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Children's Attention to Beliefs in Interactive Persuasion Tasks

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Whether and when children can apply their developing understanding of belief to persuasion was examined using interactive puppet tasks. Children selected 1 of 2 arguments to persuade a puppet to do something (e.g., pet a dog) after hearing the puppet's belief (e.g., "I think puppies bite"). Across 2 studies, 132 children (ages 3–7 years) engaged in these persuasion tasks and in false-belief reasoning tasks, presented in puppet and story formats. Belief-relevant argument selection increased with age, as did appropriate reasoning about false beliefs, and occurred more in puppet than story tasks. Results suggest that improvements in belief reasoning in early childhood may be reflected in social interactions such as persuasion.

Keywords: belief reasoning, perspective taking, persuasion, social cognition, theory of mind

Young children undergo remarkable development in their appreciation of psychological states, their own and those of other people. Most notably, children approaching school age acquire some understanding of belief and its role in action (e.g., Flavell, 2004; Wellman, Cross, & Watson, 2001). Researchers have reported positive correlations between children's understanding of mind and their social competence (e.g., Astington & Jenkins, 1995; Lalonde & Chandler, 1995), although it is not clear precisely how acquiring an understanding of belief is involved in such social developments. Two studies reported here investigate one way in which children's developing belief understanding might be reflected in their social interactions, specifically in their attempts to persuade others.

Even very young children engage in some forms of persuasion. A straightforward prediction is that as children begin to understand the existence and formation of beliefs, they begin to tailor arguments to the beliefs of their conversational partners. Certainly other changes in young children's social behavior, arguably related to belief understanding, have been documented. Peskin and Ardino (2003), for instance, reported positive associations between children's belief understanding and success in hide-and-seek games and secret-keeping tasks.

However, two lines of research question whether young children's emerging belief understanding is accompanied by a simultaneous application of that knowledge to persuasive encounters. One line of research suggests that attention in persuasion to subjective states such as beliefs may not emerge until much later in development (e.g., Clark & Delia, 1976). Another line implies, to the contrary, that 2- and 3-year-olds already exhibit manipulative behavior stemming from an appreciation of subjective, even representational, states (e.g., Dunn, 1991; Dunn & Munn, 1985; Reddy, 1991). Thus, it is an open question whether preschoolers' acquisition of belief understanding significantly influences their persuasion attempts. To introduce our investigation of this issue, we briefly review three areas of pertinent literature: (a) research documenting young children's developing belief understanding, (b) research investigating children's developing persuasion abilities (and the possibilities of early or late sophistication), and (c) preliminary studies exploring children's attention to beliefs during persuasion.

Much evidence now supports the claim that young children acquire an understanding of belief. Experimental support comes from studies in which children are asked to predict the actions of story protagonists said or inferred to possess false beliefs. Wimmer and Perner (1983) were first to report that between ages 4 and 6 years children begin to appropriately predict that someone who left candy in one location, and who did not see the candy moved to a second location, will search for it in the original spot. A recent meta-analysis showed that this finding was replicated in numerous and varied investigations (Wellman et al., 2001). Naturalistic observations have offered further support. Bartsch and Wellman (1995), for instance, noted that children begin to talk about beliefs at about age 3, with such talk increasing at ages 4 and 5.

The realization that people have beliefs (i.e., individual mental representations of the world that can be false) seems a profound revelation that would likely affect social interactions (see Baron-Cohen, Tager-Flusberg, & Cohen, 1993; Dunn, 1988; Flavell & Miller, 1998). Astington and Jenkins (1995) reported significant positive correlations between 3- to 5-year-olds' false-belief scores

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and their production of joint proposals and explicit role assignments during pretend play. Watson, Nixon, Wilson, and Capage (1999) found moderate positive correlations between false-belief scores and teachers' ratings of children's social skills. More specifically, Lalonde and Chandler (1995) found that high scorers on false-belief tasks were more likely to be viewed as socially competent by teachers on behaviors involving intentionality (e.g., "able to comment on differences between his/her own feelings and those of another"). Such reports suggest that belief understanding and social interaction are linked but do not specify how.

Persuasion, an activity observed in people young and old, is a social interaction that may directly reflect changes in belief understanding. As children come to recognize that people have particular beliefs, they may employ more effective (i.e., belief-relevant) persuasive strategies. For example, if a child who wants a puppy understands that her father thinks puppies are noisy, she might tell her father that the desired puppy is very quiet, although she might tell her mother, who is particularly worried about the mess made by puppies, that the puppy is very clean.

Extant empirical evidence suggests that persuasion tactics improve with development, but the observed changes do not, for the most part, address our specific hypothesis. In several studies, children's persuasion skill is portrayed as developing quite slowly over the elementary school years, both in regard to argumentative writing (e.g., Knudson, 1992) and oral argument (e.g., Erftmier & Dyson, 1986). Clark and Delia (1976) studied persuasion in children ranging in age from 7 to 16 years and observed social role-taking only among the oldest. However, these researchers construed social role-taking broadly, as being able to imagine a perspective other than one's own. For example, if a child trying to obtain a desired gift mentioned that it would benefit his parent, he was credited with role-taking. Because Clark and Delia did not assess or manipulate children's understanding of the specific beliefs and desires of another person, their study did not address whether children's grasp of specific psychological states, such as beliefs, affected persuasion.

To date, only one set of studies has addressed directly whether children attend to specific psychological states in persuasion. Bartsch and London (2000) conducted three studies in which children were presented with stories such as the following:

> This is Jeff. At the store, Jeff sees a bird that he wants. This is Jeff's mother. She thinks a bird would be noisy. What should Jeff tell his mother, to get the bird? This is Jeff's father. He thinks a bird would be messy. What should Jeff tell his father, to get the bird?

In the first study, 4-, 8-, and 12-year-olds were told such stories and asked to invent or select appropriate arguments. Children were credited with a correct answer if they offered belief-relevant responses for both parents in the story. By manipulating belief information, the researchers directly assessed children's attention to the specific and differing beliefs of two individuals. Overall, 12- and even 8-year-olds selected more belief-relevant arguments than 4-year-olds, who failed to consistently attend to belief information.

This age-related improvement was replicated in a second study in which 9-year-olds attended to beliefs more consistently than 6-year-olds. A third study, in which 6-year-olds were given the belief-relevant persuasion tasks and also a standard false-belief assessment, examined whether in fact the younger children understood beliefs, as had been assumed. Children averaged 75% correct on false-belief tasks, compared with 44% correct on persuasion, suggesting that belief understanding emerged in advance of belief-relevant persuasion.

It is premature, however, to draw strong conclusions from these preliminary studies of children's use of belief information in persuasion, which employed a novel method not yet subjected to extensive critical review. A potential limitation was the use of story tasks— children might demonstrate greater psychological insight in a social activity such as persuasion if the task were more similar to a real-life conversation, with the child playing a more interactive role. Even very young children have been observed to engage in social manipulation in their home environments (e.g., Dunn, 1991; Dunn & Munn, 1985; Reddy, 1991). Dunn (1988), for instance, reported that children as young as 18 months engaged in effective teasing and comforting of siblings, as though relying on an early appreciation of specific desires, emotions, and beliefs. It may be that a more active social role is required to elicit children's consideration of other people's beliefs during persuasion. Specifically, children might exhibit more psychological insight when faced, not with a hypothetical story character, but with an agent acting in the real world and the need to get that agent to do something. When persuasion is called for in real life, a child faces a person who directly states her own views (such as an objection to taking the desired action). In responding directly to those views, the child may be cued by the other's remarks (e.g., "I think puppies are too messy." "But this puppy isn't messy!").

Research is needed to address this possibility and to further explore children's developing reasoning on both false-belief and belief-relevant persuasion tasks, given that only one study has included both. A paradigm for studying children's belief-relevant persuasion has been introduced, but questions remain about how to characterize development: Does children's reasoning about belief show similar development in domains as different as those represented by false-belief tasks and persuasion tasks? Might children use belief information to predict action, as in false-belief tasks, before they are able to consider such information in selecting a persuasive argument? Alternatively, can children consider others' beliefs during persuasion before they can predict action from an actor's false belief? None of these scenarios have been ruled out.

To begin to address these questions, we devised a version of the belief-relevant persuasion tasks that involved children in something more similar to social interaction (Bartsch & London, 2000). The task logic was retained in that children selected from two argument choices, one belief-relevant and one belief-irrelevant, the best argument to get someone to do something (e.g., pet a stuffed kitten). But instead of hearing a story, children chose what to say to two hand puppets (enacted by the interviewer) that voiced their own opinions (e.g., one thought that kittens scratch, the other that kittens are dirty). As if engaging in ongoing conversation with the puppets, children were asked (by the whispering interviewer) what should be said to each puppet (e.g., that the kitten didn't have claws or that the kitten was clean).

In a pilot study of thirty 6-year-olds given this task, 90% selected a belief-relevant argument for both puppets, whereas only 40% performed comparably on the older type of story task. In a second pilot study, twenty 6-year-olds averaged 85% and 4- to 5-year-olds averaged 45% correct on the new task. Thus, pilot results implicated an earlier sensitivity to belief information than

was apparent in previous research, albeit through administration of a single task.

More research, using multiple tasks, is needed to ascertain how well children in the process of acquiring belief understanding would reason on this new puppet version of a belief-relevant persuasion task. In Study 1, we administered two such tasks to children ages 3 to 5 years who also completed two standard false-belief reasoning tasks. Using the new puppet persuasion task, we hypothesized that there would be a significant effect of age group on belief-relevant persuasion similar to that generally reported (and expected here) for false-belief reasoning, with the oldest, but not the youngest, children using belief information consistently. We also hypothesized that children's belief-relevant persuasion would be positively associated with their false-belief reasoning.

Study 1

Method

Participants. Sixty children were recruited from daycare, preschool, and kindergarten programs serving a mostly White population in a small university town in the western United States. Participants included nineteen 3-year-olds (M = 3 years 6 months, SD = 3.0 months, 11 girls), twenty 4-year-olds (M = 4 years 5 months, SD = 2.7 months, 8 girls), and twenty-one 5-year-olds (M = 5 years 6 months, SD = 3.8 months, 10 girls). Socioeconomic status was not formally assessed.

Tasks and procedure. In an individual interview, each child was given two belief-relevant puppet persuasion tasks. One was scripted as follows:

Interviewer: [indicate stuffed puppy] This is Muffy. She's a really gentle puppy. And she's a really quiet puppy. Muffy wants a friend to pet her. Look, here comes a friend.

Puppet 1: Hi, my name is Tricia.

Interviewer: Tricia, Muffy would really like for you to pet her. Will you pet her?

Puppet 1: No, I don't want to pet Muffy, because I think puppies bite.

Interviewer: [whisper to child] Should we tell Tricia that Muffy is gentle or that Muffy is quiet? [record child's response]

Interviewer: Oh, look, here comes another friend.

Puppet 2: Hi, my name is Chris.

Interviewer: Maybe we can get Chris to pet Muffy. Chris, Muffy would really like for you to pet her. Will you pet her?

Puppet 2: No, I will not pet Muffy because I think that puppies bark too loud.

Interviewer: [whisper to child] Should we tell Chris that Muffy is gentle or that Muffy is quiet? [record child's response]

After the child answered the question about the first puppet (e.g., Tricia), the interviewer quickly introduced the second puppet, as though interrupted by its arrival, thus avoiding the need for the first puppet either to pet or not pet the animal. After the child responded to the last question, the second puppet (e.g., Chris) petted the animal briefly regardless of the child's response. The second persuasion task involved a "gentle" and "clean" kitten believed by the puppets to scratch and to be dirty. The tasks, therefore, differed in the type of animal involved, the beliefs attributed, and, to a degree, the argument choices, although "gentle" was deemed to be a good choice of argument against both the beliefs that puppies bite and that kittens scratch.

Each child was also administered two false-belief tasks of the type introduced by Wellman and Bartsch (1988) involving a story illustrated by colored sketches. This type of false-belief task was chosen because it provided explicit belief information, as did the belief-relevant persuasion tasks. One story was as follows:

> Annie's kitten is in the playroom, but Annie thinks her kitten is in the kitchen. Where will Annie look for her kitten, the playroom or the kitchen? Where is the kitten really, the playroom or the kitchen?

The second false-belief story task concerned a boy named Sam who sought his puppy in the kitchen or the playroom. In telling each false-belief story, the experimenter presented a sketch of the two locations and pointed to each location as it was mentioned. Half of each age group received the real location questions first and the action prediction questions second, and half heard the questions in the reverse order.

Within age groups, half the children received the persuasion tasks first and half the false-belief tasks first. Tasks of the same type were juxtaposed to minimize transitions between puppet and story materials. Within this constraint, task orders were counterbalanced across participants. Thus, for persuasion and false-belief tasks, half of each age group reasoned about the puppy first and the kitten second, and half did the tasks in the reverse order.

Results

As in previous research using this persuasion paradigm (Bartsch & London, 2000), we scored children as responding correctly on each puppet persuasion task only when belief-relevant arguments were selected for both puppets, so persuasion scores ranged from 0 to 2. Children were scored as responding correctly on the false-belief tasks only if responses to both the question about the desired object's real location and the question about where the protagonist would search were correct, so false-belief scores also ranged from 0 to 2.

Preliminary analyses were conducted to determine whether scores were affected by the presentation order of persuasion and false-belief tasks. We performed separate t tests on persuasion and false-belief scores and detected no significant order effects.

Next, we tested our primary hypothesis that age group would affect belief-relevant persuasion, such that performance would range from no consistent use of belief information in the youngest children to consistent use in the oldest children. Correct scores on the puppet persuasion tasks averaged 21% (M = .42, SD = .61), 38% (M = .75, SD = .85), and 72% (M = 1.43, SD = .81) for 3-, 4-, and 5-year-olds, respectively. Scores on the false-belief tasks averaged 32% (M = .63, SD = .83), 30% (M = .60, SD = .82), and 41% (M = .81, SD = .91) for 3-, 4-, and 5-year-olds, respectively. Scores were subjected to a repeated-measures analysis of variance (ANOVA), in which the repeated factor was task type (persuasion or false belief) and the between-subjects variable was age group. A marginally significant interaction between age group and task type was detected, $F(2, 57) = 3.16$, $p = .05$, with a significant main effect emerging only for age group, $F(2, 57) = 4.92$, $p < .05$. Follow-up Tukey HSD comparisons showed a significant difference between the 3- and 5-year-olds ($p < .05$) and a marginally significant difference between the 4- and 5-year-olds ($p = .07$).

In assessing individual performances, we first examined children's consistency within the two tasks of each type. As shown in Table 1, a majority of children (68%, 75%, and 81% of 3-, 4-, and 5-year-olds, respectively) answered either correctly or incorrectly on both persuasion tasks. Similarly, most children (79%, 80%, and 86% of 3-, 4-, and 5-year-olds, respectively) were either consistently right or consistently wrong on the false-belief tasks. Relationships between belief-relevant persuasion and false-belief scores were positive, as hypothesized, but not statistically significant. As shown in Table 1, of 19 children who answered correctly on both persuasion tasks, only 8 answered correctly on both false-belief tasks; conversely, of 15 who answered correctly on both false-belief tasks, only 8 answered correctly on both persuasion tasks.

Finally, we explored the nature of children's incorrect responses to the persuasion tasks. Children who scored 0 did so by selecting the nonbelief-relevant response for either one or both of the puppets in each task. Few children selected two incorrect responses (2 children in each age group on the puppy task, and 3 or fewer in each age group on the kitten task). This observation suggests that children did not employ a "switch" strategy, simply changing their response between puppets in reaction to a perceived failure to elicit a petting response from the puppet. Most children who erred on persuasion tasks selected the same argument for both puppets, such that one but not the other was belief-relevant. Because a predominance of errors regarding a specific puppet (such as the one that thought that puppies bark loudly) might suggest that children failed to understand that particular belief attribution or the arguments regarding it, we compared, for each task, the number of children who erred regarding the first but not the second puppet to those with the opposite pattern. Sign tests within each age group revealed no significantly biased performances on the puppy task. On the kitten task, a significant difference emerged for 4-year-olds who erred more by selecting "clean," rather than " gentle," for both puppets. In considering how specific task features might have affected performance, we noted that "gentle" appeared in both persuasion tasks, possibly encouraging or discouraging children's choice of that argument. A sign test comparing belief-relevant responses to questions for which the correct response was "gentle" to belief-relevant responses to questions for which the correct responses were "clean" and "quiet" revealed no significant difference.

Discussion

In Study 1, we extended exploration of children's belief-relevant persuasion by administering interactive puppet tasks designed to sensitively tap belief reasoning, including children as young as 3 years, and administering explicit false-belief reasoning tasks.

On the persuasion tasks, age group affected children's reasoning as hypothesized. Children performed similarly across the two belief-relevant persuasion tasks, with roughly 70% to 80% achieving identical scores, and similarly to children in the pilot studies. The oldest group, 5-year-olds, averaged 72% correct, compared with 90% and 85% correct for 6-year-olds in the pilot studies, respectively. Four-year-olds averaged 38% correct, compared with 45% correct reported for the (on average, slightly older) 4-year-olds in the second pilot study. As expected, 3-year-olds performed worse than 5-year-olds, averaging 21% correct. This poor performance accords with the assumption that many 3-year-olds have not yet achieved belief understanding and thus cannot use belief information in social problem solving.

Although children improved with age on the persuasion tasks as expected, their false-belief reasoning was worse and showed less improvement than is sometimes reported (e.g., Siegal & Beattie, 1991), although the absolute levels of performance were in line with other investigations (e.g., Wimmer & Perner, 1983). Relationships between false-belief and persuasion scores, although positive as hypothesized, were not statistically significant, and a number of children obtained perfect scores on one type of task but not the other, findings at odds with the idea that both types of reasoning reflect a common underlying understanding of belief.

Features associated with each type of task may have contributed to children's relatively depressed false-belief scores, however. The false-belief tasks were presented through stories illustrated by pictures, as in previous studies (e.g., Wellman & Bartsch, 1988), selected because only such story-based methods also have involved an explicit statement of belief by the story protagonist. Our use of puppets in the persuasion tasks may have effectively diminished performances in the false-belief tasks that did not involve puppets.

To address this concern, Study 2 included story and puppet versions of persuasion and false-belief tasks, with four tasks of each type administered to each child. In view of the merely partially proficient belief reasoning exhibited by 5-year-olds in Study 1, the age range of Study 2 participants was extended upward. As before, we hypothesized that there would be a significant effect of age group on children's belief-relevant persuasion similar to that generally reported (and expected here) for false-belief reasoning, with only the older children using belief information consistently. We hypothesized that children would reason better on puppet than story tasks and that, within these formats, there would be a positive association between belief-relevant persuasion and false-belief reasoning.

Table 1
Study 1: Number of Children Obtaining Various Scores on Persuasion and False-Belief Tasks in the Persuasion Puppet Task

Task	Score	0	1	2	Total
False belief	0	15	11	8	34
Story	1	7	1	3	11
Task	2	4	3	8	15
Total		26	15	19	60

Study 2

Method

Participants. Seventy-two children were recruited from daycare, preschool, and kindergarten programs serving a mostly White population in a small western university town. Participants included twenty-four 3-year-olds (M = 3 years 6 months, SD = 3.0 months, 9 girls), twenty-four 4- and 5-year-olds (M = 4 years 10 months, SD = 5.3 months, 10 girls), and twenty-four 6- and 7-year-olds (M = 6 years 7 months, SD = 5.5 months, 9 girls). Socioeconomic status was not formally assessed.

Tasks and procedure. In an individual interview lasting less than 10 min, each child was administered two belief-relevant persuasion story

tasks, two belief-relevant persuasion puppet tasks, two false-belief story tasks, and two false-belief puppet tasks.

The belief-relevant persuasion story tasks were modified from story tasks used in previous research (Bartsch & London, 2000) to make them more similar to the puppet tasks and were illustrated by simple sketches. The script is exemplified below:

> Here is a kitten, and this is Chloe. This kitten is very gentle and very clean. The kitten wants to be brushed, but Chloe says, "No, I don't want to brush the kitten because I think kittens bite!" Should we tell Chloe that this kitten is gentle or that this kitten is clean?
>
> This is Zach. The kitten still wants to be brushed. Maybe Zach will brush the kitten. But Zach says, "No, I don't want to brush the kitten because I think kittens are dirty!" Should we tell Zach that this kitten is gentle or that this kitten is clean?

The second task of this type involved characters Andrew and Ashley, who thought that a tame and nice-smelling rabbit would scratch and be stinky, respectively.

The belief-relevant persuasion puppet tasks were similar to those in Study 1. One involved puppets Mike and Amy who thought that a tame and nice-smelling mouse would scratch and be stinky, respectively; the other involved puppets Tricia and Chris who thought that a gentle and clean puppy would bite and be dirty, respectively. In a departure from Study 1, the animals were not actually petted in Study 2 because a comparable task culmination was difficult to achieve for the story tasks; instead, the interviewer simply went rapidly to the next task.

The false-belief story tasks were modified from those in Study 1 to include two people in the story, thus increasing similarity to the persuasion story tasks, as exemplified here:

> This is Jordan. Jordan left his rabbit in the bedroom and then went out to play. While Jordan was gone, his sister Emily wanted to play a trick on Jordan, so she took his rabbit out of the bedroom and put it in the garage. Then Jordan came back to get his rabbit. Where will Jordan look for the rabbit, the garage or the bedroom? Where is the rabbit really, the garage or the bedroom?

The other task of this type was about Tori, who left in the kitchen a kitten that was later moved by brother Lewis to the bedroom.

False-belief puppet tasks were designed to follow the general story script closely, but the two characters were enacted by hand puppets and were shown to hide and seek the desired object in shoe-box sized "doll" rooms furnished with small plastic doll furniture so as to resemble a bedroom, a kitchen, a playroom, and a garage. Instead of involving two characters, the puppet tasks involved the child and experimenter as the agents who hid the pet in the second location, with the aim of increasing the child's interaction in the scenario just as the child was required to be more interactive in persuasion puppet tasks by selecting an argument for an active puppet. One task was scripted as follows:

> This is Annie. Annie left her mouse in the garage and then went out to play. Let's play a trick on Annie! Let's move the mouse from the garage to the bedroom. So where is the mouse really, in the garage or the bedroom? Oh, look, here comes Annie to get her mouse. Where will Annie look for the mouse, in the garage or in the bedroom?

The other false-belief puppet task concerned Sam, whose puppy was left in the playroom and moved to the kitchen. The order of the questions concerning the protagonist's predicted action and the pet's real location was alternated across participants, as in Study 1.

In all, children completed four types of tasks (persuasion story, persuasion puppet, false-belief story, and false-belief puppet), two of each type. The two same-type tasks were presented together to minimize transition fuss, but the orders of the four task types were counterbalanced across children in each age group, resulting in four task-type orders. Within these orders and within each age group, the order of the two tasks of each type was alternated across children.

Results

As in Study 1, children were scored as responding correctly on the persuasion tasks only when belief-relevant response selections were made to both questions (i.e., questions about both puppets or both story characters), so scores ranged from 0 to 2 on the persuasion story and puppet tasks. As before, children were credited with a correct response on the false-belief tasks only if both the real location response and the action prediction response were correct, so scores on the puppet and story versions of the false-belief tasks also ranged from 0 to 2.

In a preliminary analysis, we examined these task scores to determine whether task presentation orders affected performance. One-way ANOVAs detected no significant effect of task orders on either persuasion or false-belief scores.

Addressing our primary hypothesis concerning the developmental trajectories of belief-relevant persuasion and false-belief reasoning, Table 2 shows each age group's average score and standard deviation on each task type. Correct scores on persuasion puppet tasks averaged 9%, 44%, and 73% for 3-, 4- to 5-, and 6- to 7-year-olds, respectively. For ascending age groups, average scores on the other three task types were, respectively, persuasion story tasks, 13%, 32%, 67%; false-belief puppet tasks, 13%, 52%, 77%; and false-belief story tasks, 4%, 54%, 67%.

Subjected to a repeated measures ANOVA with task type (persuasion or false belief) and task format (puppet or story) serving as within-subjects variables and age group as a between-subjects variable, these data revealed the hypothesized significant effect of task format, $F(1, 69) = 4.06$, $p < .05$, but no effect of task type. Overall, children averaged 45% correct ($M = 1.78$, $SD = 1.52$) on the puppet tasks compared with 39% ($M = 1.57$, $SD = 1.52$) correct on the story tasks. Age group had a significant effect, $F(2, 69) = 31.43$, $p < .001$, with correct scores across all eight tasks averaging 9% ($M = .75$, $SD = 1.19$) for 3-year-olds, 45% ($M = 3.63$, $SD = 2.75$) for 4- to 5-year-olds, and 71% ($M = 5.67$, $SD = 2.24$) for 6- to 7-year-olds. Follow-up Tukey HSD comparisons revealed significant differences between each pair of age groups, $ps < .005$.

At the level of individual performances, we first examined individual consistency within each of the four task types. As Table 3 shows, consistent performances (i.e., both tasks correct or both

Table 2
Study 2: Mean Scores and Standard Deviations for Each Age Group on Each Task Type

	Age group					
	3-year-olds		4- to 5-year-olds		6- to 7-year-olds	
Task type	*M*	*SD*	*M*	*SD*	*M*	*SD*
False-belief story	.08	.28	1.08	.93	1.33	.96
Persuasion story	.25	.44	.56	.82	1.33	.82
False-belief puppet	.25	.61	1.04	.99	1.54	.78
Persuasion puppet	.17	.38	.88	.74	1.46	.78

Table 3
Study 2: Number of Children Obtaining Various Scores on Persuasion and False-Belief Tasks in the Persuasion Story and Puppet Tasks

	Score	0	1	2	Total
Persuasion story task					
False belief	0	28	6	5	39
Story	1	4	2	0	6
Task	2	5	9	13	27
Total		37	17	18	72
Persuasion puppet task					
False belief	0	22	9	4	35
Puppet	1	3	1	2	6
Task	2	7	10	14	31
Total		32	20	20	72

incorrect) were given by a majority of children in each type of task, specifically, by 81% of children (83%, 79%, and 79% of 3-, 4- to 5-, and 6- to 7-year-olds, respectively) on persuasion puppet tasks, by 76% (75%, 79%, 75%) on persuasion story tasks, by 92% (92%, 96%, 88%) on false-belief puppet tasks, and by 89% (92%, 88%, 88%) on false-belief story tasks. Examining the relationship between persuasion puppet and false-belief puppet scores within each age group, we found positive correlations, as hypothesized, but none of statistical significance. Similar analyses of the story task scores also revealed positive correlations, statistically significant only for the 3-year-olds and the 4- to 5-year-olds, r_ss = .52 and .69, respectively, ps $< .01$.

Because our data confirmed that most children conclusively passed or failed the false-belief tasks (often regarded as diagnostic of belief understanding), we also examined individual patterns of performance in terms of passing and failing. Conservatively stipulating that a score of 2/2 was the criterion for "passing" a task, we noted that with puppets 14 children passed both persuasion and false-belief tasks and 35 failed both. Critically, 17 passed only the false-belief tasks compared with 6 who passed only the persuasion tasks, McNemar's $\chi^2(1) = 4.35$, $p < .05$. Similar asymmetry was found for the story tasks: 13 children passed both tasks and 40 failed both, with 14 passing only the false-belief tasks compared with 5 who passed only the persuasion tasks, McNemar's $\chi^2(1) = 3.37$, $p = .07$, *ns*.

As in Study 1, we conducted follow-up analyses to examine patterns of incorrect responses to the persuasion tasks. We first explored whether one or the other of the puppets in each task tended to garner more incorrect responses, indicating a possible misunderstanding of task content. Sign tests comparing the number of children selecting correctly for one puppet but not the other to the number displaying the opposite pattern were conducted for each of the four persuasion tasks within each age group. Significant asymmetry was evident in two tasks for 3-year-olds; they more often selected "smells nice" twice (i.e., for both characters or puppets) compared with "tame" for both the mouse and rabbit tasks, ps $< .05$. To determine whether this bias figured substantially in our results, we conducted the repeated measures ANOVA testing for task type, task format, and age effects on data excluding 3-year-olds' responses on the mouse and rabbit tasks; the pattern of significant effects did not change. Nor did omitting these data in assessing the relationships between persuasion and false-belief scores change the overall results.

Discussion

Study 2 provided the most extensive examination to date of children's belief-relevant persuasion by administering multiple belief-relevant persuasion and false-belief tasks, in both puppet and story formats, to children ages 3 to 7 years. In reflecting on our results, we considered first whether data from the new puppet persuasion tasks replicated previous findings in terms of absolute levels of performance and age-related changes. As expected, we found notable improvement with age. Three-year-olds averaged 9% correct, even worse than the 21% reported in Study 1. Four- and 5-year-olds averaged 44% correct, and 6- and 7-year-olds averaged 73% correct, somewhat lower than comparably aged children in the pilot studies. The relatively depressed scores of the youngest and oldest children may have reflected the more demanding protocol, which involved eight as opposed to four tasks.

Marked improvement with age was also evident in children's reasoning on the other three types of tasks (persuasion story, false-belief puppet, and false-belief story; see Table 2), and results across all four task types revealed better reasoning with puppets than stories, as hypothesized. This format effect, although significant, did not change the developmental picture suggested by the data: Whether tested with puppets or stories, the youngest children made no consistent use of belief information, the oldest used the information more often than not, and the middle group's performance fell in between. The fact that puppets facilitated both types of belief reasoning constrains, to some extent, possible explanations for the effect. Initially, we used puppets in the persuasion tasks because we thought if the child heard about beliefs directly from the puppet and was positioned to respond (albeit indirectly through the experimenter) with the aim of affecting a potential real-life event (e.g., petting the animal) that she would be both motivated and conversationally cued to use her best psychological insight. However, the fact that puppets also facilitated reasoning on the false-belief tasks (which in Study 2 did not involve direct belief expressions or a chance to influence behavior or events) suggests that the puppet advantage may be due to a general factor, such as the child's having an active role ("tricking" the puppet in the false-belief task and choosing the argument in the persuasion tasks) or in some other way simply making the tasks more interesting than story tasks. This conclusion is in line with the recommendation of Wellman et al. (2001) that investigators "interested in assessing younger children's first emerging understanding of belief would do well to consider tasks that . . . engage the child in actively transforming the situation" (p. 679). Regardless of the precise mechanism, of course, our use of puppet tasks had the desired effect of revealing a previously unobserved capacity in children as young as 6 and 7 years old for using belief information in persuasion.

The similar age-related improvements evident on group performances across persuasion and false-belief tasks may reflect a common underlying development of belief understanding. However, two asynchronies observed in individual performances suggest that further investigation is needed. First, the positive correlations between persuasion and false-belief scores were significant only on story tasks in the two youngest age groups. Second, when children were viewed as passing or failing the puppet tasks, more passed false belief but not persuasion compared with those showing the reverse pattern. A task difference that might have contrib-

uted to this asymmetry was that, in the persuasion tasks, children were asked, "What should we say. . . ?" with regard to each puppet, whereas on false-belief tasks, they were asked, "Where will Annie look. . . ?" and "Where is the kitten really?" These different questions may have elicited different attention to beliefs. However, insofar as the persuasion questions arguably involved the child in more interaction by asking what should be said, compared with the false-belief questions that did not require the child to speak even indirectly to the puppet, one might have expected better, not worse, reasoning on persuasion tasks. A second difference that might have made persuasion tasks more difficult was that they required children to consider the perspectives of two puppets, whereas the false-belief tasks required consideration of only the puppet seeking a lost pet (although here we did include two agents in the false-belief scenarios, one a hider and one a seeker, to increase similarity to the persuasion tasks). Future research aimed at precisely characterizing the relationship between belief-relevant persuasion and false-belief reasoning will require even better equated tasks, together with a longitudinal perspective on individual change.

General Discussion

The acquisition of belief understanding is recognized as a profound achievement, yet its effect on children's social lives has been investigated in only limited ways. In particular, whether and how belief reasoning is directly involved in social interactions, such as persuasion, has received little attention. In two studies, we have begun to address this issue, using an experimental paradigm designed to manipulate the belief information presented to children in the context of persuasion (Bartsch & London, 2000). By crafting puppet tasks on the basis of this paradigm, we tried to involve child participants in something like genuine social interaction that would elicit their best reasoning. Insofar as our approach continues to rest on laboratory tasks, our perspective is still limited. We did not observe children engaged in everyday persuasion but instead administered story and puppet tasks that tapped forced-choice reasoning. The scenarios were not unrealistic, but children engaged in real-life persuasion are not offered argument choices; they must spontaneously use arguments of their own invention. Moreover, we assessed belief reasoning via limited though arguably seminal measures (but see Bloom & German, 2000), and our cross-sectional designs did not permit direct examination of individual change.

Despite these limitations, our studies offer needed replication data and new data pertinent to the issue of how children's changing appreciation of belief relates to their social reasoning. Our approach permitted us to compare children's use of belief information in persuasion tasks and in false-belief prediction tasks widely regarded as diagnostic of belief understanding. By interviewing children as young as 3 years old, we were able to explore (albeit indirectly through cross-sectional designs) whether belief-relevant persuasion and belief-relevant action prediction emerged similarly. By introducing puppet persuasion tasks, we tested whether a more socially interactive situation would elicit belief-relevant reasoning in even quite young children. Finally, by using puppet versions of both persuasion and false-belief tasks, we compared children's belief reasoning on the two types of tasks with greater precision.

A central finding was that belief-relevant persuasion, measured with puppet or story tasks, improved substantially between ages 3 and 7. Our results reinforce the conclusion that the capacity for consistent belief-relevant persuasion emerges in early childhood (Bartsch & London, 2000). In addition, 3-year-olds' inconsistent application of belief information suggests that this capacity emerges after age 3. Our findings challenge views suggesting that belief-relevant persuasion is either much easier or much harder than false-belief reasoning. The similar age-related improvements in belief reasoning on persuasion and false-belief tasks accord with the idea that children begin to attend to beliefs in social endeavors such as persuasion even as they acquire the general concept of belief.

It is, however, premature to strongly conclude that children's improving performances with age on false-belief tasks and belief-relevant persuasion tasks necessarily reflect a common development. One factor that warrants consideration is language development, which has been argued to play an important role in children's ability to reason about belief (e.g., de Villiers & de Villiers, 2000; Hale & Tager-Flusberg, 2003). Lohmann and Tomasello (2003), for instance, reported that training in the syntax of sentence complements (e.g., "Ernie showed us that [he could lift up this candle]") improved children's predictions of action from information about false belief. We did not assess children's language development, but reflection on the language demands of our tasks speaks indirectly to this issue. Note that the critical belief information was presented slightly differently in Studies 1 and 2. In Study 1, both persuasion and false-belief tasks involved explicit mention of *think* together with a sentential complement (e.g., "I think puppies are dirty," "Annie thinks her kitten is in the kitchen"). Clearly, a grasp of sentential complements might have similarly affected performance on both tasks. However, in Study 2, the false-belief tasks did not make explicit mention of the beliefs, so the term *think* was employed only in the persuasion tasks. This discrepancy in the use of sentential complements for belief reference across the two tasks had, if anything, an effect opposite to what might be expected from the perspective of a concern about the effects of language understanding on belief reasoning. That is, the difference in persuasion and false-belief performances in Study 1 was larger, rather than smaller, than the difference in Study 2. Of course, other sentential complements (as in "The kitten wants to be brushed") were involved in all the tasks, as were other potentially challenging aspects of language, so we cannot categorically rule out a role for language understanding in contributing to the observed patterns.

A second aspect of our tasks that warrants reflection concerns how children comprehended the information, especially the belief information, as it was presented from different sources (e.g., from a puppet enacted by the experimenter, from a story character as narrated in a story, from the experimenter as narrator, etc.). Research on text comprehension in adults suggests that such variation may result in differential effects on memory for text elements such as who said what (Graesser, Bowers, Olde, & Pomeroy, 1999). However, Graesser et al. (1999) observed better recall in conditions involving a first-person narrator (perhaps equivalent here to the persuasion tasks in which belief information was always delivered through an "I think" statement) than in conditions involving a third-person narrator (as in the false-belief tasks in Study 2, although no direct belief attributions were made). Children's

slightly superior performance on false-belief puppet tasks compared with persuasion puppet tasks in Study 2 is thus at odds with what might be expected and offers some evidence that variations in information sources did not unduly influence children's responses. It is, of course, possible that any presentation of scenarios or stories, as in these laboratory tasks, is effectively third-person narrative, whereas direct real-life interaction exposes children to mostly first-person perspectives. On this analysis, all such laboratory tasks may underestimate children's capacity to reason about beliefs (or anything else) in real-life exchanges.

Insofar as our persuasion puppet tasks represented situations that children might encounter in daily life, with their attendant language, perspective-taking, and memory requirements, our results take us a step closer to ruling out a very late acquisition of the capacity for belief-attuned persuasion. The findings are at odds with (or, at any rate, bring into question) implications that children are unable to take subjective states into account during persuasion until late elementary school or early adolescence (e.g., Clark & Delia, 1976). At least in highly structured, forced-choice problems, children can attend with reasonable consistency to belief information by 6 or 7 years of age. Of course, producing spontaneous persuasive arguments that similarly reflect attention to others' subjective states may be a more difficult business mastered only later in development. We have demonstrated an early capacity to attend to belief information in the context of persuasion in children as young as 4 and 5 years, but even in our structured and supportive tasks, young children were far from perfectly correct. Future research may show that spontaneous generation of belief-relevant arguments emerges later, as does other complex belief reasoning according to some reports (e.g., Carpendale & Chandler, 1996; Pillow, Hill, Boyce, & Stein, 2000; Pillow & Mash, 1999; Wimmer, Hogrefe, & Perner, 1988).

Our data also lead us to doubt the second alternative scenario in which even very young children manipulate people through a sensitivity to their beliefs, a scenario that might be extrapolated from observations of toddlers (e.g., Dunn, 1991; Dunn & Munn, 1985; Reddy, 1991). Three-year-olds in our studies performed quite poorly. The apparent discrepancy between our results and observations of psychologically attuned social interaction in toddlers may be due to several factors. One possibility is that very young children attend to subjective states such as emotions and desires in other people and can act persuasively on those recognitions, but they do not yet respond to beliefs. This would accord with experimental and observational research indicating that even 2-year-olds frame action in terms of desires and emotions (e.g., Bartsch & Wellman, 1995; Gopnik & Wellman, 1994; Meltzoff, Gopnick, & Repacholi, 1999; Repacholi, 1998; Repacholi & Gopnik, 1997; Wellman & Woolley, 1990). Close examination of the specific interactions reported by Dunn and others (Dunn, 1988; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991) reveals that few, if any, implicate definitively a young child's grasp of a clearly representational state, such as a belief as opposed to a desire or emotion. Of course, although this explanation of 3-year-olds' poor performance accords with the idea that children proceed from desire to belief understanding, it is also possible that we simply have not yet found an adequate way to tap an earlier sensitivity to beliefs in a persuasion context. Our tasks may not be sufficiently free of demand characteristics (e.g., language demands or those resulting from a combination of task factors) or they may not be sufficiently motivating. Support for this line of thinking comes from O'Neill's (1996) report that 2-year-old children, requesting a parent's help in retrieving a toy from a high shelf, communicated better (i.e., named the toy and gestured to the location) with parents who were not present during the toy's placement than with parents who were present. Such communications arguably resemble persuasive utterances designed to produce action in another person that reflect a consideration of that person's beliefs.

In showing similar acquisition of belief-relevant reasoning on persuasion and false-belief tasks, our results accord with the conclusion that children acquire an understanding of belief in early childhood and begin to attend to others' beliefs in ways that support psychologically attuned persuasion. Our findings complement reports of positive association between false-belief scores and teachers' ratings of social skills (Watson et al., 1999) and social competence (Lalonde & Chandler, 1995) and go a step further in confirming, through experimental manipulation, that children's changing appreciation of belief information potentially underlies these developments.

A second conclusion consistent with our results, if not mandated by them, is that our persuasion tasks did in fact tap children's understanding of belief instead of a more general appreciation of other subjective states. Bartsch and London (2000) noted that, unlike the false-belief paradigm, the belief-relevant persuasion tasks might not necessarily require belief understanding. For instance, children might interpret them in terms of desires (i.e., "Chloe thinks the kitten bites" means Chloe does not want to be bitten). But even with our current more interactive paradigm, 3-year-olds performed poorly; use of explicit belief information improved with age similarly on persuasion and false-belief tasks.

Our results suggest that belief understanding is linked to social reasoning, but they do not distinguish among various accounts proposed to explain the development of mental state understanding itself. That is, the findings do not discriminate among "theory–theory" accounts (e.g., Gopnik & Wellman, 1994), simulation accounts (e.g., Harris, 1994), executive function accounts (e.g., Zelazo & Frye, 1996), and modularity accounts (e.g., Leslie, 1991). Moreover, our results do not preclude the possibility that social interactions themselves contribute to children's growing appreciation of belief states. Indeed, it seems likely that children's early participation in persuasion, a common occurrence among siblings, might facilitate their discovery of the importance of people's representations; in this regard, our findings complement reports that point to a child's experience with siblings as a factor in belief understanding (e.g., Brown, Donelan-McCall, & Dunn, 1996; Perner, Ruffman, & Leekam, 1994; Ruffman, Perner, Naito, Parkin, & Clements, 1998). Some scholars have argued strongly for a role for social experience in the development of an understanding of mind (Carpendale & Lewis, 2004; Chandler & Hala, 1994; Dunn, 1996; Feldman, 1992; Tomasello, Kruger, & Ratner, 1993); along those lines, children may discover the effectiveness of an argument that happens to be relevant to their conversational partner's stated belief and eventually may come to appreciate the importance of the other's perspective. A closer examination of such specific interactions may be needed to sort out why only some studies have reported a sibling effect as described above (Carlson & Moses, 2001; Cutting & Dunn, 1999; Dunn, Brown, & Beardsall, 1991).

Future research must continue to broaden the scope of abilities under investigation if we are to understand the links between children's conceptual development and social behavior. As a starting point, we have focused on situations in which the child is asked to persuade two people with different beliefs that both discourage the desired action. But the ways in which we rely on our understanding of people's beliefs during persuasion are probably legion. For instance, we might try to persuade someone not by changing his beliefs but instead by using an argument that fits into his known beliefs. We might convince a jealous husband to leave his wife by pointing out circumstantial evidence that aligns with his suspicion that she is unfaithful. Just as the false-belief paradigm taps a singular way in which people reason about beliefs and actions, so the persuasion paradigm used here involves only one type of belief-contingent social interaction. Nevertheless, the inclusion of persuasion assessment in studies of belief reasoning is a marked expansion in an area often narrowly focused on false belief. In targeting social communication skills, this expansion offers a tentative promise to address the gaps (see Chandler & Carpendale, 1998) between an older literature on social role-taking (e.g., Chandler & Boyes, 1982; Elkind, 1967; Flavell, 1968; Selman, 1980), with its claims that social cognition develops through adolescence, and the more recent focus on children's understanding of mind and its claims of precocious capacity. Broadening the range of belief reasoning tasks put to children in future research will be essential both to adequately describe the scope of naive psychological reasoning and to understand the course of social–cognitive development.

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