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Environmental Language Factors in Theory of Mind Development

Evidence From Children Who Are Deaf/Hard-of-Hearing or Who Have Specific Language Impairment

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Theory of Mind (ToM) is a foundational skill related to understanding the thoughts, beliefs, and desires of oneself and others. There are child factors that play an important role in the development of ToM (e.g., language and vocabulary) as well as environmental factors (e.g., conversations among family members and socioeconomic status). In this review, we discuss the role of language in ToM and include the nature of social interactions that scaffold ToM development. We review research on deaf and hard-of-hearing children and children with specific language impairment; 2 groups who experience difficulties with language for different reasons, but both encounter deficits in ToM development. Finally, we conclude with examples of how clinicians can easily assess a child's ToM abilities and offer empirical evidence that aspects of ToM can be scaffolded with explicit instruction. **Key words:** *deafness*, *environmental factors*, *language*, *specific language impairment*, *theory of mind*

THEORY OF MIND (ToM) is a term that refers to the development of children's understanding of the mind and how it relates to human action and interaction. Theory of Mind is a foundational skill associated with sociocognitive development, with important links to the development of socialization skills (Carpendale & Lewis, 2004). Typically developing children acquire foundational ToM skills between the ages of 4 and 5 years, whereas moderate to profound delays have been shown in atypical groups, such as children with autism (Baron-Cohen, Leslie, & Frith, 1985), children with specific language impairment (SLI; Bishop, 1997), and children who are deaf or hard-of-hearing (DHH[1]; Peterson & Siegal, 1995).

The purpose of this review is to discuss literature that builds the case for how ToM is influenced by environmental factors, such as conversational discourse, family size, and socioeconomic status (SES; Astington & Baird,

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[1]We use the term "DHH children" throughout this article, in keeping with recommendations by the Council on Education of the Deaf.

2005; de Rosnay & Hughes, 2006), and by child factors, such as language and vocabulary skills (Milligan, Astington, & Dack, 2007). In this review, we focus on the nature of social interactions that facilitate ToM development in typically developing children. Our aim is to provide a template that clinicians could use to address the needs of children who face additional challenges. In addition, we illustrate how language and social interaction influence ToM development by focusing on children with SLI and DHH children. These two groups offer unique perspectives when studying ToM because they both experience delays in this area of social cognition, while experiencing different challenges related to language and different causes underlying those challenges.

The experiential view of cognitive development assumes that social experience provides a platform for learning new knowledge and language about the mind through interacting with others in the social and cultural world (Nelson, 1996). It is also the case that the child's language skills affect how much a child can access and understand conversations that refer to the mind. These external factors have shown a consistent influence on ToM development (see Dunn & Brophy, 2005). In addition to these factors, several training studies suggest that aspects of ToM can be taught, having particular clinical significance (e.g., Wellman & Peterson, 2013). This suggests that the development of social understanding can be constructed through social interactions and explicit teaching (Hale & Tager-Flusberg, 2003).

ToM IN TYPICALLY DEVELOPING HEARING CHILDREN

Theory of Mind is a conceptual framework used for interpreting human social activity (Astington, 2003). Fundamental to understanding people is understanding that their beliefs and desires govern their actions. To date, much of the research on ToM has been constrained by the tasks used to measure it. Often such tasks measure false belief, which is an understanding that people may have different beliefs about a situation and that those beliefs may not be consistent with reality. This requires a child being assessed to understand that someone else's belief depends on that person's history of perceptual access or experience with an object and/or a situation, regardless of whether the belief is true or false. Typically, children younger than 4 years misrepresent the mental states of others, but not their own.

Several types of false-belief tasks have been developed. (See Appendix A, which is available as Supplemental Digital Content to this article available at: http://links.lww.com/TLD/A38.) Most are simple to administer and can be observed across studies. One example is the unexpected displacement task. The classic version of this task involves two dolls (Sally and Anne), a marble, a basket, and a box. Sally is playing with a marble, while Anne is watching. Sally decides to go outside to play and places the marble in the basket. While Sally is gone, sneaky Anne moves the marble from the basket to the box. While the child sees the marble being moved, Sally has not. When Sally returns, the child is asked, "Where will Sally look for her marble?" Typically a 3-year-old will answer "the box" and a 5-year-old will answer "the basket," recognizing that Sally will not be aware that the marble has been moved.

Another example of a false-belief task is the deceptive container task. This experiment includes a clearly identifiable box (e.g., an M&M box) with an odd toy inside (e.g., a toy fish). First, the experimenter will ask the child what he or she thinks is inside the box (candy), and then the experimenter reveals the true contents (a fish). Mary, who has not seen the contents of the box, enters the room and the question is asked, "What does Mary think is inside this box?" Children younger than 4 years will answer "a fish" and older children will answer "candy," because they are aware that Mary has not had the experience to know that a fish rather than candy is in the box. Passing false belief tasks requires children to know that the world is represented in the mind and that people act on that representation, even when it is incorrect.

Some meta-analyses have examined classic false-belief studies from around the world to establish when children develop an understanding of false belief (Liu, Wellman, Tardif, & Sabbagh, 2008; Wellman, Cross, & Watson, 2001). For example, Wellman et al. (2001) investigated different conditions of false-belief tasks and how performance changed with age. The meta-analysis included 178 studies including 591 false-belief conditions, with a total of more than 4,000 children. They found that 30-month-olds were 20% correct, 44-month-olds were 50% correct, and 56-month-olds were 75% correct in passing false belief. Performance began to shift from being statistically below chance to above chance around the age of 4 years. This robust finding is somewhat universal across cultures and false-belief conditions, showing that an understanding of false belief develops around 4–5 years of age.

For some time, researchers have argued that false belief is just one step in a progression of the child's understanding of the mind (see Gopnik & Wellman, 1992, 1994). Some have argued that the fixation on false belief in investigations has prevented researchers from examining a more expansive view of sociocognitive development (Carpendale & Lewis, 2004). This broader framework proposes that early beginnings of ToM development emerge from individuals' everyday commonsense psychology about the mind. As people, our everyday interactions with others require us to make predictions on the basis of beliefs, desires, and emotions (Bartsch & Wellman, 1995; Nelson, 1996). Psychologists often characterize this everyday system of reasoning about the mind, world, and behavior as a belief-desire psychology (D'Andrade, 1987; Fodor, 1992; Wellman, 2011). For example, we might wonder why Mary went to open the drawer. She *wanted* cookies and *thought* there would be cookies inside the drawer. Belief-desire reasoning is seen in children as early as age 2 years, well before success on false belief between ages 4 and 5 years (Bartsch & Wellman, 1995; Repacholi & Gopnik, 1997). Gopnik and Wellman (1992, 1994) suggested that desires and beliefs help people form a cohesive theory about how to understand others, and these experiences are usually embedded within social interactions with others. By adopting a broader definition of ToM as a series of related understandings about how the mind operates on intentions, perceptions, emotions, beliefs, and desires, researchers can capture more comprehensively the development of social cognition prior to false belief.

On the basis of the concept that ToM is broader than false belief, Wellman and Liu (2004) explored the evidence for a sequence of ToM understanding that develops throughout preschool. First, they conducted a meta-analysis on more than 45 studies investigating mental state development in preschool-aged children. The results showed that children understand that two people can have different desires about the same object well before understanding that two people can have different beliefs about the same object. Following this development, children gain an understanding that only people given access to privileged information (e.g., seeing the contents of a box) will know the information.

Wellman and Liu (2004) used the results of the meta-analysis to create a ToM scale composed of a series of tasks that represent a continuum of skills related to ToM (see their article to view the scale). The first task, *diverse desires,* requires the child to recognize that someone else has a different desire about the same object than the child. The second task, *diverse beliefs,* involves the child judging her own belief versus someone else's belief about the same object. In the third task, *knowledge access,* the child sees what is inside an unmarked box while predicting the knowledge of someone else who has not seen the contents. In the fourth task, *contents false-belief,* the child is involved in knowing what is inside a distinctive container and someone else having a false belief about the contents. In the fifth task, *explicit false-belief,* the child judges how someone will search for an item, provided the false-belief situation. In the sixth task, *belief emotion,* the child will judge how someone might feel, when a prediction is incorrect. Finally, in the seventh

task, *real-apparent emotion*, the child judges a situation in which a person can feel one emotion but display another emotion. Wellman and Liu used this ToM scale to assess 75 typically developing preschoolers with normal hearing ranging in age from 3 to 5 years. The results show that these tasks form a highly reliable scale that increases in developmental difficulty with *diverse desires* being the easiest, and *emotion understanding* the most difficult. As is shown subsequently, this same timeline does not always hold for some groups of children, including DHH children and children facing the challenges of SLI.

While a previous meta-analysis (Wellman et al., 2001) showed limited differences in ToM development across cultures, more recent work has found some cultural differences. Liu et al. (2008) focused on the development of false belief in children from the United States, Canada, Hong Kong, and Mainland China. Whereas children across the four locations showed parallel false belief understanding, children from Hong Kong showed later developmental timing than children from Mainland China. Similarly, cultural differences were evident in a study by Shahaeian, Peterson, Slaughter, and Wellman (2011), in which they compared performance of 135 three- to six-year-olds from Australia and Iran on the ToM scale. The results indicated that Iranian children first successfully understood knowledge access before diverse beliefs, which was similar to how Chinese children performed in a study by Wellman, Fang, and Peterson (2011). However, there were no significant differences between Iranian and Australian children in their overall rates of ToM development. Furthermore, Vinden (2002) studied ToM among Mofu children of Cameroon and found that children who attended school performed better on standard ToM tasks than nonattenders, suggesting that schooling promotes sociocognitive development. It is possible that these cultural differences reflect variances in exposure to ToM talk, an environmental factor to be discussed in a later section.

In summary, ToM development for children with normal language and hearing involves a range of developmental steps that begin as early as 3 years of age, with the more complex aspects developing at 4–5 years of age. Research has demonstrated that the development of false belief is universal across different tasks, languages, and cultures, but the overall sequence of development may not be consistent across cultures.

LANGUAGE AND ToM DEVELOPMENT IN DHH CHILDREN

DHH children offer a unique opportunity to study ToM development because of differences in their range of language learning experiences. Broadly speaking, there are two distinct groups of DHH children. DHH children who have parents who are also DHH develop in a language-rich environment much like many of their hearing peers; this is because they share a common sign language with their parents, siblings, and peers. In contrast, DHH children who have hearing parents, who represent the vast majority of DHH children (about 95%), typically develop in language environments that are restricted by their limited access to spoken language (see Lederberg, Schick, & Spencer 2013) and by having parents who are not fluent in sign language. Even after diagnosis, hearing aids often do not provide sufficient access to speech for children with a severe-to-profound hearing loss to acquire spoken language. Newer technologies, such as digital hearing aids and cochlear implants, provide DHH children with better access to sound. Nevertheless, although there have been significant improvements in language associated with these advances, with some DHH children showing a trajectory of language development comparable to hearing children, many DHH children with hearing parents still show considerable differences from that of a typically developing hearing child (see Niparko et al., 2009). Although many of these children also learn sign language, because most hearing parents of DHH children are not fluent signers, the early language-learning environment is not as rich as that experienced by DHH children of DHH parents and by typically developing hearing children (Moeller & Schick, 2006).

The differences in language development and experiences in DHH children have led ToM researchers to be interested in the development of false belief within this group. Numerous studies have found significant relationships between language and performance on ToM tasks in typically developing children (Astington & Jenkins, 1999; Milligan et al., 2007). Researchers observe this same relationship in DHH children (Courtin, 2000; Peterson & Siegal, 1995; P. A. de Villiers, 2005; Schick, de Villiers, de Villiers, & Hoffmeister, 2007).

Some researchers have argued that language plays a causal role in ToM development (P. A. de Villiers, 2005), but there is some debate as to which aspect of language is the most important. Bartsch and Wellman (1995) suggested that language plays a fundamental role in typically developing children because ToM relies on acquiring the semantics of mental-state vocabulary, such as *think, know,* and *remember* (see also Hughes & Leekam, 2004; Appendix B, available as Supplemental Digital Content at http://links.lww.com/TLD/A38, includes a list of mental state terms in English). Mental-state verbs are unique in that they focus on abstract internal states and psychological processes, concepts that cannot be observed directly. Typically developing children begin using these terms around the age of 2 years during their spontaneous conversations with others (Bartsch & Wellman, 1995); however, many are conversational phrases (e.g., "You know what?"). Before the age of 3 years, genuine references to mental states appear, along with statements that contrast the children's own mental states with those of others. With further development, children begin using mental-state verbs to refer to others' internal states, suggesting that semantics (i.e., lexical knowledge of mental state words) is important for success on ToM tasks that rely heavily on this knowledge. However, it also may be the case that children's emerging understanding of ToM concepts may scaffold development of vocabulary and syntax, aiding in the development of language.

Other researchers believe that children must master the use of sentential complement clauses to represent false beliefs, both in language and in cognition (J. G. de Villiers & P. A. de Villiers, 2000; Schick et al., 2007). Sentential complements are linguistic structures where one sentence is embedded within another (Hauser, Chomsky, & Fitch, 2002). Relevant to ToM development, the set of mental verbs (e.g., *think, believe, know, forget, pretend, see*) and communication verbs (e.g., *say, tell, ask, report, promise*) take either *that*-complements or *wh*-complements (e.g., "I *thought that* cookies were in the jar," "I *remember where* my toy is!"). Complex sentence production and complement clause use develops with age (Diessel & Tomasello, 2001; Kidd, Lieven, & Tomasello, 2006). Children do not start using mental state verbs and *that*- or *wh*-complements until around the age of 4 years, a time when they are also successful on false-belief tasks. P. A. de Villiers (2005) argued that this type of syntax acquisition is a necessary precursor for the understanding and cognitive representation of false belief. de Villiers and Pyers (2002) developed a task to assess memory of sentential complements in which children see a picture and the examiner says, "She told the man she saw a ghost, but it was really a blanket. What did she tell the man?" and the child must recall the information in the sentential complement.

It is likely that multiple aspects of language are necessary for the development of a ToM (Astington & Baird, 2005). A meta-analysis by Milligan et al. (2007) investigated the relationship between language and ToM (specifically false belief) in 104 studies that included typically developing children ($n = 8{,}891$). They included five aspects of language (i.e., general language, semantics, receptive vocabulary, syntax, and memory for syntactic complements) as well as potential moderators. The results showed that performance on false-belief tasks was related to measures of general language (27% of the variance explained) and receptive vocabulary (12% of the variance explained). No significance difference was found among semantics, syntax, and memory

for complements because of the limited number of studies in each category. In addition, earlier language ability predicted later ToM performance, suggesting a causal relationship between language and ToM.

Researchers such as Astington (1996) and Tomasello (2009) have argued that it is not the language skills specifically that predict success on ToM tasks, but rather that language allows interaction among people, which then contributes to performance on those tasks. Having the ability to take the perspective of another and attribute mental states to others allows people to participate more intimately. This makes it possible for people to learn from each other because our sophisticated development of social cognition allows us to internalize not only the knowledge of the conversation but the social interaction itself. This would suggest that the relationship between language and ToM understanding may be bidirectional (Slade & Ruffman, 2005). That is, misunderstandings related to delayed ToM development also may contribute to the child's delayed acquisition of ToM vocabulary and the sentential complements needed to represent some aspects of false belief, as well as vice versa. Milligan et al. (2007) found such bidirectional effects in their meta-analysis, in that earlier performance on language measures predicted later false-belief performance, and earlier false belief predicted later language performance.

To this point, however, research has focused primarily on the development of false belief, although there is more recent research that uses the ToM scale. Researchers have consistently found that DHH children with parents who also are DHH develop false belief around the same age as hearing children, but that DHH children with parents who can hear develop false belief at significantly older ages (Courtin, 2000; Meristo et al., 2007; Peterson & Siegal, 1999; Schick et al., 2007). This is because DHH children who have parents who are also DHH develop in a language-rich environment much like many of their hearing peers; they share a common sign language with their parents, siblings, and peers.

DHH children who have hearing parents can experience severe to profound delays in the development of ToM well into school age, and some stretching into adolescence (Peterson, Wellman, & Liu, 2005; Schick et al., 2007). Researchers suggest three reasons to account for the ToM delay in DHH children: (1) the language required to engage in the task is complex (Schick et al., 2007); (2) knowledge of complement structure is required to develop ToM (P. A. de Villiers, 2005); and (3) the use of mental state language is required to engage in everyday conversations with others to access ToM concepts (Moeller & Schick, 2006; Peterson et al., 2005).

To investigate the role of language in ToM development, Schick et al. (2007) studied 176 children who were DHH, who had either deaf or hearing parents, and who used American Sign Language (ASL) or oral English, compared with a control group of 42 typically developing hearing children. Three DHH groups were formed as follows: (1) ASL users who have deaf parents (average age = 6.0 years), (2) ASL users who have hearing parents (average age = 6.11 years), and (3) oral English language users who have hearing parents (average age = 6.0 years). Children were tested with tasks that included measures of nonverbal intelligence, false-belief reasoning (both verbal and nonverbal), and language. Classic verbal false-belief tasks were those mentioned earlier, such as the unexpected displacement or deceptive container tasks. In contrast, nonverbal false-belief tasks mirror classic false-belief tasks, while minimizing the language demands of the tasks. For example, Schick et al. changed the Sally Anne procedure into a picture book and used minimal language to scaffold the child through the scenario. The results indicated that the hearing children and ASL users who have deaf parents were indistinguishable in their false-belief performance (both verbal and nonverbal), and both groups performed better than the other two groups of DHH children. In contrast, ASL and oral English users who have hearing parents were delayed in false belief, with a 50% group success rate around 7 years of age. Furthermore,

Schick et al. included two types of ToM tasks in the study: (1) traditional false-belief tasks that require language to understand the task and questions, as well as sufficient language to answer the questions, and (2) nonverbal tasks that required no language or minimal language to participate. They included the nonverbal tasks because it is possible that DHH children have ToM skills, but the language demands of the tasks prevent them from demonstrating it. None of the DHH children performed better on the nonverbal tasks than on the verbal tasks, indicating that false-belief delays are not due to the language demands of the tasks (see also J. G. de Villiers & P. A. de Villiers, 2000; Figueras-Costa & Harris, 2001; Woolfe, Want, & Siegal, 2002).

Despite delays in false belief, the developmental trajectory for all children who are DHH appears to parallel that of hearing children across the range of ToM skills. Peterson et al. (2005) studied school-aged DHH children, using the ToM scale created by Wellman and Liu (2004). DHH children in this study ranged in age from 5.5 to 13 years and were enrolled in Total Communication classrooms using signed English, supplemented by lip-reading, fingerspelling, and Australian Sign Language. They were compared with typically developing preschool-aged hearing children who ranged in age from 3.5 to 5.5 years. Results indicate that DHH children's responses were highly scalable and consistent with findings with hearing children found by Wellman and Liu (2004). All but two of the DHH children who had deaf parents passed all four tasks. DHH children who had hearing parents were profoundly delayed compared with hearing peers. Peterson and Wellman (2009) conducted a similar investigation with school-aged DHH children ranging in age from 5 to 15 years, compared with preschool-aged hearing children (3–6 years). While the DHH children progressed through a similar sequence of ToM understanding as hearing children, the average age of false-belief acquisition was 4.9 years for hearing children and 12 years for DHH children.

More optimistic developmental outcomes for DHH children have been found in a study that included children who had received cochlear implants at a relatively young age (2.9 years; Remmel & Peters, 2009) and who had good spoken word recognition scores. Results on the ToM scale showed that the DHH children with earlier cochlear implantation did not differ significantly from a hearing control group in both ToM performance and on language comprehension and expression, both of which were significantly correlated with expressive language skills.

Although the majority of DHH children with hearing parents consistently show delays in ToM, a critical question is whether these delays persist into adulthood. As O'Reilly, Peterson, and Wellman (2014) state the question, once DHH children master false beliefs, do they learn more advanced aspects of ToM in a more developmentally appropriate manner, or do the early delays cascade into delays in later skills? Do these delays persist into adulthood? In their first study, they looked at DHH children with deaf and hearing parents compared with hearing peers. As expected, they found that the DHH children with hearing parents scored lower than the DHH children with deaf parents or the hearing children on false-belief tasks. However, on more advanced ToM tasks, hearing children outperformed DHH children with deaf parents, who outperformed DHH children with hearing parents. Then they studied a group of DHH adults, with deaf parents and with hearing parents (18–69 years of age) and compared ToM performance with a matched group of hearing adults. They found that both DHH adults with deaf parents and hearing adults performed similarly, both outperforming DHH adults with hearing parents. However, as important, the DHH adults of hearing parents performed better than the DHH children of hearing parents in Study 1. That is, there was evidence that DHH children may continue to develop ToM into adulthood, although for the DHH adults with hearing parents, evidence of delays persisted.

In summary, although DHH children and who have hearing parents have been shown by prior research to be delayed in ToM compared with their typically developing hearing peers, there is evidence that they progress in

development along the ToM scale into early adolescence (Wellman et al., 2011). Wellman et al. argued further that this is evidence that there is no critical period for ToM development. There is also evidence that while delays that are evident in childhood may persist into adulthood, DHH children continue to improve their ToM skills through adolescence and adulthood.

LANGUAGE AND ToM DEVELOPMENT IN CHILDREN WITH SLI

Some children with SLI experience difficulties in language and social interaction and have deficits related to social competence, despite normal intelligence and a lack of hearing or neurological issues (see Bishop, 1997). While there is considerably less research on ToM and children with SLI, some research shows that these children experience ToM delays of 12–18 months compared with their typically developing peers (Farmer, 2000; Farrant, Fletcher, & Mayberry, 2006; Norbury, 2005). For example, Farrar et al. (2009) studied the relationship between language and ToM in a group of 34 children with SLI (average age = 56 months), using a battery of assessments that included receptive vocabulary, sentential complements, grammar, and ToM, including tasks other than false belief. As expected, there was a relationship between overall language and ToM, with vocabulary and general grammatical development as the best predictors of ToM ability. However, sentential complements did not uniquely contribute to ToM. When two subgroups of children with mild and moderate language impairment were compared, there was a significant difference in ToM performance, with children who had a mild language impairment performing twice as high on ToM as children with a moderate language impairment.

Similarly, Andres-Roqueta, Adrian, Clemente, and Katsos (2013) investigated several aspects of language and their relationship to ToM in children with SLI. They compared both age- and language-matched children (average ages 5.4 and 4.4 years, respectively) with and without SLI on a series of ToM and language measures (i.e., grammar, vocabulary, semantic-pragmatics). As predicted, children with SLI performed similarly to the language-matched group and performed worse than the age-matched group on measures of language and ToM. Moreover, grammar was the best predictor of ToM performance. To examine the long-term effects of this delay, Botting and Conti-Ramsden (2008) studied 16 adolescents with a history of SLI. At the time of testing, the adolescents no longer met the criteria for having an SLI. The researchers found that, nevertheless, they performed lower than their typically developing peers on both measures of social cognition and language. These findings suggest that those with earlier impaired language can continue to show delays in social cognition into adolescence despite closing gaps in other areas.

In contrast, a study by Miller (2001) provides mixed evidence for ToM delays in children with SLI. Miller compared children with SLI (59 months of age) with age- and language-matched typically developing groups (60 months of age and 44 months of age, respectively) on measures of language, sentential complements, and false-belief conditions that ranged from low to high in linguistic demands. For example, children were asked simpler questions such as "where will the puppet look for the toy?" and more complex questions such as "what does the puppet think we're pretending the block is?" The results showed that the language-matched group did not benefit from lower linguistic demands and performed poorly across all tasks; however, children with SLI performed similarly to their age-matched typically developing peers in the less linguistically demanding condition but performed worse in the more linguistically demanding condition. After controlling for chronological age, only sentential complements predicted ToM. This suggests that language-matched children, who are younger than the typical age when false-belief tasks are passed (4–5 years old), are still incapable of passing ToM even when task demands are

lowered. Children with SLI, at an older age, may have emerging ToM that is more easily tapped by tasks that require less language processing.

It is important to consider that children with SLI are very diverse and heterogeneous, which presents a range of limitations. Schwartz (2008) describes theories of SLI as broadly fitting into two main categories; those that view SLI as a result of deficits in linguistic knowledge and those that describe SLI in terms of domain-general or domain-specific cognitive and cognitive–linguistic processes. Much of the ToM research with children with SLI has framed the issues as a language issue, but it could be that there are relationships between other challenges experienced by some SLI children such as those in the social–pragmatic domain.

CONVERSATIONAL FACTORS AND ToM

During social interaction, children have the opportunity to engage with others in ways they could not generate on their own (Gauvain & Perez, 2007). According to this viewpoint, these experiences can lead to changes in the way children think. For example, the way children converse and play with their siblings is different than with their parents. In light of these interesting differences, researchers have investigated whether certain interactions are predictive of children's ToM development. In this section, we discuss two main family-related environmental factors that may influence a child's sociocognitive development: (1) conversational discourse with parents and siblings and (2) SES. We also discuss the results of ToM training studies and the potential for scaffolding ToM in at-risk children.

Conversational discourse: Parental input

Considerable research has demonstrated the important role of conversational input and its relationship with ToM in typically developing children (Dunn, Brown, & Beardsall, 1991; Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003; Meins et al., 2002; Ruffman, Slade, & Crowe, 2002; Youngblade & Dunn, 1995). The amount of mental-state talk that mothers use with their young toddlers has a strong relationship with their children's ToM skills. For example, Ruffman et al. (2002) investigated mothers and children's use of mental-state language and ToM three times over 1 year. Mothers' mental-state utterances at Time 1 and 2 predicted their children's success on ToM tasks at Time 3. This finding has been replicated numerous times (de Rosnay & Hughes, 2006; Jenkins et al., 2003; Symons, Fossum, & Collins, 2006), including within longitudinal studies (Laranjo, Bernier, Meins, & Carlson, 2010).

Meins et al. (2002) referred to this maternal input as mind-mindedness; that is, treating the infant or child as an individual who has his or her own mind and can make intentional causal decisions. Meins and colleagues observed mothers and children during free play when the infants were 6 months old. They coded the mother's mental-state language as either appropriate or not appropriate, considering the child's observed mental state. When they measured the child's ToM scores at 48 months, they found that they were correlated with the mother's use of appropriate mental-state references at 6 months. This suggested that maternal input, even at a preverbal stage, played an important role in the development of ToM.

It is plausible that, rather than the mother's conversations influencing the child, the child's topics of interest may dictate the types of conversations that occur. For example, some children may want to talk about the Princesses' feelings when playing pretend, while others may want to talk about cars. Meins et al. (2002) had addressed this possibility by conducting their study with preverbal infants to control for conversational input. Taking a different approach, Ruffman et al. (2002) statistically controlled for children's input, language ability, their earlier ToM understanding (mostly false belief), age, and mothers' education. Similar to the conclusions by Meins et al., Ruffman et al. concluded that it is not the conversations initiated by the child

that drive maternal discourse; rather, it is the input coming from the mother that is important. The child's earlier ToM understanding and use of mental-state terms had almost no relationship with the mother's later use of mental-state terms.

Almost all studies investigating mental-state use in parent–child dyads have looked at mothers, not fathers. There is some indication that fathers and mothers may differ in their use of mental-state talk. Jenkins et al. (2003) observed mother–child dyads and mother–father–child triads. They found that mothers used more mental-state words during dyadic observed free play than fathers. They speculated that differences were related to the frequency with which fathers focus on rough and tumble play and organized games compared with mothers, with mothers being more involved traditionally in caretaking and comfort activities. These results should be interpreted with caution, however, because the authors did not observe father–child dyads separately; therefore, the presence of both parents in the mother–father–child triads may have influenced the findings, rather than the gender of the parent.

Studies including DHH children supplement research findings with hearing children that indicate the importance of conversations about mental states for ToM development. Hearing loss can limit a child's ability to overhear family discussions and to share thoughts and feelings, especially if the communication used at home is not consistent with the child's primary means of communication (Peterson & Siegal, 1995). Even children who are hard-of-hearing or have a cochlear implant miss a great deal of conversation due to the effects of noise, distance, and not always being able to see a speaker's face. DHH children are at risk for less exposure to language, reduced opportunities for language-rich social play experiences with siblings, and limited access to eavesdrop on other's conversations that might involve a misunderstanding (Moeller & Schick, 2006; Peterson & Siegal, 1995, 1999). While DHH parents who have DHH children can fluently engage in discussion about mental states using sign language, hearing parents who have DHH children are challenged to converse fluently in sign language, limiting the conversational experience (Lederberg & Everhart, 2000).

Moeller and Schick (2006) found that hearing mothers of DHH children (4–10 years of age) who use sign language talk less about mental states than mothers of hearing children (4–6 years of age) even though there were no differences in the amount of overall talk between the two groups. In addition, mothers who had better sign language skills had children with more mature ToM skills. More recently, Morgan et al. (2014) studied Swedish and UK mothers of hearing infants and children and compared them with mothers of DHH infants and children (17–35 months of age) who used mostly spoken communication, and some mothers used some sign language. All the DHH children had access to sound with either cochlear implants or hearing aids. They found that hearing mothers of DHH children used less mental state language and had lower conversational quality, examined by turn-taking between speakers, compared with mothers of hearing children. Even mothers who used only spoken communication used significantly fewer mental-state words and cognitive references than mothers of hearing children. Apparently, it is not just the mother's ability in sign language that is affecting mental-state talk, but something related to having a child with a hearing loss. It should be noted that the DHH group and the hearing group were not compared in terms of language skills, and the mothers might have also been responding to their perception of the child's language skills.

Children with SLI offer an additional perspective in that they might receive similar conversational input as their typically developing peers without hearing loss, even though they experience language delays. In one study, Farrant, Maybery, and Fletcher (2012) investigated mothers of typically developing children and children with SLI who were matched on age (average age 62 months). Mothers read 12 vignettes with four possible responses that

she might make to a 4-year-old child. They ranked the vignettes in terms of which represented their most preferred to least preferred responses. At the child level, typically developing children performed better on the ToM scale and sentential complements than children with SLI. At the parent level, overall maternal input did not differ between the two groups. When adding sentential complements as a covariate, the significant group difference in ToM performance disappeared, suggesting that memory of complement structure is an important predictor of a child's ToM ability in children with SLI. Although the study did not look at actual maternal use of mental-state language, it provides some support that input is not different for those with SLI versus typically developing children. This is an interesting finding regarding the relative effects of internal versus external factors, but clearly there is room for more research related to input and children with SLI related to ToM.

Conversational discourse: Siblings and peers

Siblings provide a unique learning relationship for children in that various types of behaviors and emotions are shared that are related to ToM development, such as pretend play, affection, trickery, anger, conflict, and hostility (Dunn, Slomkowski, & Beardsall, 1994). Interactions with older siblings may provide the child with the benefits of a more skilled conversational partner, and the child may benefit from observing older siblings interacting with others, especially caregivers. Experiencing these opportunities with a familiar and close partner seems to foster several areas of cognitive development, especially ToM. Perner, Ruffman, and Leekam (1994) found that the number of siblings in a family was positively correlated to a child's false-belief understanding. Many studies followed supporting earlier claims by Perner et al. (1994) that ToM is "contagious" (Brown, Donelan-McCall, & Dunn, 1996; Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996; for counterevidence see Cutting & Dunn, 1999). In addition, these studies helped refine the understanding of this relationship in that it is older siblings, not younger ones, who seem to be important for sociocognitive development (Ruffman, Perner, Naito, Parkin, & Clements, 1998). It is possible that older siblings provide more mature input related to mental states such as persuasion, coercion, trickery, and misunderstandings.

Part of the benefit of having a sibling may be in the types of interactions afforded by siblings compared with mother and child interactions. For example, Youngblade and Dunn (1995) investigated pretend play behaviors and the interactions between children, mothers, and siblings. Their results suggested that children engage in more pretend play with their siblings than with their mothers, and that child-sibling discourse during play was related to child role enactment and role-play. Furthermore, child-sibling discourse, especially talk about feelings, predicted pretend play behaviors. More recently, Hughes, Lecce, and Wilson (2007) found that there was a higher frequency of mental state talk about emotions and desires between siblings than between friends. In addition, conversations between child and sibling predicted ToM performance. Similarly, child-sibling dyads who worked at establishing shared meaning during play used more mental state language than those who disrupted the flow of play (Howe, Petrakos, Rinaldi, & LeFebvre, 2005).

Socioeconomic status

Socioeconomic status has been shown to be related to language development in typically developing children. Children from lower SES homes show lower levels of oral language skills, including vocabulary and language comprehension and production (Bornstein & Bradley, 2003; Bradley & Crowyn, 2002; Fernald, Marchman, & Weisleder, 2012; Hart & Risley, 1995; Hoff, 2003, 2006; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010). Socioeconomic status also has been associated with differences in the amount and richness of maternal talk to children (Laranjo & Bernier, 2012) and to have a

strong relationship to a child's ToM. That is, children growing up in low SES families perform worse on ToM tasks than children who grow up in working-class or high SES families (Cole & Mitchell, 1998; Cutting & Dunn, 1999; Weimer & Guajardo, 2005). For example, Cole and Mitchell (1998) tested 57 children aged between 4 and 5 years on false-belief tasks. In addition, parents completed a measure of SES related to their highest level of education. Results showed SES to be a significant predictor of ToM. Families of professional status who are more educated typically have children who perform better on ToM tasks.

Children enrolled in Head Start programs provide further evidence for the role of SES in ToM development (Weimer & Guajardo, 2005). Head Start is a federally funded early childhood program, which is free of cost to low-income families. It is aimed at providing educational experiences to children in families with low SES to help them succeed academically. Weimer and Guajardo studied two groups of children: those enrolled in a Head Start program and those in non–Head Start programs. Parents of the Head Start children had significantly lower incomes and lower educational levels and were younger than parents of the non–Head Start peers. The researchers found that Head Start children performed significantly worse on false-belief tasks than non–Head Start children, after controlling for age and language comprehension. In contrast, Lucariello, Durand, and Yarnell (2007) found no difference in ToM in their investigation of 5- and 6-year-old children from low- and middle-SES families; however, as Lucariello et al. pointed out, their study included a broad range of ToM tasks, not just false belief. They speculated that the SES gap might be different for various aspects of ToM, which would have interesting implications for intervention, in that relative areas of strength in ToM could be used to scaffold other ToM skills. In addition, the children in the Lucariello et al. study were 4 and 5 years of age, who are older than children in most studies of SES and ToM, and the age at which most children pass ToM tasks. This would indicate that while low SES children may have slight delays in ToM, these delays do not persist. Lucariello et al. did not specify how long the children had been in Head Start, and it is possible that the program helped remediate those differences. Clearly, more research is needed regarding ToM and SES, but current evidence indicates that children from low SES backgrounds are at risk for sociocognitive development.

The quantity and quality of research on maternal input, the child's language skills, and ToM development in children from low SES homes are particularly meager. Fifteen years ago, Cutting and Dunn (1999) called for more research on the mechanisms in how SES affects children's understanding of thoughts and beliefs. They hypothesized then that there could be a variety of factors involved, such as how the parents interact and talk with the child, the kinds of activities the child engages in, as well as the potential effect of parenting styles. They hypothesized further that it might be a combination of these environmental factors that contributed to the differences in rates of development. Such questions remain to be addressed.

CLINICAL IMPLICATIONS AND INTERVENTION

Several training and intervention studies provide evidence that aspects of ToM can be encouraged through conversational scaffolding, suggesting that interventions can be developed for at-risk children (Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003; Wellman & Peterson, 2013). Research shows, for example, that mothers can be trained to talk more elaborately about past events with their children. Taumoepeau and Reese (2013) trained mothers of 19-month-old typically developing children how to use elaborative talk about past events. They speculated that such talk would allow children to reflect on mental states and events (as would be necessary to pass false-belief tasks) as well as to participate in perspective-sharing

discussions. The results showed that mothers who received the training used more elaborative language than a control group. In addition, children with lower language skills benefited from mothers' elaborative talk and performed better on ToM tasks at the end of training; however, this effect was not found for children with higher language skills.

Other training studies have taught children directly to understand aspects of ToM and to learn language used to represent ToM, with positive results. In one study (Hale & Tager-Flusberg, 2003), children were randomly assigned to one of three groups, who received (1) discussion of false-belief events, (2) training on sentential complements, or (3) training on relative clauses. The findings showed that children in both the false belief and sentential complement training groups improved their ToM (see also Allen & Kinsey, 2013; Benson, Sabbagh, Carlson, & Zelazo, 2012; Lohmann & Tomasello, 2003). This finding supported the concept that it is both conversations about the mind and grammar that facilitate ToM development.

A training study conducted with DHH children (7–13 years of age) focused on using thought bubbles to understand representational mental states and allowed children to compare mental states in different individuals (Wellman & Peterson, 2013). The results showed that the training group improved false-belief scores and performance on the ToM scale, as compared with two different control groups. Although there are few studies on training of ToM with DHH children, and none that we could find on children with SLI, the limited evidence looks promising enough to support the need for further research with these populations.

Clinicians who work with at-risk preschool-aged children can assess a child's ToM abilities relatively easily using the scale provided by Wellman and Liu (2004). The research described previously supports the inclusion of ToM events into intervention and directly talking about contrasting feelings and beliefs. Taken together, these training studies show that clinicians may be able to scaffold ToM by implementing tasks that involve mental state talk and vocabulary related to ToM, using a conversational approach. Furthermore, engaging in joint storybook reading using stories that require knowledge of false belief (e.g., *Little Red Riding Hood* or *Stone Soup*) may help expose children to dual mental representations. Preschool books include many references to beliefs and emotions (Dyer, Shatz, & Wellman, 2000; see also Westby & Robinson, 2014, in this issue). In addition, sharing these books and elaborative storytelling techniques with parents could allow these conversations to occur more frequently.

CONCLUSIONS

Research with both typical and developmentally different populations supports the conclusions that the development of ToM and language are inextricably linked and are influenced by child and environmental factors. Astington and Baird (2005) concluded that it is impossible yet to answer the question of whether there is a single factor underlying the relationship of ToM and language or whether they are two unique factors, the social environment that provides essential input and the child's own cognitive and language resources that make use of the input.

As this review shows, we know that a child's language skills are related to ToM development, especially complex syntax and vocabulary, and that this observation holds both for children who are developing typically and for DHH children and children with SLI. Furthermore, we know there are several environmental factors that help shape a child's developing ToM. These include the quality of maternal conversational discourse and the extent to which mothers talk about feelings and beliefs, both of which appear to play a central role in ToM development.

The evidence suggests that for both DHH children and children with SLI, mothers tend to engage in less conversation about mental states. Furthermore, the presence of older siblings appears to contribute to a child's ToM, suggesting that the social interactions and

conversations provided by older siblings can help scaffold development. This may have implications for placing children in educational settings where they can learn from older children or from children of the same age without additional language-learning challenges. Finally, typically developing children from low SES families may be at risk for delayed ToM, possibly because of the link between the nature of maternal input and SES, although more research is needed to understand the essence of this relationship.

The few training studies that exist have yielded positive results that support the need for further research. Such preliminary efforts offer encouragement for teachers and clinicians to include ToM in both their direct and family intervention services. Limited research on parents suggests that they can be taught to provide richer conversation about the mind. Research shows that DHH children can continue to develop skills across the range of ToM understanding into adolescence. The fact that ToM follows a developmental sequence beginning in early childhood, even in infancy, means that clinicians should not wait until they have established that children do not understand false belief. Rather, intervention can begin on foundational ToM skills that can promote later false belief and more advanced ToM concepts. The evidence that DHH children continue to develop ToM skills through adolescence and adulthood would indicate that service providers need to expand our concept of intervention being limited to early childhood and into the adolescent years. Investigators need to continue to research and develop interventions that reduce ToM delays in all children at risk for language delays.

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