‘Once upon a ribbit’: Stories narrated by autistic children

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Ten autistic, 10 mentally retarded and 10 normal children, matched on verbal mental age, were asked to narrate a story from a wordless picture book. The narratives were coded on a range of measures tapping the following characteristics: story length and complexity, story structure, referential devices, and affective and social-cognitive narrative enrichment devices. The main findings were that, compared to both control groups, the autistic children produced significantly shorter stories and were less likely to include any causal statements to explain the relationship between events in the stories. For the autistic children, the use of a story schema, referential devices that took account of their listener’s needs, and the frequency of enrichment devices were all significantly correlated, suggesting that they reflect the same underlying knowledge. These findings are discussed in relation to the theory of mind hypothesis of autism.

There has been considerable interest in recent years in looking at the extended discourse of children with impaired language or cognitive abilities (e.g. Feagans & Short, 1984; Fine, 1985; Hemphill, Picardi & Tager-Flusberg, 1991; Kernan & Sabsay, 1987; Merritt & Liles, 1989; Reilly, Klima & Bellugi, 1990; Sleight & Prinz, 1985). Much of this interest derives from a growing awareness that investigations of language beyond the level of the sentence provide us with richer information, not only about children’s linguistic abilities, but also about their cognitive and social knowledge as it is revealed through narrative discourse (Bamberg & Damrad-Frye, 1991). Research on normally developing children, which has utilized a variety of discourse genres including personal narrative and story-telling, reveals that the development of narrative skills is a lengthy process that continues into the school years (Applebee, 1978; Kemper, 1984; Klecan-Aker, McIngvale & Swank, 1987). At a structural level children acquire the syntactic and morphological abilities to control tense shifts and complex constructions that mark causal and temporal relations (Bloom, Hood, Lifter & Fiess, 1980; Scott, 1984). At a pragmatic level, children develop knowledge about the appropriate contexts in which narratives are told, the techniques for introducing characters and for keeping track of shifts in reference so that the listener can understand the main events in the story (Bamberg, 1987; Karmiloff-Smith, 1985; Stenning & Mitchell, 1985). In addition to these kinds of linguistic skills, the development of story-telling entails acquiring the cognitive schema which guides the structure of a story with a plot, episodes, goals and consequences (Mandler, 1984; Peterson & McCabe, 1983), and social-cognitive knowledge which guides the interpretation of the story characters’ intentions.

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While young normal children control some aspects of each of these linguistic, cognitive and social-cognitive elements of narrative competence, the ability to integrate knowledge from these domains, which is essential to achieving mastery in a variety of discourses, continues to develop through middle childhood (Kemper, 1984).

Studies of narrative abilities have been conducted with a variety of clinical populations, including children with learning disabilities (Feagans & Short, 1984; Roth & Spekman, 1986; Weaver & Dickinson, 1979), specific language impairment (Liles & Purcell, 1987; Merritt & Liles, 1989; Sleight & Prinz, 1985), mental retardation (Hemphill et al., 1991; Kernan & Sabsay, 1982, 1987; Nwokah, 1982; Reilly et al., 1990) and autism (Baron-Cohen, Leslie & Frith, 1986; Loveland, McEvoy, Tunali & Kelley, 1990). One reason for studying narrative in these populations is that it is a particularly sensitive tool for identifying discourse problems that may not be captured on standardized language tests. In addition, narrative ability is a good predictor of academic performance (Cameron, Hunt & Linton, 1988; Feagans & Applebaum, 1986). Studies of autistic children's narrative skills have placed greater emphasis on the role of pragmatic competence and social cognition in their ability to tell a story. Current research on the nature of the psychological deficits in autism has shown that autistic children are specifically impaired in their acquisition of a theory of mind, which involves understanding the role of mental states in predicting and explaining behaviour (Baron-Cohen, Leslie & Frith, 1985). This social-cognitive deficit has been used to interpret not only the primary social impairments that are central to the syndrome (cf. Fein, Pennington, Markowitz, Braverman & Waterhouse, 1986), but also the language and communication deficits that are characteristic of autistic children (Baron-Cohen, 1988; Frith, 1989i; Tager-Flusberg, 1993). In particular, autistic children's pragmatic impairments in speaker-listener relations (Baltaxe, 1977) and discourse skills (Tager-Flusberg & Anderson, 1991), both of which are central to narrative ability, have been interpreted from the perspective of their deficits in theory of mind (Tager-Flusberg, 1993).

In one of the few detailed studies of autistic children's narrative story-telling, Loveland and her colleagues (1990) asked autistic and Down's syndrome children, matched on chronological age and verbal mental age, to tell the story that they were shown in the form of a puppet show or video sketch. They found that the autistic children were more likely to exhibit pragmatic violations including bizarre or inappropriate utterances and were less able to take into consideration the listener's needs. Some of the autistic subjects in this study even failed to understand the story as a representation of meaningful events, suggesting that they lacked a cultural perspective underlying narrative (Bruner & Feldman, 1993; Loveland & Tunali, 1993). Loveland et al. (1990) concluded that the discourse problems that they had identified in the autistic children's narratives were consistent with the theory of mind hypothesis.

Taking a somewhat different approach, Baron-Cohen et al. (1986) compared matched groups of autistic, Down's syndrome and normal children in their ability to sequence sets of four pictures depicting mechanical (i.e. physical causation), descriptive-behavioural and psychological-intentional stories. After the subjects had completed the sequencing task, they were asked to narrate the stories depicted. Interestingly Baron-Cohen et al. report that only about half the subjects in each of the disordered groups were able to provide stories in this context. The stories were coded for the presence or absence of
causal and mental state expressions, and the major findings were that, unlike both groups of control subjects, the majority of autistic subjects did not produce mental state language for the psychological-intentional stories, though they were able to use causal and behavioural language. This deficit in using mental state language in appropriate contexts mirrored the autistic subjects' specific difficulty in sequencing the psychological-intentional stories. Although only a simple coding scheme was used to analyse the stories from this study, the findings suggest that autistic children have particular difficulty understanding and talking about the intentions, motivations, and cognitive mental states of characters in a causal explanatory framework within a story-telling context (cf. Tager-Flusberg, 1992). These initial studies of story-telling abilities in autistic children suggest that their various difficulties with this genre do indeed reflect their social-cognitive deficits in theory of mind.

The goal of the present study was to explore further narrative abilities in autistic children. In particular, the major question addressed by this study concerns the relationship between autistic children's linguistic difficulties in telling a story, and their problems in interpreting story characters' actions using mentalistic constructs. If these very different sorts of problems in narrative are indeed related to one another, and are specific to autistic subjects, this would provide strong support for the hypothesis that the proposed deficit in theory of mind accounts for a broad range of both discourse and social deficits in this population.

Method

Subjects

Three groups of subjects, composed of 10 autistic, 10 mentally retarded and 10 normal children, participated in this study. The autistic subjects came from a private school serving this population. The normal and mentally retarded subjects were recruited from public schools, which served a range of middle- and working-class populations. The mentally retarded subjects were drawn from ungraded special education classrooms for students with this diagnosis. The normal children came from the same schools as the mentally retarded subjects; they were all in second grade and none of the children in this group had been diagnosed with language or learning disabilities.

The autistic children were diagnosed using DSM-III-R criteria and current proposals for defining autism (e.g. Cohen, Paul & Volkmar, 1987; Denckla, 1986) based on information in the subjects' school records, medical histories and a behaviour checklist completed during observations prior to testing.

The subjects in all three groups were monolingual speakers of English. Basic characteristics of the subjects are summarized in Table 1. The three groups were closely matched for verbal mental age, based

<table>
<thead>
<tr>
<th>Table 1. Subject characteristics</th>
<th>Autistic</th>
<th>Mentally retarded</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in group</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Male/female</td>
<td>9/1</td>
<td>6/4</td>
<td>4/6</td>
</tr>
<tr>
<td>Chronological age</td>
<td>12:1 (2:7)</td>
<td>11:3 (1:2)</td>
<td>7:9 (0:3)</td>
</tr>
<tr>
<td>PPVT-R age</td>
<td>6:8 (1:4)</td>
<td>6:9 (1:4)</td>
<td>7:3 (0:7)</td>
</tr>
<tr>
<td>PPVT standard score</td>
<td>58.3 (18.5)</td>
<td>60.0 (15.8)</td>
<td>94.6 (5.2)</td>
</tr>
</tbody>
</table>

on the Peabody Picture Vocabulary Test (PPVT)—Revised Version ($F(2,27) = 0.74$, n.s.). The autistic and mentally retarded groups were also selected to be matched on chronological age ($t(18) = 1.09$, n.s.). It should be noted that this study includes a relatively small number of subjects in each group, reflecting, in part, the difficulty of obtaining well-matched groups of subjects and the labour-intensive nature of the linguistic analyses. Within these relatively small samples in each group, there is a fairly wide variation in age and PPVT standard scores; however, it should be noted that the three groups were closely matched, with a relatively narrow range and variance on the PPVT mental age levels.

Discussions with the subjects’ teachers indicated that all the subjects had considerable experience with story books, including picture books, and that they were used to story-telling, at least in the context of learning to read. None of the subjects were known to have previously seen the book used in this study.

**Narrative task**

A wordless picture book, *Frog, Where Are You?*, by Mercer Mayer (1969) was used to elicit a story narrative from each child. This book was chosen in part because it has been used extensively in research on narrative development in normally developing children from many different language communities (e.g. Bamberg, 1987; Berman, 1988; Berman & Slobin, 1987; Kail & Hickmann, 1992; Marchman, 1989), and in research on a variety of developmentally disordered populations (e.g. Hemphill et al., 1991; Reilly et al., 1990). The book has a well-defined story structure, and the content is engaging for children from a wide range of age groups. At the beginning of the book, a boy and his dog are looking at a frog in a jar, in the boy’s bedroom. Later in the night the frog escapes, and the main theme of the story is the search for the frog. Along the way, the boy and dog have numerous adventures. Eventually, they find two adult frogs and several baby frogs behind a log. The boy takes one of the babies, waves goodbye to the rest of them, and leaves for home with his dog.

**Procedure**

Subjects were tested individually by two experimenters in a quiet room in the schools they attended. One experimenter showed the book to the child. She told the child: ‘This is a book about a boy, a dog and a frog. Let’s see how the story goes.’ She went through the book with the child, slowly turning the pages in order to allow the child to see the characters, get a sense of the plot line, preview the sequence of events and the ending to the story. Then, the experimenter went back to the beginning of the book and asked the subject to tell the story to the second experimenter. Again, she turned the pages for the child and the child told the story page by page. Occasionally, if the child needed prompting, limited probes were given by the first experimenter, such as ‘What is going on here?’ On the last page of the book the child was asked: ‘How does the story end?’ The entire session, which took about 15 minutes, was audiotaped. Although there were differences in how much children spoke for each page, and in the amount of prompting that they needed, this was true for children in all three groups, and there were no discernible differences between the groups in their interest and engagement in the task, or in their motivation to narrate a story.

The audiotapes were all transcribed in the form of an ASCII file and then formatted using the CHAT transcription system (MacWhinney, 1992) by two trained transcribers. Both transcribers reached a high level of reliability and agreement on the transcription; in cases where there was no agreement, the transcribed portion was placed in parentheses and not included in the coding and analyses.

**Coding**

All coding was done independently by two coders. They reached a high level of agreement (over 90 per cent) and all disparities were resolved through discussion.

*Length and structural complexity of narrative.* These measures included mean length of utterance (MLU; Brown, 1973), the number of different words used, and the total number of words. Because MLU may not be a useful indicator of syntactic complexity beyond 4.0, the total score on the *Index of Productive Syntax* (IPSyn; Scarborough, 1989) was also computed. This measure provides an evaluation
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of syntactic complexity in productive language, independent of the length of the narrative. Finally, the total number of propositions used, defined as a verb plus its arguments, was assessed to offer another measure of the length and complexity of the stories (Stein & Glenn, 1979).

**Story structure.** The extent to which subjects organized their narratives into a conventional story was measured by identifying the presence of the following characteristics of a story schema (cf. Mandler, 1984): formal opening (e.g. ‘Once upon a time’); formal ending (e.g. ‘And they lived happily ever after’; ‘The end’); explicit mention of the main theme of the story, i.e. looking for the missing frog; orientation remarks, which provide an introduction to the characters, setting and events in the story; and an explicit resolution to the story, i.e. finding the frog.

**Referential devices.** One of the primary means a narrator uses to facilitate the listener’s comprehension of a story is to introduce new characters in an unambiguous way, and by clearly marking shifts in focus from one character to another. Mastery of these referential strategies is an important aspect of pragmatic competence in narrative discourse that normal children acquire at around the age of 7 (Bamberg, 1987).

Two measures of reference were applied to the narratives, based on Bamberg’s (1987) coding scheme. First, the dominant way in which the main characters in the story were introduced, on first mention, was identified. The ideal introduction is the use of a nominal phrase with an indefinite article (e.g. a 'boy'; 'a dog'); other means include using a nominal phrase with a definite article (e.g. 'the frog', 'the boy'), or a pronoun (e.g. 'he'; 'it').

The second referential device measured was the primary means by which the main character of the boy was identified throughout the narrative. All references to the boy were located and coded by type as either a full noun phrase or pronoun. Each reference was also coded for whether the focus on the main character was maintained or shifted from the previous utterance. Based on the distribution of the types of reference to the boy across these codes, each child’s referential strategy was determined as falling into one of the following categories: nominal, thematic, anaphoric or mixed. Children were classified as using a nominal strategy if the majority of their references to the boy was in the form of a full noun phrase. The thematic strategy was attributed if the majority of references to the boy was with the pronoun 'he'. Children were classified as using an anaphoric strategy (which is ideal from the listener’s perspective) if the majority of references to the boy when the focus on him was maintained was in the form of a pronoun, but when the focus was shifted to him from another character, a full noun phrase was used, in at least 60 per cent of shifted contexts. Finally, children whose distributions of reference types did not fit any of these categories were classified as mixed.

**Narrative enrichment devices.** The book used in this study is composed of pictures of the main characters and events that take place in the story. In order to provide a rich narrative that holds the attention of the listener, and gives the complete structure of the story, the child must go beyond what is directly observable in the pictures. Labov & Waletzky (1967) referred to these aspects of a narrative as evaluation. Following Reilly et al. (1990), narrative enrichment devices were divided into two broad categories: affective and social-cognitive enhancers.

(a) Affective enhancers. The frequency of a number of different affective enhancers was coded. These included mentioning the emotional state of a character in the story; character speech, defined as the use of direct quotation of a story character’s speech; sound effects, including onomatopoeia (e.g. ‘splash’, ‘woof-woof’), which heighten the drama of the story; audience hookers, which are exclamatory phrases such as ‘suddenly’, ‘lo and behold’, that maintain the listener’s attention; and emphatic markers, including intensifiers (e.g. ‘very slowly’), and repetition (e.g. ‘they looked and looked and looked’).

(b) Social-cognitive enhancers. This cluster of enrichment devices involved aspects of the story that need to be inferred in order to motivate the sequence of events that unfold over the course of the book. These included mental state terms, which provided information about the desires, beliefs, motives and so forth of the characters in the story, thus providing a rationale for their behaviour; negatives, defined as propositions embedded in a negative form (e.g. ‘The frog wasn’t there’), indicating a violation of expectations; causal statements, which provide information about the relationship between events in the story (e.g. ‘The squirrel was getting very angry because he was trying to sleep’); and finally all other kinds of inferences, where the narrator offers information that is not directly given in the pictures. The frequency of each of these kinds of narrative devices was tallied.
Results

Preliminary reviews of the data revealed that there was considerable variation within
groups, and that on some measures the between-group variances were not equivalent.
Therefore, the analyses of the data were accomplished using non-parametric tests. To
illustrate the range of narratives produced by the autistic subjects, who were at the
extreme ends on many of the measures, some examples of their narratives are provided in
the Appendix.

Length and structural complexity

Table 2 presents the means and standard deviations for the five measures of length and
complexity. Four of the five measures showed a significant group difference on a
Kruskal–Wallis one-way analysis of variance by ranks. For MLU, $\chi^2(2) = 13.90, p<.001$;
for the total number of propositions, $\chi^2(2) = 7.95, p<.02$; for the number of different
words, $\chi^2(2) = 6.24, p<.05$; and for the total number of words, $\chi^2(2) = 6.76, p<.04$.
Inspection of the means suggests that on all these measures the autistic children were
significantly lower than both the mentally retarded and the normal children. The one
measure that was not significant was the IPSyn.

Table 2. Means (and standard deviations) for measures of length and complexity of stories

<table>
<thead>
<tr>
<th></th>
<th>Autistic</th>
<th>Mentally retarded</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean length of utterance</td>
<td>7.3 (2.2)**</td>
<td>12.5 (5.0)</td>
<td>13.5 (2.6)</td>
</tr>
<tr>
<td>IPSyn total score</td>
<td>63.4 (15.2)</td>
<td>67.8 (8.3)</td>
<td>64.1 (7.2)</td>
</tr>
<tr>
<td>Number of propositions</td>
<td>38.2 (27.8)*</td>
<td>51.8 (12.5)</td>
<td>49.8 (12.7)</td>
</tr>
<tr>
<td>Number of different words</td>
<td>77.2 (42.7)*</td>
<td>98.6 (25.7)</td>
<td>93.9 (13.2)</td>
</tr>
<tr>
<td>Total number of words</td>
<td>200.8 (109.6)*</td>
<td>300.5 (94.8)</td>
<td>284.4 (80.1)</td>
</tr>
</tbody>
</table>

* $p<.05$; ** $p<.001$.

Story structure

The number of children in each group using each of the five story structure
characteristics is shown in Table 3. The two aspects of story structure that were most
likely to be included were the theme and resolution. The normal children were

Table 3. Number of children using story structure components

<table>
<thead>
<tr>
<th></th>
<th>Autistic</th>
<th>Mentally retarded</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ending</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Orientation</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Theme</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Resolution</td>
<td>4</td>
<td>5</td>
<td>10*</td>
</tr>
</tbody>
</table>

* $p<.05$. 
significantly different from both the autistic and mentally retarded groups in providing a resolution to the story ($\chi^2(2) = 8.9, p<.02$). Three of the autistic and one of the mentally retarded subjects included none of the elements of story structure in their narratives.

**Referential devices**

Table 4 shows the number of children in each group using the various referential devices. Significantly more of the normal children used full noun phrases to introduce the main characters ($\chi^2(2) = 6.67, p<.05$). There was a considerable amount of variation in the use of different referential strategies in each subject group. No significant group differences emerged on this measure.

<table>
<thead>
<tr>
<th>Character introduction</th>
<th>Autistic</th>
<th>Mentally retarded</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indefinite noun phrase</td>
<td>1</td>
<td>2</td>
<td>6*</td>
</tr>
<tr>
<td>Definite noun phrase</td>
<td>8</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Pronoun</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Referential strategy</th>
<th>Autistic</th>
<th>Mentally retarded</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaphoric</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Nominal</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Thematic</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Mixed</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

* $p<.05$.

**Narrative enrichment devices**

The total number of enrichment devices and the number of children in each group using these devices at least once is shown in Table 5. Kruskal–Wallis analyses of variance revealed no significant group differences in the frequency of use of any of the affective enrichment devices. The only social-cognitive device that reached significance was the use of causal statements ($\chi^2(2) = 8.53, p<.05$) indicating that the autistic subjects were significantly less likely than the other subjects to include causal statements in their narratives.

Chi-square analyses on the number of children in each group using the different enrichment devices showed that, among the affective enhancers, only the use of sound effects was significant ($\chi^2(2) = 7.5, p<.05$) with the normal children more likely to include this device than either the autistic or mentally retarded children. Of the social-cognitive enhancers, again only causal statements was significant ($\chi^2(2) = 10.62, p<.005$) suggesting that autistic children were less likely than either the mentally retarded or normal children to include causal statements.
Table 5. Total frequency (and number of children) for each narrative enrichment device

<table>
<thead>
<tr>
<th></th>
<th>Autistic</th>
<th>Mentally retarded</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective enhancers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion terms</td>
<td>8 (4)</td>
<td>9 (6)</td>
<td>14 (6)</td>
</tr>
<tr>
<td>Character speech</td>
<td>42 (6)</td>
<td>10 (4)</td>
<td>17 (8)</td>
</tr>
<tr>
<td>Sound effects</td>
<td>10 (2)</td>
<td>10 (4)</td>
<td>11 (8)</td>
</tr>
<tr>
<td>Audience hookers</td>
<td>16 (4)</td>
<td>9 (3)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>Emphatics</td>
<td>27 (5)</td>
<td>22 (6)</td>
<td>24 (6)</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Social-cognitive enhancers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total mental states</td>
<td>9 (4)</td>
<td>18 (7)</td>
<td>10 (5)</td>
</tr>
<tr>
<td>Desire/volition</td>
<td>6 (2)</td>
<td>13 (6)</td>
<td>8 (5)</td>
</tr>
<tr>
<td>Cognition</td>
<td>3 (2)</td>
<td>5 (3)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Negation</td>
<td>9 (5)</td>
<td>13 (5)</td>
<td>13 (7)</td>
</tr>
<tr>
<td>Inference</td>
<td>15 (4)</td>
<td>11 (5)</td>
<td>17 (9)</td>
</tr>
<tr>
<td>Causality</td>
<td>0 (0)</td>
<td>9 (7)</td>
<td>10 (4)</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>51</td>
<td>50</td>
</tr>
</tbody>
</table>

Relationships between narrative characteristics

In order to test whether there was a relationship among the different characteristics of the narratives, especially among the pragmatic, narrative structure, and narrative enrichment devices, Spearman rank correlations were computed, for each group, between the following variables: a combined reference score (the use of indefinite reference for introducing new characters plus the use of an anaphoric referential strategy), the total number of story structure elements present, and the total number of narrative enrichment devices (combining the frequencies of the affective and social-cognitive enhancers). The correlation between story structure and reference was significant, or marginally significant for all three groups: for the autistic group $p = .57, t(8) = 1.96, p < .05$; for the mentally retarded group $p = .58, t(8) = 2.02, p < .05$; and for the normal group $p = .54, t(8) = 1.81, p < .06$. Similarly the correlation between story structure and the use of enrichment devices was significant for all three groups: for the autistic group $p = .81, t(8) = 3.92, p < .005$; for the mentally retarded group $p = .72, t(8) = 2.94, p < .02$; and for the normal group $p = .79, t(8) = 3.62, p < .005$. The correlation between reference and enrichment devices was significant for the autistic group ($p = .63, t(8) = 2.30, p < .05$) but not for the mentally retarded ($p = .31$) or the normal group ($p = .44$).

Discussion

Overall, the findings from this study suggest that autistic children produce quite impoverished narratives, especially when compared to normal children matched for verbal mental age. Thus, their stories were significantly shorter and included fewer propositions, they were less likely to include a resolution, to introduce new characters in
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an unambiguous way, or to include causal statements. However, in many respects their narrative problems were similar to those of the mentally retarded subjects. Thus, both developmentally disordered groups showed similar problems in story structure and in the use of referential devices. These cognitive and pragmatic aspects of narrative are therefore not deficits that are specific to autism.

Two aspects of the autistic children’s narratives were significantly different from both the mentally retarded and the normal children. First, their stories were shorter and less complex and second, their stories did not contain causal statements. Compared to the other groups, the autistic subjects’ stories were deficient in length and complexity as measured by the number of propositions, the total number of words, the number of different words and the average length of their sentences. These results contrast with the findings of Loveland et al. (1990), who found no differences in the length of the stories produced by their autistic and Down’s syndrome subjects. This discrepancy might be accounted for by the difference in the control groups; in this study the children were mildly mentally retarded without known congenital syndromes whereas Loveland et al. included only children with Down’s syndrome whose language abilities are known to be worse than their cognitive capacities (e.g. Miller, 1987), and who have also been shown to produce very impoverished narratives (Reilly et al., 1990). Because Loveland et al. did not include a matched normal control group it is not known whether both the autistic and the Down’s syndrome children in their study produced shorter and less complex narratives than normal children matched on verbal mental age. Another reason that might account for the discrepancy in findings is the difference in the narrative tasks. In this study, children were not provided with a verbal story by the experimenters—they had to formulate their own narrative de novo while they looked at the wordless picture book. In contrast, Loveland et al. presented a verbal story in the form of a puppet show or video and then asked their subjects to recall the verbally presented material. In addition, it could be that the autistic subjects in this study had greater difficulty in spontaneous productive language than the control subjects. The subjects were matched on a measure of vocabulary comprehension (the PPVT) and we know from their IPSyn scores that their productive syntax was similar to the control groups. Nevertheless, the autistic subjects may have had greater difficulty formulating sentences in extended discourse, as is required in story-telling. The results of Loveland et al. suggest that this deficit may not be evident in story recall.

One of the specific predictions of this study was that autistic children would be less likely to include a range of narrative enrichment devices, in part because they may lack a culturally based understanding of narrative (cf. Bruner & Feldman, 1993; Loveland & Tunali, 1993), and in part because their impairments in theory of mind will influence their ability to impute intentions and other mental states to the story characters. Surprisingly, there were no significant differences between the autistic and the control groups in the use of affective enrichment devices, and in the use of mental state language. One reason why the autistic subjects may not have been deficient in using affective enhancers is that at least some of these evaluative devices, such as audience hookers, sound effects and emphatics, may be learned by rote. Given some experience with stories, at least some of the autistic subjects in this study may have reproduced these devices without having a genuine understanding of their influence on the listener’s attention.
The finding that autistic subjects were no different from the control groups in their use of mental state terms contrasts with the results from the other main study on narratives in autistic children conducted by Baron-Cohen et al. (1986), who found that autistic subjects were significantly less likely than either Down's syndrome or normal children to use mental state terms such as 'think' and 'know'. It also contrasts with Tager-Flusberg's (1992) data on the paucity of cognition terms in the spontaneous speech of younger autistic children. Across all groups, the subjects in this study were relatively unlikely to make any reference to the characters' mental or emotional states, especially cognitive states, so it may well be that this particular story was not conducive for eliciting this kind of language and the findings reported here represent a floor effect. Furthermore, the small sample of autistic subjects in this study may have obscured any significant differences among the groups. Future studies on narrative abilities in autistic children should investigate this issue further in a larger sample by specifically utilizing a narrative task that is more likely to elicit mental state language.

The only narrative enrichment device that the autistic children were specifically impaired on was their use of causal statements. Not one autistic child produced a single causal statement! Normal and mentally retarded children were more likely to explain the relationship between events in the story, as in the following examples taken from one mentally retarded and two normal subjects:

'... and the dog was still calling in the beehive to see if his frog was there'.
'The little boy got mad because he [the dog] jumped out of the window'.

Even the best of the autistic children's narratives lacked explanatory statements of this sort. The absence of causal statements may be correlated with the shorter and less complex stories produced by the autistic subjects, given that causal statements typically involve clausal connectives that add to the length and complexity of sentences. As we see from the examples, while some of the causal statements involved mental or emotional states, most involved behavioural explanations, that is, explaining the causes for someone's actions. Baron-Cohen et al. (1986) found that the autistic children in their study were quite comparable to the controls in producing mechanical and behavioural causal statements and were only deficient in using mental state causal statements, in stark contrast to the findings in this study. In their study autistic children only showed impairments in sequencing and narrating the psychological-intentional stories, which was taken as evidence for a specific impairment in theory of mind. There is less evidence in this study for impairments in theory of mind leading to a specific paucity in mental state language, but again the problem may be one of sample size. Clearly more research needs to be conducted on this issue. In particular, are autistic children impaired in interpreting events, behaviour and action in any causal-explanatory framework? This kind of explanation would be consistent with Frith's (1989b) hypothesis that autism involves a deficit in 'central coherence'. Alternatively, are autistic children limited to an impairment in placing human action in a psychological explanatory framework, as is suggested by the theory of mind hypothesis? A third possibility is that, while the autistic children in this study did not lack an understanding of causality, they were less inclined to include causal explanations in their narratives because they lacked the communicative competence to recognize the need to provide this kind of information to their listener.
Another goal of this study was to investigate the relationships among the different aspects of narrative discourse, especially the pragmatic, narrative structure and narrative enrichments. For all three groups the use of story schema elements was significantly related both to the total number of narrative enrichment devices, and to the use of unambiguous reference to the story characters. In addition, only for the autistic subjects, the use of unambiguous reference was significantly correlated with the use of narrative enrichment devices. In previous studies these pragmatic and social-cognitive aspects of narrative have been independently investigated (and measured somewhat differently), and their relative absence in autistic children's narratives has been taken as evidence for the theory of mind hypothesis (Baron-Cohen et al., 1986; Loveland et al., 1990). This is the first study to look at both the linguistic and social-cognitive aspects of mental state knowledge in the same narratives, and the finding that they are significantly related in the autistic group does support the earlier findings. In fact, only two of the autistic subjects produced really coherent narratives—parts of their narratives are included in the Appendix in the first and second examples. The remaining subjects varied enormously but none included all the elements of a story schema; nor did other autistic subjects take account of their listener's needs in their referential strategies, or in the use of a full range of affective enhancers. Interestingly, recent testing of the two subjects who produced good narratives on a false belief task showed that they were able to pass this litmus test, lending further support to the idea that narrative abilities may be a useful indicator of theory of mind abilities. (Unfortunately false belief data were available for only four of 10 subjects in the autistic sample and for none of the subjects in the control groups. Interestingly, the two autistic subjects who passed the false belief task produced the best narratives, whereas the two who failed produced relatively impoverished narratives. The relationship between narrative discourse and performance on standard false belief tasks should be investigated more systematically.) This discussion underscores the wide variability that was found even among this relatively small sample of autistic subjects, suggesting that narrative abilities, as well as the social-cognitive abilities with which they may be associated, vary more widely in this population than has generally been recognized (cf. Bowler, 1992; Happe, 1993; Ozonoff, Pennington & Rogers, 1991).

The data reported both here and in Loveland et al. (1990), suggesting deficits in narrative ability in autistic children, complement the findings reported by Landa, Folstein & Isaacs (1991), who investigated the spontaneous narratives produced by the parents of autistic individuals. In their study, parents of both autistic and control children were asked to complete a story stem and their narratives were analysed for a variety of discourse characteristics. Overall, the autistic children's parents produced significantly poorer stories that were incomplete, less complex and less coherent than the stories produced by the control group parents. Landa et al. interpret their findings as evidence for a genetic liability for autism, which in its milder form may be expressed as a language disorder, evident in the families of autistic children (August, Stewart & Tsai, 1980; Bartak, Rutter & Cox, 1975; Folstein & Rutter, 1977). One manifestation of this phenotype in autism may be impairments in narrative discourse that are related to other primary deficits in social cognition.

Although the findings from this study must be viewed with caution because of the limitations in sample size, the results suggest that autistic children do have particular problems in spontaneously telling a story. The autistic children produced significantly
shorter and less complex stories than the subjects in the control groups. Furthermore, they never produced any causal statements, suggesting that they lacked the ability to place the events in the story in an explanatory framework in the context of a narrative. Finally, the significant correlations among the various elements of narrative, including story schema, linguistic means for clearly marking reference, and a range of evaluation devices, suggest that they reflect the same underlying knowledge, which has been interpreted here and in other related studies to be in the acquisition of a theory of mind.

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Appendix

Excerpts of narratives from autistic subjects

1. Once upon a time a boy named Fred and his dog named Pierre had a frog. Her name was Brigitte. That night he was lovely and she was lovely. And then his dog and his boy slept. But when Brigitte escaped she was gone. The next morning when they woke up they found that Brigitte was missing. He looked over the boots, in the bottle, up in the bed, in the bird cage, under a chair, but he could find it nowhere. [. . .]

Total length: 111 propositions; 464 words.

2. Once upon a ribbit there was a frog in a jar. But suddenly the frog came out and then he shout 'Frog, where are you? Frog, where are you? Frog! Frog! Where are you frog?' And then he saw [said] again and again, 'Where are you frog? Frog! Hey, frog! Frog! Frog!' 'Ribbit ribbit.' Then and so the frog and the boy lived ribbitly ever after.

Total length: 12 propositions; 67 words.
3. The dog is having a frog. The frog is in the jar. [...] The boy is near the bed. The dog is in the glass. The dog is licking the girl. The boy is looking at the bees. The boy is looking at something. The bees are buzzing. The boy is in the tree. The bees are all buzzing. The boy is having a good day. The boy is having a deer. The boy felling down. The boy got wet in the water. And the frogs were there. The boy is staying under a log. The boy is in the water.

Total length: 20 propositions; 137 words.

4. The dog is looking inside and he sees a frog. The frog was then going to come out. The frog is coming out and he is gone. The frog isn’t there anymore. The boy is calling, ‘Stop frog! Where are you?’ Where is the dog going? [...] The dog broke the jar. The boy is calling, ‘Frog where are you?’ The dog sees trees. The dog sees the bumblebees’ hive. The dog is running away from the bees. The boy sees the owl. I see a moose. The boy is falling. The boy is all wet. The dog is jumping over the log. The boy sees the frog. [...] And the boy has the frog back.

Total length: 24 propositions; 149 words.