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ORIGINAL PAPER

# Person-Centred (Deictic) Expressions and Autism

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**Abstract** We employed semi-structured tests to determine whether children with autism produce and comprehend deictic (person-centred) expressions such as 'this'/'that', 'here'/'there' and 'come'/'go', and whether they understand atypical non-verbal gestural deixis in the form of directed head-nods to indicate location. In Study 1, most participants spontaneously produced deictic terms, often in conjunction with pointing. Yet only among children with autism were there participants who referred to a location that was distal to themselves with the terms 'this' or 'here', or made atypical points with unusual precision, often lining-up with an eye. In Study 2, participants with autism were less accurate in responding to instructions involving contrastive deictic terms, and fewer responded accurately to indicative head nods.

**Keywords** Autism · Deixis · Identification · Pointing · Communicative intent · Self

## Introduction

How do children with autism experience themselves in relation to other people? One important facet of this complex question concerns the children's awareness that other people have psychological orientations to the world that are not only distinct from, but also interchangeable with, their own. Here we investigated such awareness through the study of deictic linguistic and non-linguistic (pointing and nodding) communicative expressions.

Typically, interpersonal communication by means of deictic terms and gestures takes place within a framework of self-other awareness and role-shifting. The term 'deixis' is derived from the Greek word for pointing and indicating. For example, the meanings of the spatial deictic words we studied here—'this'/'that', 'here'/'there' and 'come'/'go'—are related to the vantage-points of the speaker who utters the terms and the listener who interprets them. It is in this sense that we describe them as person-centred. 'This' is near to me whereas 'that' is more distanced, 'here' to me may be 'there' to you, and both 'come' and 'go' have reference to the bodily location of the person who speaks. Although several authors have commented on the possibility that children with autism find difficulty with such linguistic expressions (e.g., Bartolucci and Albers 1974; Fay 1979; Landry and Loveland 1989; Ricks and Wing 1975), there has been surprisingly little systematic investigation of the matter.

The most celebrated example of deictic confusions among individuals with autism is their atypical usage of the personal pronouns 'I' and 'you'. In his original account of early childhood autism, Kanner (1943) wrote: '*Personal pronouns are repeated just as heard,* with no change to suit the altered situation. The child, once told by his mother, 'Now I will give you your milk', expresses the desire for milk in exactly the same words. Consequently, he comes to speak of himself always as 'you', and of the person addressed as 'I'. Not only the words, but even the intonation is retained' (p. 244). Although Kanner believed that

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'I'/'you' confusions were tied up with the children's proneness to echolalia, his emphasis on the unmodified usage of these terms according to context—and most importantly, according to the 'altered situation' involving changes in speaker roles—seems to implicate the children's limited engagement with the stances of other people. This theme was taken up by writers such as Fay (1979) and developed by Bosch (1970), Charney (1981) and Hobson (1990, 1993), each of whom proposed that children with autism might have a limited propensity to identify with the orientation-in-speaking of other persons, and *for this reason* show echolalia as well as atypicality in the comprehension and use of personal pronouns.

If children with autism are less engaged with the psychological stance of a speaker, and have a lesser propensity to be moved to adopt that speaker's utterances from the speaker's own standpoint (Hobson 2002, 2007), then they may be prone to interpret utterances in relation to their own, egocentric position. For example, they might be less likely to understand someone else's use of the words 'this', 'here' or 'come' as having meaning in relation to that other person's stance. If this were the case, then they might well adopt the expressions wholesale and without appropriate modification according to speech roles—they might fail to grasp that *they* can use 'this', 'here' or 'come' in relation to *their own* position, for example—even if other aspects of situation-based meaning were registered.

These considerations illustrate why self-other awareness and role-taking are bound up with children's understanding and use of a range of deictic contrasts, not only those involving personal pronouns. Both the comprehension and production of deictic terms depends upon an appreciation of how the speaker is positioned in the act of making utterances. If a child hears someone using the word 'here', for example, this needs to be understood in relation to a 'there' that has reference to a place further from the speaker (but perhaps nearer to the listener) than wherever 'here' is meant to be, the boundaries of which depend on context (Clark 1978). If a child uses the word 'this' in appropriate opposition to 'that', or 'come' in opposition to 'go', he or she needs to understand how each term contrasts with its paired associate in relation to proximity versus distance, or movement towards versus away from, the child-as-speaker.

Clark (1978) provides a helpful overview of issues in the development of deictic terms in typical development, and describes how diary studies and vocabulary records suggest that most children use 'I' and 'you', 'here' and 'there', 'this' and 'that', and 'come' and 'go' by their third birthday, with 'bring' and 'take' appearing a few months later (and see Charney 1979; de Villiers and de Villiers 1974, for experimental evidence). Indeed, a deictic word based on 'there' or 'that' often appears in the first ten words of English-speaking children (e.g., Nelson 1973), usually accompanied by pointing and intent staring (Bloom 1970). However, these observations do not mean the terms are used without error or with full adult meaning, and Clark considered that the although the speaker/addressee contrast between 'I' and 'you' is learnt by 3 years of age, the full meanings of contrasts between 'here' and 'there' and 'this' and 'that' are not mastered until around the age of five, and between 'come' and 'go' and 'bring' and 'take', later still (Clark and Garnica 1974; Clark and Sengul 1978). Although as Clark (1978) points out, there might be a number of different ways in which deictic terms could be learned and applied, Charney (1981) argues that in the case of very young typically developing children, even restricted and immature forms of personal pronoun usage bear the signs that children have identified with the stance of language-users they have heard using the terms. Certainly, identification of this kind would provide an effective and efficient route by which the shifting nature of deictic terms might be appreciated.

What, then, is the evidence that deictic terms present special difficulty for children with autism? Although there is a wealth of clinical description that affected children manifest a variety of abnormalities in personal pronoun usage, for instance in referring to themselves with third-person pronouns (e.g., Bosch 1970; Ricks and Wing 1975), experimental evidence pertaining to the broader range of deictic expressions is sparse. In an early investigation, Loveland and Landry (1986; also Landry and Loveland 1988, 1989) videotaped matched groups of participants aged between five and 13 years in play with an investigator who stage-managed interactions that required a child either to produce or comprehend personal pronouns or the demonstratives 'this'/'that' or 'here'/'there', or to respond to attention-directing gestures such as pointing, gaze shifting or tapping an object. Not only were the children with autism less responsive to language or gestures used to direct their attention, but also they were less likely than language-delayed children to be spontaneous in the use of pointing or showing gestures, or to use 'this'/'that' or 'here'/'there'. Subsequent studies of personal pronoun comprehension and use have reported that relatively able children with autism are atypical in tending to substitute proper names for personal pronouns, or to use the pronoun 'I' rather than 'me', sometimes in formulaic phrases such as 'I can see it' (Jordan 1989; Lee et al. 1994).

Two studies have provided suggestive evidence that such abnormalities are intimately related to interpersonal engagement. Firstly, Loveland and Landry (1986) reported that among a group of children with autism, correct production of I/you pronouns was related to the number of spontaneous inititiations of joint attention with an investigator. This suggests that the children's propensity to

achieve active alignment with someone else's psychological orientation is closely related to their productive grasp of 'I' and 'you'. Secondly, Hobson et al. (2009) reported that within a set of three experimental tasks, children with autism not only displayed markedly infrequent use of third-person pronouns to refer to a third party present in the room, but also they rarely looked to the person and back to the interlocutor when making reference to this third party. In each case, atypicality in personal pronoun usage was accompanied by evidence that something was *also* atypical in the children's co-ordinated attention and engagement with a communicative partner.

There is additional evidence that children with autism do have a relative lack of the propensity to adjust communicative roles that switch from speaker to hearer in a way that is structured according to the bodily location of whoever is communicating. Hobson and Meyer (2005) presented a 'sticker test' in which children needed to communicate to another person where on her body she should place her sticker-badge. The majority of children without autism pointed to a site on their own bodies to indicate the tester's body, that is, anticipating that the other person would identify with their act of identifying with her body. The children with autism rarely communicated in this way; instead, most pointed to the body of the investigator to indicate where the sticker should be placed. In a related study by Hobson and Hobson (2007), participants who imitated a tester's self/other-orientation in a series of actions (a relatively rare event among those with autism) *also* tended to be those most likely to manifest 'sharing looks' towards the tester in the imitation task itself. Other recent research provides complementary evidence of limited communicative role-taking as well as interpersonal engagement and identification among children with autism (García-Pérez et al. 2007, 2008; Hobson and Hobson 2007).

The above studies illustrate what we had in mind in framing our hypotheses for the present study. Firstly, we hypothesized that not only full understanding but also proficient use of both verbal and non-verbal deictic expressions relies on children's capacity to identify with other people. Our reasoning was that this primitive form of person-centred role-taking affords a grasp of how speakers' utterances are related to their bodily-anchored stance. Secondly, we hypothesized that children and adolescents with autism are limited in their propensity to identify with others, and in recognizing and/or adopting the psychological perspectives of other people (Hobson and Lee 1999; Hobson et al. 2006). Therefore we predicted that in relation to language-matched participants without autism, individuals with autism would respond to tests of the production and/or comprehension of the deictic terms 'this'/'that', 'here'/'there', and 'come'/'go', or non-verbal head nods to indicate a position in relation to the person nodding, by (a) producing fewer deictic words and gestures (both singly and in combination), and/or atypical forms of expression, and (b) showing limited or atypical understanding of deictic words and gestures produced by others.

In order to test these predictions, we designed a task with the aim of eliciting both verbal and non-verbal deictic expressions from our participants, while completely avoiding any deictic expression in the task instructions. Secondly, we designed a set of comprehension tasks in which we presented both non-verbal and verbal deictic expressions in a systematic way, alongside comparison conditions to exclude the possibility that any group differences to emerge were due to non-deictic task-related factors. The test of production was administered first as Study 1, in order that participants' spontaneous responses were not influenced by the investigators' use of deictic terms in the comprehension test that followed.

## Study 1: The Production of Deictic Terms and Pointing

### Method

#### *Participants*

The participants were 20 children and adolescents with autism, and 20 children and adolescents without autism or other specific diagnoses but with mental retardation, all of whom came from special education schools for children with special needs. The participants with autism were diagnosed using the criteria of the diagnostic and statistical manual of mental disorders (DSM-IV: American Psychiatric Association 1994) for autism. The second author observed the participants in different settings in their schools and the clinical information obtained was corroborated through discussions with the children's teachers. In order to confirm diagnoses, we completed the childhood autism rating scale (CARS: Schopler et al. 1988, where scores of 30 and above are taken to reflect autism), and the participants with autism were given scores of mean 35.4, SD 4.5, range 30–46.5.

The participants with autism were group-matched with individuals without autism and with learning difficulties (but without specific diagnoses) who were closely similar in chronological age and verbal mental ability as assessed by the British Picture Vocabulary Scale (BPVS: Dunn et al. 1982), as shown in Table 1. Performance on the BPVS represents a relative trough in the functioning of children with autism, and tends to correspond with other aspects of their linguistic functioning (Jarrold et al. 1977). Having said this, the test is one of receptive vocabulary, and we supplemented this measure with a test of productive language,

**Table 1** Participant characteristics

| | Chronological age | | | Verbal mental age (BPVS) | | |
|---|---|---|---|---|---|---|
| | Mean (year; month) | SD (year; month) | Range (year; month) | Mean (year; month) | SD (year; month) | Range (year; month) |
| Study 1 | | | | | | |
| With autism $n = 20$ | 10; 11 | 2; 10 | 5; 09–14; 09 | 5; 09 | 2; 04 | 3; 01–12; 05 |
| Without autism $n = 20$ | 10; 10 | 1; 09 | 7; 03–13; 05 | 6; 00 | 2; 06 | 3; 04–12; 03 |
| Study 2 | | | | | | |
| With autism $n = 15$ | 12; 00 | 1; 10 | 8; 02–14; 08 | 6; 06 | 2; 02 | 4; 03–12; 04 |
| Without autism $n = 15$ | 11; 00 | 1; 05 | 8; 09–13; 05 | 6; 07 | 2; 06 | 3; 04–12; 03 |

the Action Picture Test (Renfrew 1997). Unfortunately, one audiotape containing the record of the performance of five participants with autism and seven without autism was lost; yet it remained possible to compare BPVS scores for the remaining 15 participants with autism and 13 participants without autism. As it happened, these subgroups were similar on their BPVS scores (mean 56, SD 22.6 and mean 50, SD 22 for participants with and without autism, respectively), and this similarity was reflected on both components of the Renfrew Test: the scores for participants with and without autism were, respectively, on information (verbal formulation) mean 28, SD 6.0 and mean 28, SD 7.5, and on grammar mean 18, SD 8.8 and mean 18, SD 7.3. Therefore within this sub-sample of participants, BPVS scores were approximately on a par with the Renfrew measure of productive language. These group similarities mean that any group differences to emerge cannot be attributed to disparities in 'general' language ability.

*Procedure*

The testing session, which took place in a quiet testing room in school and lasted between 15 and 30 min, involved two investigators, one female and one male. The materials comprised six plastic animals (a cow, a rabbit, a sheep, a dog, a horse and a pig) and two white plastic toy 'fields' created by white plastic fencing in a circle. To begin with, the materials were placed on a table midway between two chairs situated ~1.5 m apart from each other, but to one side so that it was not directly between the chairs. A second investigator stood on the far side of the room, and was attentive to the participant. The arrangement is depicted in Fig. 1.

Each participant (P) was seen individually. The female investigator (E1) began by establishing that P could name all the animals and the (white) colour of the two fields, and asked P to place one of the fields on each of the two chairs. Then E1 said: *'Some of the animals live in one field* (*E1 stood by the field nearest the participant and without pointing, indicated the field by touching it*) *and some of the animals live in the other field* (*E1 stood by the other field and without pointing, indicated the field by touching it*). *We want you to help us put the right animals in the right fields. We'll tell you,* [*participant's name*], *what to do.'* At this point, the participant was asked to sit on the chair set aside for him/her next to one field, so that this field was in front of P and directly in line with the second field some distance away. A videotape camera was positioned to capture P's responses.

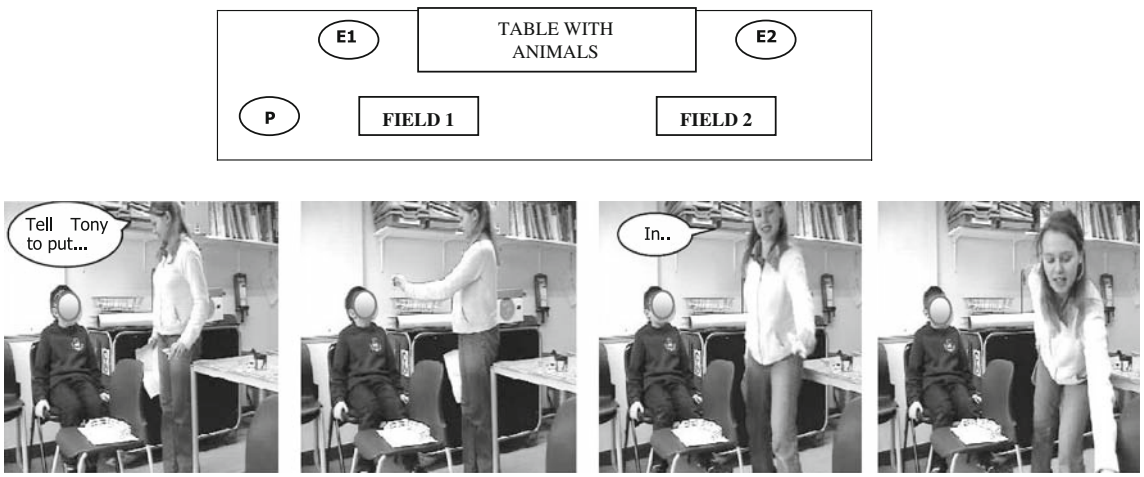


**Fig. 1** Study 1: testing production of deictic terms and gestures

E1 continued: *'Tony turns around and I will tell you what to do'*. Here the second investigator turned his back so he could not see what was happening. E1 picked up one of the plastic animals and said: *'Tell Tony to put*—(E1 showed the animal to the participant)—*in*—(E1 briefly placed the animal in one of the two fields and then she put it back on the table)*'*. The approach is illustrated in Fig. 1, where the second field and the second investigator, who at this point was turned with his back to the scene, are off camera. Our aim here was to avoid using deictic terms or gestures in conveying what participants were supposed to do.

Once E1 had placed the animal back on the table, she asked E2 to turn around to face P, and then waited for P to tell E2 what to do. If P did not respond, or if P's instructions to E2 were ambiguous, E2 would give a prompt such as '*What shall I do?'*, or if P indicated the animal to pick up but did not indicate which field, *'Which field?'*. In those cases where the participant did not respond at all after approximately 3 s, E2 said: *'Tell me what to do'*. E2 did whatever he was instructed to do.

The animal was placed back on the table, E2 returned to his initial position and again turned his back, and the procedure was repeated with a different animal, and then subsequently four more times. The fields in which the animals were to be placed varied, such that three instructions were directed to the field closest to P and three to the field furthest from P, with systematic alteration that did *not* amount to rigid alternation between the fields nearest to and farthest from P.

Although participants were expected to remain seated when giving E2 instructions, there were some (four participants in each group) who stood up and demonstrated where E2 should put the animal. When this happened, a further full six trials were given, with E1 asking the participant to remain seated when telling E2 what to do.

### *Scoring and Reliability*

Videotaped responses to each of the six trials were coded according to four separate non-exclusive ratings, as follows (so for each measure, scores ranged from 1 to 6):

(1) Verbal Deixis: score 1 if P used a verbal deictic term (VD).
(2) Non-Verbal Deixis: score 1 if P used a non-verbal deictic gesture. In all cases, the gesture used was pointing.
(3) Co-ordinated Deictic Expressions: in each trial, a score of 1 was given if the participant used a verbal deictic expression *together with* a non-verbal deictic expression.
(4) 'Atypical' deixis: A score of 1 was given if P used the terms 'this' or 'here' to refer to the field that was situated far from the participant, or if 'that' or 'there' was used to refer to the field that was situated close to the participant.

The principal rater was not blind to the hypothesis of the study, nor participants' diagnostic group. Since the verbal terms were unambiguous, estimates of inter-rater reliability were required only for participants' use of pointing when instructing E2. In this respect, a second rater blind to both the hypothesis and diagnosis of the participants rated 25% of videotaped material (i.e., 10 participants, of whom five were randomly selected from each group and then intermixed), and the ratings yielded a kappa of 0.73, indicating 'substantial agreement' according to Landis and Koch (1977).

Although we had not framed predictions about the *quality* of points produced by participants, we became interested in exploring whether this might betray group differences in the *nature* of the communicative engagement established with a tester. There were two additional ratings that were made by the same independent raters later in the study, when the videotape record of three participants (two with autism and one without autism) were mislaid and therefore could not be included. The first rating, made for each and every point that occurred in trials intended to elicit deictic expressions, was whether or not there was anything unusual about the point. In those cases where the point seemed atypical, the rater was asked to give a brief description of how this was the case. The nominal kappa estimate of inter-rater reliability for those participants who showed an atypical point was .62 (substantial agreement). In the results, we consider as 'atypical' only those points considered to be atypical by both raters. The second rating was whether the participants looked back to the tester during or immediately after the point. The purpose was to assess whether they showed awareness of the person for whom they were pointing, and checked out whether their message had been registered. The inter-rater reliability of these latter ratings was kappa .81 (almost perfect); the data analyzed came from the rater who was unaware of group constitution.

## Results

Across the two groups, all but one participant (with autism) were spontaneous in telling E2 what to do in at least four out of the six trials. There were nine participants with autism but not a single control participant who in at least one of the six trials, initially failed to say where E2 should place an animal. Among participants who gave instructions to the experimenter, 10 with autism and 11 in the control group required a prompt because in at least one trial they gave unclear instructions, but of these, only four

participants with autism and two control participants required a prompt in three or more trials.

*Use of Deictic Terms*

The distribution of participants' scores for verbal deixis, with or without prompting, is shown in Table 2. Contrary to prediction, the two groups were very similar in their use of deictic terms across the six trials (Mann–Whitney Test, $U = 192$, ns). For example, at least half the participants in each group (13 with autism and 10 without autism) used deictic terms in at least five out of the six trials. If only non-prompted responses are considered, 11 participants in each group used a verbal deictic term in at least four trials; and at the other extreme, four participants in each group failed to use deictic terms spontaneously at any juncture.

When it came to consider the atypical use of deictic terms (that is, 'there' or 'that' for the field nearest the participant, or 'here' or 'this' for the field farthest away), it was possible to consider only those participants who used such terms at all viz. 20 participants with autism and 17 control participants. Fifteen out of 20 autistic participants (generating 31 atypical responses), and 12 out of 17 control participants (26 responses), used an 'atypical' deictic term at least once.

However, one form of response appeared to be less atypical than the other. There were 11 participants with autism (20 responses) and 12 control participants (26 responses) who used either 'there' or 'that' atypically at least once in referring to the field immediately in front of them (for those with autism, five used 'there', five used 'that', and one used both: for those without autism, four used 'there', six used 'that', and two used both). In these instances, on reflection, these seemed options that were neither unnatural nor ambiguous as an alternative to 'here'. Indeed, the use of 'there' and 'that' for a proximal location is commonly observed among young children (Clark 1978).

On the other hand, there were 7 participants with autism (11 responses) but not a single control participant who used the terms 'here' or 'this', instead of 'there' or 'that', to refer to the *far* field (Fisher's Exact Test, two tailed, $p = .008$). All of these instances involved the participant pointing to the target as they used these terms. In the case of four participants with autism, such atypical use occurred on the first trial of the study, where any tendency to perseveration in the use of terms would not have been operating.

*Pointing*

The distribution of scores for non-verbal deixis—that is, the use of pointing to indicate the field in which the toy animal should be placed—also appears in Table 2. Once again, the distribution of scores was remarkably similar between the two groups (Mann–Whitney Test, $U = 195$, ns). The large majority of participants in each group (20 participants with autism and 17 control participants) used a point in at least five out of the six trials. When we examined non-prompted responses only, 15 participants with autism and 16 control participants used pointing in four or more trials.

Given the above results, it is perhaps unsurprising that the groups were also similar in the propensity to co-ordinate a verbal deictic term with a pointing gesture (Mann–Whitney Test, $U = 176.5$, ns). By way of summary, the numbers of individuals who showed such co-ordinated communicative behaviour on 0–2, 3–4, or 5–6 out of the total 6 trials, were as follows: for the group with autism, 2, 7, and 11 participants, respectively; for the group without autism, 5, 7, and 8 participants, respectively.

However, there remains a question of whether the points were typical in form as well as frequency. It should be recalled that because of mislaid videotapes, we were able to examine this only in the case of 18 participants with autism and 19 without autism. The results were that, when

**Table 2** Study 1: use of deictic terms, and pointing, over the six trials

| Number of trials (out of 6) featuring deictic terms/pointing | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Use of verbal deictic terms | | | | | | | |
| Number of participants with autism ($n = 20$) | | 1 | 1 | 4 | 1 | 6 | 7 |
| Number of participants without autism ($n = 20$) | 3 | 1 | 1 | 3 | 2 | | 10 |
| Use of pointing | | | | | | | |
| Number of participants with autism ($n = 20$) | | | | | | 3 | 17 |
| Number of participants without autism ($n = 20$) | | | | 1 | 2 | | 17 |

we considered only those participants whom both raters agreed had produced an atypical point, there were eight out of 18 children with autism but not a single participant without autism who did so (Fisher's exact test, $p = .001$, two-tailed). When we reviewed the descriptions of the points, both raters recorded that of the eight children with autism who showed atypical points, seven children (i.e., almost 90%) produced a total of eight points that were directed in an unusually focussed way towards the target. Moreover, seven of these eight instances of pointing (from six participants, since two such points were made by a single individual) involved the child 'taking aim' with one eye closed. This was something that never occurred among the participants without autism. The remaining child pointed in an approximate fashion without looking to the target, giving the impression that he was not really pointing.

If from the participants who were assessed for atypical points, one considers participants who *either* showed atypical pointing *or* atypical deixis in relation to the far field, there were 13 out of 18 participants with autism but *not one* of the 19 participants without autism who did so (Fisher's exact test, $p < .001$, two-tailed). Among the participants with autism, those who showed instances of atypical pointing, as well as those whose responses featured atypical deictic terms, were distributed across the range of chronological and mental ages.

Finally, we recorded whether, when participants pointed, they *also* accompanied the point with a look back to the tester. The results were that such looks occurred in M = 30% (SD 29.9%) of points by children with autism, and M = 60.1% (SD 32.7%) of points by children without autism, $t = -2.9$ (35), $p < .01$, two-tailed. Thirteen out of 18 (72%) participants with autism who pointed gave such looks on fewer than half their points, whereas this was the case for only 5 out of 19 (26%) participants without autism who pointed. Therefore according to this measure, there was a group difference in sustained engagement with the person *for* whom (one might presume) the point was intended.

## Study 2: Comprehension of Deictic Terms, and Responses to an 'Atypical' Deictic Gesture

### Method

#### *Participants*

Participants were 15 young people with autism and 15 without autism but with mental retardation, diagnosed as in Study 1. Ten of the participants with autism, and all 15 of those without autism, had taken part in Study 1. The two groups were closely matched for verbal mental ability, as estimated by the British Picture Vocabulary Scale (BPVS: Dunn et al. 1982). Children with autism had scores on the Childhood Autism Rating Scale M = 36.3, SD 4.1, range 30–46.5. Participant characteristics appear in Table 1.

#### *Procedure*

This test examined participants' understanding of deictic terms and, in a separate but counterbalanced procedure, a single non-verbal deictic expression, namely a head nod towards a location. The arrangement of a table and two chairs was the same as that in Study 1, but on this occasion there were two modifications in the setting (see Fig. 2). Firstly, we placed a white field on one chair and a brown field on the other chair, so that it was possible to identify the fields by referring (non-deictically) to their colour. Secondly, the two investigators were seated on chairs facing and next to the respective fields, some distance away from (and facing toward) each other. This meant that each investigator could see both fields and the other investigator beyond, and one was closer to the white field and the other closer to the brown field. The participant was asked to stand next to the table to the side of the investigators, so that the animals were within reach and it was easy for the participant to walk a few steps to each field, as necessary.

The investigators took it in turns to communicate to the participant, in which fields to put two animals. On each item of the task, that is, one investigator would


**Fig. 2** Study 2: test of verbal comprehension (deictic terms)

communicate to the participant that he or she should put one animal in one location, and another animal in either the same or the contrasting location. Once this had been achieved, the animals were returned to the table, and now it was the turn of the other investigator to say where the animals should be located.

We had the investigators refer to two animals in this way, for four reasons. Firstly, certain forms of deictic usage (as occurred in this particular testing situation) were partly ambiguous *until* an investigator established a deictic contrast, in particular between 'there' and 'here' but to a lesser extent with other terms employed, namely 'bring' and 'take', 'this' and 'that', and 'come' and 'go'. Secondly, we needed to avoid interference among successive questions, which would have been more likely if only one animal at a time was involved. Thirdly, the chances of randomly correct responding were substantially reduced. Fourthly, our aim was to make this a relatively taxing task (not least, to avoid ceiling effects), and the combination of memory load and instances of unusual sentence construction that nevertheless maintained meaning (e.g., 'Put a horse in the brown field and put a cow in the brown field') was intended to assess the degree to which participants were influenced by the semantics of the deictic terms.

Finally, we included a screening test to ensure that participants were able to deal with general (non-deixis-involving) task demands. This test replicated the form of the tests of understanding deixis, except that the fields in which animals were to be placed were identified by colour, rather than by deictic terms.

Therefore three conditions were administered. The screening task was given before the deictic tasks in half of the participants, and after the deictic tasks in the other half of participants. Within the deictic tasks, as already indicated, the verbal and non-verbal sets of items were counterbalanced. Full instructions, together with their order of administration, appear in Appendix.

### *Screening Task*

In the eight items of the screening task, the fields were referred to by colour, for example, *'Place a pig in the WHITE field and put a duck in the BROWN field'*. In four items, the two animals were directed to different fields, and in four they were directed to the same field. Here participants needed to comprehend and remember the instructions, but did not have to understand deictic terms.

We decided in advance that we would accept potential participants into the study only if they gave five or more out of eight correct spontaneous responses during the screening task (by the binomial distribution, the probability of achieving this by chance is two in one hundred).

### *Verbal Comprehension Test*

The test of comprehension of deictic terms involved eight items that were similar in form to those used in the screening task, only now the instructions involved deictic terms such as *'Put a duck in THAT field and put a horse in THIS field'*. Here we needed to accept that in order to give such instructions without any accompanying gesture or indication of meaning (for example, by looking at the location indicated), we needed to be controlled and unnatural in expression. Therefore we read the instructions and looked straight at the participant, whose task was to make sense of what to do from the words alone. We switched speaker roles between the investigators in order that the particular field to which 'bring' and 'take', 'there' and 'here', 'this' and 'that', 'come' and 'go' was inconsistent, and the anchorage of meaning in the stance of the speaker was critical.

If participants failed and/or were clearly bewildered in any given item of the verbal or non-verbal tests, we gave a follow-up instruction replacing the deictic terms with names of the colours of the fields. This allowed the participant to succeed so that we could pass on to the next item, having elicited a successful response with the non-deictic terms.

### *Non-Verbal Comprehension Test*

We decided to test an atypical but meaningful non-verbal deictic gesture for the reason that the prototypical indicative gesture, that of pointing, is learned (by whatever mechanism) relatively early by many children with autism. Our aim was to evaluate participants' propensity to interpret even non-conventionalized bodily communicative signs in a self/other-oriented framework. The gesture we employed in the absence of any deictic term was a nod directed towards one or the other field (Fig. 3). For example, participants were asked to *'Put a cow* (the investigator nodded towards the brown field, to indicate this to be the correct location) *and put a pig* (the investigator nodded to the white field)*'*. We always ensured that a participant was watching, when the nods were made. In this part of the study, there were only four trials: on two occasions, the experimenter's nods indicated that the two animals should be placed in opposite fields, and on the remaining two trials, the nods indicated they should be placed in the same field (see Appendix).

For each condition, a score of 1 was given when a participant put *both* animals in the correct field(s). Thus, the maximum number of correct responses in the verbal deictic tasks was eight, and in the non-verbal deictic task it was four.


**Fig. 3** Study 2: test of non-verbal comprehension (head nods)

## Results

### *Screening Task*

After screening larger groups for the ability to comply with non-deictic versions of the instructions, ten participants with autism and five control participants were excluded from the study. This meant that the final groups of participants ($n = 15$ per group) achieved scores on the screening task as follows: participants with autism M = 6.5 out of 8 (SD 1.1), and those without autism M = 6.9 out of 8 (SD 1.0).

### *Verbal Comprehension Test*

Results from the test of comprehending deictic terms appear in Table 3. As predicted, participants with autism made significantly fewer correct responses than did the control participants (Mann–Whitney Test, $U = 73$, one tailed, $p < .05$). If one considers only those participants who gave six or more correct responses (i.e., those participants who were very unlikely to have responded randomly), there were three participants with autism and nine control participants who fell into this category (Fisher's Exact Test, one tailed, $p = .03$). As one can see from Table 3, these three children with autism were outliers within their group, and no other participants with autism achieved more than 50% correct responses. There were significant correlations between the comprehension of deictic terms and verbal mental age, both for participants with autism (Spearman's *rho* = .58, $p < .05$) and for those without autism (*rho* = .79, $p < .001$).

Although the groups were very similar in performance on the screening condition to assess compliance with non-deictic test demands, we examined whether there was a group difference in the degree of discrepancy between individual participants' performance when deictic terms were and were not part of the task. In order to assess this, we converted scores to percentage correct, and calculated the difference between the percentages for each condition. All but three participants with autism, and all but five participants without autism, found the screening task easier; however, there was a group difference in the predicted direction, insofar as the participants without autism scored relatively highly when deictic terms were involved, vis-à-vis their own scores on the screening task (Mann–Whitney $U = 72.5$, $p < .05$, one-tailed).

**Table 3** Study 2: comprehension of deictic terms

| Number of trials (out of 8) featuring correct responses | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| Number of participants with autism ($n = 15$) | 1 | 3 | 1 | 2 | 5 | | | | 3 |
| Number of participants without autism ($n = 15$) | 1 | | | 2 | 3 | | 4 | 3 | 2 |

We also considered those participants who were correct on both trials containing either or both of the terms 'here'/'there', 'this'/'that', 'come'/'go', and 'bring'/'take'. There were only six out of 15 participants with autism who satisfied this criterion for understanding deictic terms, and of these, three were correct on 'this'/'that' only, and three were correct on all the terms. Among those without autism, 10 of the 15 participants understood at least one pair of deictic terms according to this criterion. One participant was correct on 'here'/'there' only, two were correct on 'here'/'there' and 'this'/'that', three were correct on 'here'/'there', 'this'/'that'', and 'come'/'go', two were correct with 'here'/'there', 'this'/'that', and 'bring'/'take', and two were correct throughout. Although this pattern of responses needs to be considered in relation to possible order effects, given the fixed order of presentation, it is notable that for control participants, the gradient of difficulty among the deictic terms is compatible with that described for typically developing children (Clark 1978).

A lingering methodological concern prompted us to conduct a final set of analyses. We were aware that when the instructions in the verbal deixis task involved non-contrasting deictic terms—for example, 'Put a sheep in THIS field and a dog in THIS field'—the expressions were pragmatically odd. Therefore one might question the meaning of the group differences, when a pragmatically sensitive participant might over-ride the literal instructions and respond by putting the animals in different fields. In order to address this issue, we compared participants' responses to instructions that contained contrasting deictic

terms (those that were pragmatically felicitous: items 1, 3, 4, and 6 in Verbal Deictic Section of Appendix) with responses to instructions that were odd in containing non-contrasting deictic terms (items 2, 5, 7, and 8 in Appendix). As it turned out, the results were closely similar on each set of items (for the group with autism, M = 2.5, SD 1.8 on the contrasting and M = 2.4, SD 1.8 on the non-contrasting items: for the control group, M = 3.6, SD .9 on the contrasting and M = 3.9, SD .3 on the non-contrasting items—with a similar pattern of scores in the corresponding subtests from the screening test). When the results from the four contrasting items are considered in isolation, the group difference remains significant, $t(28) = 2.12$, $p < .05$, two-tailed. Therefore it does not seem to be the case that the pragmatic oddness of the non-contrasting instructions introduced distortion into the results.

*Non-Verbal Comprehension Test*

Results from the four items designed to test a (relatively) unconventional deictic gesture, namely a determined head-nod, appear in Table 4. Once again, there was a significant group difference in the numbers of correct responses given (Mann–Whitney Test, $U = 65$, one tailed, $p < .05$). When one considers those individuals who responded correctly on either three or four of the trials, a pattern unlikely to be due to chance (given that each trial involved two animals), six participants with autism and 11 control participants fell into this category (Fisher's Exact Test, one tailed, $p = .09$).

We examined whether the participants with autism who found most difficulty in interpreting the head nods were also those who had low scores in comprehending deictic terms, but the correlations between scores (percentage correct) on the two forms of test were relatively low (Spearman's *rho* = .1). On the other hand, there was a positive correlation between the comprehension of head nods and verbal MA that was just shy of significance for participants with autism (*rho* = .49, $p < .07$) and significant for those without autism (*rho* = .63, $p < .05$). More importantly, for children with autism there was a significant negative correlation between the comprehension of head nods and CARS scores (*rho* = −.60, $p < .05$). This relation between participants' limited comprehension and CARS assessments of degree of autism (insofar as high scores on CARS reflect more severe autism) remained significant when variance associated with verbal MA was taken into account (partial-$r$ (12) = −.55, $p < .05$).

**Table 4** Comprehension of head-nodding as a deictic gesture

| Number of trials (out of 4) featuring correct responses | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Number of participants with autism ($n = 15$) | 4 | 1 | 4 | 3 | 3 |
| Number of participants without autism ($n = 15$) | 1 | 1 | 2 | 3 | 8 |

## Discussion

The results of this study were not altogether as predicted. In particular, in Study 1 there was little group contrast in the tendency of participants to use *some* deictic terms, often in conjunction with pointing, to indicate a location either close to or at some distance from themselves. In many cases, moreover, the terms used were similar to those employed by control participants without autism. At first blush, this might suggest that, at least among participants of the age and intellectual level tested here, and in relation to the measure of receptive verbal ability (the BPVS) according to which they were matched with participants without autism, children without autism have little difficulty in using the deictic terms 'this' and 'that', and 'here' and 'there'.

Yet closer inspection of the details of the children's choice of deictic terms, as well as the style of their pointing and associated looks back to the communicative partner, suggested that similar *levels* of performance disguised atypical *qualities* of linguistic and non-linguistic deixis among participants with autism. The evidence here was that a majority of children with autism, but *not a single one* of the children without autism, showed atypicalities in referring to a location that was distal to themselves with the terms 'this' or 'here', or in pointing with unusual precision—what we came to call a 'laser-beam point'—that was sometimes accompanied by lining up an eye behind the look, and pointing exactly where they intended to indicate a correct location. In addition, participants with autism were less likely to accompany points with a look back to the person for whom—one might easily presume—the points were intended.

This was not all. In Study 2, children with autism achieved significantly lower scores for placing toy animals in fields either close to or distant from themselves, in accordance with instructions from the testers that contrasted the terms 'this' and 'that', 'here' and 'there', 'bring' and 'take', and 'come' and 'go', with respect to a given speaker's location. In order to establish that participants' grasp of these deictic terms were necessary as well as sufficient to inform their responses, we needed to limit any other cues (and in particular, looks to locations) that might indicate the speaker's meaning, and this meant the task was a stilted version of typical communicative exchanges. Normally, looks to appropriate locations would be expected to accompany the use of deictic terms. Therefore it is possible that the absence of a speaker's looks, either because of the unnaturalness this introduced or because of

the requirement that participants focus on linguistic meaning—or indeed, the pragmatic oddness of some of the instructions—might have confused participants with autism more than those without autism. Yet the fact remains that even when assessed in relation to responses to a tester's use of non-deictic terms that were *also* unaccompanied by (expectable) looks, and even when the pragmatically felicitous instructions were considered separately, the children with autism were less able than control participants to decipher the meanings of the deictic terms.

Then there was a further contrast between the groups. When the testers employed non-conventional deictic gestures in the form of head-nods to indicate location, participants with autism were less proficient in interpreting the tester's intended message. Moreover, there was a correlation between these participants' limitations in such understanding and their degree of autism according to the CARS, even when verbal MA was taken into account. This provided corroborative evidence that the participants with autism were less able to interpret deictic communication, in this case communication that took the form of an unconventional gesture. One way of thinking about this, is to consider how these participants were less proficient in interpreting the communicative intention behind the head-nodding, that is, less sensitive to the tester's attempt to deliver a message through this unusual gesture. Elsewhere we have considered how the interpretation of communicative intentions depends upon a person's understanding of what it means to share experiences and to convey alternative perspectives (e.g., Hobson 1993), and how the very structure of communicative transactions may be scaffolded on primitive forms of non-inferential role-taking based on identifying with other people (Hobson 2007). Here there is a partial contrast with Theory of Mind accounts that tend to stress how children with autism lack *concepts* of mind needed to *infer* communicative intent (e.g., discussion in Colle et al. 2008, a recent study of narrative with results that might also relate to deictic aspects of language use among individuals with autism).

In the light of these complementary findings, it is worthwhile to reconsider the meaning of the atypical deictic terms and pointing gestures used by a substantial minority of participants with autism. When they used the term 'this' or 'here' to indicate distal locations, these children were not maintaining the contrast between such terms as applied to locations near to themselves-in-speaking, and those that were situated further from themselves. When they showed 'laser-beam points', they appeared to be indicating in a geometric fashion that lacked a relativistic framework that might give meaning not only to the 'this/that' and 'here/there' contrasts—because the scope of such contrasts is always established in relation to one another and the topic of discourse, as when 'here' can be applied to a city or country as well as a more immediately proximal locations—but also to the context of the listener's anticipated interpretation. Typically, a point is understood by a listener with reference to current discourse, so that it is not necessary for a speaker to be geometrically exact in conveying what is meant, only precise enough to communicate which of several alternatives is the referent singled out. By all appearances, children who employed laser-beam looks were doing so with reference to an absolute standard of indication, on the model of establishing the target of a laser-guided bomb (and compare Goodhart and Baron-Cohen 1993, with regard to relatively intact 'referential pointing' among children with autism). Their focus was on the exact location, not the person communicated-with who needed to be informed in a manner that was calibrated according to the pragmatic requirements of the situation and with reference to the 'common ground' (Clark 1996) that frames communication. A similar explanation might account for participants' use of 'this' or 'here' to refer to a distal target, in that here the terms reflect an egocentric and not an intersubjective-communicative framework or common ground of co-ordinated meaning. And finally, this interpretation is in keeping with the finding that when participants without autism pointed, they mostly looked back to the person *for whom* the point was intended and framed, but such looks inconsistently accompanied the points of participants with autism.

It will be clear that this interpretation of the current findings has relevance for understanding more than deictic terms. In particular, the oft-reported 'pedantic literalness' of the language of individuals with autism, as well as these individuals' egocentric, seemingly self-absorbed preoccupations, fit the same mould. As Bosch (1970, p. 111) described: 'If we consider from this angle the interests and achievements that come to the fore in autistic children, we find that they may all be classified as being of the type that to a large extent requires little or no objectivization within a common world'. We suggest that among participants with autism, the atypicalities that we observed in their comprehension and production of deictic language and gesture reflect limitations in the co-ordination of interpersonal experience and reciprocal role-taking that establish a world held in common with others.

It remains to consider alternative interpretations of the findings. In particular, it may be argued that since participants were matched according to a measure of receptive rather than productive language, albeit with evidence that they were also similar in the latter respect, it is possible that the groups were unequal in some domain-general aspect of productive grammar that affected the ability of participants with autism to make appropriate adjustments in their use of deictic terms. The problems with such a view are not merely that the group contrasts extended to comprehending

deictic terms and to the expression and comprehension of non-verbal aspects of deixis, but also that the participants demonstrated very substantial skills in using deictic terms. It was not so much that they showed an inability to formulate utterances containing meaningful deictic terms—nor an inability to make points, come to that—but rather, a substantial proportion of participants were atypical in the style of what they produced on some occasions (only). It is difficult to see how these results might be explained in terms of domain-general linguistic constraints.

Of course, this begs the question of how they achieved their relative proficiency in comprehending and using deictic terms, and in pointing. Perhaps a child could be shaped to point to something in order to get what the child wants, and to understand something of other people's points, without this entailing that the child appreciates the reciprocal nature of one's own and others' points as devices for achieving psychological co-ordination within intentional communication. So, too, a child might be able to grasp aspects of the meanings of deictic terms, including the meanings of personal pronouns, without this understanding being grounded in the experience of fully reciprocal and reversible self/other role-taking (e.g., Charney 1980, 1981). We believe the group differences that emerged in the present study provide tell-tale signs of an alternative grounding for deictic expressions among individuals with autism. Yet given the relatively small groups of children tested, as well as the restricted range of abilities represented, one needs to be cautious not to overgeneralize even tentative conclusions to all subgroups of individuals with autism.

In summary, this investigation has yielded experimental evidence that children with autism are atypical in their comprehension and use of both verbal and non-verbal aspects of deixis. It is plausible that such abnormalities stem from the children's limited propensity to identify with other people, and that they are linked with other phenomena that appear to reflect unusual self-other experience and communication (e.g., Hobson et al. 2006, 2007). Yet it remains to establish whether this is the source of the children's limitations and atypicalities in deictic communication, and beyond this, how they develop their impressive abilities to understand and use deictic terms.

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## Appendix

See Table 5.

**Table 5** Comprehension test instructions

| E1's instructions | E2's instructions |
|---|---|
| *Screening task* | |
| 1. Put a cow in the BROWN field and place a horse in the WHITE field | 2. Place a horse in the WHITE field and place a duck in the WHITE field |
| 3. Put a pig in the BROWN field and place a goat in the WHITE field | 4. Put a dog in the BROWN field and put a sheep in the BROWN field |
| 5. Place a horse in the WHITE field and a put a sheep in the WHITE field | 6. Place a pig in the WHITE field and put a duck in the BROWN field |
| 7. Place a horse in the BROWN field and put a cow in the BROWN field | 8. Put a pig in the BROWN field and place a sheep in the WHITE field |
| *Verbal deictic task* | |
| 1. BRING a duck and TAKE a Sheep* | 2. COME with a horse and COME with a cow |
| 3. Put a cow THERE and put a pig HERE | 4. COME with a goat and GO with a horse |
| 5. BRING a pig and BRING a sheep | 6. Put a duck in THAT field and put a horse in THIS field |
| 7. Put a sheep in THIS field and put a dog in THIS field | 8. Put a pig HERE and put a horse HERE |
| *Non-verbal deictic task* | |
| 1. Put a duck (NOD TO WHITE) and put a sheep (NOD TO BROWN)** | 2. Put a horse (NOD TO BROWN) and put a cow (NOD TO BROWN) |
| 3. Put a goat (NOD TO WHITE) and put a horse (NOD TO WHITE) | 4. Put a cow (NOD TO BROWN) and put a pig (NOD TO WHITE) |

* When participants were unable to respond to any item, there were follow-up instructions to enable them to respond correctly, for example, in this case, "*Put a duck in the brown field and a sheep in the white field*"

** When participants were unable to respond to any item, there were follow-up instructions, for example, in this case, "*Put a duck in the white field and a sheep in the brown field*"

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