitive behaviors, and a lack of interest in using language for social closeness. Charlie has been receiving speech-language services for almost 2 years and has made considerable progress. Two of the goals that are currently being emphasized are expanding his receptive and expressive vocabulary and increasing social uses of language.

The speech-language pathologist, Karen, decides to assess Charlie's theory of mind development in several ways. Given that social use of language is an issue for Charlie, Karen wants to determine whether he can establish joint attention with a partner. She observes his play with his mother, and in her own interactions with him creates opportunities for him to respond to and initiate joint attention. She notes that when the adult partner calls his name or says, "Look at this!" he will follow her gaze to a nearby object. If the adult points to an object across the room or behind him, he will look at it, even if he has to turn around. When presented with a novel, interesting toy, he will usually initiate joint attention, looking from the toy to the adult and back and appearing interested or happy. Karen concludes that she does not need to focus on joint attention in intervention.

To assess understanding and use of mental state terms, Karen chooses several picture books that include characters who are experiencing emotions such as happiness, fear, or surprise; characters wanting or wishing for objects or events; and events in which there is a potential for false belief (e.g., one character hiding from others, a character's expectations being violated, a character telling a lie or a joke). An example provided in Cassidy et al. (1998) is *Harry the Dirty Dog* by Gene Zion (1956), in which Harry gets so dirty that his family falsely believes he is not their dog. Karen reads the books with Charlie, simplifying the text when necessary to match his comprehension level. She finds that although Charlie talks about what he sees in the pictures, he rarely refers to emotions, desires, or beliefs spontaneously. She tries prompting (e.g., "Did Harry's family know it was him? Why not?") and elicits some mention of mental states, usually accurate. However, it is clear that Charlie is more interested in the characters' behavior than their mental states.

Because mental state terms are often used in sentence complement structures, Karen also assesses Charlie's understanding of sentence complements with both mental and communication verbs. She follows the method described by Hale and Tager-Flusberg (2003). One character performs an action on another character (e.g., tickling) but says he did it to a different character. Karen asks Charlie, "What did he say?" or "Who did he say he tickled?" Karen conducts several trials, using different characters and actions. Charlie responds correctly about 25% of the time.

Karen assesses Charlie's performance on several false belief tasks incorporated into play periods. For instance, she sets up a change of location scenario in which a teddy bear leaves his bouncy ball in a box rather than a basket. The teddy bear is then placed outside the room (to "visit a friend"), and Karen helps Charlie move the ball from the box to the basket. She uses different test questions to assess the effect of syntactic complexity on Charlie's performance. When asked where the teddy bear thinks the ball is, Charlie answers correctly about 30% of the time; if he was simply guessing, he should get about 50% correct. When Charlie is asked where the teddy bear will look for the ball, his performance improves to about 70% correct, suggesting that his language abilities may be constraining his false belief performance.

Based on her assessment, Karen decides to include mental state terms (*know, think, believe, want, wish, pretend*) among Charlie's vocabulary goals. Use of these words will be infused into many therapy activities, especially book reading and pretend play, and used in both simple sentences and sentence complement structures. Because communication verbs may provide a stepping-stone to mastering mental verbs, Karen will also make sure to model communication verbs in sentence complements, highlighting contrasts between what someone says and what is true. For example, Karen and Charlie read the story of Red Riding Hood and then act it out with puppets. Karen narrates, "The wolf says, 'I'm your grandma,' but that's not true. He says he's her grandma but really he's the wolf!"

Karen expects that as Charlie becomes better at using mental state terms and understanding sentence complements, his false belief performance will also improve, and she plans to probe all these areas periodically. It is worth noting that the goals for mental verbs and sentence complements might have been chosen even without taking theory of mind into consideration. However, in this case they were specifically selected to contribute to the broader goal of increasing Charlie's ability and willingness to use language to engage in rewarding social interactions with others. These are not the only methods Karen will use to reach that goal, but they are important tools that are informed by an understanding of how language and theory of mind interact.

Conclusion

In their efforts to help children become fully competent communicators, speech-language pathologists will benefit from a consideration of their clients' theory of mind abilities. Children with autism spectrum disorder are known to have difficulty with theory of mind, and for them this should be a particular area of emphasis. However, the development of language and theory of mind are closely intertwined from

infancy on, and children with language disorders may be at risk for problems with theory of mind, especially when pragmatic deficits are present. Conversely, an immature theory of mind may limit a child's language and communicative development, even one who does not have an autism spectrum disorder. By using some of the examples that have been provided here and taking advantage of the growing literature on assessment and intervention for abilities related to theory of mind, speech-language pathologists can help their young clients enjoy communication that leads to a true meeting of minds.

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