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The recognition of attitude conveyed by utterance: A study of preschool and autistic children

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A growing body of work shows that autistic children and adolescents have very limited understanding of propositional attitudes. One aspect of this is their typical failure to employ a concept of *belief*. In normal children the concept of *belief* seems to undergo an important development around age 4 years. The question naturally arises whether autistic impairment comprises simply a 3-year-old level of conceptual competence or whether their similarity to 3-year-olds in performance on certain theory of mind tasks masks underlying differences at the level of cognitive mechanism. We present data which show that in following a conversational interaction, normal 5-year-olds display a sophisticated understanding of the beliefs of the protagonists. Three-year-olds showed a much more limited comprehension but were able to attribute propositional attitudes. Our autistic adolescents did not display even this limited understanding of the conversational situation. We interpret our findings in terms of the metarepresentational theory of autism and point out the theoretical importance of a comparative approach to understanding normal cognitive development.

Recent research has shown that autistic adolescents perform poorly on a range of 'theory of mind' tasks which are passed by normal 4-year-old children (see Baron-Cohen, 1990; Frith, 1989*a*,*b*; Leslie & Frith, 1990 for reviews). On tasks testing comprehension of *false beliefs*, for example, autistic adolescents with verbal mental ages (MA) in excess of 8 years often perform like normal 3-year-olds. Does this surface behavioural similarity between autistic adolescents and normal 3-year-olds reflect an underlying cognitive similarity or are the deeper processes of development different in the two cases? To put it crudely, does the autistic person simply get 'stuck' at the 3-year-old level in theory of mind or is his/her development in this domain abnormal all along?

Our main objective is to show that the behavioural similarity between very young normal and older autistic children is misleading, and that the 3-year-old child, in

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some respects, knows more about the mind than the typical able autistic adolescent. We present evidence that at certain 'theory of mind' tasks young normal children and autistic adolescents will perform differently.

Leslie's (1987, 1988; Leslie & Frith, 1990; see also Baron-Cohen, 1988) metarepresentational theory postulates that young normal and autistic children differ in their underlying representational capacities. We explore this assumption in the context of verbal communication. We tested the ability to conceive false utterances as expressing the speaker's and affecting the hearer's intentions and beliefs. As predicted, 3-year-old children and able autistic adolescents demonstrated different patterns of performance, supporting the metarepresentational conjecture.

Leslie's metarepresentational theory

Leslie (1987) hypothesized that the normal development of 'theory of mind' depends upon an innately specified mechanism which emerges during the second year of life. Because of factors at a biological level, this mind/brain mechanism fails to emerge in autistic children leading to an abnormal pattern of development at the cognitive level.

Leslie distinguished between types of mental representations, including a system of 'primary' representations, which are typically the product of perceptual and inferential processes involved in a literal understanding of the world, and higher order representations which he dubbed *metarepresentation.** In this theory, the term 'metarepresentation' is applied to certain internal symbolic structures constructed by the operation of a special representational mechanism (called variously the 'decoupler' [Leslie, 1987] or 'theory of mind module' [Leslie, 1991]). This representational structure revolves around an element called an 'informational relation'. This element encodes particular propositional attitudes, e.g. *believes* or *pretends*, and, as defined by Leslie (1987), is a function with three arguments, namely: an agent, an aspect of reality described by means of primary representation, and an imaginary or counterfactual situation described by means of a 'decoupled' representation. For example: **Father** BELIEVES/PRETENDS **the marble 'it is in the box'**. The mechanism underlying the capacity to acquire a 'theory of mind', then, specifies a basic set of attitude concepts (e.g. *pretends, believes, wants*) and employs them for the construction of metarepresentations. Such a mechanism is therefore considered to be the core and the initial state of the young child's rudimentary 'theory of mind'.

Following his analysis of the ability to pretend, which revealed similarities between types of pretence and the semantic properties of belief statements (e.g. referential opacity) and which highlighted the importance of the related ability to understand pretence in others, Leslie suggested that the capacity for pretence is linked, via metarepresentational mechanisms, to the ability to construe belief statements (see Leslie, 1987, 1988 for detailed discussion). The conclusion that follows from Leslie's analysis and from the early appearance of pretence is that young children have the basic representational resources for belief attribution from about 2 years onwards.

* The term *metarepresentation* has recently been used in different senses (e.g. Forguson & Gopnik, 1988; Perner, 1988, in press). We refer to it in the sense originally proposed by Leslie (1987; see also Leslie, 1983 and Baron-Cohen, Leslie & Frith, 1985).

Young children might fail to demonstrate mature belief attribution, however, for a number of reasons. For example, their concept of *believing* might be available only in limited contexts. Or they may fail when the inferential requirements of the task are too demanding. In this view, metarepresentations are constructed as the conclusions of inferential processes. For example, from the rule, *iff X saw that p then X believes that p*, together with the fact that a certain person (say, Sally) saw only the previous situation and not its transformation, the conclusion that *Sally believes that p is still true* should follow. It is possible that 3-year-old children fail to employ or to see the relevance of such inferences when presented with standard false belief scenarios.

By contrast to normal children, autistic children are assumed to suffer a different and more profound limitation. These children are impaired in the representation system underlying 'theory of mind' and therefore fail to form and/or process metarepresentations.

An intriguing contrast, then, emerges from the theory. On the one hand, young normal children are assumed to have the capacity to form and process metarepresentations and to employ a (limited) variety of basic attitude concepts. Autistic children, on the other hand, are hypothesized to lack that normal capacity, and consequently, to develop abnormally. This contrast, however, will be empirically demonstrable only in those cases where the young children are able to draw the required inferences and thus to reveal their competence.

Communication and beliefs

One way of testing the conjecture suggested above is by using a situation which involves verbal communication. Normal children spontaneously engage in intentional communication from very early on (e.g. Shatz, 1983), whereas autistic children show a serious and enduring impairment (e.g. Baron-Cohen, 1988; Frith, 1989*b*; Perner, Frith, Leslie & Leekam, 1989; Rutter, 1978). In light of the metarepresentational theory, this deficit is hardly surprising (Leslie & Happé, 1989) since communication depends upon continuing recognition of intentions and attitudes (Grice, 1957; Levinson, 1983; Sperber & Wilson, 1986).

Communication theorists (e.g. Grice, 1957; Searle, 1969; Sperber & Wilson, 1986), draw a distinction between the content of an utterance and its function as an expression of the speaker's intention and attitude. The content consists of certain relevant information that the speaker intends to convey by the interpretation of his utterance as a proposition. In pragmatics theory, this is often called the speaker's 'informative intention'. Thus the speaker's intention to inform is normally fulfilled when the hearer decodes the linguistic meaning of the message. As to their function, utterances are frequently employed to convey evidence about the speaker's state of mind or attitude. Some of the evidence is quite straightforward: For example, when the attitudes are conveyed by the mood of the sentence (e.g. indicative mood as an expression of *belief*). Other sorts of evidence are less direct (Bach & Harnish, 1979; Sperber & Wilson, 1986).

The above distinction between types of information conveyed by utterances corresponds roughly to the types of mental representation postulated earlier. Thus, the informative content may portray a situation and therefore be processed as a

primary representation, while the recognition of the speaker's mental attitude requires metarepresentation.

In light of the metarepresentational theory of autism, we expected verbal autistic children to decode the linguistic meaning of utterances and to consider the information they portray, but to fail to conceive of them as expressing the attitudes of the speakers. By contrast, we assumed that normal children would be able to consider both aspects: the informative content, as well as the speaker's attitude towards it.

To explore this conjecture we constructed a story in which a speaker is asked for information and in response produces an assertion which the observer (i.e. the subjects) should recognize as false. Normally, assertions express the speaker's belief about a situation. We assumed that the processing system of the autistic child, lacking metarepresentation, will construe the linguistic meaning of the false utterance, compare it with other representations of the same situation (i.e. his knowledge about reality), and consequently, reject it as false and uninformative. The normal 3-year-old, in contrast, who is able to metarepresent, should also reject the utterance as a source of information about reality, but at the same time he/she should be able to conceive it, under certain circumstances (e.g. when it is emphasized or made explicitly relevant), as an expression of the speaker's mistaken belief.

The ability to metarepresent, then, could enable the very young child to conceive an utterance as expressing a speaker's mistaken belief and to separate it from her/his own representation of reality. This 3-year-old ability, however, is still rudimentary and allows only a limited understanding of communication processes. More complex communication acts, such as for example deception and lying, would be beyond such a capacity. We assume that recognition of a speech act as a lie requires an ability to discern the speaker's intention to deceive and, minimally, to understand that the speaker believes his utterance to be false (Coleman & Kay, 1981). Recent studies have shown that the ability to recognize higher order intentions to deceive develops only around 5–6 years of age (Leekam, 1991). Other studies showed that the ability to deceive an opponent also emerges around the same age (Russell, Sharp & Mauthner, 1989; Sodian, 1991). We expected to find the same developmental pattern in our task which requires recognition of an utterance as a lie.

To investigate the above assumption, we compared 3-year-olds with a group of 5-year-olds. We also manipulated whether or not the speaker's motivation to produce the lie was made explicit. We predicted that the manipulation would affect only older normal children who already have the notion of a lie. Such children might do better in the explicit motivation condition than in the implicit motivation condition. The limited number of autistic subjects available to us did not allow large enough subgroups for this comparison. In any case, from the existing literature, we did not expect the autistic subjects to understand deception. Therefore, only a subgroup of the normal subjects received the explicit motivation condition.

To summarize, three groups of subjects, older and younger normal children and autistic adolescents, were presented with an acted-out story in which a protagonist first hid an object in one location, and then, when asked about the object's location by another character, produced a misleading assertion. The question–answer exchange was dramatized by a conversation between the story characters. Following presentation of the story, the subjects were asked about the speaker's and the

listener's beliefs as well as about their own knowledge. We expected the 5-year-old children to discern the false belief of the listener and the lie of the speaker, and thus, to point to two different locations when asked about the characters' beliefs. The 3-year-old children were expected, on the one hand, to conceive of utterances as expressing or influencing attitudes and thus to demonstrate their ability to metarepresent, but, on the other hand, to fail to recognize the speaker's lie (i.e. that the speaker believes his own utterance to be false). Consequently, we expected them to provide utterance-based answers to the two belief questions (i.e. to ignore the deceiver's belief that his/her utterance is false) but to refer to the true location when asked about their own knowledge. Finally, the autistic subjects, we predicted, would fail to conceive the utterances as expressing or influencing attitudes and would consider them only as a source of information (true or false) about reality. We expected them then to produce a series of reality-driven answers to both belief and own-knowledge questions.

Experiment 1

Before the testing session, subjects were given a screening task which was modelled on the test situation. It was introduced to filter out subjects who were unable to cope with the linguistic demands of the task. Both the screening and the experimental tasks consisted of a conversation of the form:

Speaker 1: 'where is X?'
Speaker 2: 'X is in *a*!'

with similarly phrased test and control questions.

In the screening task, subjects had no other information available besides that expressed in the utterances, while in the main task they knew where the object was placed prior to the conversation and thus had independent information about reality. The screening task, then, provided a test for the subjects' ability to comprehend the conversation and the test questions. It also contrasted with the main task in the information needed for successful performance. In the screening task, subjects could answer questions correctly by considering only the informative content of the utterances. In the main task, the falsehood of the critical utterance was evident, and therefore, a distinction had to be made between reality and the utterance as an expression of a mistaken belief.

Method

Subjects. Two groups of normal children, 34 3–4-year-olds (mean 3:4, range 2:9–4:0) and 28 5–6-year-olds (mean 5:5, range 5–5:11) were drawn from kindergarten and nursery schools in the Tel Aviv area. Fifteen young autistic adults and adolescents (mean age 18:5 years, range 13–28 years) came from a special school and a hostel specialized for autism in Tel Aviv, having been diagnosed according to established criteria (Rutter, 1978). Most of them were relatively old and appeared fairly verbal. Since the experimental task was based on verbal communication, we needed a comparative measure of the subjects' verbal capabilities. However, given that standardized verbal mental age (MA) tests are not available in Hebrew, we considered success on the screening task, which was modelled exactly on the

linguistic demands of the main task, as an inclusion criterion. Such a task should be at least as relevant as a picture-vocabulary test in establishing a minimum verbal ability across the 3-year-old and autistic groups, though it does not guarantee equality.

Materials. The protagonists were dramatized by two linen dolls about 30 cm high, one was dressed as a boy and the other as a girl. In the screening task, a bed was represented by a 80 x 20 x 15 cm wooden shelf covered by a sheet. The main task used a 30 x 30 x 45 cm cardboard model house. A 15 x 15 x 20 cm kennel made of the same material was placed beside the house. Opposite stood a model of a tree with a wooden box beside it.

Procedure. Each subject was tested individually in a quiet room. The display was placed on a large table facing the subject. The experimenter sat opposite the child and manipulated the dolls. The story and the conversations were presented by tape-recorder.

In the initial phase the experimenter produced two linen dolls, introduced them by their names and made sure that the child was familiar with them. The screening task's display was then set up and the testing immediately followed.

Following are English translations of the experimental protocols which were presented in Hebrew.

Screening task. [two dolls are sitting on model bed]
'Rina and Yosi are sitting on Yosi's bed. It's a nice day and Yosi wants to play with the ball. So, he says:
Yosi: Let's go to play with the ball.
Rina: OK, I agree.
[experimenter to the subject: 'now listen carefully']
Yosi: where is my ball?
Rina: It's under the bed!
[Belief question:] 'where does Yosi/Rina think the ball is?'
[Reality question:] 'where is the ball?' [answer: under the bed]

The testing phase was immediately presented to the subjects who passed the screening task.

Main task. [On scene there is a display representing a playground in front of the protagonists' house]
'Yosi and Rina are going to play outdoors. Yosi has some chocolates in his hand. He leaves them on the ground until they finish the game. Now they are playing.'
[Yosi and Rina are seen playing with the ball]
'suddenly, the ball is thrown behind the house. Yosi runs to bring it back'
[Yosi is placed behind the house and the experimenter ensures that the subject understands that he cannot see what Rina is doing]
'In the meanwhile, Rina hides the chocolate in the box beside the tree'
[in the + motivation condition Rina said to the subject: 'I love chocolate, I want to eat them all by myself'
in the − motivation condition Rina's motive was left implicit]
'then Yosi returns, he looks around for his chocolates and says:
Yosi: 'who took my chocolate?'
Rina: 'the dog took it'
[experimenter to the subject: 'Listen now!']
Yosi: 'where are my chocolates now?'
Rina (pointing): 'they're over there, in the kennel!'
Then the following questions were presented:
[Memory question:] 'Yosi asked where his chocolates are, what did Rina answer?'
[Listener's belief question] 'where does Yosi think his chocolate is?'
[Speaker's belief question] 'where does Rina think the chocolate is?'
[Reality question:] 'where do *you* think the chocolate is?'
The order of the speaker/listener belief questions was counterbalanced, while the order of the control questions was constant.

Results

Four autistic subjects failed to understand either the conversation or the critical questions of the screening task. Four 3-year-old subjects also failed the screening task. All were excluded from further testing. Furthermore, as an inclusion criterion for the analysis of the data, subjects had to answer the two control questions correctly. Therefore, five of the younger children who failed either one or both of these questions were eliminated from the final analysis. The final sample consisted of 29 3-year-olds, 28 5-year-olds and 11 autistic adolescents who passed both the screening task and the control questions.

We were interested in different patterns of responding across the three groups and not just pass/fail. We therefore looked at responses to the two test questions (listener's and speaker's belief) together. This error analysis is more informative than examining responses separately, since, for example, a 'correct' answer to speaker's belief question could be given spuriously on the basis of reality. Table 1 thus shows the four possible patterns of answers.

Table 1. Categories of responses to the belief questions of Expt 1

Response pattern		
Listener's belief	Speaker's belief	Categorized as:
Kennel	Box	'Fully correct'
Kennel	Kennel	'Attitude based': *Listener deceived/speaker utt. based*
Box	Kennel	'Attitude based': *Listener reality/speaker utt. based*
Box	Box	'Reality based'

The children whose answers were 'fully correct' demonstrated an adult-like understanding of both the listener's mistake and the speaker's lie (speaker believes what is true, not what he says). Those who produced 'attitude-based' answers of the *listener deceived/speaker utterance-based* type attributed correctly the mistaken belief to the listener, but failed to recognize the speaker's disbelief in what he says. The subjects who provided the *listener reality-based/speaker utterance-based* type of answers showed substantially less understanding but, like the last category, at least attributed to the speaker a belief that diverges from reality. The significance of these three patterns of answers is that they show an ability to divorce the counterfactual expression from reality and to relate at least one of the characters to the alternative situation. The fourth category, 'reality based', which covers responses on the basis of reality for *both* the speaker and the listener, is thus qualitatively different and does not require (meta)representing an agent's attitude to a counterfactual situation.

Table 2 shows percentages of children responding in these four categories. It can readily be seen that a majority of the 5-year-olds gave 'fully correct' answers, apparently aware of the speaker's deceptive utterance. In this, the 5-year-olds stand out from the other two groups. However, it would be misleading to suppose that the

Table 2. The patterns of answers to the two test questions of Expt 1 (in percentages)[a]

Group	(*N*)	Fully correct %	Attitude based: Listener deceived/speaker utterance based %	Attitude based: Listener reality/speaker utterance based %	Reality based %
5-year-old	(28)	64	29	4	4
3-year-old	(29)	10	62	24	4
Autistic	(11)	18	18	0	64

[a] Figures may not sum to 100 because of rounding.

3-year-olds and autistic adolescents were equatable simply because of similar proportions in this category. A breakdown of their errors shown in Table 2 reveals different patterns across the groups. Thus, a majority of the 3-year-olds were apparently not aware of the speaker's deception, and instead attributed to the speaker a mistaken belief. These 3-year-olds correctly recognized that this mistaken belief would be imparted to the listener.* In contrast, a clear majority of the autistic adolescents (64 per cent) simply made reality-based responses. Only 3.5 per cent of the normal children fell in this category.

We analysed the above results in the following way. The number of autistic adolescents who passed the screening task meant that an overall χ^2 test did not meet requirements for expected frequencies (Siegel, 1956). However, we were able to demonstrate two crucial patterns in the data. First, that the number of normal 5- and 3-year-olds giving 'fully correct' vs. 'attitude-based' answers (collapsing across the two 'attitude-based' subcategories) is different: 18 older children were 'fully correct' and nine 'attitude based', while only three younger children were 'fully correct' and 25 were 'attitude based' (χ^2 (1) = 15.94, $p < .001$). This confirms the prediction that only the older normal children would understand the speaker was lying.

Second, we found the number of 3-year-old normal children giving at least attitude-based answers was different from the autistic adolescents (collapsing across the three 'fully correct' and 'attitude-based' categories): 28 younger children were at least attitude based and only one gave a 'reality-based' response, while four autistic subjects were at least attitude based and seven gave 'reality-based' responses (Fisher's exact, $p = .0001$). This confirms the prediction that normal 3-year-olds would have a greater availability of metarepresentationally based answers than autistic adolescents.†

* In standard false belief tasks, the age of 3 years 9 months and above marks a kind of 'watershed' for passing (see e.g. Wellman, 1990). We looked, therefore, at our subjects who were 3 years 8 months or less. Their success on the listener's belief question was still evident (binomial, $N = 26$, $x = 8$, $p = .038$).

† The reliability of the autistic subjects' performance was tested by presenting the story again with slight variation about a week after the first testing session. For most autistic subjects, performance was reliable and consistent across testing sessions. Three subjects, however, changed their answers when the story was repeated: two subjects in the 'fully correct' category and one of the subjects in the first 'attitude-based' category changed their responses on retest to 'reality based'. On retest, then, 93 per cent of autistic responses were 'reality based'. The results reported above may thus slightly overestimate the competence of the autistic sample.

Table 3. Frequencies of answers to the test questions of Expt 1 according to age and motivation conditions (normal children only)

	Implicit motivation				Explicit motivation			
Age	FC[a]	AB1[b]	AB2[c]	RB[d]	FC[a]	AB1[b]	AB2[c]	RB[d]
3 years	2	10	4	0	1	8	3	1
5 years	9	6	0	0	9	2	1	1

[a] = 'Fully correct'.
[b] = 'Attitude based': Listener deceived/speaker utterance based.
[c] = 'Attitude based': Listener reality/speaker utterance based.
[d] = 'Reality based'.

Next we looked at the effect of the explicitness of the speaker's motivation to lie on the two groups of normal children. The results are shown in Table 3. As predicted, 3-year-olds were not helped by making the motivation of the speaker to lie explicit; only one child in that condition responded in the 'fully correct' category. Somewhat surprisingly, the 5-year-olds too were little affected by making motivation explicit. It seems, however, that ceiling effects have limited the scope for an improvement in 5-year-old performance by making motivation explicit. On the whole, then, it appears that 5-year-olds do not require motivation to be made explicit in the detection of deceit.

Discussion

Our predictions were broadly confirmed, particularly those concerning different bases for responding across the three groups. But first we should consider some possible objections. One objection could be that the utterance was more salient than the actual situation, and as a consequence, superseded the children's representation of reality. However, the children's correct answers to the reality (control) question rules this out. Furthermore, the results cannot be attributed to memory failures given that all subjects whose data are reported passed two control questions. Thus, for example, all the autistic subjects repeated correctly the speaker's mistaken answer, yet indicated where the object really was.

A third objection could be that normal children were merely 'parroting' the false utterance without attending to the details of the scenario. Such a possibility seems unlikely in light of the children's correct responses to the reality question, which was phrased similarly to the test questions (i.e. where do *you* think the object is?). However, one might still argue that the children understood the difference between the questions, and answered only the test questions by repeating the words of the utterances. Experiment 2 was designed to rule out such an objection.

Experiment 2

One reason for taking seriously the 'parroting' objection mentioned above is that it is

compatible with the assumption that children would always reject a false utterance once they have recognized its inconsistency with reality (Perner, 1988, in press). To meet this objection, the normal children were tested again, a week later, with the story presented in the presence of a new puppet character who was placed next to the child. This puppet acted as an observer exposed to the same events as the child. Since the puppet observer saw the liar hiding the chocolate, he should have a true belief. Children who were able to refer to the true location when asked about the observer's belief, and then to point to the other location when asked about the deceived character's belief (the listener), would thus show that their answers did not result from merely 'echoing' the false utterance.

Pilot study revealed that 3-year-old children were indeed capable of distinguishing the two characters' beliefs, but that such performance required explicit indication of the differences between the character's exposure conditions. That is, when the deceived character left the scene, the experimenter emphasized that only the observer can see, and therefore know, where the object really is, as opposed to the other character who is not present. In doing that, the experimenter may be helping the subjects to draw the required inferences. However, as previous studies demonstrate (Perner & Wimmer, 1988), understanding that a person knows (or does not know) is in itself insufficient for appreciating his belief. Therefore, though the children were told that the observer can see and therefore knows what the girl (in the story) was doing and though this may help to emphasize what the listener does *not* know, they still had to infer her belief. The introduction of an observer, then, allowed us to gauge whether the 3-year-olds simply attribute the speaker's utterance to all characters in the scenario (i.e 'parroting').

To test the reliability of the results obtained in the first experiment, a randomly selected subgroup was also asked the second belief question (about the speaker's belief). The question was presented in addition to the repeated belief question (about the listener) which was presented to the entire group.

Method

Subjects. The same normal children who participated in Expt 1 were tested again for this study which was administered a week later. Three children dropped out. Therefore, 28 3-year-olds and 26 5-year-olds were tested.

Procedure. The material and procedure of Expt 1 were used again. Children heard the same stories in terms of the motivation conditions to which they were previously assigned.

Before the story was presented, the experimenter introduced a big toy monkey and told the subject that it would accompany her/him in observing the scenario. The monkey was then seated next to the child where it could 'see' the modelled playground.

Then the story was presented: The procedure described in Expt 1 was repeated up to the point where the ball is thrown behind the house. At that point the experimenter indicated that only the monkey, but not Yosi (the boy) could see and therefore knows what Rina is doing.

Then, the conversation of Expt 1 (see Procedure section) was presented. The child was then asked the control and test questions in the following order:

[Memory question:] 'Yosi asked where his chocolate is, what did Rina answer?'

[Observer belief question:] 'remember, the monkey saw everything, where does the monkey think the chocolate is?'

[Speaker/listener's belief question:] 'where does Yosi/Rina think the chocolate is?'

[Reality question:] 'Where do you think the chocolate is?'
All the children were asked the listener's belief question. The last 13 children of each age group were asked also the speaker's belief question.

Results and discussion

The percentages of children in the two age groups who answered the test questions correctly are presented in Table 4. A large majority in both age groups answered the observer's belief question correctly pointing to the real location of the chocolate (binomial test, $p < .002$). The listener's belief question was also answered correctly by a large majority of both groups, this time by pointing to the (deceptive) location specified by the speaker (binomial test, $p < .002$). The children were not then responding to the test questions by merely parroting the words of the speaker.

Table 4. Percentages of children correctly responding to the test questions of Expt 2

Group	Observer's belief (%)	Listener's belief (%)	*(N)*
3-year-olds	89	85	(28)
5-year-olds	84	100	(26)

Table 5 presents the concordance between the performance of the 3-year-old group on listener's belief questions across Expts 1 and 2. It will be seen that 16 3-year olds answered correctly in *both* experiments while 11 changed their answers. The numbers changing in each direction were not significantly different (McNemar Q, n.s.). The performance of the 3-year-old group overall in terms of *consistently* correct responses to listener's belief question was highly significant (χ^2 (3) = 18.0, $p < .0001$, one-tailed).

Table 5. Reliability of 3-year-olds' answers to listener's belief question across experiments

		Experiment 1	
		Pass	Fail
Experiment 2	Pass	16	7
	Fail	4	1

The above effect can be contrasted with the subgroup of 3-year-olds who were also retested on the speaker's belief question. All 13 of these children gave speaker utterance-based answers in both experiments. In the normal 3-year-old, then, belief attribution to the speaker (based on what he/she says) may be a more robust phenomenon than belief attribution to the listener (based on what he/she hears).

General discussion

Our main finding concerned the difference between autistic adolescents and normal 3-year-old children. Three-year-olds show a limited understanding of *belief* in the communication situation we tested. Specifically, they show little appreciation of the intention to deceive, and tend to attribute belief to a speaker based on what the speaker has just said rather than on what the speaker should know. Limited though this understanding may be, it still requires, we would maintain, the employment of metarepresentation in the sense outlined in the introduction. We found that even this limited 3-year-old type of understanding was largely absent from our sample of autistic adolescents who approached the main task in a highly literal way, sticking to reality and discarding the significance of the conversational interaction as expressing the speakers' attitudes.

These findings are consistent with the idea that different information processing mechanisms underlie the performance of the autistic adolescents and the normal children in this task. In particular, in line with the metarepresentation theory, we contend that the autistic children relied on primary representations, whereas the normal children, both young and old, were additionally able to entertain metarepresentations as an interpretation of the utterances. More specifically, the autistic subjects were able to interpret the meaning of the utterances both in the screening and the test tasks as conveying information about the situation they referred to. They used these interpretations to answer correctly the reality and belief questions of the screening task. They failed, however, to refer to the utterance when this interpretation contradicted their knowledge of reality.

This pattern of results can be explained on the assumption that the meaning of an utterance is entertained by an autistic person only as a primary representation.* Such representations are subjected to verification procedures and should be consistent with other representations stored in memory. Therefore, when the situation portrayed by the utterance contradicts the representation of reality, the utterance must be rejected as false. To reconcile simultaneously a model of reality and a person's counterfactual expression concerning that reality, one needs to construe a metarepresentation (e.g. speaker *believes* that 'p'). According to the metarepresentational theory, autistic subjects will fail to do this because of their specific impairment. Therefore, when faced with conflicting information about the situation, they simply reject the counterfactual and consult their model of reality. The young normal children, in contrast, are able to coordinate the contradictory representations. They explicitly represent the actual state of affairs, and refer to it in their answers to the reality question, while, at the same time, they entertain a model of the situation conveyed by the false utterance, and answer belief questions accordingly.

Did the 3-year-old children ascribe a *false belief* to the speaker? The evidence obtained in this study is still inconclusive on this point. There are other possibilities. For example, it might be that the children conceived the false utterance as a special

* We are disregarding here the distinction between decoupled representations and primary representations (to focus on metarepresentations). This distinction may be important, however, when considering the different weights attached to perceptual evidence and to utterances in the fixation of beliefs about a situation. Some decoupled representations, i.e. those not involved in metarepresentation, do seem to be available to autistic children (Leslie & Thaiss, submitted).

case of pretence. Another option would be that they entertained it as an act of informing (e.g. speaker *asserts* 'p'). We claim, however, that in both cases the child is entertaining a metarepresentation since it is only the construction of metarepresentation that enables the children (but not the autistic subjects) to divorce the misleading expression from reality (see Fodor, 1981 for the parallelism between verbs of saying and propositional attitudes). Further research is needed to decide between the alternatives. As regards the 3-year-olds' attributions to the listener, it seems more difficult to escape the conclusion that the majority of the children attributed something like a belief attitude.

The second prominent finding concerns the 3-year-olds' failure to conceive the true belief of the deceiver (the speaker). The findings show that though the 3-year-olds were aware of the actual situation and witnessed the speaker hiding the object, they ignored these facts and consulted only the false situation mentioned in the utterance. The 5-year-olds, by contrast, were able to discount the speaker's false utterance in attributing speaker's belief while calculating the impact of that utterance on the listener's belief. The 5-year-olds thus showed a much more expert use of metarepresentational analysis in this conversational scenario.

Why did the 3-year-old children fail to appreciate the speaker's true belief though they appreciated correctly the listener's mistaken belief? We suggest that this striking result reflects the fact that young children do not recognize deliberate false utterances as lies. This assumption is strengthened by the children's indifference to the explicitness of the speaker's motivation to lie. To understand a false utterance as a lie, one has to discern its falsehood but also to recognize that the speaker believes it to be false and that the speaker produced it with an intention to deceive (Coleman & Kay, 1981). The 3-year-old subjects were apparently able to discern the falsehood of the utterance (as indicated by their answers to the reality question), but failed to appreciate the fact that the speaker conceives it as false, and therefore, holds a different belief. This may result from a failure to consider the higher order intention to deceive (i.e. S *wants* L to *believe* that 'p'). This may be beyond the capacity of children younger than 5 (Perner, 1988). By contrast, in order to discern the listener's false belief the child needs only to appreciate a first order belief statement and to identify the content of the listener's attitude with that of the speaker's assertion. This failure to discern a lie is consistent with other recent studies finding that 3-year-old children fail to deceive an opponent in a carefully controlled situation (Russell, Mauthner, Sharpe & Tidswell, 1991; Sodian & Frith, in press).

As for the autistic subjects, our results do not allow us to rule out the possibility that they thought the speaker was lying. However, it would be surprising if they did, given that they did not recognize any impact of this lie on the listener. It is more plausible in view of this and in light of previous studies of the autistic child's ability to deceive (Russell *et al.*, in press; Sodian & Frith, in press) that our autistic subjects had little or no understanding that the speaker was lying.

We can compare the 3-year-olds' performance on the present task to the results obtained in previous studies employing 'standard' false belief scenarios (Baron-Cohen *et al.*, 1985; Wimmer & Perner, 1983). In both cases a failure to infer the character's belief on the grounds that he/she has put the target object in a certain location was revealed. However, the children's patterns of answers were different in

the two tasks. In standard tasks, 3-year-old children tend to answer the belief questions by referring to reality, whereas in the present study they seem to ignore reality and to consider only the utterance as a source of information about the character's belief.

Two alternative explanations might account for this discrepancy. The first would emphasize the temporal order of the events, and the second the communicative nature of the conversation. According to the first view, the fact that in the present study the critical utterance was produced after the hiding event might have facilitated the children's ability to consider it as relevant information. The memory question, which immediately followed the conversation might also help to focus the subjects' attention on the utterance. An assumption consistent with this view would be that young children conceive of the speaker's belief as a continuously updated description of the situation, and hence, update it according to the latest available information (e.g. standard scenario: change in reality, present scenario: latest utterance). Development, then, will consist of a more sophisticated appreciation of relevant information across the unfolding sequence of events.

Alternatively, it is possible that the metarepresentation mechanism is initially employed in communicative settings, and only later in development is 'extrapolated' to conceptualize non-communicative behaviours (e.g. seeing, putting, etc.). In this view, it might be easier for the children to construe metarepresentations of *speakers'* attitudes towards counterfactual expressions. For example, in contrast to situations comprising standard scenarios which exist as independent states of affairs in the world, communicated situations exist only by virtue of being communicated. Representations of such events should therefore specify the communicator as well as the communicated situation and thus invite metarepresentation.

The evidence provided by the present study is still insufficient to decide between these alternatives. A study in progress will explore these issues further.

Finally, we would like to discuss the apparent inconsistency between the present experiment and two previous studies (Johnson & Maratsos, 1977; Perner & Wimmer, 1988). In the first of these studies (Johnson & Maratsos, 1977), children were told a story about a character who hid an object and then lied about its location. Johnson & Maratsos, however, employed an indirect report of the event and did not display a conversation. This may be an important factor as we have already indicated.

The second study (Perner & Wimmer, 1988) did employ a conversation as a means of misinforming a character about the false location, but the children were asked only about the listener. In both the above studies, the 3-year-olds pointed to the actual location when asked to predict the misinformed character's future behaviour. A major difference between these studies and the present one then concerned the test question. While in these other studies the children were asked about the character's future behaviour (i.e. where will Maxi *look* for x?), we asked directly about the character's belief. It may be that the additional inference required to predict future behaviour leads to greater difficulty for younger children. We should also recall the greater difficulty within our own task of inferring the listener's belief (see the consistency results above). It may be that focusing the 3-year-old on the speaker's belief helps them with that of the listener.

To conclude, let us consider two implications of these results. The first is that similarities of performance (i.e. behaviours) on various tasks can yet reflect very

different underlying processes at the cognitive level. Such differences may only be uncovered under particular circumstances. In the case of 3-year-old children and autistic adolescents, the results we obtained support the theoretical assumption that they are indeed different in their representational capacities. The second point we would like to make concerns the theoretical importance of studying abnormal development as a frame of reference for understanding normal development (see also Leslie & Thaiss, submitted). We suggest that this constitutes an important kind of comparative psychology. Without the results from the autistic group one might have missed or dismissed the peculiar pattern of results demonstrated by the 3-year-old children. The clear contrast between normal and autistic groups in this and other studies requires a searching theoretical analysis of the underlying structures and processes which produce normal development.

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