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Does the autistic child have a "theory of mind"?*

SIMON BARON-COHEN
ALAN M. LESLIE
UTA FRITH

MRC Cognitive Development Unit, London

Abstract

We use a new model of metarepresentational development to predict a cognitive deficit which could explain a crucial component of the social impairment in childhood autism. One of the manifestations of a basic metarepresentational capacity is a 'theory of mind'. We have reason to believe that autistic children lack such a 'theory'. If this were so, then they would be unable to impute beliefs to others and to predict their behaviour. This hypothesis was tested using Wimmer and Perner's puppet play paradigm. Normal children and those with Down's syndrome were used as controls for a group of autistic children. Even though the mental age of the autistic children was higher than that of the controls, they alone failed to impute beliefs to others. Thus the dysfunction we have postulated and demonstrated is independent of mental retardation and specific to autism.

1. Introduction

Childhood autism is a severe developmental disorder. It is a rare condition, affecting about 4 in every 10,000 children. The diagnostic criteria at present are behavioural (American Psychiatric Association, 1980; Kanner, 1943; Ritvo & Freeman, 1978; Rutter, 1978) and the main symptom, which can be reliably identified, is impairment in verbal and nonverbal communication. This impairment is part of the core feature of childhood autism, namely a profound disorder in understanding and coping with the social environment, regardless

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of IQ. Additional symptoms can occur, in particular, mental retardation, islets of ability, and 'insistence on sameness'. Nevertheless, the pathognomonic symptom is failure to develop normal social relationships.

Autistic children find even the immediate social environment unpredictable and incomprehensible. They are often said in some sense to 'treat people and objects alike'. Wing and Gould (1979) in their epidemiological study of severely retarded autistic children bring out the range of socially impaired behaviour: from total withdrawal through passivity to repetitive pestering. Lord's (1984) review of work on peer interaction in autistic children highlights the low level of social competence even in able autistic children, despite improvements due to intervention. A picture of apparently intractable social impairment emerges in the clinical follow-up studies of autism (e.g. Kanner, 1971; Kanner, Rodriguez, & Ashenden, 1972) and in the as yet rare experimental investigations (e.g. Attwood, 1984; Martini, 1980).

Although the majority of autistic children are mentally retarded (DeMyer *et al.,* 1974; Wing, Yeates, Brierley, & Gould 1976), and although a number of their symptoms may be attributable to this fact (Hermelin & O'Connor, 1970) this in itself cannot be a sufficient explanation for their social impairments. First, there are autistic children with IQ's in the normal range, and second, mentally retarded non-autistic children, such as Down's syndrome, are socially competent relative to their mental age (Coggins, Carpenter, & Owings, 1983; Gibson, 1978).

In order to explain the specific impairments of childhood autism it is necessary, then, to consider the underlying cognitive mechanisms independent of IQ (Frith, 1982; Hermelin & O'Connor, 1970; Rutter, 1983). So far, nobody has had any idea of how to characterise such mechanisms in even quasi-computational terms. In this paper we put forward a suggestion which has been derived from a new model of metarepresentational development (Leslie, 1984, to appear). This model specifies a mechanism which underlies a crucial aspect of social skills, namely being able to conceive of mental states: that is, knowing that other people know, want, feel, or believe things; in short, having what Premack and Woodruff (1978) termed a 'theory of mind'. A theory of mind is impossible without the capacity to form 'second-order representations' (Dennett, 1978; Pylyshyn, 1978). According to Leslie's model this capacity does not appear until the second year of life. While this capacity manifests itself eventually in a theory of mind, Leslie shows that it also accounts for the emergence of pretend play. An absence of the capacity to form second-order representations, then, would lead not only to a lack of theory of mind, with the concomitant aspects of social ineptness, but also to a lack of pretend play.

Now, it is well known that autistic children, in addition to their social handicaps, also show a striking poverty of pretend play (Sigman & Ungerer, 1981;

Ungerer & Sigman, 1981; Wing, Gould, Yeates, & Brierley, 1977; Wing & Gould, 1979). An explanation for the lack of pretend play and its curious association with the social impairments typical of autism is not obvious, and again the notion of mental age is not helpful for this purpose. On the one hand, even high IQ autistic children lack pretend play, and on the other hand, severely retarded Down's syndrome children don't (Hill & McCune-Nicolich, 1981). However, if we suppose that autistic children lack second-order representations, then we can make sense of the association of impairments. In order to test this hypothesis we can make the prediction that autistic children will lack a theory of mind. It is of course possible for autistic children to have a theory of mind and still exhibit incompetence, since social competence must depend on a large number of factors. However, if our prediction was proved wrong and autistic children did show evidence of employing a theory of mind, then we could rule out a deficiency in second-order representations. Even if our prediction was confirmed, that is, if autistic children lacked a theory of mind, we would still have to establish that this was a *specific* deficit, that is, largely independent of *general* mental retardation. Thus we would have to demonstrate (a) that even those rare autistic children whose IQ's are in the average range should lack this ability and (b) that non-autistic but severely retarded children, such as Down's syndrome, should possess it.

In a seminal paper, Premack and Woodruff (1978) defined theory of mind as the ability to impute mental states to oneself and to others. The ability to make inferences about what other people *believe* to be the case in a given situation allows one to predict what they will do. This is clearly a crucial component of social skills. There is growing evidence for the ability to attribute mental states to others, and its development from the second year of life onwards (Bretherton, McNew, & Beeghly-Smith, 1981; MacNamara, Baker, & Olson, 1976; Shantz, 1983; Shultz, Wells, & Sarda, 1980; Shultz & Cloghesy, 1981). A convincing demonstration that an explicit theory of mind is well within the capacity of the normal four-year-old has been given by Wimmer and Perner (1983). These authors developed an ingenious paradigm that can be used with very young children based on the case where the child's own belief is different from someone else's belief. In order to succeed on the task the child has to be aware that different people can have different beliefs about a situation. Hence this case provides the strongest evidence for the capacity to conceive of mental states (Dennett, 1978). It is this paradigm that we used in the present study.

2. Method

2.1 Subjects

Details of the subjects are shown in Table 1. The 20 autistic children had been diagnosed according to established criteria (Rutter, 1978). In addition there were 14 Down's Syndrome and 27 clinically normal preschool children. The autistic group's mean mental age (MA) was not only higher than that of the Down's Syndrome group on a non-verbal scale, but also on the more conservative measure of a verbal scale. We assumed that for the normal group MA would roughly correspond to chronological age (CA). Therefore, their MA was, if anything, lower than that of the handicapped groups. We selected a high functioning subgroup of autistic children in order to enable a stringent test of the specific deficit hypothesis to be made. Thus, the autistic group was of a relatively high mean IQ of 82 (derived from non-verbal MA), mostly in the average and borderline range, i.e. 70 to 108, with only one subject scoring less than 70. The IQ's of the Down's Syndrome group were rather lower with a range from 42 to 89, and an average of 64.

Table 1. *Means, SDs and ranges of Chronological Age (CA) and Mental Age (MA) in years; months*

Diagnostic groups	*n*		CA	Nonverbal* MA	Verbal** MA
Autistic	20	Mean	11;11	9;3	5;5
		SD	3;0	2;2	1;6
		Range	6;1-16;6	5;4-15;9	2;8-7;5
Down's syndrome	14	Mean	10;11	5;11	2;11
		SD	4;1	0;11	0;7
		Range	6;3-17;0	4;9-8;6	1;8-4;0
Normal	27	Mean	4;5	-	_
		SD	0;7		
		Range	3;5-5;9		

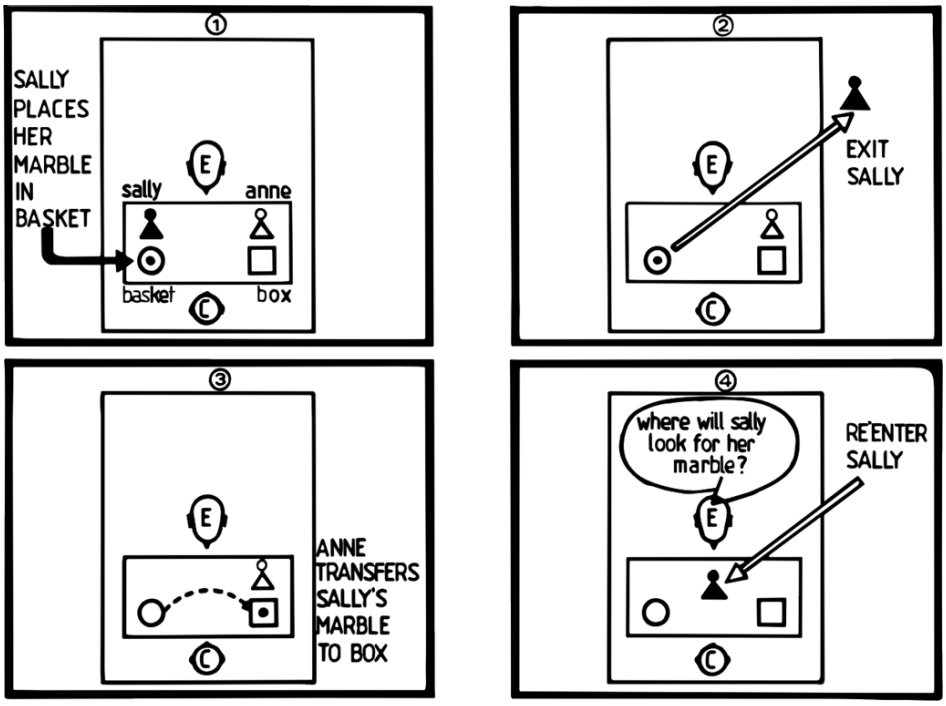
*Leiter International Performance Scale.
**British Picture Vocabulary Test.

2.2 *Procedure*

The procedure is illustrated in Figure 1. There were two doll protagonists, Sally and Anne. First, we checked that the children knew which doll was which (Naming Question). Sally first placed a marble into her basket. Then she left the scene, and the marble was transferred by Anne and hidden in her box. Then, when Sally returned, the experimenter asked the critical Belief Question: "Where will Sally look for her marble?". If the children point to the previous location of the marble, then they pass the Belief Question by appreciating the doll's now false belief. If however, they point to the marble's current location, then they fail the question by not taking into account the doll's belief. These conclusions are warranted if two control questions are answered correctly: "Where is the marble really?" (Reality Question); "Where was the marble in the beginning?" (Memory Question).

The control questions are crucial to ensure that the child has both knowledge of the real current location of the object and an accurate memory of

Figure 1. *Experimental scenario.*



the previous location. There is no reason to believe that the three questions differ from each other in terms of *psycholinguistic* complexity, but of course we hypothesize that they differ in terms of *conceptual* complexity. The standard scenario was repeated using a new location for the marble, so that now there were three different locations that the child could point at (basket, box and experimenter's pocket). Correct responses to all three Questions for each of the two trials were therefore different.

3. Results

All subjects passed the Naming Question. Furthermore, all subjects without a single exception performed without any errors for both the Reality and Memory Questions in both trials. The Belief Question for both trials was answered consistently by each child with the sole exception of one Down's Syndrome child who failed trial 1 and passed trial 2. The results for Down's Syndrome and normal subjects were strikingly similar. 23 out of 27 normal children, and 12 out of 14 Down's Syndrome children *passed* the Belief Question on both trials (85% and 86% respectively). By contrast, 16 of the 20 autistic children (80%) *failed* the Belief Question on both trials. This difference between the groups was highly significant ($\chi^2 = 25.9$, df = 2, $p < .001$). All 16 autistic children who failed pointed to where the marble really was, rather than to any of the other possible locations ($p = .006$, Binomial Test, one tailed). The four autistic children who passed succeeded on both trials. Their CA ranged from 10:11 to 15:10, their non-verbal MAs were between 8:10 and 10:8, and their verbal MAs between 2:9 and 7:0. Comparison with data in Table 1 shows that these children were fairly average on all our available variables. There were certainly other children of equal or greater MA and CA who gave incorrect responses.

4. Discussion

The fact that every single child taking part in the experiment correctly answered the control questions allows us to conclude that they all knew (and implicitly believed) that the marble was put somewhere else after Sally had left. The critical question was, "Where will Sally look?" after she returns. Here a group difference appeared: Autistic children answered this question in a distinctly different way from the others. The Down's Syndrome and normal preschool children answered by pointing to where the marble was put in the first place. Thus they must have appreciated that their own knowledge

of where the marble actually was and the knowledge that could be attributed to the doll were different. That is, they predicted the doll's behaviour on the basis of the doll's belief. The autistic group, on the other hand, answered by pointing consistently to where the marble really was. They did not merely point to a 'wrong' location, but rather to the actual location of the marble. This becomes especially clear on trial 2 where the autistic children never pointed to the box (which had been the 'wrong' location on trial 1), but instead to the experimenter's pocket—that is, again to where the marble really was. This rules out both a position preference and a negativism explanation. Furthermore, the autistic children were not 'contrary' on the Reality or Memory Questions which they always answered correctly. Clark and Rutter (1977, 1979) investigating alleged negativism in autistic children also found no evidence of such behaviour. The failure on the Belief Question was also not due to random pointing. Nor could it have been due to any failure to understand and remember the demands of the task or the narrative since these children all answered the Naming, Memory and Reality Questions perfectly. We therefore conclude that the autistic children did not appreciate the difference between their own and the doll's knowledge.

Our results strongly support the hypothesis that autistic children as a group fail to employ a theory of mind. We wish to explain this failure as an inability to represent mental states. As a result of this the autistic subjects are unable to impute beliefs to others and are thus at a grave disadvantage when having to predict the behaviour of other people. There is, however, also a suggestion of a small subgroup of autistic children who succeeded on the task and who thus may be able to employ a theory of mind. These children who nevertheless, by definition (American Psychiatric Association, 1980; Rutter, 1978), exhibit social impairment, would certainly deserve further study. From Leslie's (1984) model we would predict that if they did have the capacity to form second-order representations, then they would also show evidence of an ability to pretend play. Furthermore, we would predict that their social impairments would show a rather different pattern from those autistic children who fail to use a theory of mind.

The ability we have been testing could be considered as kind of *conceptual* perspective-taking skill (Shantz, 1983). However, it is important to contrast the present task with traditional *perceptual* perspective-taking tasks, such as 'line of sight' or 'three mountains', where a child has to indicate what can be seen from another point of view (Hobson, 1982; Hughes & Donaldson, 1979; Piaget and Inhelder, 1956). Such perceptual perspective-taking tasks can be solved using solely visuo-spatial skills and in no way require imputing beliefs to others (Cox, 1980; Huttenlocher & Presson, 1979). Hobson (1984) has recently shown that autistic children succeed on perceptual perspective-

taking tasks with doll protagonists as well as can be expected from their MA. This finding, Hobson argued, suggests that it is very unlikely that the cognitive abilities required in taking different points of view in perceptual situations are the same as those that underlie the autistic child's social disability. The results of the present study would confirm this interpretation and point towards a crucial distinction between the understanding of perceptual situations and the attribution of higher order mental states.

We conclude that the failure shown by the autistic children in our experiment constitutes a specific deficit. It cannot be attributed to the general effects of mental retardation, since the more severely retarded Down's syndrome children performed close to ceiling on our task. Thus we have demonstrated a cognitive deficit that is largely independent of general intellectual level and has the potential to explain both lack of pretend play and social impairment by virtue of a circumscribed cognitive failure. This finding encourages us to continue with a theoretical framework (Leslie, 1984, to appear) which can specify the underlying connections between pretend play, theory of mind and social skills. Deriving further testable predictions from such a model may lead to a new approach to the cognitive dysfunction in childhood autism (Frith, 1984).

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Resume

Les auteurs presentent un nouveau modele de developpement meta-cognitif pour predire le deficit cognitif qui rendrait compte d'un composant essentiel du handicap social de l'enfant autiste. Une des manifestations d'une capacite de base meta-cognitive est une 'theorie de l'esprit'. Nous avons des raisons de croire que cette theorie fait defaut chez l'enfant autiste Celui-ci serait donc incapable d'attnbuer des croyances aux autres ou de predire leur comportement. Cette hypothese a ete testee avec le paradigme de jeu des marionettes utilise par Wimmer et Perner. Des enfants normaux et des enfants avec trisomie 21 ont servi de groupe controle Bien que l'age mental des enfants autistes ait ete plus eleve que deux du groupe controle, seuls les enfants autistes n'ont pu attnbuer aux autres des croyances. Ainsi le dysfonctionnement prevu a pu etre demontre, il s'avere independant du retard mental et specifique a l'autiste