Deaf Children's Use of Beliefs and Desires in Negotiation

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Although several studies have shown that deaf children demonstrated impaired performances on false-belief tasks, the children's belief understanding appeared intact when asked to explain emotions or behavior. However, this finding does not necessarily indicate a full-fledged theory of mind. This study aimed to investigate deaf children's negotiation strategies in false-belief situations, because situations that require negotiation provide a natural context with a clear motivational aspect, which might appeal more strongly to deaf children's false-belief reasoning capacities. The purpose of this study was to compare the reactions of 11- to 12-year-old deaf and hearing children to scenarios in which a mother, who is unaware of a change in the situation, threatens to block the fulfillment of the child's desire. The results showed that deaf children more often failed to correct the mother's false beliefs. In contrast with hearing children, who frequently left their own desires implicit, deaf children kept stressing their desires as a primary argument, even though the mother could be expected to be fully aware of these desires. Moral claims were used to the same extent by both groups. In general, deaf children more often used arguments that did not provide new information for their conversation partners, including repetitions of the same argument. The results were interpreted in terms of the special needs that are required by the hampered communication between deaf and hearing people as well as in terms of the ongoing discussion regarding theory-of-mind development in deaf children.

Deaf children, although widely varying in their personalities and mental health, share developmental experiences that are far from optimal. Consequently, it is not surprising that most of them are delayed in the development of language and cognition, as well as within the area of social and emotional skills (Greenberg & Kusché, 1993). This affects their daily interactions with others. Deaf children feel less accepted compared with their hearing peers (Obrzut, Maddox, & Lee, 1999) and display less self-confidence in social situations (Desselle, 1994; Yachnik, 1986). They find it difficult to understand the social rules of friendship (Rachford & Furth, 1986), they easily attribute hostile intentions to others (Murdock & Lybarger, 1997), and, although they can be quite persistent in social interactions (Vandell & George, 1981), they are less competent in expressing their emotions in social conflicts (Rieffe & Meerum Terwogt, 2003; Rieffe, Meerum Terwogt, & Smit, 2004). Each of these factors might contribute to the tendency of some authors to consider a relatively large percentage of deaf children as stubborn and hard to handle (Van Eldik, 1994; Vostanis, Hayes, Du Fue, & Warren, 1997). However, an underlying common factor might be their frequently noted impaired development of theory of mind (see Peterson & Siegal, 2000, for an overview), which refers to an understanding that people do not react to situations as such, but rather to their desires and their beliefs about those situations (Wellman, 1990). The aim of this study is to further explore the effect of deaf children's theory-of-mind impairment on their social functioning.

The present study aimed to address one of the basic interaction patterns that might contribute to the lack of

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understanding between deaf children born to hearing parents and their environment: deaf children's negotiation behavior. Negotiation refers to the ability to agree upon a compromise in a situation in which at least two parties have conflicting interests and both parties aim to obtain the most optimal outcome possible. From a psychological point of view, negotiating behavior is interesting because it strongly appeals to children's theory-of-mind capacities for two reasons. First, a conflict of interest often originates from the fact that the interlocutors hold different premises. Adequate negotiating therefore requires awareness of such discrepancies and implies an attempt to emphasize one's own beliefs. Second, the purpose of negotiation in daily life is to move towards obtaining one's own desires; it entails a self-directed focus that makes it even more difficult to consider the opponent's perspective (Barnett, King, & Howard, 1979; Meerum Terwogt, 2002). The understanding that two people may hold different perspectives regarding the same situation is a fundamental prerequisite in theory-of-mind development.

The acknowledgement that desires are subjective precedes the acknowledgement concerning beliefs. Therefore, testing children's belief-desire reasoning is usually focused on the belief aspect. The so-called *false-belief paradigm* is the most widely used criterion. The "Sally-Ann" task is a typical example (Baron-Cohen, Leslie, & Frith, 1985). In the first scene of this task, children see Ann put her marble in a box, after which she leaves the scene. Then the children witness how Sally switches the marble from the box to a basket. Later on, Ann reappears and the participants are asked: "Where will Ann look for her marble?" Children with an active theory of mind will realize that Ann will still believe that her marble is in the box, although the participants know this to be false. Whereas this simple kind of false-belief task presents no problem for hearing 5-year-olds or for deaf children born to deaf parents (Courtin & Melot, 1998; Peterson & Siegal, 2000; Woolfe, Want, & Siegal, 2002), even 10-year-old deaf children born to hearing parents often fail to provide the correct answer (Courtin & Melot, 1998; Peterson & Siegal, 2000; Steeds, Rowe, & Dowker, 1997).

However, various authors have warned against the use of the traditional false-belief tasks as the only index for theory-of-mind reasoning (e.g., Siegal & Beattie, 1991; Siegal & Peterson, 1994). First, the false-belief task in this format is susceptible to unwritten conversational rules (Grice, 1975). For instance, "where will Ann look?" easily could be interpreted as "where should Ann look?" which of course will lead to the opposite response. Even a relatively nonverbal variety of the false-belief task cannot prevent this kind of conceptual mistake in deaf children (Woolfe et al., 2002). Obviously, already their early verbal deficiencies have restricted their conceptual development, because language plays a crucial role in concept formation (de Villiers, de Villiers, Schick, & Hoffmeister, 2000). Second, increasing the real-life impact of the situation by making the children active participants—for instance, by letting them take part in a deception game (Chandler, Fritz, & Hala, 1989) or by putting them in a situation in which they directly gain by correcting false beliefs (Meerum Terwogt, Rieffe, Tuijn, Harris, & Mant, 1999)—has also shown that the conventional false-belief paradigm can underestimate theory-of-mind capacities. For example, Meerum Terwogt and colleagues created a situation in which participants knew where a little present for them was placed, whereas the experimenter lacked this information in half of the cases (and instead had a false belief about the location of the present) but not in the other half (true-belief condition in which the experimenter had a correct belief about the location of the present). Children in the false-belief condition prompted the experimenter towards the correct location of their presents earlier than those in the true-belief condition. Therefore, the main reason for the present study was to examine the possibility that deaf children's performances on theory-of-mind tasks might have been affected by these kinds of motivational factors.

Bartsch and Wellman (1995) suggested another approach, investigating children's theory-of-mind understanding by studying children's spontaneous use of mental references in explaining behavior. This idea was also applied to deaf children (Marschark, Green, Hindmarsh, & Walker, 2000; Rieffe & Meerum Terwogt, 2000). Both studies provided a much more positive picture of the theory-of-mind abilities of deaf children: The deaf participants in these studies produced even more mental-state references than their

hearing counterparts. This finding makes it hard to deny that deaf children an active theory of mind, even though it is usually found that post hoc explaining—as was the case in both studies—precedes predicting (Wellman, 1990). Rieffe and Meerum Terwogt's study (2000) demonstrated why deaf children even exceeded hearing children in the number of mental-state references, which might also explain the findings of Marschark et al. (2000): Rieffe and Meerum Terwogt found that deaf children produced many more desire statements. The authors argued that this so-called ''desire priority'' was caused by deaf children's history of impaired communication opportunities. Consequently, it might better serve deaf children to keep their messages simple and make sure that others know exactly what they want. So, in the short term, deaf children's desire priority seems functional. Explaining why, which usually also implies the expression of underlying beliefs, might be too problematic and increase the risk of being misunderstood. Several issues that might cause limited communication opportunities for deaf children can be identified.

First, deaf children are dealing frequently with hearing people who either have impaired communication skills or make less use of them to communicate with the deaf child. For example, 90% of deaf children are raised by hearing parents. Even if the children themselves are sufficiently skilled in the use of sign language, it is most likely that the majority of their parents are not. The communication skills of hearing parents to their deaf offspring seldom exceed the level of a four-year-old. This results in short and simple interactions, in which the interlocutors openly display their impatience with one another and show reluctance to talk about abstract concepts, such as emotions and beliefs (Vaccari & Marschark, 1997). However, other studies have shown that interactions between hearing teachers—who learned either sign language or sign-supported English—and deaf pupils are also limited. Wood (1991) stated that these teachers tend to use too much control, which results in fewer child initiatives and short responses. Teachers of deaf children frequently rely on modeling, extension, and correction techniques whereas other techniques for interaction are largely ignored (Harrison, Layton, & Taylor, 1987). Consequently, communication between deaf children and hearing conversation partners seldom involves important aspects for the development of a better understanding of their social environment such as speculation, hypothesis formulation, imagination, or negotiation (Wood, 1991).

Second, deaf children who are raised in a family with hearing family members already have considerable language delay before they master sign language and enter a community in which full-fledged communication partners are available. This also causes limited communication opportunities for deaf children. For example, communication breakdowns happen frequently between deaf children and the hearing community. In contrast to hearing individuals who learn the necessary repair strategies naturally and spontaneously through their everyday auditory experiences, research has shown that deaf children are not as effective in their use of these strategies, which could indicate that they have never acquired these strategies to the same extent as hearing children (Ciocci & Baran, 1998; Most, 2002). Moreover, their delayed language development also restricts deaf children's employment of other sources of information about other people's mental states. For example, hearing children often benefit from overhearing conversations between others or reading children's books. Such sources are less accessible to deaf children.

In conclusion, deaf children are less exposed to and participate less frequently in the kinds of conversations that promote the use of the basic theory-of-mind principles. Several authors (e.g., de Villiers et al., 2000; Jenkins & Astington, 1996) have already demonstrated that the development of a theory of mind partly depends on the development of language (i.e., the ability to talk about mental phenomena), as well as the availability of knowledgeable people who are able to provide the necessary information. So, there are a number of reasons to expect a general delay in theory-of-mind reasoning among the deaf. However, the desire priority that was observed in deaf children has to be distinguished from purely desire-based reasoning, as can be found in very young children (Wellman, 1990). Young hearing children seem to ignore beliefs as a representational device, whereas deaf children clearly acknowledge that beliefs are an important element in explaining behavior or emotions (Rieffe

& Meerum Terwogt, 2000). This suggests that deaf children are not simply "delayed." The phenomenon of desire priority can also be observed in other interactions with limited communicative possibilities. For example, based on our own experience, we want to suggest that hearing adults tend to do the same when they are visiting a foreign country and are unable to speak the native language fluently. In sum, although deaf children's desire priority should not be regarded as proof of impaired theory-of-mind development, the finding that deaf children acknowledge that behavior is governed by beliefs and desires does not necessarily indicate fully fledged theory-of-mind reasoning either. This study looked more closely into the daily use of deaf children's theory-of-mind understanding.

The strength of the false-belief paradigm is that it unequivocally indicates that children who pass this criterion (a) clearly acknowledge that others may hold beliefs that are different from their own, and (b) have recognized that the various situations presented to them in the false-belief tasks indicate such belief differences. In relation to (a), acknowledging the subjective element of beliefs is one of the cornerstones of adult theory-of-mind reasoning. However, the spontaneous use of mental-state references by deaf children in order to explain behavior (as was observed in the studies mentioned earlier) still does not exclude the possibility of egocentric reasoning (in the Piagetian sense of the term), a type of reasoning in which children tend to regard their own mental states as a starting point. In relation to (b), even when children acknowledge the possibility that people may hold different mental representations about the same situation, the question still remains whether they apply this understanding to everyday-life situations. When children have the tendency to focus strongly on their own desires, it seems unlikely that they will notice signs indicating that other people hold different opinions.

In this study we wanted to look into deaf children's negotiation strategies in false-belief situations because situations that require negotiation provide a natural context with a clear motivational aspect. In the present experiment, participants were confronted with two scenarios in which their mother intends to block the fulfillment of a desire on the basis of a false-belief, and children were asked for their reactions. Providing their mother with the relevant information would correct her false belief and resolve the situation. First, it was expected that hearing children primarily would try to correct their mother's false belief. If the tendency of deaf children to stress desires is no more than an epiphenomenon of their restricted communication possibilities, they should realize that under the presented circumstances, it is necessary to take notice of their mothers' false belief and correct it. If this is the case, then their answers should be similar to those of the hearing children. However, if their restricted communication has seriously hampered the development of a full-fledged theory of mind, deaf children should fail to inform the mother about the changed situation.

Second, we also wanted to look into children's use of desire arguments. When people have to negotiate, the mere expression of desires is usually not sufficient and a situation can easily escalate through the confrontation of opposing desires. Besides, there was no reason in the presented stories for children to repeat their desires, since the scenarios clearly stated that the mother was well informed about the child's wishes. If children realize that desire repetition only weakens their negotiation position, they should actively try to suppress these kinds of statements, despite the fact that the fulfillment of that desire is their reason for negotiation. A weak theory of mind, in combination with a tendency to focus on their own desires (an egocentric point of view), would cause deaf children to exhibit fewer restraints in stressing their desires than hearing children.

Method

Participants

Twenty-one severely and profoundly deaf children and 36 hearing children participated in this study. The group of deaf children consisted of 12 boys (mean age 12 years and 1 month, or 12;1, range 11;3 to 12;10) and 9 girls (mean age 11;4, range 10;5 to 12;4) who came from a primary school for the deaf (note that children attend primary school in the Dutch system from ages 4 through 12). All children were audiologically diagnosed as being profoundly deaf: Two of them had

Table 1 Relation between children's SDD skills and that of their home environment (most skilled parent)

	SDD skills—children		
SDD skills—parents	Poor	Average	Good
Absent			1
Poor	2	2	4
Average		1	6
Good			5

Table 2 Relation between children's SDD skills and that of their primary environment

SDD skills—primary environment	SDD—skills children		
	Poor	Average	Good
Poor	2	2	2
Average		1	6
Good			8

no measurable hearing and the mean hearing loss of the remaining 19 children was 112.37 dB ($SD = 8.23$) in the better ear. All children but one had entered the kindergarten of this school for the deaf when they were 3 years old. They had not attended another kindergarten or daycare center before. Only one girl who had moved from Mexico to the Netherlands entered the school for the deaf (Effatha) when she was 4 years old. Deaf women looked after the children in the kindergarten.

All teachers at Effatha communicate in Sign-Supported Dutch (SSD), which most deaf children also use among themselves. The school psychologist judged the SSD skills of the children: 16 (of which 4 children are resident at the Institute for the Deaf) were good, 3 were average, and the remaining 2 were poor. Apart from their deafness, they had no other handicaps. The deaf children participate in a standard educational program, which requires at least average intelligence. To confirm that the deaf children were of average intelligence, IQ assessments by the school psychologist were used. Eight children were tested with the SON-R (a standard Dutch nonverbal intelligence test), and 13 children were tested with the nonverbal WISC-R test. The mean IQ score was 103.33 ($SD = 17.48$).

All but one child had hearing parents. Parents had been receiving family supervision from the moment that their child was diagnosed with a hearing loss. This also included teaching SSD to the parents and other family members. Most parents use SSD to communicate with their deaf child. The school psychologist judged the SSD skills of the parents: 7 parents were good, 12 were average, and 13 were poor. Five parents (four fathers and, for one child, the mother as well) only use oral language to communicate with their deaf child. Table 1 shows the relation between the SDD skills of the children and that of their home environment (as indicated by the parent with the highest SDD skills). The association between the two measures is moderate ($R = .37$, $p = .099$).

Note, however, that four children were not living at home, but were resident at the Institute of the Deaf. Three of them have parents with poor or no SDD skills. However, their primary environment (the institute) provides them with good conversation possibilities. Corrected for the position of these children (Table 2), the association between children's SDD skills and that of their primary environment improved considerably ($R = .61$, $p = .003$).

The control group of 36 hearing children consisted of 20 boys (mean age 11;1, range 9;8 to 12;10) and 16 girls (mean age 11;1 month, range 9;8 to 12;1). Separate IQ scores were not assessed, but their teachers described all hearing participants as having normal intelligence. The mean age of the hearing group was slightly younger than the deaf group, which was intended to work to the advantage of the deaf children. Consequently, any possible effects of the age discrepancy could only work against the hypotheses formulated in this study.

Materials

Children were presented with two scenarios that were designed to address children's understanding of the necessity to correct false beliefs in others. In both scenarios, the fulfillment of the child's desire is blocked by the mother's false belief. Providing the mother with the missing information would help the child to reach the goal. After each scenario, children were asked what they would say to their mother.

Scenario I (Granny):

Your mother promised you that you could stay overnight with your grandma. You are very much looking forward to this stay. But on the morning itself, your mother tells you that you can't go, because Granny is too tired and she can't have children around. You feel angry and think, "How come, if Granny were tired, I am sure she would have told me herself." You telephone your friend to tell him/her about it and how unfair it is. After you have told him/her your story, he/she remarks: "But you can come and stay overnight with us, if your mother says it's okay." The idea makes you happy again. Joyfully you immediately go to your room to pack your bag. A few moments later, your mother looks through the open door and says angrily: "Hey, what are you doing? Didn't I tell you that you couldn't stay with Granny?!"

Scenario II (Bike):

The shop on the corner has a beautiful bike for sale. Your bike is very old and no longer goes very well. But your mother thinks that the bike in the shop, which you like so much, is too expensive. "Then I'll pay for it myself," you think. You empty your moneybox and count your savings, but you don't have enough. Your mother is out shopping. You go to your father and tell him your problem. He looks quite cheerful and says, "No problem, if you give my car a good wash, I'll give you ten pounds." You start cleaning his car and when you are finished, your father gives you the ten pounds. Happily, you go with all your money to the shop on the corner in order to buy that great bike. Just as you are going into the shop, your mother comes around the corner with two fully packed shopping bags. She sees you at the door of the shop and shouts angrily: "What's this? Didn't I tell you that you couldn't have that bike?!"

Procedure

All the participants were tested individually. A non-familiar hearing female staff member who was highly skilled in using Sign-Supported Dutch tested the deaf children. She had first translated the two vignettes into SSD. Words such as "listen" and "say" posed no problem for the deaf participants, because these were words that teachers would use in the classroom. For all children, the instruction for each scenario was simply "listen carefully," followed at the end of each scenario by the question: "What would you say to your mother?" The order in which the scenarios were presented was alternated.

All sessions were tape-recorded in order to achieve a verbatim report of the answers. The deaf children's experimenter simultaneously verbalized the deaf children's responses. Transcriptions of these audiotapes were made by the experimenter who had tested the hearing children. The sessions with the deaf children were also videorecorded in order to check the translations afterwards. An independent deaf adult found no discrepancies between children's responses in the audiobased transcripts and on the video.

The two authors of this paper designed a coding system (see Results) and coded all responses anonymously. The interrater agreement was 97% and disagreements were resolved by discussion.

Results

False-belief Corrections

Our first concern was the extent to which deaf children would correct the mother's false belief by informing her about what had happened during her absence. Therefore the responses were judged on the basis of their information aspect and assigned to one of several categories, as indicated in Table 3.

Table 3 shows the distribution of responses in this respect by deaf and hearing children. It can be seen that deaf children less often provided their mother with the information necessary for her to understand the situation. In order to check this conclusion, full explanations were attributed a score of 2, partial explanations a score of 1, and no explanations a score of 0. These scores were summed over two stories. Children could thus obtain a minimum score of 0 and a maximum score of 4. Since the frequency in some cells was less than five, a Mann-Whitney U Test was carried out, which confirmed the difference between the two groups ($p = .047$). *Full explanations* are responses that provide the mother with enough information to understand the new situation, thereby enabling the child to fulfill his or her desire. For example, a child might state, "But I called my friend and she said that I could stay overnight with her" or

Table 3 Number of children with respect to their attempts to correct the mother's false belief (summed over two stories; percentages in parentheses)

	Score	Deaf children	Hearing children
No explanations for either story	0	6 (29%)	1 (3%)
Partial explanation for one story	1	2 (9%)	3 (8%)
Partial explanations for both stories	2	3 (15%)	10 (28%)
Full explanation for one story	2	2 (9%)	1 (3%)
One partial, one full explanation	3	4 (19%)	11 (31%)
Full explanations for both stories	4	4 (19%)	10 (28%)

"But I washed daddy's car and he gave me money for it." *Partial explanations* are responses providing some of the critical information, but not enough to allow the mother to reconstruct what had really happened. Examples include, "But I'll go to my friend" or "But daddy gave me money." *No explanations* are responses that contain no information unknown to the mother. For example, the child might state "But I cannot visit Granny" or "But I want that bike."

Additional Mann-Whitney U Tests did not show differences between deaf children with poor/average SDD skills versus the children with good SDD skills, nor between the deaf children of parents who had no/poor/average SDD skills versus children of parents with good SDD skills, nor between children who were living in an environment with poor/average SDD skills versus children living in an environment with good SDD skills. It has to be noted, however, that the sample sizes for these additional analyses were small and these outcomes are only indicative.

Desire Arguments

Our next concern was whether the children would stress their own desires again. Therefore we scored the answers once more, but this time on the desire aspect. We distinguished four patterns expressing different levels of desire priority. The highest level of desire priority (score 3) was assigned to answers in which the children express their desire once more ("But I want that bike") in the absence of any other argument. A score of 2 was given when the child starts by repeating the desire, but goes on with other arguments. A score of 1 was assigned when the desire appears only later in the argument, and score 0 was assigned when the child refrains from repeating the desire. These scores were summed over two stories. Children could thus obtain a minimum score of 0 and a maximum score of 6. This distribution is presented in Table 4.

Table 4 Distribution of children's desire references (summed over two stories; percentages in parentheses)

	Score	Deaf children	Hearing children
No desires for both stories	0	9 (43%)	24 (67%)
Desire later for one story	1	1 (5%)	5 (14%)
Desire later for both stories	2	2 (9%)	1 (3%)
Desire first for one story	2	2 (9%)	3 (8%)
Once desire later, once desire first	3	3 (15%)	1 (3%)
Only desire for one story	3	1 (5%)	1 (3%)
	4	—	—
Once desire first, once desire only	5	1 (5%)	1 (3%)
Only desires for both stories	6	2 (9%)	—

It can be seen that deaf children referred to desires more often and with a higher priority than their hearing peers. A Mann-Whitney U Test was carried out, which confirmed the difference between the two groups ($p = .022$). Additional Mann-Whitney U Tests did not show differences between deaf children with poor/average SDD skills versus the children with good SDD skills, nor between the deaf children of parents who had no/poor/average SDD skills versus children of parents with good SDD skills, nor between children who were living in an environment with poor/average SDD skills versus children living in an environment with good SDD skills. It has to be noted here as well that the sample sizes for these additional analyses were small and these outcomes are only indicative.

Finally, we calculated the association between children's scores on false-belief corrections and desire references to look at individual differences. The results of Wilcoxon Signed Rank Tests showed that hearing children who had a higher ranking in desire priority had provided less advanced information to correct the mother's false belief ($Z = -4.58$, $p = .001$). However,

Table 5 Distribution of number of arguments (summed over two stories; percentages in parentheses)

	Deaf children	Hearing children
Mean score (*SD*)	5.05 (2.56)	4.83 (1.42)
2	3 (14%)	3 (8%)
3	3 (14%)	2 (6%)
4	6 (29%)	9 (25%)
5	2 (10%)	11 (31%)
6	2 (10%)	7 (19%)
7		3 (8%)
8	2 (10%)	1 (3%)
9	1 (5%)	
10	2 (10%)	

Table 6 Distribution of number of old arguments (summed over two stories; percentages in parentheses)

	Deaf children	Hearing children
Mean score (*SD*)	2.29 (2.24)	1.14 (0.87)
0	4 (19%)	10 (28%)
1	6 (29%)	12 (33%)
2	4 (19%)	13 (36%)
3	2 (9%)	1 (3%)
4	2 (9%)	
5	1 (5%)	
7	1 (5%)	
8	1 (5%)	

this test failed to show significance for deaf children ($Z = -0.24$, $p = .812$).

Other Indices

The answers of deaf and hearing children might not have been equally elaborate, in which case the findings above could be confounded. However, the mean *number of arguments* (irrespective of the nature of the argument) was similar for deaf (5.05) and hearing (4.83) children. A *t* test did not show a difference between the two groups. Table 5 represents the distribution of the number of arguments for both groups.

As suggested by the belief and desire findings, the main difference is found in the fact that deaf children tend to fall back on arguments that do not provide the conversation partner with new information. The conversations that have preceded the scenes described in the scenarios are not explicitly given, but it is unlikely that the mother is not aware of the child's central desires (''But I want that new bike''). Similarly, it does not seem plausible that the topic of a new bike arises without discussing the shortcomings of the old one (''But my bike is much too old.'') Among the deaf children, a mean number of 2.29 arguments per answer were based on *old information*, compared with 1.14 among hearing children. A *t* test showed that this difference was significant ($t_{(55)} = 2.75$; $p = .008$). The distribution of the number of new arguments per group is presented in Table 6.

One of the more powerful ways to get what you want is to focus on moral aspects. Arguments like this can involve old information (''But you promised me that I could stay with Grandma,'' implying that the mother therefore cannot refuse an overnight stay with a friend) as well as new information (''I have earned the money myself,'' implying that it is your own decision how to spend that money, or ''my daddy promised me ''). As it turns out, deaf children used the moral appeal as often as their hearing peers. A *t* test showed no difference between the two groups. The distribution of the number of moral arguments per group is shown in Table 7.

Within the naturalistic setting a *repetition of the same argument* is a common phenomenon. However, such repetitions are usually elicited by the intervening reactions of the interlocutor. Without these reactions they are not expected, and indeed they rarely appeared in this study. Especially among hearing children these repetitive answers did not appear frequently (in three answers, which is only in 4% of the answers). Among deaf children, however, this index rose to eight (19%). Thus, even within these circumstances, a reasonably large proportion of the answers still contained a repetition of arguments. Since the frequency in one cell was less than five (Table 8), a Fisher's Exact Test was carried out ($p = .018$).

Finally, we looked at the associations between a child's number of arguments and other indices (level of information, desire priority, number of arguments based on old information and number of moral arguments). We carried out these tests separately for deaf and hearing children. The results of Wilcoxon Signed Rank Tests showed that there were positive associations between the number of arguments and children's level of new information, as well as their

Table 7 Distribution of children using moral arguments (summed over two stories)

	Deaf children	Hearing children
Mean score (*SD*)	0.57 (0.75)	0.75 (0.84)
0	12	18
1	6	9
2	3	9

Table 8 Number of children using argument repetition (summed over two stories)

	Deaf children	Hearing children
Repetitive	8	3
Not repetitive	34	69

desire priority for both groups (all tests reached a significance of $p < .001$). Correlations between the number of arguments and the number of old or moral arguments showed significance only for deaf children with respect to the number of old arguments ($R = .56$, $p < .009$).

Discussion

The results indicate that deaf children's desire priority is more than a local conversational phenomenon. Our deaf participants not only persevered in stressing their own desires within the present circumstances, but also proved to be less aware of the necessity to enlighten their conversation partners about the changed situation in order to receive a more favorable reaction. The finding that deaf children relatively often ignored the false-belief character of the situation is consistent with the finding that deaf children, even at the age of ten, also frequently fail false-belief tasks (Courtin & Melot, 1998; Peterson & Siegal, 1995; Steeds et al., 1997; Woolfe et al., 2002). Although deaf children are able to acknowledge that people are governed by beliefs and desires—as was argued in the introduction—they clearly do not always activate this principle when the situation requires it. The finding that the number of desire arguments was inversely related in hearing children to the tendency to correct other people's false beliefs indicates that a self-centered focus hampers the acknowledgement of other people's perspectives. The fact that this relationship did not reach significance for deaf children suggests that deaf children's failure to correct false beliefs is caused by more than just a lack of attention. A relative weakness in theory-of-mind reasoning is a plausible explanation. However, before prolonging this argument, we will first consider a more trivial explanation.

Deaf children produced shorter messages, which possibly could have caused the pattern of results we found in this study. We used the number of arguments contained in children's answers to control for this alternative explanation, but analysis showed no difference in this respect between deaf and hearing children. Therefore, we may safely conclude that the differences in the nature of their arguments were due to causes other than economy of expression, which implies that although deaf children might have a basic theory-of-mind understanding, they might fail to activate it when daily situations require them to do so.

Very young children seem to embrace a theory of mind that is exclusively based on the desire aspect (Wellman, 1990). With respect to deaf children, as was already indicated in the introduction, that does not necessarily mean that the tendency to stress the desire element in itself should be regarded as an indication of an impaired theory of mind. As discussed previously, deaf children's desire priority possibly originates from the special requirements that stem from their limited communication means within a hearing world. Yet, this desire priority can have several negative effects on their further development. First, it might promote a self-centered attitude and block empathic understanding (Bachara, Raphael, & Phelan, 1980). Second, negotiating one's own position (i.e., convincing the other person to change position) involves the introduction of new information or at least a new perspective on the given information. Deaf children, however, often tended to present elements that were already known to the opponent or even repeated the same argument twice. Repeating one's desires does not add new arguments to the discussion and it might even irritate the conversation partner, especially when the conversation partner is well informed about that particular desire, as was the case in the present experiment. Each of these phenomena could hinder deaf children in developing meaningful interaction patterns, and future

research should look more closely into the assumptions that are raised here.

It has been shown repeatedly that deaf children with at least one deaf parent show no delay on false-belief tasks (Peterson & Siegal, 2000). This strongly suggests that children's communication possibilities play a central role in their theory-of-mind development. Possibly, deaf children with adequate communication means (i.e., adequate SDD skills in both parents and children) are less focused on their own desires and give more attention to false beliefs in others. In this study, the relationship between both measures (desire arguments and false belief corrections) was examined in the light of children's and their parents' SSD abilities or those in their primary environment. Of course, effective communication asks for skilled partners on both sides. But note (see Table 2) that all children living in an environment that could be qualified as 'good' had 'good' skills themselves. One would expect that at least these eight children would benefit from this. The outcomes of these analyses, however, provided no conclusive evidence, because none of the effects reached significance, which might have been caused by the small sample sizes. Alternatively, the acquired level of SDD skills of the children and parents in our sample might have not been comparable to those of deaf children growing up with a deaf parent, because the communication skills of the participants in this study have been acquired much later in development. It is important to note in this respect that communication is not only based on technical language skills. It would have been informative to have a measure of children's level of language *comprehension.* The impact of possible impairments within this area should be taken into account in future research.

Another way to reveal within-group differences is to examine possible associations between several variables and the number of arguments. A higher number of arguments could indicate communicative fluency and a higher level of communicative abilities. The findings showed that the number of arguments was indeed related to the information provided to the mother, but also to the number of desire arguments. Thus, there is no sign that the number of arguments is related to the quality of these arguments. Instead, these outcomes suggest that a higher number of arguments merely reflect 'more of everything'. Moreover, in deaf children it also meant more repetition of old arguments.

The data also gave some insight into deaf children's understanding of moral arguments. The overall number of arguments showed no relationship with the appearance of moral arguments. Although not directly linked to our central hypotheses, moral reasoning can be very effective in negotiation. The deaf participants proved to be equally able to point out and exploit moral obligations (e.g., 'a promise is a promise'). This might seem somewhat amazing, since deaf children are known to lag behind in moral development (DeCaro & Emerton, 1978; Greenberg & Kusché, 1993), but in this special case the moral rule worked to their own advantage. It was enough here to know the rule, and deaf children are clearly aware that morality provides a powerful argument. Yet, that does not tell us for instance whether they would live up to their obligations if the situation were reversed. Real moral behavior entails sometimes giving up one's own desires in favour of other people's interests. Both central findings of this research—a strong desire orientation in combination with a lack of perspective taking—suggest that this could be quite problematic for deaf children. Other findings that suggest that deaf children lag behind in impulse control (Harris, 1978), empathy (Bachara et al., 1980) and role-taking ability (Kusché & Greenberg, 1983; Weisel & Bar Lev, 1992) seem to corroborate this conclusion.

The title of this article may have been somewhat misleading since the design of our study is different from real negotiation in at least two aspects. First, our participants did not face their real opponents, but provided their reactions to a neutral interviewer, which might have provided a slightly optimistic view of the strategic abilities of our participants. Emotional problem solving tends to be less rational than normal problem solving (Meerum Terwogt & Olthof, 1989), and the emotional impact in these circumstances, as compared with a real confrontation with the mother, will probably be less potent. The finding that our deaf participants' answers equaled the answers of their hearing peers in number of arguments is probably also a direct consequence of this procedure. Others have also argued that the interactions of deaf children with their hearing parents tend to be short and simple

(Rieffe et al., 2003; Vaccari & Marschark, 1997). Now that the children in our experiment were able to communicate with a skilled interpreter, however, they proved to be just as elaborate as the hearing group. What makes it even more interesting is the finding that this did not seem to generalize to the *nature* of the arguments. Although the interpreter was well able to appreciate their belief considerations, the deaf children still exhibited the pattern of arguments we expected to appear in their (hampered) communication with hearing interlocutors. This points to a strong habit formation in deaf children. Regretfully, this habit does not stimulate the necessary development of empathy and role-taking skills. Future research should look further into this issue.

Second, real negotiation involves a chain of reactions, whereas the present approach only asked for a single answer. The second discrepancy is that we did not study prolonged interactions. If the mothers' reactions become more explicit later on in the discussion, the child may still realize the source of the misunderstanding and provide the missing information. After a bad start, a conflict can easily escalate. At a later stage, the mother would have developed a stronger commitment to her own point of view and would therefore be less willing to give in, which is not a good prospect for a smooth solution to the problem. However, lacking necessary strategic insights based on theory of mind might prevent deaf children from finding the 'clever' solution exhibited by three of our hearing participants: they explicitly apologized for not informing the mother in time. It might be argued that these hearing children simply had not realized that the course of events gave them no opportunity to do so (the mother was absent during the whole intervening period), but it seems more likely that they gathered that this 'humble' approach provided them (at least when they were dealing with skilled communication partners who can appreciate this approach) a maximum chance of success. Deaf children might be too focussed on fulfilling their desires to think of a broad variety of strategies. However, future research should look more closely into the possible strategies that deaf children employ in daily-life situations. For example, it would be very informative to examine what strategies deaf children use among themselves. Another issue would be to look for developmental patterns and consider different age groups.

In conclusion, the findings in this study have shown that the frequently noted impaired theory-of-mind development in deaf children also effects their daily social functioning. Even though it would have been in their own interest, deaf children in hypothetical situations provided their mothers less often with the necessary information to correct her false belief than did their hearing peers. Instead, the deaf children unnecessarily stressed their own desires, as was also evident in previous studies (Rieffe & Meerum Terwogt, 2000; Rieffe et al., 2003). These findings might contribute to the social impairments we frequently find in deaf children. More insight into these issues and the causes of deaf children's hampered social development might provide new strategies to offer support to this specific group.

References

Bachara, G. H., Raphael, J., & Phelan, W. J. (1980). Empathy development in deaf preadolescents. *American Annals of the Deaf, 125,* 38–41.

Barnett, M. A., King, L. M., & Howard, J. A. (1979). Inducing affect about self or other: Effects on generosity in children. *Developmental Psychology, 15,* 164–167.

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a 'theory of mind'? *Cognition, 21,* 37–46.

Bartsch, K., & Wellman, H. M. (1995). *Children talk about the mind.* Oxford: Oxford University Press.

Chandler, M., Fritz, A. S., & Hala, S. (1989). Small-scale deceit: Deception as a marker of 2-, 3-, and 4-year-olds' early theories of mind. *Child Development, 60,* 1263–1277.

Ciocci, S. R., & Baran, J. A. (1998). The use of conversational repair strategies by children who are deaf. *American Annals of the Deaf, 143,* 235–245.

Courtin, C., & Melot, A. (1998). Development of theories of mind in deaf children. In M. Marschark (Ed.), *Psychological perspectives on deafness.* Malwah, NJ: Erlbaum, 79–102.

DeCaro, P., & Emerton, R. G. (1978). A cognitive-developmental investigation of moral reasoning in a deaf population. Rochester, NY. Paper Series, Department of Research and Development, National Technical Institute of the Deaf.

Desselle, D. D. (1994). Self-esteem, family climate, and communication patterns in relation to deafness. *American Annals of the Deaf, 139,* 322–328.

De Villiers, P. A., de Villiers, J. G., Schick, B., & Hoffmeister, R. (2000, July). *Theory of mind development in signing and non-signing deaf children: The impact of sign language on social cognition.* Paper presented at the 7th Conference on Theoretical Issues in Sing Language Research, Amsterdam.

Greenberg, M. T., & Kusché, C. A. (1993). *Promoting social and emotional development in deaf children: The paths project*. Seattle, WA: University of Washington Press.

Grice, H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (Eds.), *Syntax and semantics: Vol. 3. Speech acts* (pp. 41–58). New York: Academic Press.

Harris, R. I. (1978). The relationship of impulse control to parent hearing status, manual communication, and academic achievement in deaf children. *American Annals of the Deaf, 123,* 52–67.

Harrison, M. F., Layton, T. L., & Taylor, T. D. (1987). Antecedent and consequent stimuli in teacher-child dyads. *American Annals of the Deaf*, 227–231.

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.

Kusché, C. A., & Greenberg, M. T. (1983). The development of evaluative understanding and role-taking in deaf and hearing children. *Child Development, 54,* 141–147.

Marschark, M., Green, V., Hindmarsh, G., & Walker, S. (2000). Understanding theory of mind in children who are deaf. *Journal of Child Psychology and Psychiatry, 41,* 1067–1073.

Meerum Terwogt, M. (2002). Emotional states in self and others as motives for helping in 10-year-old children. *British Journal of Developmental Psychology, 20,* 131–147.

Meerum Terwogt, M., & Olthof, T. (1989). Awareness and self-regulation of emotion in young children. In C. Saarni & P. L. Harris (Eds.), *Children's understanding of emotion* (pp. 209–240). Cambridge: Cambridge University Press.

Meerum Terwogt, M., Rieffe, C., Tuijn, A. H., Harris, P. L., & Mant, I. (1999). Children's spontaneous correction of false beliefs in a conversation partner. *International Journal of Behavioural Development, 23,* 113–124.

Most, T. (2002). The use of repair strategies by children with and without hearing impairment. *Language, Speech, and Hearing Services in Schools, 33,* 112–123.

Murdock, T. B., & Lybarger, R. L. (1997). An attributional analysis of aggression among children who are deaf. *Journal of the American Deafness and Rehabilitation Association, 31,* 10–22.

Obrzut, J. E., Maddock, G. J., & Lee, C. P. (1999). Determinants of self-concept in deaf and hard of hearing children. *Journal of Development and Physical Disabilities, 11,* 237–251.

Peterson, C. C., & Siegal, M. (1995). Deafness, conversation and theory of mind. *Journal of Child Psychology and Psychiatry, 36,* 459–474.

Peterson, C. C., & Siegal, M. (2000). Insights into theory of mind from deafness and autism. *Mind & Language, 15,* 123–145.

Rachford, D., & Furth, H. G. (1986). Understanding friendship and social rules in deaf and hearing adolescents. *Journal of Applied Developmental Psychology, 7,* 391–402.

Rieffe, C., & Meerum Terwogt, M. (2003). Deaf children's understanding of emotions: Desires take precedence. *Journal of Child Psychology, Psychiatry and allied disciplines, 41,* 601–608.

Rieffe, C., & Meerum Terwogt, M. (2003). *Anger communication in deaf children.* Manuscript submitted for publication.

Rieffe, C., Meerum Terwogt, M., & Smit, C. (2003). Deaf children on the causes of emotions. *Educational Psychology, 23,* 159–168.

Siegal, M., & Beattie, K. (1991). Where to look first for children's knowledge of false beliefs. *Cognition, 38,* 1–12.

Siegal, M., & Peterson, C. C. (1994). Children's theory of mind and the conversational territory of cognitive development. In C. Lewis & P. Mitchell (Eds.), *Children's early understanding of mind: Origins and development* (pp. 344–354). Hove, UK: Lawrence Erlbaum.

Steeds, L., Rowe, K., & Dowker A. (1997). Deaf children's understanding of beliefs and desires. *Journal of Deaf Studies and Deaf Education, 2,* 185–195.

Vaccari, C., & Marschark, M. (1997). Communication between parents and deaf children: Implications for social-emotional development. *Journal of Child Psychology and Psychiatry, 38,* 793–801.

Van Eldik, T. T. (1994). Behavior problems with deaf Dutch boys. *American Annals of the Deaf, 139,* 394–399.

Vandell, D. L., & George, L. B. (1981). Social interaction in hearing and deaf preschoolers: Success and failures in initiations. *Child Development, 52,* 627–635.

Vostanis, P., Hayes, M., Du Feu, M., & Warren, J. (1997). Detection of behavioural and emotional problems in deaf children and adolescents: Comparison of two rating scales. *Child Care, Health & Development, 23,* 233–246.

Weisel, A., & Bar Lev, H. (1992). Role taking ability, nonverbal sensitivity, language and social adjustment of deaf adolescents. *Educational Psychology, 12,* 3–13.

Wellman, H. M. (1990). *The child's theory of mind.* Cambridge, MA: MIT Press.

Wood, D. (1991). Communication and cognition. How the communication styles of hearing adults may hinder—rather than help—deaf learners. *American Annals of the Deaf, 136,* 247–251.

Woolfe, T., Want, S. C., & Siegal, M. (2002). Signposts to development: Theory of mind in deaf children. *Child Development, 73,* 768–778.

Yachnik, M. (1986). Self-esteem in deaf adolescents. *American Annals of the Deaf, 13,* 305–310.

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