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Sibling conflict and theory of mind

Rachel C. Foote[1] and Heather A. Holmes-Lonergan[2]*

[1] Hammond Developmental Center, USA
[2] The Metropolitan State College of Denver, USA

This study examined conflicts between siblings in an attempt to identify variables that are related to false-belief understanding. The variables investigated were children's use of mental state terms and specific types of arguments (Slomkowski & Dunn, 1992) that occurred during conflict episodes. Twenty-two children between 3 and 5 years of age were administered eight false-belief tasks and were also videotaped while playing with an older sibling. Use of other-oriented arguments by the target child was significantly associated with success on false-belief tasks after controlling for age and general language ability. No use of argument was negatively related to performance on the false-belief tasks after controlling for age and general language ability. Neither the use of self-oriented arguments nor use of mental state terms was found to be associated with false-belief performance. The findings indicate that specific features of sibling conflicts are related to children's developing false-belief understanding.

Since its inception, theory of mind research has been concerned with delineating the progress of children's understanding of the mind and with possible theoretical explanations for their developing folk psychology. Much of this research and theory-building has taken a rather Piagetian approach by focusing on the child's role in acquiring knowledge about the mind. Less attention has been paid to the kinds of social experiences that might help mould the child's theory of mind. Recently, however, Nelson, Plesa, and Henseler (1998) have proposed an experiential approach to theory of mind development. The experiential view states that the child's theory of mind develops as a result of the interaction between the internal processes of the child and environmental influences acting upon the child. Children construct their knowledge about the mind based on events that take place in their environments and also based on their reasoning about those events. Although the relationships between social interactions and theory of mind development have only recently been examined, researchers have explored various aspects of the child's cultural background (Vinden,

* *Requests for reprints should be addressed to Dr Heather A. Holmes-Lonergan, Department of Psychology, The Metropolitan State College of Denver, Campus Box 54, PO Box 173362, Denver, CO 80217–3362, USA (e-mail: holmeslo@mscd.edu).*

1997; Wahi & Johri, 1994), family background (Cole & Mitchell, 1998; Cutting & Dunn, 1999), and peer relationships (Dunn & Cutting, 1999; Slomkowski & Dunn, 1996).

The present research focuses on sibling relationships and their connection to the development of a theory of mind. In this area, two kinds of research have been conducted—studies that examine the number of siblings a child has, and studies that examine characteristics of the sibling relationship itself. Several studies have shown that false-belief performance is related to both the number of siblings that children have and to the ages of those siblings. Research has indicated that children with more siblings perform better on false-belief tasks than children with fewer siblings (Jenkins & Astington, 1996; Perner, Ruffman, & Leekam, 1994), and that the number of older (but not younger) siblings is correlated with children's false-belief performance (Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996; Ruffman, Perner, Naito, Parkin, & Clements, 1998).

It has been argued that it is within the context of sibling relationships that children have their most intense social experiences (Dunn, 1985; Perner *et al.*, 1994). In particular, siblings are potential sources of influence on sociocognitive abilities such as perspective taking, reflection about internal states, and developing an understanding of how the mind works and how it influences behaviour (Boer & Dunn, 1992). Research using naturalistic observation has revealed particular features of sibling interactions that are related to sociocognitive development. Dunn, Brown, Slomkowski, Tesla, and Youngblade (1991) found that the degree of children's cooperative interaction with their siblings was related to their performance on various sociocognitive tasks 7 months later. Brown, Donelan-McCall, and Dunn (1996) examined children's use of mental state terms during unstructured interactions at home with friends, siblings, and mothers. Children made significantly more references to mental states during conversations with siblings or friends than during conversations with mothers. Further, children's use of mental state terms in conversations with siblings and friends was correlated with their performance on measures of false belief.

The two studies just discussed focused on cooperative sibling interactions. The present research differed from previous research by investigating sibling conflicts and their relationship to false-belief understanding. Dunn and Slomkowski (1992) have stated that sibling conflicts may represent an especially powerful stimulus for the growth of children's social knowledge. They argue that sibling conflicts involve a combination of self-interest, emotional arousal, and a close relationship that has particular significance. Children are therefore strongly motivated to pay attention to the reactions, perspectives, feelings, and beliefs of their siblings when conflicts occur (Dunn & Slomkowski, 1992). Through conflict, children learn to negotiate, compromise, persuade, and take turns (Katz, Kramer, & Gottman, 1992). Children learn that others may have opinions, feelings, and intentions that differ from their own, and with which they may choose to agree or disagree. In addition, siblings who engage in constructive conflicts, in which children attempt to reconcile their differing points of view, are more likely to display cooperative and conciliative behaviour, while siblings who engage in destructive conflicts are more likely to be hostile and aggressive (Vandell & Bailey, 1992).

Although certain kinds of sibling conflict may relate to the development of children's knowledge about the mind, little is known about the particular variables within sibling disputes that might facilitate such development. In this study, two variables were measured. The first was children's use of mental state terms. As discussed, it has been demonstrated that children's overall use of mental state terms during sibling

interactions is related to their understanding of false belief (Brown *et al.*, 1996). The present research differed from past research by first isolating conflict episodes, and then measuring children's use of mental state terms within those episodes. It was hypothesized that the use of mental state terms by a child during conflict episodes with a sibling would be correlated with his or her false-belief performance.

It has been argued that the frequency of mental state term use simply reflects individual differences in children's language ability (Bloom, Rispoli, Gartner, & Hafitz, 1989). In addition, children's performance on false-belief tasks has been shown to be highly related to language development (see Astington & Jenkins, 1999, for a discussion of this issue). Further, Jenkins and Astington (1996) found that the relationship between number of siblings and false-belief understanding was dependent upon children's language ability. Because the present study examined mental state term use during verbal conflict episodes between siblings, general language ability was controlled.

The second variable studied was children's use of arguments that occurred during sibling conflicts. Slomkowski and Dunn (1992), as well as Dunn, Slomkowski, Donelan, and Herrera (1995), reported that children's use of arguments with siblings was predictive of their performance on an affective perspective-taking task 7 months later. Slomkowski and Dunn examined three types of arguments: other-oriented, self-oriented, and no argument. Other-oriented arguments involve negotiation or reasoning that incorporates either the partner's interests or the interests of both children. Self-oriented arguments are excuses or reasons that are geared toward the speaker's interests alone. No argument is a conversational turn in which the child does not offer any sort of justification, reasoning, excuse, or conciliation.

In the present research, these three types of arguments were measured in relation to false-belief understanding, rather than to affective perspective taking. In addition, the siblings in the present study interacted alone, without the presence of the mother (mothers were often present during sibling interactions in Slomkowski and Dunn's, 1992, research, and the presence of the mother was not controlled). It was hypothesized that children's use of other-oriented and self-oriented arguments during conflicts with siblings would be positively related to their performance on false-belief tasks. Children's lack of arguments was hypothesized to be negatively correlated with false-belief performance. Language ability was controlled for these variables as well.

This study also differed from past research on sibling interactions and sociocognitive development by using a more structured and controlled observational procedure. In previous research (e.g. Brown *et al.*, 1996; Slomkowski & Dunn, 1992), naturalistic observations were conducted in each child's home. In the present study, the target child and his/her sibling were observed in a laboratory room designed as a playroom. All interaction sessions therefore took place at the same location and all children were observed for the same length of time. In addition, this study isolated the interaction between the child and his or her sibling; the two children played alone, without the caregiver present.

Each target child in this study was the younger child of the sibling pair. As stated, the presence of older siblings seems to be more highly related to the child's understanding of false belief than the presence of younger siblings (Lewis *et al.*, 1996; Ruffman *et al.*, 1998). It has also been argued that interactions with older, more linguistically advanced siblings are more likely to facilitate more sophisticated expression of language (such as mental states) than are interactions with younger, less linguistically developed siblings (Ruffman *et al.*, 1998).

False-belief tasks involving both prediction and explanation of another's belief were used in this study. Bartsch and Wellman (1989) have suggested that many young children (3-year-olds in particular) tend to weight desire more heavily than belief in predicting a story character's actions on a false-belief task. When explanation tasks are used, the tendency to reason based on desire satisfaction is reduced, and children are more likely to reason about the character's actions in terms of beliefs. Other studies involving children's interactions with siblings have also adopted Bartsch and Wellman's procedure (Dunn *et al.*, 1991; Slomkowski & Dunn, 1996; Youngblade & Dunn, 1995). It was anticipated that children would perform better on the explanation tasks than on the prediction tasks.

Method

Participants

Twenty-two children between the ages of 3 years 0 months and 5 years 8 months (M = 51.8, SD = 9.9) participated. Most of the children (N = 18) were recruited from several day-care centres in south-eastern Louisiana on the basis of parent permission letters. The remaining children (N = 4) were acquaintances of the first author. Thirteen children were male, and nine were female. All of the children were Caucasian and were from primarily working- and middle-class families. Ten children participated with an older brother, and 12 participated with an older sister. Nine of the sibling pairs were girl–girl, six were boy–boy, and seven were boy–girl. All families received a gift certificate to a local discount retailer as compensation for their participation.

Procedure

Each child was given the Test of Early Language Development-3 (TELD-3; Hresko, Reid, & Hammill, 1999) as a control for general language ability. In a separate session, each child was administered eight false-belief tasks. The order of these two sessions was counterbalanced.

The target child and his or her sibling were also brought to a laboratory room set up as a playroom. The room was equipped with three sets of toys: a Winnie the Pooh Safari game, a Fisher-Price farm, and building blocks. The children were asked to choose one of these toys, and were told they should play together while the tester met with the caregiver in an adjoining room. Each dyad was videotaped for 15 minutes using a camera mounted near the ceiling. After 15 minutes had passed, the tester and caregiver returned to the room and the play session was ended. For those children recruited from the child-care centres, all testing sessions preceded the play sessions. Children recruited through personal contact participated in the testing and the play sessions in one visit to the laboratory The order of their participation was as follows: (1) general language test or the false-belief tasks, (2) play session, (3) remaining test or tasks.

Measures

Test of Early Language Development-3 (1999)

The TELD-3 was used to assess the children's general language development. Both expressive and receptive forms of syntactic and semantic abilities are assessed through

responses to questions and pictures. This test has been standardized on children between the ages of 3 and 7 years (Hresko *et al.*, 1999). Raw scores from the TELD-3 were used in all analyses.

False-belief tasks

Eight different false-belief tasks were administered. The tasks required the children to predict how one of two figures would behave, given a false belief, or to give an explanation of the figure's behaviour, given a false belief (Youngblade & Dunn, 1995). The procedures were similar to those used by Bartsch and Wellman (1989). Each child was shown two closed boxes for each task. One was marked with a familiar picture, and the other was a plain unmarked box of the same size. Four types of marked boxes were used: a Band-Aid box, a crayon box, a Play-Doh box, and a raisin box. Each unmarked box was of the same dimensions as the marked box with which it was paired. Each pair of boxes was introduced immediately prior to its use, and the order of presentation of the four pairs of boxes was counterbalanced. For each pair, the child was asked to choose the box that contained the expected items. Next, the child was asked to look inside the container in order to see that it was empty. The child was then asked to look inside the unmarked box, which did contain the expected items.

The child was then introduced to the first toy figure (either Tigger or Winnie the Pooh) and given either a prediction or an explanation task question. After the child answered that question, the second toy figure was then introduced and the alternative question was asked. Prediction and explanation questions were counterbalanced for order of presentation, with half of the children receiving a prediction task first for each pair of boxes, and the other half receiving an explanation task first. The two tasks were administered consecutively for each pair of boxes. In the prediction tasks, the child was asked where the toy figure would look for the expected items. The toy figure was then made to move in the predicted direction and the child was asked if the figure would find the expected items. In the explanation tasks, the examiner moved the toy figure toward the marked but empty container. The child was then asked to explain the figure's action. If a false belief was mentioned, the child was asked if the items were really in the box (as a memory check). If no response was made or no belief explanation was mentioned, then the examiner prompted the child by asking what the toy figure thought.

Scoring

False-belief tasks

For each of the eight tasks, the child was given a score of 0 (fail) or 1 (pass) for a total of 8 possible points. On each of the four prediction tasks, children's responses predicting that the figure would search in the marked but empty box were scored as passing and responses predicting that the figure would search in the unmarked but full box were scored as failing. On the four explanation tasks, children who gave one or more explanations of the toy figure's action in terms of the figure's false belief (prompted or unprompted) were scored as passing. Children who gave no explanation for the figure's action were scored as failing.

Conflict coding

Slomkowski and Dunn's (1992) procedure for defining and scoring conflict was

followed. Conflict was defined as an interaction which follows an opposition to an action, a request for action, or an assertion. A request for action may be one child asking his or her sibling for a toy by saying, 'Would you gimme that doll?' The sibling's verbal refusal to give the child the toy would be an opposition; e.g., 'No, I don't wanna.' A conflict episode was scored if it included at least one verbal exchange. An exchange was defined as one utterance spoken by each participant. All interaction following the initial opposition was recorded until: (1) an obvious settlement was reached; (2) one child left the scene of the interaction and was not pursued; or (3) the discourse topic was altered and not resumed for a period of 1 minute.

Mental state talk

The conversations of the children with their siblings during conflict were analyzed for the use of mental state terms by the target child. A mental state term was defined as a term that referred to the thoughts, memories, or knowledge of the speaker, listener, or a third person. The terms coded included those reported in earlier studies of children's mental state discourse (Brown *et al.*, 1996; Shatz, Wellman, & Silber, 1983) and appear in Appendix A. Expressions of desire such as 'hope' or 'wish' or emotion terms such as 'happy' or 'sad' were not included in the coding. For the purpose of analysis, the frequency of mental state terms used in conflict was represented as a proportion of the target child's total speaking turns. This transformation reflected the relative use of mental state terms, and also controlled for differences in the amount of talk across dyads.

Type of argument

Each speaker turn by the target child contributing to a conflict episode was scored as one of three mutually exclusive categories: other-oriented argument, self-oriented argument, and no use of argument. Other-oriented arguments were defined as conversational turns that take into account the partner's interests and may include compromise, conciliation, bargaining or agreement. Self-oriented arguments were defined as conversational turns that involve giving a reason or justification for the disagreement solely in defence of one's own position or interest. No use of argument was defined as conversational turns in a conflict in which the speaker fails to argue, justify, or provide an excuse. Appendix B presents examples of each category. In the unlikely event that more than one type of argument was used in a turn, only one type of argument was coded using the following procedure: other-oriented arguments were given first priority, and self-oriented arguments were given second priority (Slomkowski & Dunn, 1992). In the analyses, each category of argument turns was, like mental state term use, represented as a proportion of the target child's total speaking turns.

Inter-rater reliability

Correlations were computed to assess inter-rater reliability for mental state terms and argument type. Twelve of the 22 pairs of siblings were coded by two independent raters. All correlations were of an acceptable level: mental state term use (r = .96, p = .0001), no use of arguments (r = .85, p = .001), self-oriented arguments (r = .61, p = .03), and other-oriented arguments (r = .87, p = .0001).

Results

Descriptive statistics

Descriptive statistics are presented in Table 1. Descriptive data summarizing children's performance on the false-belief tasks were also computed. The results revealed that 27% of the total sample passed all eight false-belief tasks, 4% passed seven tasks, 14% passed six tasks, 9% passed five tasks, 14% passed four tasks, 14% passed two tasks, 4% passed one task, and 14% did not pass any tasks. Before submitting the data to hypothesis testing, a correlation matrix was computed for all variables analysed and is presented in Table 2.

Table 1. Means and standard deviations for age in months, age difference between siblings in months TELD-3 scores, false-belief scores, proportion of mental state terms, proportion of no arguments, proportion of self-oriented arguments, proportion of other-oriented arguments, proportion of conflict turns in total speaker turns and total speaker turns (N = 22)

Variable	*M*	*SD*	Range
Age in months	51.86	9.90	36–68
Age difference between siblings in months	19.59	5.63	10–30
TELD-3 scores	56.50	6.86	41–65
False-belief scores	4.64	2.92	0–8
Proportion of mental state terms	0.01	0.04	0.00–0.13
Proportion of no arguments	0.10	0.09	0.00–0.36
Proportion of self-oriented arguments	0.09	0.06	0.00–0.24
Proportion of other-oriented arguments	0.08	0.07	0.00–0.22
Proportion of conflict turns in total speaker turns	0.26	0.09	0.14–0.44
Total speaker turns	32.73	13.43	12–66

Table 2. Correlation matrix for age in months. TELD-3 scores, mental state terms, no arguments, self-oriented arguments, other-oriented arguments, and false-belief scores (N = 22)

Measure	1	2	3	4	5	6	7
1. Age in months	—	.64**	.19	−.45*	−.09	.64**	.61**
2. TELD-3 scores		—	.22	−.43	.11	.64**	.70**
3. Mental state terms			—	−.12	.38	.47*	.35
4. No arguments				—	−.23	−.48*	−.67**
5. Self-oriented arguments					—	.08	.22
6. Other-oriented arguments						—	.76**
7. False-belief scores							—

*p < .05; **p < .01.

Hypothesis 1

The data were submitted to a multiple regression analysis to determine whether children's use of mental state terms during conflict predicted false-belief understanding. False-belief understanding was regressed onto: (a) age in months, (b) general language

ability, and (c) proportion of mental state terms used in conflict per total speaking turns during the conflict. The overall model was statistically significant, $F(3, 18) = 7.93$, $r = .569$, $p = .001$, as was the main effect for language ability (see Table 3). The analysis revealed no significant main effect for the use of mental state terms. Because this finding failed to support predictions, the data were examined further to try to determine the reason for the nonsignificant results. Examination of the data revealed that the use of mental state terms during conflict episodes occurred infrequently and was skewed in nature. A stem and leaf plot for the use of mental state terms and additional descriptive statistics are presented in Appendix C.

Table 3. Results of the regression analysis for mental state term use and false-belief scores ($N = 22$)

Predictor	β	Δr^2	F^a
Age in months	.27	.04	1.75
General language ability	.48	.13	5.59*
Mental state terms	.19	.03	1.47

*$p < .05$.
[a] Values represent $F(3, 18)$.

Hypothesis 2

The next analyses were conducted to investigate the relationships between the three types of arguments and false-belief scores. The data were submitted to three separate multiple regression analyses to determine whether children's use of particular types of arguments during conflicts were related to their false-belief understanding. In the first analysis, false-belief scores were regressed onto: (a) age in months, (b) general language ability, and (c) proportion of total speaking turns where no arguments were used. Results are presented in Table 4. The overall model was statistically significant, $F(3, 18) = 12.34$, $r = .673$, $p = .0001$. As predicted, there was also a significant main effect for no use of arguments (see Table 4).

The second and third analyses repeated the same procedure for self-oriented and other-oriented arguments. For self-oriented arguments, the overall model was significant, $F(3, 18) = 8.061$, $r = .573$, $p = .001$, as was the main effect for language ability (see Table 5). However, the hypothesized main effect for use of self-oriented arguments was not significant. For other-oriented arguments, the overall model was also significant, $F(3, 18) = 11.44$, $r = .656$, $p = .0001$. As predicted, there was also a significant main effect for use of other-oriented arguments (see Table 6). These results indicate that, as predicted, there is a positive relationship between the use of other-oriented arguments and false-belief understanding and a negative relationship between no use of arguments and false-belief understanding.

Hypothesis 3

A two-sample dependent t test was conducted to examine whether children performed differently on prediction versus explanation versions of the false-belief tasks as expected. No significant difference was found between children's performance on the two versions of the tasks.

Table 4. Results of the regression analysis for no use of arguments and false-belief scores (N = 22)

Predictor	β	Δr^2	F^a
Age in months	.15	.01	0.70
General language ability	.42	.10	5.44*
No arguments	−.43	.14	7.63*

*p < .05.
[a] Values represent $F(3, 18)$.

Table 5. Results of the regression analysis for self-oriented arguments and false-belief scores (N = 22)

Predictor	β	Δr^2	F^a
Age in months	.38	.06	2.69
General language ability	.46	.12	4.97*
Self-oriented arguments	.20	.04	1.65

*p < .05.
[a] Values represent $F(3, 18)$.

Table 6. Results of the regression analysis for other-oriented arguments and false-belief scores (N = 22)

Predictor	β	Δr^2	F^a
Age in months	.08	.004	0.21
General language ability	.32	.05	2.77
Other-oriented arguments	.49	.12	6.38*

*p < .05.
[a] Values represent $F(3, 18)$.

Discussion

The goal of the present research was to identify variables within the context of sibling disputes that are associated with false-belief understanding. It was hypothesized that children's use of mental state terms and arguments that occurred during sibling conflicts would relate to their performance on false-belief tasks. The first hypothesis, that children's use of mental state terms during sibling conflict episodes would be correlated with their false-belief scores, was not supported. Although previous research has demonstrated such a relationship (Brown *et al.*, 1996), the extremely infrequent occurrence of mental state terms in this study prevents any meaningful interpretation of the results. Brown *et al.* (1996) reported a mean of only 5.1 mental state turns per hour of conversation with sibling. Children in this study were only observed for 15 minutes and the coding was restricted to conflict episodes, limiting the possibility that relations between mental state terms and false-belief performance would be found. Given the constraints of this study, it would be important in future research to lengthen the time that children are observed to allow for the development of more conflict. It might also

be useful to observe children in various contexts (naturalistic as well as laboratory), and/or to use alternative measurements, such as parent or teacher reports of mental state term use.

The second hypothesis involved the relationships between children's use of arguments during sibling conflict and their false-belief understanding. As predicted, participants who used a higher proportion of other-oriented arguments scored higher on the false-belief tasks. Also as hypothesized, participants who used a higher proportion of no arguments during conflict scored lower on the false-belief tasks. These results are consistent with Slomkowski and Dunn's (1992) findings that children's use of arguments with siblings is related to their sociocognitive performance. This study also provides new support for the relationship between arguments that occur during sibling conflicts and children's false-belief understanding.

Specifically, this study demonstrated that when a child fails to use arguments, he or she is also failing to demonstrate examples of more advanced sociocognitive development such as negotiating, compromising, persuading or taking turns. No use of arguments was related to less successful performance on false-belief tasks. Conversely, a child who uses an argument that takes into account the interests of his or her sibling is demonstrating an understanding of the sibling's perspective. These other-oriented arguments were related to better performance on false-belief tasks. The results of this study indicate that there are specific features of sibling conflicts that are associated with children's performance on false-belief tasks, which assess the ability to understand another person's mental states and their relationships to behaviour. Nelson *et al.* (1998) proposed that children's social relationships influence (and are influenced by) their understanding of other minds. The present findings appear to support this theoretical view.

Contrary to hypotheses, use of self-oriented arguments was not related to false-belief understanding. This study failed to replicate Slomkowski and Dunn's (1992) finding that use of self-oriented arguments influences sociocognitive performance. One possible explanation is that the acquisition of theory of mind knowledge is a gradual process and the use of self-oriented arguments may be part of an intermediate phase of its development. As Dunn and Munn (1987) point out, arguments between children who are of approximately equal status and who share close interests may play a role in children's moves from egocentrism to recognition of the perspectives of others. The three argument types appear to mirror this transition in perspectives. No arguments is the most egocentric type of argument because it consists of simple assertions and expressions of desire by the child. Self-oriented arguments are less egocentric, as the child now recognizes the need to express his or her perspective to a second party. Other-oriented arguments are the most advanced of the argument types, as they indicate a recognition of others' perspectives. Of the seven children who passed between 0 and 2 of the false-belief tasks, five used no arguments more often than self-oriented or other-oriented arguments. Three of the five children who passed between 3 and 5 tasks used self-oriented arguments more often than no or other-oriented arguments. Six of the 10 children who passed between 6 and 8 tasks used other-oriented arguments more often than no or self-oriented arguments. The negative correlation between no use of arguments and use of other-oriented arguments also supports the idea that these two types of arguments are perhaps opposite ends of a continuum. Finally, there was no significant difference between children's performance on the explanation and prediction versions of the false-belief tasks, indicating that one type of task was not more difficult than the other. Yet 60% of the children neither

passed all of the tasks nor failed all of them. It appears that as children begin to develop a theory of mind, they are variable in their performance instead of uniformly successful.

Several cautions should be noted here. First, the small sample size of this study limits conclusive interpretations of the data. Replication with larger sample sizes is necessary. In addition, this study did not include other variables that might mediate the relationships discussed here. For example, the arguments *received* by the target child from the sibling would be important to measure in addition to the arguments *used* by the target child. Interactions between the target child and more than one sibling at a time might also yield different patterns of data than those reported here. Interactions with the target child and an older versus a younger sibling might also be compared. Finally, the correlational nature of the data should be emphasized. Obviously, it may not be that experiences in conflict with a sibling lead to more or less successful performance on false-belief tasks. It could well be that those individuals who performed poorly on the false-belief measures were more likely to use unreasoned argument in conflict because of their more limited sociocognitive abilities. Likewise, it could be that those individuals who performed well on the false-belief measures were more likely to use other-oriented arguments in conflict because of their more advanced sociocognitive abilities. However, Slomkowski and Dunn (1992) examined both child–sibling and child–mother interactions and found significant correlations only for child's arguments with a sibling, and not with mother. Future research on the relationship between children's arguments with siblings and false-belief understanding might consider including a child–mother observation in an attempt to replicate these findings. Also, longitudinal research that examines both sociocognitive abilities and social interactions would help clarify the connections between the two in the course of development. Future research may also include tasks that measure children's emotional or affective knowledge in addition to tasks that measure knowledge about false beliefs (e.g. Dunn *et al.*, 1995; Slomkowski & Dunn, 1992).

In summary, this research has identified for the first time specific variables within the context of sibling disputes that were related to children's false-belief understanding. This research supports and extends the findings of Slomkowski and Dunn (1992) and indicates that the use of no arguments and other-oriented arguments during conflicts with siblings is correlated with false-belief understanding, in addition to affective perspective taking. In this study, there were relationships between the degree of false-belief understanding displayed by the children and the kinds of arguments they used during sibling disputes. Although very limited, the present findings may suggest that children's developing false-belief knowledge may be linked along a continuum with their ability to use certain kinds of arguments during disputes with siblings. This is consistent with the view that siblings who engage in constructive conflicts, which involve attempts to take the other's perspective and to cooperate, are more likely to display advances in their sociocognitive understanding (Vandell & Bailey, 1992). More generally, this research also reinforces the experiential viewpoint which contends that the social interactions in which a child engages are an important source of theory of mind knowledge; knowledge that may then be used to develop mental concepts (Nelson *et al.*, 1998). According to this viewpoint, advances in the development of a theory of mind might then in turn be related to children's social relationships, so that progress in one aspect of development might facilitate change in the other. Future research should continue to focus on the interaction between the child and the child's environment in exploring the development of theory of mind knowledge.

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References

Astington, J. W., & Jenkins, J. M. (1999). A longitudinal study of the relation between language and theory-of-mind development. *Developmental Psychology, 35*, 1311–1320.

Bartsch, K., & Wellman, H. (1989). Young children's attribution of action to beliefs and desires. *Child Development, 60*, 946–964.

Bloom, L., Rispoli, M., Gartner, B., & Hafitz, J. (1989). Acquisition of complementation. *Journal of Child Language, 16*, 101–120.

Boer, F., & Dunn, J. (1992). *Children's sibling relationships: Developmental and clinical issues*. Hillsdale, NJ: Erlbaum.

Brown, J. R., Donelan-McCall, N., & Dunn, J. (1996). Why talk about mental states? The significance of children's conversations with friends, siblings, and mothers. *Child Development, 67*, 836–849.

Cole, K., & Mitchell, P. (1998). Family background in relation to deceptive ability and understanding of the mind. *Social Development, 7*, 181–195.

Cutting, A. L., & Dunn, J. (1999). Theory of mind, emotion understanding, and family background: Individual differences and interrelations. *Child Development, 70*, 853–865.

Dunn, J. (1985). *Sisters and brothers*. Cambridge, MA: Harvard University Press.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Younglade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62*, 1352–1366.

Dunn, J., & Cutting, A. L. (1999). Understanding others, and individual differences in friendship interactions in young children. *Social Development, 7*, 201–219.

Dunn, J., & Munn, P. (1987). Development of justification in disputes with mother and sibling. *Developmental Psychology, 23*, 791–798.

Dunn, J., & Slomkowski, C. (1992). Conflict and the development of social understanding. In C. U. Shantz & W. W. Hartup (Eds.), *Conflict in child and adolescent development* (pp. 70–92). Cambridge: Cambridge University Press.

Dunn, J., Slomkowski, C., Donelan, N., & Herrera, C. (1995). Conflict, understanding, and relationships: Developments and differences in the preschool years. *Early Education and Development, 6*, 303–316.

Hresko, W. P., Reid, D. K., & Hammill, D. D. (1999). *The Test of Early Language Development-3 (TELD-3)*. Austin, TX: Pro-Ed.

Jenkins, J. M., & Astington, J. W. (1996). Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology, 32*, 70–78.

Katz, L. F., Kramer, L., & Gottman, J. M. (1992). Conflict and emotions in marital, sibling, and peer relationships. In C. U. Shantz & W. W. Hartup (Eds.), *Conflict in child and adolescent development* (pp. 122–149). Cambridge: Cambridge University Press.

Lewis, C., Freeman, N., Kyriakidou, C., Maridaki-Kassotaki, K., & Berridge, D. (1996). Social influences on false belief access: Specific sibling influences or general apprenticeship? *Child Development, 67*, 2930–2947.

Nelson, K., Plesa, D., & Henseler, S. (1998). Children's theory of mind: An experiential interpretation. *Human Development, 41*, 7–29.

Perner, J. (1991). *Understanding the representational mind*. Cambridge, MA: MIT Press.

Perner, J., Ruffman, T., & Leekam, S. R. (1994). Theory of mind is contagious: You catch it from your sibs. *Child Development, 65*, 1228–1238.

Ruffman, T., Perner, J., Naito, M., Parkin, L., & Clements, W. A. (1998). Older (but not younger) siblings facilitate false belief understanding. *Developmental Psychology, 34*, 161–174.

Shatz, M., Wellman, H. M., & Silber, S. (1983). The acquisition of mental verbs: A systematic investigation of first references to mental state. *Cognition, 14*, 301–321.

Slomkowski, C. L., & Dunn, J. (1992). Arguments and relationships within the family: Differences in young children's disputes with mother and sibling. *Developmental Psychology, 28*, 919–924.

Slomkowski, C., & Dunn, J. (1996). Young children's understanding of other people's beliefs and feelings and their connected communication with friends. *Developmental Psychology, 32*, 442–447.

Vandell, D. L., & Bailey, M. D. (1992). Conflicts between siblings. In C. U. Shantz & W. W. Hartup (Eds.), *Conflict in child and adolescent development* (pp. 242–269). Cambridge: Cambridge University Press.

Vinden, P. (1997, April). *The effects of parenting style on theory of mind understanding*. Paper presented at the biennial meeting of the Society for Research in Child Development, Washington, DC.

Wahi, S., & Johri, R. (1994). Questioning a universal theory of mind: Mental-real distinctions made by Indian children. *Journal of Genetic Psychology, 155*, 503–510.

Youngblade, L. M., & Dunn, J. (1995). Individual differences in young children's pretend play with mother and sibling: Links to relationships and understanding of other people's feelings and beliefs. *Child Development, 66*, 1472–1492.

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Appendix A: Mental state terms

Verbs:	know, think, mean, forget, remember, guess, pretend, dream, bet, trick, wonder, figure, believe, understand, suppose, learn, doubt, lie, confuse, have in mind, surprise, realize
Nouns:	idea, dream, trick, secret
Adjectives:	pretend, curious, real

Appendix B: Examples of argument coding

No argument

1. 'Give it to me.'
2. 'I want that.'

Self-oriented argument

1. 'I need the blue block for my laser.'
2. 'I chose the horse first.'

Other-oriented argument

1. 'I'll give you all these (building blocks) if you give me that one (a block with wheels on it.'
2. 'She said we have to play together. Let's finish the building, then we'll play with that.'

Appendix C: Stem and leaf plot for proportional use of mental state terms

Mean:	0.014
Standard deviation:	0.037
Skewness:	2.617
Kurtosis:	5.816

Stem	Leaves
.1	31
.0	00000000000060000000