ORIGINAL PAPER

Narrative Role-Taking in Autism

Rosa M. García-Pérez · R. Peter Hobson ·
Anthony Lee

Abstract Are children with autism able to adopt, and
shift among, the psychological perspectives of different
people? Fifteen children with autism and 15 without aut-
ism, matched for chronological age and verbal ability, were
given Feffer's (1970) role-taking task in which they were
asked to tell and then re-tell stories from different protag-
onists' perspectives. The children with autism understood
the task, adjusted narratives according to alternative
viewpoints, and were similar to control participants in their
use of mental state terms. Despite this, the children with
autism achieved significantly lower scores for adopting
different figures' perspectives, and for shifting among
complementary viewpoints. The results illustrate aspects of
social-cognitive impairment that extend beyond the chil-
dren's limitations in 'theory of mind' understanding.

Keywords Narrative role-taking · Autism ·
Perspective taking · Theory of mind · Social cognition ·
Interpersonal relatedness

Introduction

It is a commonplace observation that children with autism
tend to be relatively unaware or unresponsive to the feel-
ings and thoughts of others. One way to think of this is in
terms of a deficit in the children's propensity and/or ability
to take the perspective or role of another person. The aim
of the present investigation is to examine whether these
widely recognized abnormalities are reflected in the chil-
dren's performance on Feffer's (1970) formally structured
role-taking task, which was designed for use with people
with mental retardation—and if they are, to determine
more precisely the nature of any limitations in role-taking.
We supplement an analysis of performance according to
Feffer's standard scoring criteria with an examination of
how participants employed mental state terms in the role-
taking task.

A long-standing tradition of research into typically
developing children's role-taking propensities and abilities
(reviewed in Shantz 1975) documents how there are many
varieties of role-taking, for example in being sensitive not
only to other people's perceptions, feelings, thoughts, and
intentions, but also their physical characteristics, needs,
preferences, abilities and limitations, and so on. In recent
years, this way of thinking about social-cognitive ability
has been partly encompassed and partly eclipsed by a focus
on children's developing theory of mind, that is, the
acquisition of concepts of intention, desire, belief, and so
on. The domain of theory of mind theorizing has spread
beyond the topic of explicit mental state understanding to
'pre-theoretical' aspects of social functioning in earlier
phases of life, where precursors to theory of mind or
'implict' theory of mind abilities are identified. A potential
limitation of this approach is that phenomena such as one-
year-olds' ability to engage with others in joint attention, or
their propensity to adopt ways of relating to the world
through imitation, may be interpreted with reference to an
account that captures only some of the critical social-
developmental processes that these communicative trans-
actions entail. In particular, there is the danger that in

R. M. García-Pérez · R. P. Hobson (✉) ·
A. Lee
Developmental Psychopathology Research Unit, Tavistock
Clinic, 120 Belsize Lane, London NW3 5BA, UK
e-mail: r.hobson@ucl.ac.uk

R. M. García-Pérez · R. P. Hobson
Institute of Child Health, University College London,
London, UK

theories centered upon the development of children's mental representations, the early development of self-other psychological connectedness and differentiation (e.g. Hobson et al. 2006), or the emotional and motivational dimensions of early interpersonal communication (e.g., García-Pérez et al. 2007; Hobson and Lee 1998), may be presupposed or marginalized. One strength of the role-taking perspective is that it highlights how children come to see themselves and others *as* centers of psychological orientation with separate but potentially interchangeable roles, and highlights the need to consider what motivates as well as what structures role-awareness and role-shifting.

So, too, when it comes to investigate the social-cognitive development of children with autism, there are reasons for studying not just representational (or metarepresentational) abilities, but also the children's emotional and motivational engagement with others. We need to consider the degree to which children with autism come to grasp both other people and themselves *as* selves with their own person-anchored affective and cognitive psychological orientations, as well as individual self-attributes (Hobson 1990, 1993; Lee and Hobson 1998). Both clinical descriptions (e.g., Bosch 1970; Kanner 1943) and experimental studies (e.g., Hobson et al. 2006) that portray how children with autism appear to lack a grasp of self and other in social interactions remind us of aspects of interpersonal relatedness beyond the narrowly cognitive/representational domain. Of course, results from investigations revealing limited 'theory of mind' abilities in children with autism (as reviewed in Baron-Cohen et al. 2000, for example) *can* be interpreted in terms of role-taking or perspective-taking abilities, as Oswald and Ollendick (1989) and Reed (1994) have done explicitly—and there is no doubt that the children's limited concepts of mind play an important role in constraining *some* forms of social sensitivity and adjustment. However, from the theory of mind perspective it is often assumed that failures in role-taking arise out of the children's representational/conceptual limitations, rather than that limitations in role-taking might be primary in development. This assumption is open to question.

In fact there are a range of studies in autism that have had a specific concern with role-taking and self-other relations among affected children or adolescents. Investigations of children's abnormal understanding or use of the personal pronouns 'I' and 'you' fall into this category (e.g., Jordan 1989; Lee et al. 1994; Loveland 1984; Loveland and Landry 1986), as does the demonstration that individuals with autism display an unusual lack of self-other comparisons in their talk about themselves, despite having intact ability to express other self-characteristics such as their physical abilities and preferences (Lee and Hobson 1998). An investigation by Volden et al. (1997) holds special interest here, in that by focusing upon the relation between one form of perspective-taking (participants' awareness of a listener's information about a task) and referential communication, these investigators found evidence that abnormalities in the latter respect might not be fully attributable to theory of mind limitations. Commenting on the ways in which some children with autism appeared to adjust their language when reporting to a naïve vis-à-vis a knowledgeable listener, Geller (1991) remarked on the need to consider a range of linguistic indices of perspective-taking when assessing the children's social-cognitive knowledge.

Other research has considered aspects of the children's social relatedness and/or understanding within a role-taking framework. In one of the first such studies, Hobson (1984) administered several original tests of visual perspective-taking including a hide-and-seek task with miniature figures that required children to co-ordinate two other-centred views simultaneously. The participants with autism were surprisingly proficient in these tasks. Subsequent studies of visual-perceptual role-taking involving a variety of methodological approaches have corroborated this finding (Baron-Cohen 1989; Leslie and Frith 1988; Reed and Peterson 1990; Tan and Harris 1991). A partial exception to this picture was the study by Yirmiya et al. 1994 (also Warreyn et al. 2005) in which a subgroup of able autistic individuals were less proficient than matched nonautistic participants in rotating a table displaying objects when told ''to turn it around so that you will see it from where you are in the same way that I see it from where I am''—but even in response to these very complex instructions, a majority of participants with autism performed quite well.

In another early study, Dawson and Fernald (1987) tested children with autism aged between six and 14 years on a range of role-taking tasks, some of visual perspective-taking (including tests of awareness of picture orientation for different viewers), others involving the choice of suitable gifts or chairs for different people, and yet others of affective role-taking that involved participants selecting drawings of facial expressions for different situations. The principal finding was that aspects of role-taking (but on the whole, not measures of receptive vocabulary and nonverbal intelligence) were correlated with teacher ratings of social competence as well as the severity of clinical features as measured by the Childhood Autism Rating Scale of Schopler et al. (1988). The authors speculated on the potentially far-reaching developmental implications of the children's limited capacity for 'role-structuring', and pointed to possible links with their impairments in imitation and symbolic play (and see Hobson 1989 and 1993 for more elaborated accounts).

The children's abilities to understand and take account of people's visual perspectives may be compared with their

relatively intact abilities to recognize their own or others' goal-directed intentions, desires or preferences (e.g. Aldridge et al. 2000; Carpenter et al. 2001; Lee and Hobson 1998; Tan and Harris 1991), and contrasted with their difficulties when it comes to understanding and taking account of other people's feelings, beliefs and related mental states (for reviews of which, see Baron-Cohen et al. 2000). In what follows, we shall focus upon expressions of such intact or limited social understanding in the domain that bears directly upon the present study: that of commenting upon, or giving a narrative account of, visually presented depictions of people in meaningful activity.

One might begin with free descriptions of abstracted presentations of people depicted as moving point-light displays on videotape, where Moore et al. (1997) reported how children with autism contrasted with matched control participants in tending to offer spontaneous comments upon the people's actions such as sitting down or scratching, rather than their subjective states such as sadness or itching. A variety of visually presented materials have been employed to elicit judgements indicative of affective perspective-taking and empathy, yielding evidence suggestive of limitation among persons with autism (e.g. Yirmiya et al. 1992; Travis et al. 2001). Baron-Cohen et al. (1986) requested participants with autism, Down syndrome, and typically developing children to 'tell the story' in cartoon pictures they had placed in sequence, and reported that those with autism used mental state expressions more rarely than the comparison group, even though they were able to use causal as well as descriptive utterances when talking about mechanical events. This result is in keeping with a lack of reference to cognitive mental states in spontaneous speech samples of young children with autism (Tager-Flusberg 1992). On the other hand, when Tager-Flusberg and colleagues (Tager-Flusberg 1995; Tager-Flusberg and Sullivan 1995) asked groups of children with autism, mental retardation and typical development to narrate a story from a wordless picture book, participants with autism were not significantly different in their use of mental states terms (except that on probing, they had difficulty explaining emotional states), but they were less likely to include causal sentences to explain relationships among events. In one but not the other study, the children with autism tended to produce shorter stories, and here the children's use of a story schema was correlated with referential devices that took account of their listener's needs. In a study that also employed a wordless picture book, Norbury and Bishop (2003) reported that although children with autism produced more ambiguous references in their narratives, there were few differences from comparison groups (especially children with specific language disorder) in reference to mental or emotional mental states, and most children 'got

the gist' of the story and were relatively sensitive to listener needs when introducing and reintroducing story characters.

Complementary features of narrative story telling were highlighted by Loveland et al. 1990 (also Loveland and Tunali 1993) who presented high functioning verbal children and adolescents with autism or Down's syndrome with a puppet show or videotape sketch, and then asked them to tell the story to a listener. Although participants with autism showed an ability to produce narratives, they sometimes produced bizarre language and tended to treat the puppet/actors as objects rather than characters. The investigators reflected that in some cases, the children seemed to have difficulty in grasping the story as a representation of meaningful events (also Bruner and Feldman 1993). However, it remains to establish for how many children this is the case, and how far the effect is influenced by particular forms of task.

In the present study, we focused upon aspects of role-taking in narrative that have not been studied before, namely the ability to verbally represent and adjust to different figures' perspectives within a given story. We employed a story-based test of psychological role-taking that Feffer (1970) designed to test children with mental retardation on just these aspects of perspective-taking. Feffer's approach was to employ cardboard cut-out figures and a drawn background scene in order to establish a framework for assessing participants' abilities to adjust their manner of recounting a story according to the points of view of different figures in a story. In appraising this test, Feffer (1970) applied Spearman's rank correlations as an index of inter-rater reliability on scoring the performance of children and adolescents with learning difficulties, and reported reliability to be high (Spearman's rho = .84). Although he also provided Tables indicating that among his participants (age 7–16 years, with mental ages 4–14 years), there were positive relations among various aspects of the test scores and mental age (even when chronological age was taken into account), it is not yet established how far performance on the test relates to aspects of 'real-life' social sensitivity among such individuals.

Our hypothesis is that whatever the contribution of 'general' mental retardation to their social difficulties, individuals with autism are distinctive in their limited propensity to *identify with* the psychological stance of other people—that is, to register and assimilate the bodily-expressed attitudes of others, in such a way as to apprehend and (potentially) relate to the world through other people's hearts and minds. This hypothesis is grounded in the theoretical approach to intersubjective impairments of persons with autism most fully elaborated in Hobson (1993, 2002/4), who has stressed these individuals' difficulties in ''identifying with the subjective orientations and mental states of other people, in recognising the nature and

varieties of interpersonal sharing and communication, and in appreciating and adapting to the range of co-referential attitudes that people may adopt towards a shared and objective world'' (Hobson 1993, pp 170–80). At root, the hypothesis about identification is one that concerns a basic, non-inferential, affectively-grounded form of role-taking that is foundational for more cognitively sophisticated forms of the ability to 'put oneself in others' shoes', as well as for important aspects of self-regulation and self-eexperince, symbolic thinking and cognitive flexibility. Support for the idea that individuals with autism are relatively less prone to identify with others has emerged from a number of recent studies within the domains of imitation (Hobson and Lee 1999; Meyer and Hobson 2004), sharing of experiences (Meyer and Hobson 2007), non-verbal communication (García-Pérez et al. 2007; Hobson and Meyer 2005; also Wimpory et al. 2007), drawings of the self (Lee and Hobson 2006), and social emotions and self-awareness (Hobson et al. 2006). In the present study, we extended such study to role-taking in narratives. Rather than selecting participants with atypically high levels of cognitive functioning, we tested individuals with sufficient language and ability to take part but mostly with mild to moderate learning difficulties, so that the results might be representative of a broader group of children and adolescents with autism.

On the basis of our hypothesis, we made the following predictions *a priori*. Each of the predictions related to specific elements in our modification of Feffer's (1970) scoring scheme. Our overarching prediction was that in comparison with control participants matched for age and verbal ability, those with autism would have lower scores for overall role-taking. In Feffer's scheme, this measure is a composite of two scores, one for co-ordinating story content and the other for taking the perspectives of characters. In this respect, we made two subsidiary predictions. Firstly, we anticipated that the groups would be more divergent in scores on the latter perspective-taking measure than on co-ordination of story content, given that (arguably, at least, although some form of stance-shifting around a common story-line may be involved) it might be possible to maintain a consistent narrative with relatively little interpersonal perspective-taking. Secondly, we predicted that few participants with autism would achieve perspective-taking at a level that involved descriptions of internal states rather than actions.

Our second principal prediction was that there would be a group difference on another specific measure within Feffer's scheme, namely participants' ability to *shift* between the perspectives of two interacting characters *in a given story*. We also conducted a systematic investigation of participants' use of psychological terms in their role-taking, but here we made no prediction about the results beyond the fact that any group difference in this aspect of theory of mind functioning would be insufficient to explain differences in role-taking.

Method

Participants

The participants in this study were 15 children and adolescents with autism and 15 children and adolescents with mental retardation but without autism. There were 14 boys and one girl in the group with autism, and 11 boys and four girls in the control group. All the participants with autism fulfilled diagnostic criteria for autism according to the Diagnostic and Statistical Manual of Mental Disorders, (DSM-IV: American Psychiatric Association 1994), as assessed by clinical diagnosis backed up by systematic review with a teacher of participants' clinical features using a checklist of DSM-IV criteria. In addition, they were assessed according to the Childhood Autism Rating Scale of Schopler et al. (CARS: Schopler et al. 1988), and were given scores within the accepted range for autism (mean score 32.9, range 30–38). The two groups were selected to be similar in chronological age, and were group-matched for verbal mental age according to performance on the British Picture Vocabulary scale (BPVS: Dunn et al. 1982), one of the relative 'troughs' in the profiles of language functioning among children with autism (Jarrold et al. 1997).

In the task we were presenting, participants were asked to tell stories involving different characters. Therefore if we were to exclude the possibility that any group differences could be ascribed to contrasts in language ability, it was especially important to establish that the two groups of children were comparable in relevant linguistic skills, including the complexity and amount of their language output. Therefore as a supplementary procedure, we assessed the mean length of utterance (MLU) for each participant. This was achieved by counting the number of morphemes per utterance (Brown 1973), using the participant's first 50 utterances in the role-taking task itself. The results appear in Table 1, where it can be seen that the groups were comparable in this respect. In order to establish that the amount of verbal output was also similar in the two groups, we counted the number of words used by each participant when responding to the role-taking task. For participants with autism, the mean number of words was 105 (SD 65, range 37–210), and for those without autism, it was 107 (SD 59, range 24–216). Therefore in these respects, as well as in performance on the BPVS, the two groups were closely similar.

Table 1 Participant characteristics

	Chronological Age			Verbal mental age (BPVS)			Mean length of utterance (MLU)		
	Mean years; months	SD years; months	Range years; months	Mean years; months	SD years; months	Range years; months	Mean	SD	Range
Autism n = 15	13;04	2;10	9;08–17;03	6;09	1;09	4;09–10;07	6.2	1.6	3.9–9.9
Without Autism = 15	14;02	2;11	10;10–19;0	7;02	1;10	4;05–10.04	6.9	1.9	4.3–11.0

Procedure

Participants were tested by a single investigator in a quiet room in their own schools. The testing session was videotaped, and subsequently transcribed. The task was a structured role-taking task designed for use with children who have mental retardation (Feffer 1966). Fifteen drawn cut-out human figures, each 8.5 cm high, were presented to the participants. They depicted a range of different people: for example a nanny, a policeman, and a little girl. There were also seven drawings of backgrounds scenes such as a classroom, an empty street, or a living room.

Each participant was asked to produce three versions of two different stories. Each of the stories took place against its own drawn background scene. For the first story, the participant was given a 'living room scene' as a background, and was asked to select three characters from the 15 available figures to take part in the story (see Fig. 1). Once the participant had selected the figures he or she was given the following instructions: *'I want you to make up a story with a beginning, a middle and an end about this scene and these people'*.

After the participant had told the story, the experimenter repeated the story back and then said: *'Now I want you to tell me the very same story again as if you are....*(one of the figures that featured often in the story was selected) *so this time you are the...'*. Subsequently, he or she was asked to
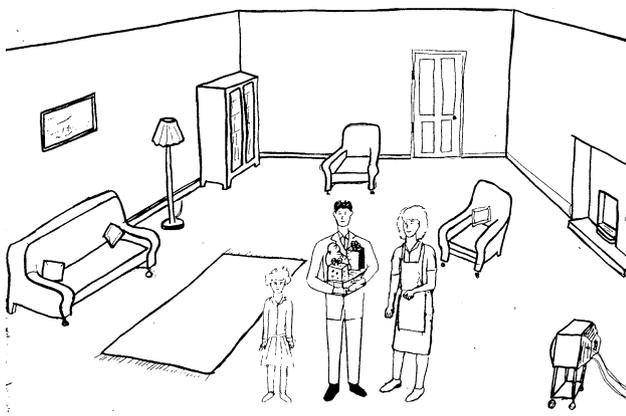
retell the very same story again, but this time from the point of view of another character. The instructions were as follows: *'I want you to tell me the very same story again but this time you are the ....'* (and here the investigator selected the figure that had interacted most with the main character). When needed to elicit a full response, the investigator gave prompts such as *'So what happened next?'*.

When the initial story and its two role-taking versions had been completed, the whole procedure was repeated a second time with a second story. In this case, however, the participant was invited to choose which background scene he or she wanted for the story, as well as which three of the remaining 12 drawn figures would take part. The critical issue was how far a participant would adjust and elaborate the stories, so that each role-taking version of a story was configured according to the perspective of the central character of that version, and other characters were described from this protagonist's point of view.

Scoring

The scoring criteria were based on those used by Feffer, with modifications to simplify the complex scoring system, as follows:

Overall Role-Taking Index (max score = 32)

This is a composite measure that combines ''perspective taking'' and ''co-ordination'' scores across the two role-taking versions of the two stories. For *each role-taking version* of a story, participants were scored for:

1. Co-ordination of story content (score 0–4 for each of the two role-taking versions of each story; max score = 16). Here the ratings concerned the degree to which the contents of each of the two role-taking versions of a story were compatible with the initial story, that is, whether the participant was recasting the original story rather than making up a new one. In a minor modification to Feffer's scoring system, for each comparison between a role-taking version and the initial story, we gave a separate score for the main character and one for the two other characters

Fig. 1 Background scene with figures

combined (range 0–2, where 0 indicated almost no overlap in the events involving the character(s), and 2 indicated that most of the events were cited). Therefore there was a maximum score of four for each of the two role-taking versions of each of the two stories, making a total maximum score of 16.

2. Perspective Taking score (Feffer's role-taking shift, max score = 16). For each of the two role-taking versions of each story, participants received a score on a scale of 0–4. A score of 0 was given when the story was not described from the point of view of the main character and there was no direct nor indirect references to the perspectives of other characters; a score of four was given when the participant used psychological terms when telling the story from a particular character's viewpoint. The full range of scoring criteria, together with examples of each level of perspective-taking in the present study, are presented in the Appendix.

Change of Perspective

This supplementary index of perspective-taking was a part of Feffer's rating scheme intended to highlight a participant's ability to *move between* alternative perspectives. Here the *two role-taking versions* of each of the two stories were considered in relation to one another. The issue was whether or not the child adopted the perspective of one character and then moved to adopt the perspective of another character within a different version of the same story. We simplified Feffer's scheme, by making a categorical division between those participants who were able to shift perspectives in this way on at least one of the two stories, and those who were not. The criterion, established *a priori*, was that a participant needed to score 3 or 4 for perspective-taking on *both* versions of a given story.

Psychological Terms

The final approach to analyzing the transcripts was not part of Feffer's scheme. This was to classify the psychological terms used by participants in their role-taking stories into one of the following categories (following Tager-Flusberg 1992): desire (e.g. care, want, wish), perception (e.g. watch, cold, smell, taste), emotion-behavior (e.g. cry, kiss, smile), emotion (e.g. angry, happy, hate), and cognition (e.g. believe, forget, think). In no case was there difficulty in deciding the category of any mental state term, and so a single rater completed this procedure.

Reliability of Scoring

The assessment of inter-rater reliabilities was based on the ratings of two independent judges blind to diagnosis rating

20% of the data (three participants with autism and three participants in the comparison group). The degree of agreement was evaluated with the weighted Kappa coefficient, which takes into account the likelihood of chance agreement between the raters. The weighted Kappa coefficients for co-ordination and perspective-taking scores were 0.63 and 0.78 respectively, representing substantial agreement between the two raters (Sprent and Smeeton 2000).
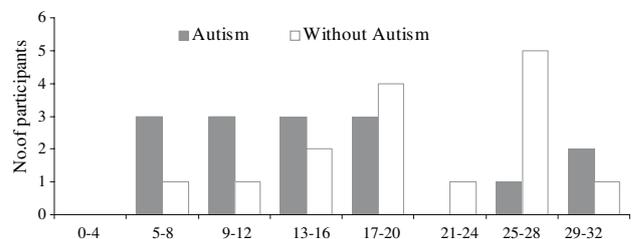
Results

Given the nature of the ratings that were made, it was appropriate to apply non-parametric statistics to analyze the data. In addition, however, we provide parametric data when this is appropriate for descriptive purposes.

Overall Role-Taking Index (max score 32).

The results are shown in Fig. 2. These accord with our directional prediction that children with autism would score lower than control participants on Feffer's measure of *overall role-taking* ability (mean rank autistic 12.7, mean rank non-autistic 18.3, Mann–Whitney $U = 71$, $p < .05$, one-tailed). Figure 2 illustrates how the majority of participants with autism are distributed among the lower scores. On the other hand, some children with autism managed to achieve relatively high role-taking scores, and three of them were at the upper end of the range.

The correlation between verbal mental age and overall role-taking score was significant among the control participants (Spearman's rank coefficient = .66, $p < .01$), but *not* among the participants with autism (Spearman's rank coefficient = .13, ns). The three participants with autism who were especially proficient in role-taking were spread across the group in CA, but tended to be in the upper range of verbal MA ($M = 8.0$, range = 6.4–10.7); they had CARS scores towards the lower end of the range characteristic of autism (between 30 and 33); and although we did not have details of their personal nor therapeutic histories, they were not obviously distinguished from other participants in their group. The six participants who performed least well were

Fig. 2 Overall role-taking scores (max = 32)

also typical in age, and not exceptional in verbal MA (*M* = 6;4, range = 4.9–8.7).

Components of Overall Role-Taking

Story Co-ordination in Relation to Perspective-Taking

The results for each component of overall role-taking—story co-ordination on the one hand, and perspective-taking on the other—appear in Table 2. We had anticipated that story co-ordination would contribute less than perspective-taking to the group differences in overall role-taking. Therefore we conducted a Mann–Whitney test on individual participants' difference scores between

co-ordination and perspective-taking. Although the group difference was not significant, one can observe from Table 2 that there is a trend in the expected direction, with more marked group difference in perspective-taking. On the other hand, levels of performance on story co-ordination were substantially higher in both groups, and approached ceiling in the control group, and this would have reduced the chance of detecting group differences.

Analysis of Perspective-Taking

We had predicted that, relative to control participants, few with autism would score in perspective taking at a level that involved descriptions of internal states rather than

Table 2 Role-taking scores

| | VMA (months) | Overall role-taking score (max = 32) | Components of overall role-taking | | |
			Co-ordination total score (max = 16)	Perspective-taking score (max = 16)	Difference score
Individuals with autism *n* = 15 (in order of VMA)	57	12	9	3	6
	61	12	8	4	4
	62	19	12	7	5
	63	15	14	1	13
	65	7	3	4	−1
	66	19	14	5	9
	75	30	16	14	2
	79	7	4	3	1
	80	14	14	0	14
	85	29	16	13	3
	88	17	12	5	7
	91	8	8	0	8
	103	12	2	10	−8
	120	13	12	1	11
	127	28	16	12	4
Mean (SD)	81 (21)	16.1 (7.6)	10.7 (4.8)	5.5 (4.7)	5.2 (5.6)
Individuals without autism *n* = 15 (in order of VMA)	53	20	13	7	6
	67	16	12	4	8
	69	17	12	5	7
	71	25	16	9	7
	72	16	8	8	0
	74	10	6	4	2
	75	24	16	8	8
	75	19	13	6	7
	77	7	4	3	1
	92	20	12	8	4
	98	27	14	13	1
	101	27	16	11	5
	117	25	16	9	7
	121	28	16	12	4
	124	32	16	16	0
Mean (SD)	86 (22)	20.8 (6.9)	12.7 (3.9)	8.20 (3.7)	4.5 (2.9)

actions. In order to study this, we examined those participants who described the perspective of the character in terms of actions (scoring 3) or who referred to internal states (scoring 4) in at least one role-taking version of the stories. There were five participants with autism and 10 participants without autism who scored three or four in at least one story, a non-significant difference. Among these participants, only three out of the five participants with autism, and four out of the 10 control participants, conveyed the psychological orientation of the character (score 4), rather than merely their actions.

The second issue was to determine how consistent or inconsistent participants were in their levels of role-taking. Eight participants with autism and 12 participants without autism scored 2 or more out of 4 on perspective taking in *at least one* of the four role-taking versions. Thus, the majority of participants in each group achieved some degree of perspective taking in at least one version of one story. On the other hand, eight participants with autism were completely lacking in any evidence of perspective-taking (i.e. scored 0) in *at least one* of the four story versions, whereas this was the case for only a single control individual (Fisher's exact test, two tailed, p < .01). Together, these results suggest that although many children with autism could make adjustments in their narratives, often they failed to do so.

Change of Perspective

Our second major prediction was that fewer individuals with than without autism would show 'change of perspective' in telling either story. Here it should be recalled that we made a categorical distinction between participants who achieved such a change of perspective on at least one of the two opportunities to do so. The results were that 9 out of 15 control participants, but only 3 out of 15 participants with autism changed perspective in at least one story (Fisher's Exact Test, one tailed, p = .03); two participants in each group did so for both stories.

Psychological Terms

The final subsidiary prediction was that group differences in role-taking ability would not be explained by the participants' lack of mental state concepts, at least as far as these were revealed in their stories. Table 3 shows the number of participants who used terms in each psychological category at least once. The group *similarity* apparent in Table 3 was also present when we analysed the numbers of participants who used each category of word more than once, which was the case for approximately half of each group for perception terms, two-thirds of each group for emotion terms, and one-third of each group for terms relating to cognition. Participants of both groups used 'desire' terms like, want, need or hope; 'perception' terms like watch, see or listen; 'emotion-behavior' terms like fight, cry or smile; 'emotion' terms like miserable, happy or worried; and 'cognition' terms like know, think and believe.

Additional Observations on Story Content

There was little to distinguish between the groups on the topics of their stories. In the first story, where the living-room was used as the background scene, participants told stories about matters involving a family (six participants from each group) and robbery (five participants from each group). Among the remaining participants with autism, stories concerned hunting, watching television, and social events; among those without autism, they were about getting ready, helping others, or social events. For the second story, six children with autism and three without chose the doctor's surgery as the background scene, three children with autism and seven without chose the classroom, two children in each group chose the street corner, and the remainder chose either the bedroom or the shop scene. In this case, stories concerned doctor/illness (five children with autism, two without), misbehaving in school (three with autism and seven without), robbery (two with autism and six without), and the remaining four participants with autism made up stories about shopping (one participant), helping others (two participants) and a row (one participant).

Discussion

This study has yielded an intriguing picture of the strengths and limitations of role-taking in individuals with autism. On the one hand, our two principal predictions concerning these participants' lesser propensity to adjust to alternative perspectives was borne out. Firstly, there was a significant

Table 3 Number of participants who used mental terms at least once, and (in brackets) more than once

	Desire	Perception	Emotion-behavior	Emotion	Cognition
Autism *n* = 15	7 (1)	12 (8)	8 (2)	14 (10)	8 (4)
Without Autism *n* = 15	6 (1)	12 (7)	5 (1)	10 (9)	9 (5)

group difference in overall role-taking, and there was a non-significant trend for this to be most marked for the component of perspective-taking rather than story co-ordination. When required to re-tell a story from the vantage-point of one of the protagonists, and not only co-ordinate this new version of the story with an earlier one but also to adopt an 'inner orientation' to one figure and an 'outer orientation' to another, participants with autism tended to be less proficient than control participants. Secondly, on the separate, non-independent but complementary measure of changing perspectives within given stories, a significantly smaller proportion of participants with autism (3 out of 15) than without autism (9 out of 15) changed perspective in at least one story.

Therefore these findings point to a difficulty or limitation among persons with autism in perceiving and/or adjusting to the perspectives of different figures within a narrative, and in shifting from one person-anchored perspective to another.

On the other hand, there was evidence not only that participants with autism were able to understand and respond to the challenge of re-telling stories, but also that most made *some* adjustments in their accounts to accord with the perspectives of protagonists, at least on some occasions. In the case of what Feffer called 'self-entry' role-taking, for example, where the participant told the story from the vantage-point of a particular figure, all but two participants with autism were able to show role-taking on at least one out of four occasions. It is even possible that such role-taking would have been enhanced if participants had additional encouragement to 'be' one of the figures, for example through selecting pictures of themselves at some point. Here it may be observed that participants' propensity to engage in role-taking might depend on the particular setting and story-making procedures employed, and not least, on the familiarity and sensitivity of the tester (and our tester, AL, was well-known to all the participants). Therefore replication with different testers would be valuable.

Although Feffer's task requires that participants make up stories with miniature figures, and the instructions make reference to pretending and acting as if one were one of the figures, these demands appeared to present little difficulty for the participants of the present study, as indicated by their scores for co-ordinating stories involving the cut-out figures. It is also of note that three participants with autism achieved very high scores for role-taking, and even showed change of perspectives within a given story. Clearly with such exceptions—and Fig. 1 indicates how exceptional they were for the present sample—it would be an oversimplification to claim that deficient role-taking in narratives is characteristic of *all* individuals with autism.

In other respects, too, group differences were absent where they might have been expected. For example, there were few participants in *either* group who produced stories in which they conveyed the psychological orientation of the main character and invoked his or her thoughts and feelings. More impressively, the prevalence of a variety of mental state terms was very similar in the stories of each group of participants. The members of each group frequently spoke of the protagonists' perceptions and emotions, and similar proportions of the participants of each group (just under half) referred to cognitive mental states such as thinking and knowing. Although this does not represent a stringent test of theory of mind understanding, in that participants might have understood mental state terms that they simply chose not to ascribe to protagonists, or have used terms they did not fully understand, it is still of interest that the evidence weighed against the likelihood that group differences in role-taking were a reflection of limitations in understanding mental states. Moreover, the groups were similar in the content of their stories, where events concerning school, the family, or robbery were frequently represented. Among this relatively able group of children and adolescents with autism, then, the present results accord with previous findings of relative abilities rather than striking atypicalities in narrative story-telling (e.g. Norbury and Bishop 2003).

Before embarking on a discussion of how these findings should be interpreted, it is important to consider how the two groups of participants were matched. In a task that involved story-telling, it was vital to ensure that any observed group differences in role-taking scores were not merely a reflection of 'general' linguistic ability, nor a side-effect of differences in creativity or talkativeness. Therefore it is important to stress that on three measures of language functioning relevant for the task—understanding of word meanings, mean length of utterance, and verbal output during the task—the two groups were very similar. One implication of this approach to matching is that the individuals with autism had already achieved a sophisticated level of language. If, as is likely, social role-taking plays some part in the acquisition of language, then matching according to language ability not only biases the samples of participants towards those who are likely to demonstrate relatively developed role-taking, but also entails pre-selection for a psychological ability that is *in part* a reflection of sensitivity to perspectives embodied in language. In other words, this is a highly conservative approach to matching, and one that might substantially reduce the magnitude of group differences in role-taking. Therefore the performance of participants with autism in the present study may overestimate role-taking abilities within the broader range of children with autism, and the modest size of some of the group contrasts may in part

reflect the fact that the matching procedure is not independent of role-taking ability. Although the three participants with autism who scored most highly for role-taking were in the upper range of verbal MA, however, there was a significant relation between verbal MA and overall role-taking score only in the group of participants without autism. The source of this group difference is not known, but it introduces the possibility that certain aspects of language functioning among children with autism might develop in relative independence from more socially embedded (including pragmatic) abilities, so that 'levels' of language ability are only partly related to other communicative abilities such as role-taking.

When one steps back and reviews the patterns of performance, it appears that group differences were characterized by the patchiness of role-taking among children with autism, as well as its relative lack. Over half (8 out of 15) of the participants with autism scored 2 or more out of 4 on perspective taking in at least one of the four role-taking versions, but it was also the case that over half (again, 8 out of 15) showed a complete absence of role-taking in at least one story, something observed in only a single control participant. What this seems to suggest is that for at least some children with autism, the problem is not that they lack *any* ability to modify narratives, but that they are prone to produce stories without any sign of adjustments in perspective. It is tempting to conclude that this amounts to a motivational explanation for limitations in role-taking, and therefore diametrically opposed to cognitive accounts such as that provided by theory of mind theorizing. In our view, however, it is not justified to force a radical disjunction between these accounts. On the basis of other studies (e.g., Hobson et al. 2006; Hobson and Lee 1999; Hobson and Meyer 2005; Meyer and Hobson 2004, 2007), we believe that children with autism have a lesser propensity to *identify with* others' bodily-expressed attitudes. This leads to a *reduced inclination to shift in perspective* through responsiveness to other people's psychological orientation, and may delay or impoverish understanding of what it means to adopt mental perspectives (Hobson 2002/4). If such an account is correct, then role-taking is *both* a motivational *and* a cognitive matter, and the performance in role-taking among participants with autism may reflect abnormality in processes that implicate both aspects of psychological functioning. In other words, what we have referred to as the patchiness of role-adjustments among participants with autism may reflect a weakness in the 'pull' towards adopting other person-centred orientations—they are less inclined to be moved to assume the stance of another individual or figure in play—*and* their tenuous grasp of the nature of persons-with-minds. Here it is relevant to recall the adolescent with autism who reported how ''I still have to remind myself that there are people'' (Cohen 1980, p 388).

We conclude by elaborating upon the developmental implications of such an account. It has become fashionable to think of limitations in psychological perspective-taking among children with autism as manifestations of deficits in their theory of mind abilities, the crux of which is the ability to *conceptualize* mental states such as those of thinking, believing, and intending. Yet we need to consider how far an account of the *development* of role-taking is foundational for, parallel with, or subsidiary to the *development* of theory of mind abilities. For example, Hobson 1993, Hobson and Lee 1999 has argued that non-inferential forms of role-taking, and specifically the processes of apprehending and identifying with other people's attitudes, are prerequisites for a child's subsequent conceptual understanding of the nature of thoughts and other mental states, or the ability to 'represent mental representations' (Leslie 1987). This approach offers an account of how mental states are attributed to *people*, and it highlights how from a developmental perspective, understanding minds is not divorced from being involved with other embodied people in feeling. On the other hand, theory of mind conceptual understanding is a prerequisite for certain forms and levels of role-taking, as famously illustrated by the difficulties young children encounter in taking account of protagonists' perspectives in false-belief tasks (Baron-Cohen et al. 1985). Thus there may be specific aspects of role-taking that are prior to and required for interpersonal understanding and the linguistic structuring of self/other relations (as expressed through personal pronoun usage, for example), whereas other aspects of role-taking may await the acquisition of 'theory of mind' concepts.

We would argue that in theory as well as in practice, it is impossible to separate completely the domains of role-taking and theory of mind. From a theoretical perspective, there are levels and forms of role-taking that entail understanding other minds, although there are some that do not. Moreover, conceptual understanding of minds involves individuation of subjects of experience (persons) to whom minds are ascribed. Even if we wish to characterize minds in terms of mental states such as those of intention and belief, or in terms of mental representations and metarepresentations (which leaves out a lot about the affective/conative relations between persons and the world), still we need an account of how mental states come to be apprehended and understood as perspectively sensitive orientations anchored in body-endowed individuals. We also need to explain how other people's attitudes, including attitudes to the self, seem to be so important for typically developing children, yet in some ways less important for children with autism.

From a practical point of view, it would be a mistake to presume that when children (or indeed adults) fail to adjust to the viewpoints of other people, this is necessarily caused by conceptual limitations. Although we hold back from tracing the potential therapeutic implications of such a stance, it is important to note how there are a range of different reasons why an individual may be unmotivated to accommodate to, as well as cognitively limited in adjusting to, someone else's perspective. Therefore to perform successfully on theory of mind tasks or to behave with social sensitivity in more natural interpersonal transactions— or even to modify points of view in re-telling stories according to the roles of different protagonists, as here—a person needs to draw on a set of motivational-cum-cognitive abilities that lead to adjustments in stance with reference to someone else's psychological orientation or other individual characteristics. The present study contributes a fresh empirically-grounded perspective on the difficulties encountered by individuals with autism in this domain of social cognition and relatedness.

Appendix: Details of scoring for Perspective Taking

Score 0

A participant received a score of 0 when the story was not described from the point of view of the main character and there was a failure to capture the perspectives of other characters.

Example from a child with autism (role-taking as the policeman):

She [a little girl] went in the car, so the policeman got out of the way, and went round the block and she jumped out of the car, and she kicked a ball in the road and the car knocked, crashed, and the policeman cried as she kicked him and the policeman died. It was a policelady.

Example from a child without autism (role-taking as the teacher):

This is the other teacher and this was her Dad coming in, and everybody went out to play ... and he went out the door. And then she [the teacher] was very quietly doing her work and all the rest were giggling and throwing pencils at her. And she was just sitting there, and everybody had to stand by the wall.

Score 1

A participant received a score of 1 when there was some elaboration of the perspectives of the characters of the story, but still it was unclear that the participant was taking the perspective of the main figure. For instance, the use of dialogue could be a sign that the participant had some degree of understanding different perspectives.

Example from a child with autism (role-taking as the boy):

One day a little boy went for a walk, and it rain and he went back home. He was feeling ill. Doctor came around. [Doctor] ''Doctor's here now. Mum she looked after you.'' [Mother] ''I'm here little boy. I'm here.'' Doctor said, ''Here are the medicines that you put on.'' Up together again. Then he had to move back to the hospital now. Mum sits down, ''Aaah.'' There he is. They back together now. The end.

Example from a child without autism (role-taking as the boy):

[boy] ''Hi Sue.'' [girl] ''Hi, What have you done to your leg?'' [boy] ''Oh I fell off the cliff. Went on holiday.'' [girl] ''Did you have a nice holiday?'' [boy] ''Yeah I did, but I fell off the cliff, that is why I have got a broken leg''.

Score 2

A participant received a score of 2 when he or she described the main character according to his or her role, but not in accordance with his or her own perspective. Showing a correct use of personal pronouns (for instance, to use 'I' every time that reference was made to the main role-taking character) was enough to receive a score of 2.

Example from a child with autism (role-taking as the boy):

So I stick out the tongue at the girl, and the teacher tell me off, send me to Headmaster, and he said, ''This is your one more chance.'' I went outside, I hit the girl, and the teacher said, ''You are expelled from school.''

Example from a child without autism (role-taking as the mother):

I'm the Mum and I'm doin' the nurse. And helpin' the boy is on crutches with the plaster leg. And the Dad is waiting.

Score 3

A participant received a score of 3 when the story was described from the point of view of the main character, in terms of specific actions and perceptions.

Example from a child with autism (role-taking as the boy):

> Once upon a time I was coming, I was walking through the door and I saw my big brother and my small brother and I gave them a present. I gave Andrew a watch, my small brother a watch and my big brother a coat.

Example from a child without autism (role-taking as the robber):

> Once upon a time I was a robber, and when I went in the shop, I got a gun, and said ''give me the money''. I look in the window and the policeman comes.

Score 4

The highest score of 4 was given when the participant used psychological terms when retelling a story from the main character's viewpoint.

Example from a child with autism (role-taking as the gunman):

> I was in Brixton prison, they thought they could trust me, but they couldn't, so they let me outside to do some work, and when I put all the stuff in the lorry I run off.

Example from a child without autism (role-taking as the boy):

> Oh, my dad bought me a dog for my birthday, cos I really love a dog, and he also got me a motor car, and I really liked the car ... and it [the dog] swallowed a bit, and its neck got caught ... and it died ... I wanted my dog back, it was dead. So I had to have one of my Mum's friend's puppies, and I got to like the puppy, and the puppy got to like me.

References

Aldridge, M. A., Stone, K. R., Sweeney, M. H., & Bower, T. G. R. (2000). Preverbal children with autism understand the intentions of others. *Developmental Science, 3*, 294–301.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders: Revised Fourth Edition (DSM-IV)*. Washington, DC: APA.

Baron-Cohen, S. (1989). Perceptual role taking and protodeclaratve pointing in autism. *British Journal of Developmental Psychology, 7*, 113–127.

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

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1986). Mechanical, behavioural and Intentional understanding of picture stories in autistic children. *British Journal of Developmental Psychology, 4*, 113–125.

Baron-Cohen, S., Tager-Flusberg, H., & Cohen, D. J. (Eds.) (2000). *Understanding other minds: Perspectives from developmental cognitive neuroscience*. Oxford: Oxford University Press.

Bosch, G. (1970). *Infantile autism: A clinical and phenomenological-anthropological investigation taking language as the guide (D. Jordan and I. Jordan, Trans.)*. New York: Springer-Verlag.

Brown, R. (1973). *A first language*. Cambridge, MA: Harvard University Press.

Bruner, J., & Feldman, C. (1993). Theories of mind and the problem of autism. In S. Baron-Cohen, H. Tager-Flusberg, & D. J. Cohen (Eds.), *Understanding other minds: Perspectives from autism* (pp. 267–291). Oxford: OUP.

Carpenter, M., Pennington, B. F., & Rogers, S. J. (2001). Understanding of others' intentions in children with autism. *Journal of Autism and Developmental Disorders, 31*, 589–599.

Cohen, D. J. (1980). The pathology of the self in primary childhood autism and Gilles de la Tourette syndrome. *Psychiatric Clinics of North America, 3*, 383–402.

Dawson, G., & Fernald, M. (1987). Perspective-taking ability and its relationship to the social behavior of autistic children. *Journal of Autism and Developmental Disorders, 4*, 487–498.

Dunn, L. M., Dunn, L., & Whetton, C. (1982). *British picture vocabulary scale*. Windsor, U.K.: NFER-Nelson.

Feffer, M. (1966). Decentering implications of social interactions. *Journal of Personality and Social Psychology, 4*, 415–422.

Feffer, M. (1970). Role-taking behavior in the mentally retarded. ERIC Report to the Bureau of Education for the Handicapped, U.S. Office of Education, Department of Health and Social Welfare.

García-Pérez, R. M., Lee, A., & Hobson, R. P. (2007). On intersubjective engagement in autism: A controlled study of nonverbal aspects of conversation. *Journal of Autism and Developmental Disorders* (in press).

Geller, E. (1991). The interplay between linguistic and social-cognitive knowledge in perspective-taking by autistic children. *Journal of Childhood Communication Disorders, 14*, 23–44.

Hobson, R. P. (1984). Early childhood autism and the question of egocentrism. *Journal of Autism and Developmental Disorders, 14*, 85–104.

Hobson, R. P. (1989). Beyond cognition: A theory of autism. In G. Dawson (Ed.), *Autism: Nature, diagnosis, and treatment* (pp 22–48). New York: Guilford.

Hobson, R. P. (1990). On the origins of self and the case of autism. *Development and Psychopathology, 2*, 163-181.

Hobson, R. P. (1993). *Autism and the development of mind*. Hove, Sussex: Erlbaum.

Hobson, R. P. (2002/4). *The cradle of thought*. London: MacMillan and New York: Oxford University Press.

Hobson, R. P., Chidambi, G., Lee, A., & Meyer, J. (2006). Foundations for self-awareness: An exploration through autism. *Monographs of the Society for Research in Child Development, 71*(284), 1–165.

Hobson, R. P., & Lee, A. (1998). Hello and goodbye: A study of social engagement in autism. *Journal of Autism and Developmental Disorders, 28*, 117–127.

Hobson, R.P., & Lee, A. (1999). Imitation and identification in autism. *Journal of Child Psychology and Psychiatry, 40*, 649–659.

Hobson, R. P., & Meyer, J. A. (2005). Foundations for self and other: A study in autism. *Developmental Science, 8*, 481–491.

Jarrold, C., Boucher, J., & Russell, J. (1997). Language profiles in children with autism: Theoretical and methodological implications. *Autism: The International Journal of Research and Practice, 1*, 57–76.

Jordan, R. R. (1989). An experimental comparison of the understanding and use of speaker-addressee personal pronouns in autistic children. *British Journal of Disorders of Communication, 24*, 169–179.

Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child, 2*, 217–250.

Lee, A., & Hobson, R. P. (1998). On developing self-concepts: A controlled study of children and adolescents with autism. *Journal of Child Psychology and Psychiatry, 39*, 1131–1141.

Lee, A., & Hobson, R. P. (2006). Drawing self and others: How do children with autism differ from those with learning difficulties? *British Journal of Developmental Psychology, 24*, 547–565.

Lee, A., Hobson, R. P., & Chiat, S. (1994). I, you, me, and autism: An experimental study. *Journal of Autism and Developmental Disorders, 24*, 155–176.

Leslie, A. M. (1987). Pretence and representation: The origins of 'theory of mind'. *Psychological Review, 94*, 412–426.

Leslie, A. M., & Frith, U. (1988). Autistic children's understanding of seeing, knowing, and believing. *British Journal of Developmental Psychology, 6*, 315–324.

Loveland, K. A. (1984). Learning about points of view: spatial perspective and the acquisition of 'I/you'. *Journal of Child Language, 11*, 535–556.

Loveland, K. A., & Landry, S. H. (1986). Joint attention and language in autism and developmental language delay. *Journal of Autism and Developmental Disorders, 16*, 335–349.

Loveland, K. A., McEvoy, R. E., Tunali, B., & Kelley, M. L. (1990). Narrative story telling in autism and Down's syndrome. *British Journal of Developmental Psychology, 8*, 9–23.

Loveland, K., & Tunali, B. (1993). Narrative language in autism, the theory of mind hypothesis: a wider perspective. In S. Baron-Cohen, H. Tager-Flusberg, & D. J. Cohen (Eds.), *Understanding other minds: Perspectives from autism* (pp. 247–266). Oxford: OUP.

Meyer, J. A., & Hobson, R. P. (2004). Orientation in relation to self and other: The case of autism. *Interaction Studies, 5*, 221–244.

Meyer, J. A., & Hobson, R. P. (2007). Identification: The missing link between imitation and joint attention? *Development and Psychopathology* (in press).

Moore, D., Hobson, R. P., & Lee, A. (1997). Components of person perception: An investigation with autistic, nonautistic retarded and normal children and adolescents. *British Journal of Developmental Psychology, 15*, 401–423.

Norbury, C. F., & Bishop, D. V. M. (2003). Narrative skills of children with communication impairments. *International Journal of Language and Communication Disorders, 38*, 287–313.

Oswald, D. P., & Ollendick, T. H. (1989). Role taking and social competence in autism and mental retardation. *Journal of Autism and Developmental Disorders, 19*, 119–127.

Reed, T. (1994). Performance of autistic and control subjects on three cognitive perspective-taking tasks. *Journal of Autism and Developmental Disorders, 24*, 53–66.

Reed, T., & Peterson, C. (1990). A comparative study of autistic subjects' performance at two levels of visual and cognitive perspective taking. *Journal of Autism and Developmental Disorders, 20*, 555–567.

Schopler, E., Reichler, R. J., & Renner, B. R. (1988). *The childhood autism rating scale (CARS)*. Los Angeles, CA: Western Psychological.

Shantz, C. U. (1975). The development of social cognition. In E. M. Hetherington (Ed.), *Review of child development research* (Vol. 5, pp. 257–323). Chicago: University of Chicago Press.

Sprent, P., & Smeeton, N. C. (2000). *Applied nonparametric statistical methods*. London: Chapman and Hall/CRC.

Tager-Flusberg, H. (1992). Autistic children's talk about psychological states: Deficits in the early acquisition of a theory of mind. *Child Development, 63*, 161–172.

Tager-Flusberg, H. (1995). 'Once upon a ribbit': Stories narrated by autistic children. *British Journal of Developmental Psychology, 13*, 45–59.

Tager-Flusberg, H., & Sullivan, K. (1995). Attributing mental states to story characters: A comparison of narratives produced by autistic and mentally retarded individuals. *Applied Psycholinguistics, 16*, 241–256.

Tan, J., & Harris, P. (1991). Autistic children understand seeing and wanting. *Development and Psychopathology, 3*, 163–174.

Travis, L., Sigman, M., & Ruskin, E. (2001). Links between social understanding and social behavior in verbally able children with autism. *Journal of Autism and Developmental Disorders, 31*, 119–130.

Volden, J., Mulcahy, R. F., & Holdgrafer, G. (1997). Pragmatic language disorder and perspective taking in autistic speakers. *Applied Psycholinguistics, 18*, 181–198.

Warreyn, P., Roeyers, H., Oelbrandt, T., & De Groote, I. (2005). What are you looking at? Joint attention and visual perspective taking in young children with autism spectrum disorder. *Journal of Developmental and Physical Disabilities, 17*, 55–73.

Wimpory, D. C., Hobson, R. P., & Nash, S. (2007). What facilitates social engagement in preschool children with autism? *Journal of Autism and Developmental Disorders* (in press).

Yirmiya, N., Sigman, M. D., Kasari, C., & Mundy, P. (1992). Empathy and cognition in high-functioning children with autism. *Child Development, 63*, 150–160.

Yirmiya, N., Sigman, M., & Zacks, D. (1994). Perceptual perspective-taking and seriation abilities in high-functioning children with autism. *Development and Psychopathology, 6*, 263–272.