A Longitudinal Investigation of the Dynamics of Mental State Talk in Families

Jennifer M. Jenkins, Sheri L. Turrell, Yuiko Kogushi, Susan Lollis, and Hildy S. Ross

Thirty-seven mothers and fathers were observed in their homes interacting with their 2- and 4-year-old-children at Time 1 and 2 years later. Parental mental state talk to children varied as a function of children’s age, the context in which talk occurred, and the gender of the parent. Four-year-old children, with an older sibling, produced and heard more cognitive talk and less desire talk than children without an older sibling. Cognitive and feeling talk by family members at Time 1 predicted change in younger children’s cognitive and feeling talk (respectively) 2 years later, after controlling for initial levels of younger children’s talk and general language ability. Findings are discussed in the context of theory of mind understanding and family talk about the mind.

Developmental changes in children’s talk about the mind have become a topic of interest for investigators over recent years. Being able to talk about beliefs, desires, and feelings is central to our ability to understand and interpret the behavior of others (Churchland, 1988; Wellman, 1990). For some, this ability to analyze action in terms of mental states is seen as one of the most crucial transitions in development (Ainston, 1993; Wellman, 1990). The term ‘theory of mind’ is sometimes used to mean, with a high degree of specificity, the point of transition around 4 years of age when children can pass false belief tasks. It has also been used more broadly to refer to the capacities such as talk of mental states, understanding emotions, teasing, and so on that predate children’s ability to pass false belief tasks but suggest a growing sophistication in children’s understanding of mind. We use the concept of theory of mind to denote the broader version of the concept.

Talk about the mind begins in the second year. The family context has been shown to be important in the emergence of such talk. For instance, Ruffman, Slade, and Crowe (2002) found that maternal mental state talk to children predicted a change in children’s mental state talk 12 months later. The aim of this study was to examine the ways the family context affects the development of children’s talk about the mind. First, we examined factors associated with children’s exposure to talk within the family. Second, we examined the causal role of exposure to different types of mental state talk within the family in the development of children’s own mental state talk.

A social-constructivist perspective on talk about the mind argues for the importance of socialization influences, such as the family, in the child’s language-learning environment. From this vantage point children are inducted into talk about the mind. Through exposure to talk in which some concepts have greater salience than others, children internalize the concepts and words of importance to that community. Using the talk of those around them allows them to join the community discourse (Nelson, in press).

Three types of mental state talk were investigated in this study: desire, feeling, and cognitive. Desire terms have been found in children’s speech before cognitive terms and are the most frequent type of mental state talk until the third year (Bartsch & Wellman, 1995; Moore, Furrow, Chiasson, & Patriquin, 1994). Feeling talk has been found to increase markedly between the second and third years (Dunn, Bretherton, & Munn, 1987). Cognitive talk appears in children’s vocabulary toward the middle of the third year (Hughes & Dunn, 1999; Shatz, Wellman, & Silber, 1983) and continues to increase in frequency until children reach at least 5 years of age (Bartsch & Wellman, 1995; Hughes & Dunn, 1999). Cognitive talk, which involves talk about beliefs and thoughts, is considered the most advanced form of mental state talk in children as it is the type of mental state talk that is truly representational (Bartsch & Wellman, 1995). Children’s cognitive talk has been found to be associated with their performance on false belief tasks (Hughes & Dunn, 1999). This
suggests that children’s growing capacity to understand the role of thought in action is indexed by talk about cognitive states.

Family Factors Associated With Children’s Exposure to Mental State Talk

Why are some children exposed to more talk about mental states than other children? Children’s age has been the most widely investigated factor in children’s exposure to talk about mental states. Parents use more cognitive talk and less desire talk as children get older (Brown & Dunn, 1991; Furrow, Moore, Davidge, & Chiasson, 1992; Moore et al., 1994). In this study we expected to see increases in parental and sibling cognitive talk and decreases in desire talk as children matured.

Parent and child gender were investigated as factors that may influence children’s exposure to mental state talk. Mothers have been found to talk to their children more than fathers, to use both more supportive and more negative speech, to use less directive and informing speech (Leaper, Anderson, & Sanders, 1998), and to talk more about emotions than fathers (Kuebli, Butler, & Fivush, 1995). These findings led us to expect mothers more than fathers to talk to their children about mental states. With respect to children’s gender, mothers have been found to use more emotion talk with daughters than with sons (Cervantes & Callanan, 1998; Dunn et al., 1987; Fivush, Brotman, Buckner, & Goodman, 2000). Gender effects on exposure to mental state talk were investigated in this data set.

Previous studies investigating mental state talk in families have mainly examined parental talk in the context of one parent interacting with children. There is evidence to suggest that parent–child interaction is greater in this context than when both parents are present with their children (Belsky, 1979; Clarke-Stewart, 1978; Lollis, Ross, & Leroux, 1996). We examined the effect of interactional context (one parent alone or both parents together) in this study and expected more mental state talk when one parent was alone with children than when both parents were together.

Finally, sibling position was hypothesized as a central factor in children’s exposure to talk. As many others have noted, first- and second-born children are born into different circumstances (Dunn, Creps, & Brown, 1996; Howes, 1992). The implications of this may be particularly interesting with respect to exposure to talk about other minds and children’s own talk about other minds. Two observations are relevant. The first is that children of about 4 years of age have been found to engage in more mental state talk with their siblings than with their parents (Brown, Donelan-McCall, & Dunn, 1996). Sibling activities including pretend play may offer a rich learning context for mental state talk (Howe, Petrakos, & Rinaldi, 1998). The second observation is that in some studies (Jenkins & Astington, 1996; Lewis, Freeman, Kyriakidou, Maridaki-Kassatakis, & Berridge, 1996; Perner, Ruffman, & Leekam, 1994; Ruffman, Perner, Naito, Parkin, & Clements, 1998), but not all (Cole & Mitchell, 2000; Cutting & Dunn, 1999), the presence of siblings in the home has been found to be associated with increased theory of mind understanding. More specifically, children with an older sibling show higher mean scores on false belief tasks than do children without an older sibling (Ruffman et al., 1998). Given that false belief understanding and the frequency of cognitive talk have been shown to be correlated (Hughes & Dunn, 1999), we were interested in whether exposure to talk was different for first- and second-born children and whether children with an older sibling would be advantaged in their cognitive talk in the same way that they are advantaged in their false belief understanding.

Testing Causal Models of Family Exposure to Mental State Talk in the Development of Children’s Mental State Talk

The second goal of this study was to examine the causal role of exposure to different types of mental state talk by family members in the development of children’s mental state talk. Nelson (in press) has argued that language of the mind is acquired as children engage in conversation with other family members. Initially, children use terms in restricted conversational contexts that they have heard other family members use. As children hear family members using these terms in more generalized contexts they build up an inferential understanding of the terms (Levy & Nelson, 1994). Frequency of exposure to mental state talk in families should, therefore, provide increased learning opportunities and in turn should promote increased use.

We expected specificity in the relationships between types of mental state talk in families. Ruffman et al. (2002) summed all types of mental state talk into one measure and found that this predicted a change in children’s mental state talk over time. We extended the Ruffman et al. study by examining whether it was exposure to a specific type of mental state talk in families that encouraged the development of that type of talk. The finding that
different types of mental state talk are directed to and used by children of different ages raises the possibility that it is only a certain type of family members’ mental state talk that encourages the development of that type of child mental state talk. We expected that exposure to cognitive talk was important for the development of cognitive talk. Specificity hypotheses were also tested for feeling important for the development of cognitive talk. This study involved 9 hr of observation at two periods.

Method

Participants

Forty families participated in the first wave of the study and were recruited based on birth announcements in the local newspaper. Families were observed in two contexts: when mothers were on their own with children (mother-only sessions) and when both parents were present with children (mother-father sessions). At Time 2, there were no mother-father sessions for 3 families, as 1 family had moved away and 2 others were in the process of divorce or separation, resulting in usable data for 37 families. Families were Caucasian, lived in a medium-sized industrial city in southwestern Ontario, Canada, and consisted of two parents and two children. The data were originally collected to examine how parents intervened in their children’s conflicts to socialize rules and standards for interpersonal behavior (Ross, Filyer, Lollis, Perlman, & Martin, 1994). In the initial interview, parents were told that investigators were interested in observing the relationship between their two children, as well as in how children learn family rules and expectations for interpersonal behavior in two common family contexts (when mothers are alone with their children and when both parents are together with their children). The children were told that the observers were coming into their homes and would watch how they played together. They were asked not to interact with the observer.

At Time 1, the older children were between 3.6 and 4.9 years of age ($M = 4.4, SD = .42$) and the younger children were between 3.8 and 4.4 years ($M = 4.2, SD = .21$). The gender of older and younger children in the original sample of 40 was balanced for an equal number of all possible brother-sister combinations. All fathers were employed outside the home on a full-time basis, and 29 mothers were employed outside the home on a full- or part-time basis. Fathers or other family members generally cared for the children in the mothers’ absence. Parents’ educational backgrounds varied widely in the sample: 29% had completed a university degree, 15% had completed a college program, 41% had completed high school, and 15% had not graduated from high school. At Time 1, parents’
ages ranged between 23 and 48 years ($M = 31.1$, $SD = 3.3$ for mothers; $M = 33.1$, $SD = 5.1$ for fathers).

**Procedure**

Data were collected during six 90-min observational sessions in the homes of the participants at each of the two periods with an equal division of mother-only and mother-father sessions. Data collection was incomplete for 4 families. Data for these families were based on between 4 and 7.5 hr of observation and the reasons for incomplete data included child refusal, equipment failure, and parental separation. Raw data have been prorated.

During the sessions, an observer followed the children and dictated onto one track of a stereo audiotape a descriptive account of all interactions between the children and of all parental behaviors that related to the children's interaction. On the second track of the tape, a recording was made of the speech that occurred in the home. Observers did not participate in family interaction and responded as little as possible to comments of family members. For observations to proceed the children had to be in the same room and parents had to be either in the same or an adjacent room, although in both cases allowances were made for brief absences of up to 2 min. Televisions, video games, or other major distractions were not allowed. Whenever these requirements were not met, observers stopped recording and either waited until the participants complied with these provisions or arranged to observe again at a time that was more convenient for the families. Children spent more of their time engaged with one another than with either parent. Parents went about their normal activities such as food preparation, laundry, clean-up, and monitoring their children's activities. Parental behavior and speech were coded only when the parents were interacting with the children. Their interactions with children involved playing games with the children, discussion and intervention in conflict (Lollis et al., 1996; Ross et al., 1994). To maintain stability and rapport, two observers were assigned to each family. To limit the intrusiveness of the observations, only one observer was present during each observation session. These procedures were repeated 2 years later. The content of the speech that family members directed to one another and a description of each person's actions were accounted for in coding the transcripts.

**Coding Talk**

Talk about the mind and particularly talk about cognitive states has been assessed in different ways according to the goals of the study. Some investigators exclude conversational uses of cognitive verbs such as *know what*, as such speech is ambiguous as to whether children are really talking about the mind or merely using these words to mean "pay attention to this" (Shatz et al., 1983). Others have made the argument that even though such uses are ambiguous they should be coded because one cannot be sure that children are not referring to a cognitive state, particularly in older preschool children (Brown et al., 1996). In one study in which both genuine references to cognitive states and more ambiguous references to cognitive states were coded separately, the more ambiguous measure predicted false belief understanding (the marker for children having a representational understanding of mind). Genuine references to cognitive states were not found to add anything to the prediction of false belief understanding beyond that achieved by the more ambiguous measure (Hughes & Dunn, 1999). Some code contrastives in natural language data on the grounds that contrastives offer the best indication of children's representational understanding of belief (Bartsch & Wellman, 1995). Contrastives indicate an understanding of a difference or discrepancy between some mental state and reality, but these are almost nonexistent in the speech of children under 3 years old (Bartsch & Wellman, 1995; Shatz et al., 1983) and are rare subsequently. The goals of this study necessitated a coding scheme appropriate to both adult talk and child talk, one that was quick to use given that we were coding 9 hr of observation in 37 families, and one for which we would have at least some range on our variables even in our youngest subjects. These considerations led us to a more inclusive coding of cognitive talk, without specific reference to contrastives. Pragmatics of talk were not coded because of resource limitations.

**Type of mental state talk.** Mental state talk was divided into three categories: cognitive, desire, and feeling talk. Cognitive talk included terms used to denote the thoughts, memories, or knowledge of the speaker, listener, or a third person. The terms included in this category were the terms *think, know, believe, wonder, remember, forget, guess, pretend, understand, and expect*, and all variations. Shatz et al. (1983) found these to be the most common cognitive state terms uttered by young children, and these terms have been included as examples of cognitive talk by later researchers (Bartsch & Wellman, 1995; Hughes & Dunn, 1999; Moore et al., 1994). Consistent with Shatz et al., we included *know what* if it was used to direct an interaction by introducing information (e.g., "Know what, I have a ...") and references
to *I know* and *I don’t know* if a descriptive statement is made implicitly, not only explicitly, such as “the big snake is dangerous,” “I know.” Consistent with Bartsch and Wellman (1995), *I know* and *I don’t know* were included if they were linked with a description of knowledge or ignorance. Consistent with Perner (1991), we included *know* as it refers to an ability (e.g., “I know how to tie my shoes”) or to facts (e.g., “I know my socks are in the drawer”).

Instances of cognitive state terms that were excluded were unclear meanings of a term or sentence fragment, repetitions of own or others’ utterance, and terms used in direct response to a question (e.g., “Where do you think the sock is?” “I think the sock is in the drawer”) and “I know Bob” if it can be paraphrased to mean “I met Bob” (Bartsch & Wellman, 1995; Shatz et al., 1983).

Desire terms included *want, hope, wish,* and *care,* and all variations of these terms used to capture children’s desires or goals (Bartsch & Wellman, 1995; Shatz et al., 1983). Specifically, *want* was included as a reference to a goal directed behavior (e.g., “I want to sit down”), *hope* as a reference to a wish or want (e.g., “I hope Santa comes soon”), and *care* as a reference to a preference or lack of preference (e.g., “I don’t care which crayon I use”). Unclear meanings of a term or sentence fragment and repetitions of own or others’ utterances were excluded, as were idiomatic phrases such as *taking care* or *wish upon a star.*

Feeling terms included those that referred to an emotional state. Consistent with previous coding criteria, we included all variations of *sad, hurt, angry, happy, excited, love, dislike, afraid, enjoy, fun, glad, mad, scared, upset, surprise,* and *fear* (Dunn et al., 1987). In addition, *disgust* was included, consistent with Dunn, Brown, and Beardsall (1991). The term *like* was included when it referred to a state of enjoyment or dislike, and *good* was included only if it denoted a feeling state (Dunn et al., 1987). Phrases that connote a feeling state were also included, such as *make a fuss* (Dunn et al., 1987). Excluded feeling terms consisted of nonverbal expressions (e.g., crying or laughing), specific and nonspecific expletives (e.g., “yuck”), *like* when it indicated volition, and *good* when used in a moral sense (Dunn, Brown, & Beardsall, 1991).

Coders were blind to the gender of parents and of children. If a child indicated gender when referring to their sibling (e.g., he, she), the reference was replaced in the transcript by a code for sibling, with no indication of gender. Inter-rater reliability was calculated for the type of mental state talk, by two raters coding 15% families. All transcripts, including
primary outcome measure took account of the overall amount of participants' talk.

The original transcripts were divided into conversational turns, which were defined as all of one speaker’s utterances bounded by the utterances of another speaker (Shatz & Gelman, 1973). A conversation turn may have contained more than one mental state term. We created an index of mental state talk by dividing the number of cognitive state terms by the number of conversation turns. This process was repeated for desire and feeling terms and for each family member. Scores for all family members were positively skewed and square root transformation was applied. Untransformed scores are given in the tables. Two fathers at Time 1 did not speak during the sessions; cognitive, desire, and feeling talk scores were coded as 0 for these fathers. One family was an outlier for conversation turns at Time 2; analyses were performed with and without these families in the analysis and there was no substantive difference in results. Accordingly, we retained them for all analyses.

Results

During sessions children were usually engaged in play with one another. Activities included drawing, eating and drinking, playing games, playing with toys, and so on. During such activities talk involved asking for an object, asking for clarification, reciting the rules of a game, parents giving directives, and so on. During these kinds of everyday activities the rate of mental state talk was found to be low, as others have found (Bartsch & Wellman, 1995; Dunn, Brown, & Beardsall 1991). Rates of talk per hour are shown separately for mother-father sessions and for mother-only sessions and can be found in Table 1. It is possible to determine the total number of mental state terms on which the analyses are based by multiplying the rate for each person and within each type of session (e.g. .92 for mothers in mother-only sessions at Time 1) by the number of families (N = 37) and the hours of observation (4.5). Thus, mothers used 153 cognitive terms in mother-only sessions and 83 cognitive terms in mother-father sessions at Time 1. The total number of cognitive terms used at Time 1 across all family members and both family contexts was 756 (older siblings, n = 420; fathers, n = 37; mothers, n = 236; younger siblings, n = 63). It is possible to see that desire terms were more common than cognitive terms and feeling terms were less common. It is evident that even though rates of mental state talk were low during naturalistic observation, particularly at Time 1, the 9 hr of observation resulted in a large corpus of terms. Families differed markedly in the amount of talk in general and in the amount of mental state talk in which they engaged. For instance, the range for mother cognitive talk at Time 1 during mother-only sessions was from 0 to 2.89 cognitive terms per hour, whereas the range for older siblings was from 0 to 5.56 cognitive terms per hour. It is these marked individual differences across families that provide both the opportunity and interest to explore whether such talk relates to the development of children’s own talk over time. All subsequent analyses are based on the index of mental state talk.

Before considering factors related to exposure to talk, patterns in children’s talk are presented to provide a backdrop against which to understand parental talk to children as a function of children’s age. A repeated-measures ANOVA with context (mother-only vs. mother-father sessions), sibling position (younger vs. older), time (two levels), and type of speech (three levels) as within-participant factors was performed. Older and younger chi-

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<th>Table 1</th>
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<tr>
<td>Means and Standard Errors (in Parentheses) of Rates per Hour of Mental State Talk and Conversation Turns at Time 1 and Time 2 for Mothers, Fathers, Younger Siblings and Older Siblings</td>
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<td></td>
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<tr>
<td><strong>Mother MO</strong> session</td>
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<tr>
<td>Conversational turns (T1)</td>
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<tr>
<td>Cognitive (T1)</td>
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<td>Desire (T1)</td>
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<tr>
<td>Feeling (T1)</td>
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<tr>
<td>Conversational turns (T2)</td>
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<tr>
<td>Cognitive (T2)</td>
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<tr>
<td>Desire (T2)</td>
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<td>Feeling (T2)</td>
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</table>

*Note. YS = younger sibling; OS = older sibling; MO = mother-only sessions; MF = mother-father sessions; T1 = Time 1; T2 = Time 2.*
Children’s genders were included in preliminary analyses as between-participant factors to test the hypotheses that girls use more mental state talk than boys and particularly emotion talk. Neither older nor younger children’s gender was found to be significant as a main effect or in interaction with type of talk, although effects were in the hypothesized direction. Consequently, gender was dropped from the analysis.

The means and standard errors for younger and older children’s mental state talk can be found in Table 2. An alpha level of .05 is used throughout the Results section and exact probabilities are quoted except when alpha levels are smaller than \( p < .001 \). Sibling position was found to be significant, \( F(1, 36) = 33.6, p < .001 \), with older children using more mental state talk than younger children. Type of speech was significant, \( F(2, 35) = 159.06, p < .001 \), with children talking most about desires, followed by cognitions, then feelings. Time was significant, \( F(1, 36) = 29.87, p < .001 \), with children using more mental state talk at Time 2 than at Time 1. The interaction between sibling position and time was significant, with younger children changing more over time in their mental state talk than older children, \( F(1, 36) = 60.44, p < .001 \). There was a significant interaction between time and type of speech, \( F(2, 35) = 60.11, p < .001 \). A doubly multivariate ANOVA was used as a post hoc test to determine which type(s) of speech changed over time, and univariate tests for cognitive, desire, and feeling talk are quoted. Cognitive talk increased significantly over time, \( F(1, 36) = 169.88, p < .001 \). Feeling talk increased slightly, \( F(1, 36) = 4.44, p = .04 \), and desire talk decreased, \( F(1, 36) = 5.41, p = .03 \) between Time 1 and Time 2. By Time 2, cognitive talk was occurring almost as frequently as desire talk. There are two things to note about this pattern of findings. At Time 2 there is little difference between older and younger children in their cognitive talk (see Table 2) even though there are 2 years of difference in age. This is true even though 6-year-old children for whom we had data at 4 years of age (i.e., only older children) showed a marked change in their cognitive talk between 4 and 6 years of age (shown by the Time \times Type interaction with the absence of a three-way interaction between time, type, and sibling position). This issue is discussed at more length later, when sibling position is not confounded with age.

For descriptive purposes the percentage of mental state talk that was cognitive for younger and older children was derived by summing all cognitive, feeling, and desire talk together into a score of total mental state talk. At Time 1, the percentage of mental state talk that was cognitive talk was 8% for younger children and 20% for older children. At Time 2, the percentage of mental state talk that was cognitive talk was 38% for younger children and 41% for older children.

### Family Factors Associated With Children’s Exposure to Mental State Talk

A repeated-measures ANOVA with context (mother-only sessions vs. mother-father sessions), sibling position (two levels), time (two levels), and type of speech (three levels) as within-participant factors was performed with maternal talk as the outcome variable. As fathers were not observed interacting on their own with their children, effects of paternal gender are investigated in a subsequent analysis. Older and younger children’s genders were included in preliminary analyses as between-participant factors. We found no evidence for main effects of older or younger children’s gender, and the hypothesized interaction was not significant. Younger and older children’s gender were dropped from the

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**Table 2**

<table>
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<tr>
<th></th>
<th>Mother MO session</th>
<th>Mother MF session</th>
<th>Older MO session</th>
<th>Older MF session</th>
<th>Younger MO session</th>
<th>Younger MF session</th>
<th>Father MF session</th>
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</thead>
<tbody>
<tr>
<td>Cognitive (T1)</td>
<td>.019 (.003)</td>
<td>.015 (.003)</td>
<td>.018 (.002)</td>
<td>.016 (.003)</td>
<td>.004 (.001)</td>
<td>.004 (.001)</td>
<td>.010 (.002)</td>
</tr>
<tr>
<td>Desire (T1)</td>
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<td>.020 (.003)</td>
<td>.059 (.005)</td>
<td>.048 (.004)</td>
<td>.048 (.005)</td>
<td>.040 (.006)</td>
<td>.017 (.004)</td>
</tr>
<tr>
<td>Feeling (T1)</td>
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<td>.010 (.002)</td>
<td>.012 (.002)</td>
<td>.014 (.002)</td>
<td>.006 (.002)</td>
<td>.008 (.002)</td>
<td>.007 (.002)</td>
</tr>
<tr>
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<td>.023 (.004)</td>
<td>.035 (.003)</td>
<td>.029 (.003)</td>
<td>.028 (.003)</td>
<td>.029 (.003)</td>
<td>.008 (.001)</td>
</tr>
<tr>
<td>Desire (T2)</td>
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<td>.016 (.003)</td>
<td>.035 (.003)</td>
<td>.034 (.002)</td>
<td>.041 (.004)</td>
<td>.036 (.004)</td>
<td>.010 (.003)</td>
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<td>Feeling (T2)</td>
<td>.006 (.001)</td>
<td>.006 (.002)</td>
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*Note.* Three decimal places are provided to represent accurately the means and standard errors. Younger = younger sibling; Older = older sibling; MO = mother-only sessions; MF = mother-father sessions; T1 = Time 1; T2 = Time 2.
analysis. Means and standard errors are given in Table 2.

There was a significant main effect of type of talk, $F(2, 35) = 39.48, p < .001$, with mothers speaking most about cognitions and desires, and least about feelings. The Type × Time interaction was significant, $F(2, 35) = 6.59, p = .004$. A doubly multivariate ANOVA was used as a post hoc test. Results of the univariate tests for cognitive, desire, and feeling talk as the outcome variables and time as the main effect revealed that cognitive state talk increased significantly over time, $F(1, 36) = 8.52, p = .006$, whereas desire talk, $F(1, 36) = 2.92, p = .10$, and feeling talk, $F(1, 36) = 2.65, p = .11$, did not change significantly. At Time 1, mothers spoke more about desires, followed by cognitions and feelings. At Time 2, mothers spoke more about cognitions, followed by desires and feelings. Sibling position was significant as a main effect, $F(2, 35) = 4.39, p = .04$. Mothers addressed higher levels of mental state talk to older children ($M = .017, SE = .001$) more often than to younger children ($M = .014, SE = .001$). The Sibling Position × Type interaction was also significant, $F(2, 35) = 10.18, p < .001$, as was the Sibling Position × Time interaction, $F(2, 35) = 3.64, p = .04$. The doubly multivariate ANOVA showed that maternal speech to older children differed significantly for cognitive talk, $F(1, 36) = 22.28, p < .001$, but not for desire talk, $F(1, 36) = 2.73, p = .11$, or for feeling talk, $F(1, 36) = 1.67, p = .21$. The Sibling Position × Time interaction, which was only significant for cognitive talk, $F(1, 36) = 11.69, p = .002$, showed that at Time 1 mothers used more cognitive talk with their older children ($M = .025, SE = .003$) than their younger children ($M = .010, SE = .002$), but at Time 2 there was no difference in their cognitive talk to older children ($M = .024, SE = .003$) and younger children ($M = .023, SE = .003$).

There was a significant effect of context, $F(1, 36) = 8.23, p = .007$. Mothers engaged in more mental state talk in mother-only sessions ($M = .017, SE = .001$) than in mother-father sessions ($M = .015, SE = .001$). There was also a significant interaction between context and sibling position, $F(1, 36) = 4.34, p = .04$. Older children ($M = .019, SE = .002$) received more talk than younger siblings in mother-only sessions ($M = .014, SE = .001$), whereas older children ($M = .015, SE = .002$) and younger children ($M = .015, SE = .001$) received a similar amount of talk in mother-father sessions. To more effectively understand this context effect, we performed a repeated-measures ANOVA on mothers’ conversation turns with context and time as factors. This showed higher levels of conversation in mother-only sessions ($M = 173.3, SE = 19.34$) versus mother-father sessions ($M = 93.85, SE = 11.35$), $F(1, 36) = 16.7, p < .001$. It also showed that there were more conversation turns for mothers at Time 2 ($M = 178.60, SE = 20.69$) than at Time 1 ($M = 88.55, SE = 8.87$), $F(1, 36) = 21.06, p < .001$.

For descriptive purposes the cognitive, desire, and feeling state talk of mothers was summed together and cognitive talk was calculated as a percentage of mental state talk. At Time 1 cognitive talk represented 34% of mental state talk and by Time 2 it represented 49% of mental state talk.

To examine whether mothers and fathers differed in their talk to children during mother-father sessions, we performed a repeated-measures ANOVA with parent (two levels), sibling position (two levels), time (two levels), and type of speech (three levels) as within-participant factors. As results for all factors but parental gender have already been reported in the previous analysis, only results for parental gender are reported. The analysis revealed a significant main effect of parent with mothers speaking more about mental states than fathers, $F(1, 36) = 12.62, p < .001$. There were no significant interactions between parent and any other factor, demonstrating that the difference between mothers and fathers was no greater for one type of mental state talk than another.

**Sibling Position and Mental State Talk**

Although sibling position was included in the previous analyses, sibling position and children’s age were confounded. To examine whether patterns of development and patterns of exposure to family talk were the same in children with and without an older sibling, holding age constant, we compared children who were oldest children with children who were youngest children at 4 years of age. At Time 2, the mean age of youngest children was 4.4 years; at Time 1, the mean age of oldest children was 4.4 years. Cognitive, desire, and feeling state talk at Time 1 for children without an older sibling and at Time 2 for children with an older sibling were the dependent variables. A repeated-measures ANOVA with Type of Speech (three levels) × Sibling Position (two levels) × Context (two levels) revealed a significant main effect of type of speech, $F(2, 35) = 99.77, p < .001$, with children talking most about desires, followed by cognitions, and then feelings. Position was not significant as a main effect, $F(1, 36) = .69, p = .41$. As hypothesized, there was a significant interaction between type of speech and
sibling position, $F(2, 35) = 23.65, p < .001$. A doubly multivariate ANOVA was used as a post hoc test. Results of the univariate tests for cognitive, desire, and feeling talk as the outcome variables revealed that cognitive state talk was significantly higher in children with an older sibling than in children without an older sibling, $F(1, 36) = 29.2, p < .001$, whereas desire talk, $F(1, 36) = 17.22, p < .001$, was significantly higher in children without an older sibling. Feeling talk did not differ significantly between children with and without an older sibling, $F(1, 36) = .09, p = .77$. Context was not significant as a main effect or in interaction with any other factor. Means and standard errors can be seen by examining Table 2, paying attention to the mental state talk in younger children at Time 2 and in older children at Time 1.

Our next question concerned the way exposure to mental state talk was different for children with and without an older sibling when they were 4 years old. The most marked differences in exposure are likely to be evident for sibling talk. Children with an older sibling were exposed to sibling talk from a 6-year-old. Children without an older sibling were exposed to sibling talk from a 2-year-old. A repeated-measures ANOVA with Type of Speech (three levels) $\times$ Sibling Position (two levels) $\times$ Context (two levels) revealed a significant main effect of sibling position, with children with older siblings receiving more mental state talk, $F(2, 35) = 46.46, p < .001$, than children without older siblings, and a significant main effect of type of speech, $F(2, 35) = 112.19, p < .001$, with children being exposed most to talk about desires, followed by talk about cognitions, and then talk about feelings. There was also a significant interaction between sibling position and type of speech, $F(2, 35) = 64.16, p < .001$. A doubly multivariate ANOVA was used as a post hoc test. Children with older siblings differed significantly from children with younger siblings on exposure to talk about cognitions, $F(1, 36) = 224.74, p < .001$, and feelings, $F(1, 36) = 11.38, p = .002$, but not desires, $F(1, 36) = .40, p = .40$.

Next, we considered whether maternal talk to which children were exposed at 4 years old varied as a function of whether the children had an older sibling. We included both talk directed to the child and talk directed to the sibling because talk to the sibling was still mental state talk to which the child was exposed. These effects can be derived from the previously described analysis for maternal talk. The time effects are the focus, with Time 1 representing 4-year-old children without an older sibling and Time 2 representing 4-year-old children with an older sibling. The nonsignificant time effect demonstrates that children with an older sibling were not exposed to a higher proportion of maternal mental state talk in general. The significant Time $\times$ Type interaction and the subsequent post hoc test demonstrated that 4-year-old children with older siblings heard more cognitive talk from mothers, but not more desire or feeling talk, than 4-year-old children without older siblings. The significant Sibling Position $\times$ Time $\times$ Type interaction revealed that the difference in the cognitive talk received by 4-year-old children with and without an older sibling came about through talk directed to their siblings, as talk directed to the 4-year-old did not differ (compare mother talk to older sibling at Time 1 with mother talk to younger sibling at Time 2 in Table 2).

In summary, 4-year-old children with older siblings are exposed to more talk about cognitions from their siblings and their mothers than children without older siblings. They also receive less talk about desires from their siblings when compared with children without older siblings. The cognitive talk of children with and without older siblings was found to differ significantly.

Testing Causal Models of Exposure to Family Mental State Talk

To understand the degree to which different family members show similarities in the extent of their mental state talk, we examined contemporaneous links between children’s and mothers’ talk about mental states before examining longitudinal relationships. To reduce the number of variables in the correlation analyses, we summed mother talk to younger, older, and both children simultaneously across mother-only and mother-father sessions to create a measure of mother cognitive, desire, and feeling talk. Older children’s talk was summed across mother-father and mother-only sessions, and the same was done for younger children’s talk. Father talk was not included in the correlational analysis because data for fathers were only available from mother-father sessions and rates of talk were low in this type of session. Relationships between children’s and mothers’ cognitive, desire, and feeling talk, maternal education and younger children’s MLU were also examined. We did examine the correlations between family members’ talk broken down by context of talk (mother-only vs. mother-father sessions) and recipient of talk (talk directed to older or younger child) to ensure that summing across different contexts and recipients was not obscuring results.

Results at both time points are presented in Tables 3 and 4 and two-tailed significance tests are
reported. Note that \( p \leq .10 \) is marked with a single asterisk. First, at both time points mothers’ cognitive talk is significantly associated with younger and older children’s cognitive talk, and older siblings’ cognitive talk is significantly associated with younger siblings’ cognitive talk. Younger siblings’ feeling talk is significantly associated with older siblings’ and mothers’ feeling talk at Time 2, with weaker relationships (although still significant at \( p \leq .10 \)) at Time 1. Younger siblings’ desire talk is associated with older siblings’ (but not mothers’) desire talk strongly at Time 2 and weakly at Time 1. Because significant associations largely occurred within type of talk, we followed up these analyses by testing the difference between mother–younger children and older children–younger children correlations within each type of talk. None of these were significantly different from one another, suggesting that amount of mental state talk to which children were exposed was likely to be more important in their subsequent production of talk than was the identity of the person doing the talking.

Maternal education was found to be significantly associated with mothers’ and older siblings’ cognitive talk but not with other kinds of mental state talk. Mothers who had received more education used more cognitive talk with their children. Third, younger children’s MLU was found to be significantly associated with all three types of younger children’s mental state talk, raising the possibility for the causal analyses that change in mental state talk was merely a function of children’s own earlier language competence.

Because no differences were found between the correlations as a function of person talking, and to achieve a more acceptable participant-to-variable ratio, we devised a measure of total exposure to each type of talk. Father talk was included in this

### Table 3

**Correlations Between Mother and Older and Younger Siblings’ Cognitive, Desire, and Feeling Talk; Mothers’ Education; and Younger Siblings’ Mean Length of Utterance (MLU) at Time 1 (\( N = 37 \))**

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<td>.32</td>
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<td>.40**</td>
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<td>.32**</td>
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</table>

*\( p \leq .10 \), **\( p \leq .05 \), ***\( p < .01 \).

### Table 4

**Correlations Between Mother and Older and Younger Siblings’ Cognitive, Desire, and Feeling Talk at Time 2 (\( N = 37 \))**

<table>
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<tr>
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<td>.32*</td>
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</table>

*\( p \leq .10 \), **\( p \leq .05 \), ***\( p < .01 \).
summed score to capture total exposure more accurately. For younger children for cognitive talk, this included cognitive talk from mothers (directed to younger, older, and both children) and from older siblings during mother-father and mother-only sessions, and cognitive talk from fathers (directed to younger, older, and both children) during mother-father sessions. This was divided by the total number of speaker turns for participants across all sessions and was called family members’ cognitive talk. The same was done for feeling and desire talk. The same family members’ talk scores were calculated for older children except that younger sibling talk was substituted for older sibling talk.

The structure of the analysis was a hierarchical regression analysis. In preliminary analyses we determined whether younger children’s MLU at Time 1 was a significant predictor of change in younger children’s talk. If it was not a significant predictor of change in children’s talk (as was found for younger children’s feeling and desire talk) it was not included in the main analysis. The criterion variable was Time 2 child talk. In Step 1, Time 2 child talk was regressed on Time 1 child talk. By entering into the regression the repeated measure that preceded the criterion measure, any subsequent measure that entered the regression was predicting change between the earlier measure of the criterion and the later measure. In Step 2, if indicated, the younger children’s MLU was entered. In Step 3, the same type of talk by family members at Time 1 was entered (i.e., when predicting younger children’s cognitive talk at Time 2, family members’ cognitive talk was entered). In Step 4, the two remaining measures of family members’ mental state talk at Time 1 were entered (i.e., when predicting younger children’s cognitive talk at Time 2, family members’ feeling and desire talk were entered in Step 4). Multicollinearity was tested for, but no evidence for this was found.

Predicting change in younger children’s cognitive talk. Results can be found in Table 5. In Step 1, younger children’s cognitive talk (Time 1) was not found to be a significant predictor of cognitive talk (Time 2), $F(1, 35) = 1.27, p = .27$. In Step 2, when younger children’s MLU (Time 1) was added to the equation, there was a significant increase in $R^2$, $F_{inc}(1, 34) = 4.46, p = .04$, accounting for 11% of the variance in change in younger children’s cognitive talk over the 2 years. In Step 3, family member’s cognitive talk (Time 1) was found to be a significant predictor of change in younger children’s cognitive talk, $F_{inc}(1, 33) = 4.12, p = .05$, and accounted for an additional 9% of the variance in change in children’s cognitive talk. In Step 4, neither feeling nor desire talk predicted a change in children’s cognitive talk.

### Table 5

**Summary of Hierarchical Regression Analysis Examining the Role of Family Members’ Talk in Predicting Change in Younger Children’s Talk From Time 1 to Time 2**

<table>
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<tr>
<th></th>
<th>$B$</th>
<th>$SE_B$</th>
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</tbody>
</table>

*Note.* MLU = mean length of utterance; T1 = Time 1; T2 = Time 2. **$p \leq .05$. **
Predicting change in younger children’s feeling talk. Results can be found in Table 5. In Step 1 of the main analysis, younger children’s feeling talk at Time 1 was not found to predict their feeling talk at Time 2, $F_{inc}(1, 35) = .01$, $p = .94$. In Step 2, family members’ feeling talk predicted change in younger children’s feeling talk and explained 10% of the variance in this change, $F_{inc}(1, 34) = 4.0$, $p = .055$. In Step 3, neither cognitive nor desire talk predicted a further change in children’s feeling talk.

Predicting change in younger children’s desire talk. Results can be found in Table 5. In Step 1, younger children’s desire talk at Time 1 was not found to predict their desire talk at Time 2, $F_{inc}(1, 35) = .05$, $p = .82$. In Step 2, family members’ desire talk was not found to be a significant predictor of change in younger children’s talk about desire, $F_{inc}(1, 34) = 2.75$, $p = .11$, although the effect was in the predicted direction. In Step 4, neither family members’ feeling nor cognitive talk predicted a change in younger children’s desire talk.

Predicting change in older children’s mental state talk. The same series of change analyses were performed for older children. Results are not presented in detail as none of the family talk measures predicted a significant change in older children’s cognitive, feeling, or desire talk over the 2 years. Note, however, that whereas the Time 1 measure of the younger children’s talk in the previous analyses never predicted the Time 2 measure of the same type of talk, there was more evidence of stability in older children’s talk. Older children’s Time 1 cognitive talk significantly predicted their Time 2 cognitive talk ($\beta = .36$, $p = .03$), and their desire talk was in the expected direction but was not significant ($\beta = .24$, $p = .16$).

Discussion

Age-Related Changes in Mental State Talk in Families

We found, like others (Bartsch & Wellman, 1995; Brown & Dunn, 1991; Moore et al., 1994), that children show much greater increases in their cognitive talk between 2 and 4 years of age than in their talk about desire and feeling. Cognitive talk continues to increase from 4 to 6 years old, whereas desire and feeling talk decreases over this period. With respect to our first question about how children’s exposure to mental state talk is affected by children’s age, parents showed an increase in their cognitive talk to children over the 2 years of the study, but desire and feeling talk did not change significantly over the 2 years. Others have also found that cognitive talk increases and desire talk decreases as children get older (Bartsch & Wellman, 1995; Brown & Dunn, 1991; Moore et al., 1994). An advantage to the design used in this study was the opportunity to examine parental talk in the context of two children in the same family of different ages. Parents’ cognitive talk to children was different for younger and older children at Time 1. Two years later, parents addressed the same amount of cognitive talk to younger and older children. Consider this finding in the light of the continued growth in cognitive talk that we see for children (for whom we had data, i.e., older siblings) between 4 and 6 years old. Although parents are sensitive to the linguistic constraints of their children before age 4, by age 4 there is no evidence for a differentiation between older and younger siblings even though children continue to differ in their own talk.

Family Factors Affecting Children’s Exposure to Mental State Talk

The context in which talk occurred was found to be important in the mental state talk that children heard. Two contexts were investigated in this study: when children were on their own with their mothers and when they were with both parents. In mother-only sessions, mothers were found to differentiate more between their younger and older children than in mother-father sessions. These two findings, as well as the findings from other studies, suggest that when parents are on their own with children they are more involved with the children and consequently provide a higher level of stimulation. As parents differentiate more in their mental state talk between their children of different ages in mother-only sessions it may also be that in this context parents are more sensitive to children’s developmental needs.

Gender differences between parents in mental state talk when both parents were present were also found. Mothers spent a higher proportion of their time talking about mental states than fathers did, and this did not vary as a function of type of mental state talk. It should be remembered, however, that mothers’ and fathers’ talk was only compared when both parents were present with both children. It is possible that context may moderate parental gender differences in mental state talk and that fathers and mothers are not differentiated in their talk when playing on their own with children. Leaper et al. (1998) examined gender differences in parental talk to children (not including mental state talk) as a function of context. They did not find that context moderated parental gender differences in talk to

Families of children who were on their own with parents were more likely to talk about mental states than were families of children who were on their own with siblings. This finding is consistent with other studies that have shown that children in the context of a sibling are less likely to talk about mental states than are children in the context of a parent.

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Predicting change in older children’s mental state talk. The context in which talk occurred was found to be important in the mental state talk that children heard. Two contexts were investigated in this study: when children were on their own with their mothers and when they were with both parents. In mother-only sessions, mothers were found to differentiate more between their younger and older children than in mother-father sessions. These two findings, as well as the findings from other studies, suggest that when parents are on their own with children they are more involved with the children and consequently provide a higher level of stimulation. As parents differentiate more in their mental state talk between their children of different ages in mother-only sessions it may also be that in this context parents are more sensitive to children’s developmental needs.

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children, but as mental state talk was not one of the types of talk they considered, this issue needs to be examined in future studies of mental state talk. One limitation of the present study was the omission of sessions during which fathers were alone with their children; the inclusion of this type of context will be important for future studies.

If gender differences between parents in mental state talk are confirmed in future studies, it would be worthwhile examining the relationship between mental state talk and the activities in which parents and children engage. One interpretation for the differences in mental state talk found here is that mental state talk is spoken during some types of activities more than during others and that mothers and fathers engage in different types of activities with their children. Fathers have been found to be more focused on play, rough and tumble, and organized games than mothers (Clarke-Stewart, 1978; Lamb, 1976; Parke & O’Leary, 1976). Mothers have been found to be more involved than fathers in educational, care, and comfort activities with children. Such activities may lead to different opportunities for the discussion of mental states.

We did not find that parents talked to their girls and boys differently, although results were in the expected direction. Others have found that parents talk more to girls about emotions than to boys (Dunn et al., 1987; Fivush et al., 2000). Differences between our findings and those of other studies may be attributed to definitional issues. Cervantes and Callanan (1998) found, for instance, that boys received more emotion talk than girls when the measure of talk involved emotion explanation, but that girls received more emotion talk than boys when the emotion talk involved labeling. As results were in the expected direction but nonsignificant, an alternative explanation is that our sample size was too small to detect such gender differences. Future studies would benefit from larger samples. We also did not find effects of own or sibling gender on child talk, although, again, effects were in the expected direction. Reports of gender differences in children’s mental state talk have been mixed (Dunn, Brown & Beardsall, 1991; Hughes & Dunn, 1999), which suggests either that gender effects are small or that important moderators have not been identified.

We also found that maternal education was associated with children’s exposure to increased levels of cognitive talk, although not to levels of feeling or desire talk. Mothers with higher levels of education used more cognitive talk with their children and had older children who used more cognitive talk. Others (Hughes & Dunn, 1999) have found that maternal education is associated with theory of mind understanding. As parental education has been found to be associated with a much broader range of cognitive outcomes in children than theory of mind development, this association should not be seen as specific to children’s understanding of mind.

Mental State Talk and the Presence of an Older Sibling

Four-year-old children with an older sibling were exposed to, and used, more cognitive talk than children without older siblings. Talk by mothers and talk by siblings contributed to this higher level of exposure. Cognitive talk by siblings was higher because 4-year-old children with an older sibling were being exposed to the talk of a 6-year-old, whereas children with a younger sibling were being exposed to the talk of a 2-year-old. As there were large increases in cognitive talk between 2 and 6 years old, differences in exposure as a function of sibling talk were large. The same pattern was evident for maternal talk. Mothers did not talk differently to 4-year-old-children with and without an older sibling when they were talking directly to the 4-year-old-child, but because the 4-year-old-child lived with a sibling that was either 2 or 6 years old, the difference in the maternal talk that the 4-year-old child heard, addressed to their sibling, was marked.

The finding that children with an older sibling use more cognitive talk at 4 years old than children without an older sibling may indicate a mechanism for the finding that children with older siblings are advantaged in their theory of mind understanding (Perner et al., 1994; Ruffman et al., 2002). Amount of exposure to family members’ cognitive talk may be such a mechanism.

The Role of Exposure to Mental State Talk in the Development of Children’s Talk

It is clear from the results that exposure to mental state talk in families varies as a function of several aspects of family life. Are such differences in exposure important to children’s own mental state talk? Correlational data within type of talk across family members suggest that at least for cognitive and feeling talk family styles of talk were apparent, with younger children showing higher levels of cognitive talk when their mothers and siblings were also engaging in more cognitive talk. Similarly, but to a lesser extent, there was a suggestion that feeling talk also clustered within families. Results of the causal modeling showed that change in younger children’s cognitive talk, was predicted by exposure
to cognitive talk from mothers, fathers, and children 2 years earlier. It is important that this effect was evident after taking account of children's general language competence and their specific use of cognitive terms 2 years earlier. A similar effect of family talk was found for younger children's feeling talk.

One important question that emerges from these data is the extent to which children are knowledgeable about the role of mental states in behavior when they use mental state terms. Skills such as using mental state terms in conversation, passing false belief tasks, and being able to understand and generate the full range of meanings for words such as know, think, and guess (Booth & Hall, 1995) can be viewed on a developmental continuum. The production of cognitive terms during conversation occurs earlier in development than differentiating between terms on the basis of certainty (such as think and know). In turn, this comes before being able to discriminate between all the complex meanings of what it is to know something (Booth & Hall, 1995). The use of cognitive terms in conversation occurs before children are able to pass false belief tasks (Bartsch & Wellman, 1995). Our interpretation of the data presented here is that exposure to cognitive talk in families promotes increased use of these terms in children, which is likely to be part of the whole process involved in children’s understanding of the role of mental states in behavior, given that frequency of use has been found to be linked to false belief performance (Hughes & Dunn, 1999). How might exposure to cognitive talk influence this process? Nelson’s (in press) metaphor of induction into the community of minds is a helpful metaphor. She argued that children want to engage with others, and consequently, they learn the words and concepts that will facilitate this engagement. Frequency of use by family members is likely to provide a good index of the variety of circumstances in which the term is used. As children hear terms being used in multiple contexts they build up an inferential understanding of the abstract concepts (Levy & Nelson, 1994). As others have noted, the link between language and theory of mind understanding is strong and the evidence suggests that the causal direction of that relationship is that more advanced linguistic competencies foster the development of increased performance on theory of mind tasks (Astington & Jenkins, 1999). Thus, it may be that living in a family in which cognitive states are frequently discussed encourages the child’s capacity to understand and generate these terms. As children listen to and use these terms perhaps they learn the syntactic structures, such as complementation (De Villiers & Pyers, 2002), that they have heard others using.

The results of this study have implications for the debate on the sibling effect in theory of mind development. Lewis et al. (1996) distinguished between an advantage that is conferred on theory of mind development by a unique quality of the sibling relationship (sibling effect) versus greater exposure to theory of mind interactions irrespective of the source of these interactions (general apprenticeship). They sampled in Crete and Cyprus to differentiate between families that were large because of older siblings and families that were large because of the presence of more adults in the home. Their data supported a general apprenticeship model. In the present study, as correlations with younger children’s language were not found to differ by family member, our data also support a general apprenticeship model. We conclude that it is the amount of talk that is heard in the family rather the source of this talk that is important in children learning to use mental state language.

The importance of general early language skills (MLU at Time 1) in predicting change in children’s cognitive talk over time was demonstrated. Although other studies (Ruffman et al., 2002) have reported that family factors are important in growth of children’s mental state talk, this study extended our understanding by demonstrating that such family effects are not accounted for more accurately by cognitive factors endogenous to the child. This is in spite of the fact that endogenous factors in the development of cognitive talk were found to be substantial, accounting for 11% of the variance in change in children’s cognitive talk over 2 years.

The pattern for findings with respect to change in older siblings’ mental state talk was different. Exposure to family talk was not associated with change in older children’s mental state talk. The fact that older siblings’ talk was more stable over time than younger siblings’ talk meant there was less variance to be explained by Time 1 predictor variables. It may be that family factors are important to the development of mental state talk when children are between 2 and 4 years old, but after that children’s talk is influenced by factors more intrinsic to the children, such as their previously established developmental trajectory.

In summary, the data presented here suggest that children are exposed to different levels of mental state talk in their families, that such differences are explained by aspects of family life, and that exposure to mental state talk by family members
encourages the development of mental state talk in children between 2 and 4 years old.

References


