DIFFICULTIES IN THE UNDERSTANDING OF FALSE BELIEF: SPECIFIC TO AUTISM AND OTHER PERVERSIVE DEVELOPMENTAL DISORDERS?

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Summary.—The present study examined the performance on a false belief task of atypical autistic children, i.e., children with a pervasive developmental disorder not otherwise specified (n=30), socially immature children (n=30), and normal children (n=50). Children were shown a chocolate box and its unexpected content, i.e., a pencil, and then required to indicate what a friend would say about the content of the box. Results can be summarized: (1) in general, 3-year-old children performed less well than children of 6 years. (2) Responses of 3-year-old atypical autistic and socially immature children did not differ significantly from those of normal children of the same age. (3) At age 6, normal children performed better than atypical autistic and socially immature children. (4) In general, no differences in performance between atypical autistic and socially immature children were found, and (5) their performance was linked to intelligence. The results support prior findings that atypical autistic children find it difficult to understand false beliefs; however, this difficulty does not seem to be specific for (atypical) autism, but might be a common feature of social immaturity in general.

Premack and Woodruff (1978) introduced what they called a ‘theory of mind’ referring to a child’s ability to ascribe thoughts, feelings, ideas, and intentions to others and to use this ability to anticipate the behavior of others. One aspect of this theory of mind is the capacity to understand another person’s wrong beliefs (Wimmer & Perner, 1983). The false belief task is a widely used procedure to test children’s comprehension of wrong beliefs. An example of such a task is the Smarties test (e.g., Hogrefe, Wimmer, & Perner, 1986; Perner, Leekam, & Wimmer, 1987). In this task, children are presented with a Smarties box and asked to indicate what it contains. Children know that these boxes usually contain Smarties, a desirable chocolate candy; however, children are shown that the box contains a pencil rather than chocolate and then told that another person will also be asked what is in the box. Finally, they are given the critical question: “What do you think the other person will say?” (i.e., belief question). From their answer, one can

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infer whether children recognize false beliefs. That is, a correct understanding of false beliefs is inferred when a child indicates that another person will think that there is chocolate in the box. In contrast, a misunderstanding of false belief is inferred when a child indicates that another person will think that the box contains a pencil.

Understanding of false beliefs is a developmental phenomenon which normally emerges between 3 and 4 years of age, and by age 6, almost all normal children correctly respond to false belief tasks such as the Smarties test (see Wellman, 1990).

A number of studies have reported that autistic children perform poorly on false belief tasks (see, for a review, Happé, 1995). For example, Baron-Cohen, Leslie, and Frith (1985) showed that autistic children were significantly impaired relative to normal and mentally handicapped controls on the Sally-and-Ann test, a task in which a false belief has to be attributed to a story character. These authors tested 20 autistic children and found that 80% failed to appreciate the false belief of the story character. In contrast, 14% of the mentally handicapped children, i.e., children with Down syndrome, and 15% of the normal preschool children were unable to solve the task. On the basis of the observation that a substantial proportion of autistic children fail false belief tasks, Frith (1989) has formulated the 'theory of mind' account of autism. This account suggests that the social impairments of children with autism can be explained in terms of a deficit in one specific cognitive component, namely, the ability to understand mental states of others.

It is not clear whether false belief deficits as found in autism are also present in other types of pervasive developmental disorders. Previous studies (Bowler, 1992; Ozonoff, Rogers, & Pennington, 1991) have shown that patients with Asperger's disorder, i.e., individuals at the more able end of the autistic spectrum, in general, perform better on false belief tasks than children who suffer from severe autism.

Furthermore, there is evidence to suggest that intelligence, and especially verbal intelligence, is a moderator variable of false belief task performance. For example, Happé (1994) compared Wechsler intelligence test scores of autistic children who either passed or failed false belief tasks. Her results showed that 'passers' had significantly higher IQs than 'failers.'

It remains to be seen whether false belief deficits are specific to autism and related pervasive developmental disorders. Recently, Steeneman, Jackson, Pelzer, and Muris (1996) found that socially immature, nonautistic children also have difficulties with the understanding of false beliefs. In that study, only three out of eight socially immature children (37.5%) correctly responded to the Sally-and-Ann task. Remarkably, all of these children were 7 years old and had an average intelligence. These results indicate that false
belief deficits not only occur in autistic but also in other socially immature children.

The present study further explored whether a false belief deficit is a specific feature of children with a pervasive developmental disorder. To examine this issue, the performance of atypical autistic children, i.e., children with a pervasive developmental disorder not otherwise specified, socially immature children, and normal children on the Smarties test was assessed. In all three groups, there were two subgroups by age, 3 years and 6 years. IQs were also obtained to investigate whether false belief understanding indeed was mediated by intelligence.

**Method**

**Subjects**

Subjects were 150 children who were divided into six groups: (1) 3-yr.-old atypical autistic children ($n=25; 14$ boys), (2) 6-yr.-old children of the same diagnosis ($n=25; 12$ boys), (3) 3-yr.-old children with social problems ($n=15; 19$ boys), (4) 6-yr.-old children with social problems ($n=25; 17$ boys), (5) 3-yr.-old normal children ($n=25; 11$ boys), and (6) 6-yr.-old normal children ($n=25; 10$ boys).

Atypical autistic children were outpatients of the South-Limburg Center of Autism, The Netherlands. After extensive psychodiagnostic and psychiatric screening, they were classified on the basis of the DSM-IV criteria (American Psychiatric Association, 1994) as having 'pervasive developmental disorder not otherwise specified.' Diagnoses were made by a specialized, multidisciplinary team of professionals. All atypical autistic children showed social problems as well as impairment in communication or repetitive and stereotyped patterns of behavior, interests, and activities.

Socially immature children were patients of the outpatient treatment center Eastern South-Limburg, Heerlen, The Netherlands. All of these children were referred to the treatment center because they exhibited problems in interactions with siblings. Problems concerned acting out behavior, i.e., aggressiveness, dominance, low frustration tolerance, bullying, quarreling, or social anxiety, i.e., introversion, shyness, avoidance of siblings, being bullied. Psychodiagnostic and psychiatric screening indicated that none of these children met the criteria for a DSM-IV Axis I or II disorder.

Normal children of these ages were selected from a nursery school and a primary school. These children were of normal intelligence and displayed no social problems.

**Assessment and Procedure**

Children were administered the Smarties test (see Introduction). After the critical belief question, i.e., "What do you think the other child will
say?", children were given two control questions: "What's really in the box?" (reality question) and "Do you remember, when I took the box out of my bag and asked you what was in it, what did you say?" (memory question). All children were tested individually by one and the same researcher in a private room.

For all children IQs were available. In atypical autistic and socially immature children, these scores were obtained during the psychodiagnostic screening: in 3-yr.-old children the Snijders-Oomen Nonverbal Intelligence Test (Snijders & Snijders-Oomen, 1975) was used, whereas for 6-yr.-old children IQ was measured with the Dutch version of the Wechsler Intelligence Scale for Children (Wechsler, 1974). In normal children, intelligence was assessed in a separate session: 3-yr.-olds were tested on the Snijders-Oomen Nonverbal Intelligence Test, 6-yr.-olds on the Leidse Diagnostic Test (Schroots & Van Alphen-De Veer, 1976). The Snijders-Oomen test is a nonverbal index of intelligence, whereas the Wechsler and Leidse diagnostic tests are verbal measures. All these measures of intelligence are commonly used in The Netherlands. Research has shown that they have satisfactory psychometric properties and that they yield comparable IQs (Van Doorn, 1992).

Results

All children performed without any errors for both the reality and memory questions. On the belief question, 3-yr.-old children performed less well than 6-yr.-old children; over-all percentages of correct responses were 21.3 vs 62.7, respectively ($\chi^2 = 27.2$, $p < .001$).

In 3-yr.-old children, there were no significant differences in test performance between the three groups, with percentages of correct responses being 28.0% for normal children, 20.0% for atypical autistic children, and 16.0% for socially immature children ($\chi^2 = 1.1$, $p = .57$). At the age of 6, however, normal children performed significantly better than atypical autistic and socially immature children: percentages of correct responses were 96.0%, 44.0%, and 48.0%, respectively ($\chi^2 = 17.9$, $p < .001$). No significant differences in test performance between atypical autistic children and socially immature children were found.

Analyses of variance showed that, in 3-yr.-old as well as 6-yr.-old children, the three groups differed significantly with respect to intelligence ($F_{2,22} = 23.6$, $p < .001$ and $F_{2,22} = 6.7$, $p < .01$, respectively). Post hoc tests indicated that normal children had significantly higher IQs than atypical autistic and socially immature children, mean IQs being, respectively, 102.9 ($SD = 8.1$), 80.2 ($SD = 16.7$), and 81.9 ($SD = 12.6$) for 3-yr.-olds, and, respectively, 100.1 ($SD = 7.8$), 89.4 ($SD = 17.7$), and 93.3 ($SD = 14.6$) for 6-yr.-olds. To examine whether test performance was related to children's intelligence, IQs of chil-
false belief task performance and autism

dren who responded correctly and those who responded incorrectly were compared within each group. As can be seen in Table 1, atypical autistic and socially immature children who responded correctly had significantly higher IQs than children who did not. In normal children, such difference was not found.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Age, yr.</th>
<th>Correctly M</th>
<th>Correctly SD</th>
<th>Incorrectly M</th>
<th>Incorrectly SD</th>
<th>t</th>
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</thead>
<tbody>
<tr>
<td>Normal children</td>
<td>25</td>
<td>3</td>
<td>103.3</td>
<td>7.1</td>
<td>101.9</td>
<td>10.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Normal children</td>
<td>25</td>
<td>6</td>
<td>100.5</td>
<td>7.7</td>
<td>90.0</td>
<td>0.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Socially immature children</td>
<td>25</td>
<td>3</td>
<td>100.5</td>
<td>14.8</td>
<td>78.4</td>
<td>11.3</td>
<td>2.6†</td>
</tr>
<tr>
<td>Socially immature children</td>
<td>25</td>
<td>6</td>
<td>103.8</td>
<td>11.1</td>
<td>76.1</td>
<td>10.5</td>
<td>6.4†</td>
</tr>
<tr>
<td>Atypical autistic children</td>
<td>25</td>
<td>3</td>
<td>105.4</td>
<td>13.6</td>
<td>76.1</td>
<td>11.5</td>
<td>4.9†</td>
</tr>
<tr>
<td>Atypical autistic children</td>
<td>25</td>
<td>6</td>
<td>107.7</td>
<td>11.0</td>
<td>85.5</td>
<td>8.0</td>
<td>5.8†</td>
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</table>

Note.—Atypical autistic children presented with pervasive developmental disorder not otherwise specified. *p < .05. †p < .001.

Taken together, at the age of 6, atypical autistic and socially immature children performed less well on a false belief task than normal children; however, because atypical autistic and socially immature children also had lower IQs than normal children, the possibility cannot be ruled out that their inferior performance on the Smarties test was entirely due to their restricted intellectual capacity. To clarify this issue, a logistic regression analysis was carried out with IQ and diagnostic status ('normal' vs 'atypical autistic/socially immature') being the predictor variables, and Smarties test performance of 6-yr.-olds ('failure' vs 'success') as the dependent variable. Both IQ (Wald $\chi^2 = 8.1, p < .005$) and diagnostic status (Wald $\chi^2 = 5.6, p < .05$) appeared to enter into the regression equation. In other words, both variables significantly contributed to performance on the false belief task.

Discussion

The current study compared performances of atypical autistic children, socially immature children, and normal children on a false belief task, i.e., Smarties test. Results show that 3-yr.-old children generally have difficulties in understanding false beliefs. Furthermore, data confirm that, at the age of 6, nearly all normal children correctly respond to this false belief task. In contrast, 6-yr.-old atypical autistic and socially immature children perform less well as more than half of them did not solve the Smarties test successfully.

The present finding is that there were no differences in Smarties test performance between atypical autistic and socially immature children. Thus,
false belief deficits do not seem to be restricted to autism or related disorders. Socially immature, but nonautistic, children also have difficulties with the understanding of such a belief. Assuming that false belief understanding is a part of theory of mind and that theory of mind is a prerequisite for socially skilled behavior (see e.g., Lalonde & Chandler, 1995), one may conclude that a proportion of the socially immature children, i.e., socially aggressive and socially anxious children, exhibit problems in social situations precisely because they lack a theory of mind. In other words, deficits in theory of mind underlie social (skills) problems. There is some indirect evidence for this state of affairs. Steeneman, et al. (1996) showed that a training program for a theory of mind attended by socially immature children not only resulted in an improvement of scores on theory of mind, but also in improvement of socially skilled behavior.

In agreement with the results of previous research (Happé, 1994), the current data also show that intelligence mediates false belief task performance. That is, children who correctly responded to the Smarties test had significantly higher IQs than children who did not. Most researchers assume that it is especially verbal capacity or intelligence that plays a role in false belief task performance (see, for a discussion of this topic, Happé, 1995). The present data suggest that this assumption may not be entirely correct. As a matter of fact, nonverbal intelligence (as measured with the Snijders-Oomen test) was also associated with Smarties test performance. Accordingly, understanding of false beliefs is likely modulated by general intelligence rather than verbal capacity or intelligence per se.

A logistic regression analysis indicated that, apart from intelligence, diagnostic status, i.e., 'normal' vs 'atypical autistic/socially immature,' contributed significantly to Smarties test performance. This finding agrees with the results of a recent study by Muris, Steeneman, Meesters, Merekelbach, Horsten, van den Hogen, and Van Dongen (in press; Study 4). In that study, children from an outpatient treatment center, i.e., children with anxiety disorders and attention-deficit and hyperactivity disorder, and children with a pervasive developmental disorder were tested with a battery of theory-of-mind tests. Analyses showed that diagnosis of a pervasive developmental disorder, IQ, and age were independent variables that predicted the children's performance.

In conclusion, the current data confirm that, compared with normal children, children with a pervasive development disorder, i.e., atypical autistic children, perform poorly on this false belief task. The finding that socially immature children and atypical autistic children did not differ in their performance on the Smarties test, seems to indicate that deficits in the understanding of a false belief are not limited to autism or related pervasive developmental disorders.
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REFERENCES


Accepted November 17, 1997.