
OPEN PEER COMMENTARIES

Joint-attention deficits in autism: Towards a cognitive analysis

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Abstract

Mundy and Sigman (1989) present a challenge to the metarepresentational theory of autism. Their argument holds if it is assumed that the capacity for metarepresentation only emerges at 12-24 months old in normal development, as manifested in pretend play. However, I present reasons for postulating that the capacity for metarepresentation may be present from as early as 7-9 months of age, manifested in joint-attention behaviors. If this account has any validity, then the metarepresentational theory of autism is unaffected by Mundy and Sigman's challenge. In addition, I highlight some problems in Mundy and Sigman's alternative model of autism. These criticisms aside, their article is without doubt important and opens up critical questions both for models of the origins of autism and of a theory of mind in normal development.

Mundy and Sigman (1989), have raised important questions concerning the developmental history of social and communicative deficits in autism. The data from their laboratory (Mundy, Sigman, Ungerer, & Sherman, 1986; Sigman, Mundy, Ungerer, & Sherman, 1986) have demonstrated that the whole range of joint-attention behaviors (showing, giving, pointing, referential gazing, etc.) are impoverished in autistic children's spontaneous behavior, relative to nonautistic controls of the same mental age. This is consistent with other research (Baron-Cohen, 1989a; Landry & Loveland, 1989; Loveland & Landry, 1986). Mundy and Sigman's other studies show that these deficits in joint-attention are correlated with and predict language development in autism (Mundy, Sigman, & Kasari, submitted; Mundy, Sigman, Ungerer, & Sherman, 1987). Since autistic children's production

and comprehension of joint-attention behaviors are significantly worse even than language-delayed control groups, this implies that deficits in joint-attention behaviors are not simply an early sign of general language delay, but are *autism-specific*, and indeed may be the earliest manifestations of autism yet identified.

Mundy and Sigman (1989) argue that the metarepresentation theory of autism (Leslie, 1987) cannot explain these deficits and instead propose a new model. I shall confine my reply to two points: (1) I shall argue that the metarepresentation theory might be usefully extended to explain joint-attention deficits in autism; and (2) I shall argue that Mundy and Sigman's alternative model is problematic in certain key respects.

Might Joint-Attention Deficits Derive from Impairments in the Capacity for Metarepresentation?

Leslie (1987) has argued that both normal development of pretend play and a theory

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of mind derive from the infant's newly maturing metarepresentational capacity. His analysis dates the supposedly spontaneous emergence (Leslie & Frith, 1988, p. 315) of this metarepresentational capacity at the age at which pretend play is first observed: 14–18 months of age. This normative framework has provided a plausible explanation for two key deficits in the developmental psychology of autism, namely an absence or impoverishment of pretend play (Baron-Cohen, 1987; Ungerer & Sigman, 1981; Wing, Gould, Yeates, & Brierly, 1977) and a failure to employ a theory of mind (Baron-Cohen, 1989b, in press-a; Baron-Cohen, Leslie, & Frith, 1985, 1986; Leslie & Frith, 1988; Perner, Frith, Leslie, & Leekam, 1989; Russell, Sharpe, & Mauthner, 1989; Swetnam, 1989). These arguments are explored in more detail elsewhere (Baron-Cohen, 1988; Leslie & Frith, in press).

Mundy and Sigman (1989) assume that since metarepresentation only appears, according to Leslie's analysis, between 14 and 18 months, the metarepresentation theory cannot explain the autism-specific deficits in joint-attention, since joint-attention behaviors normally appear 6–9 months earlier than this age. However, I think that there is another perspective to consider—one which assumes that joint-attention behaviors might also reflect a capacity for metarepresentation. This theory implies that metarepresentation might normally be present even by about 9 months of age, and that the metarepresentation theory of autism might therefore be able to make sense of the joint-attention deficits reported earlier. I will outline two arguments for why these assumptions might be plausible, one empirical (drawing on data comparing perceptual role-taking with joint-attention behaviors) and one theoretical.

Perceptual role-taking versus joint-attention behaviors

Perceptual role-taking and joint-attention behaviors might on the surface appear to make similar demands on the child's cognitive capacity, as both involve computing de-

tails of another person's visual experience. A perceptual role-taking task is illustrated in Figure 1. In this task, the experimenter asks the child, "What am I looking at?", while directing his or her eyes at an object, selected at random.

One explanation for how children succeed on perceptual role-taking tasks has been formulated in terms of a *line-of-sight* geometric problem solving strategy (Lempers, Flavell, & Flavell, 1977). To employ a line-of-sight geometric problem solving strategy is to perform certain rule-based operations on a *primary representation* (Leslie, 1987). Thus, if the child's primary representation of the environment contains a person and another object, the child can apply rules to calculate if the person can "see" the object, such as for seeing to occur, (1) the person must have at least one eye open, and (2) there must be an unobstructed "line" between the direction of the person's eye(s) and the object. These rules are expanded in Lempers et al. (1977).

When given such perceptual role-taking tasks, autistic children perform normally, that is, in line with their mental age (Baron-Cohen, 1989a; Hobson, 1984). Since autistic children generally fail to show joint-attention behaviors, this implies that joint-attention behaviors must entail more than just execution of a line-of-sight strategy. One conclusion we might draw from the data on perceptual role-taking in autism is that manipulation of primary representations is unimpaired in autism, and that joint-attention behaviors, since they are impaired in autism, may require metarepresentation.

Towards a theoretical analysis of joint-attention behaviors

Quite apart from this empirical argument, it can be argued on theoretical grounds that a line-of-sight strategy could not be sufficient to understand joint-attention behaviors, since such behaviors do not simply entail *percept diagnosis* (Lempers et al., 1977), but also entail *attention diagnosis* (Baron-Cohen, 1989a, in press-b). By atten-

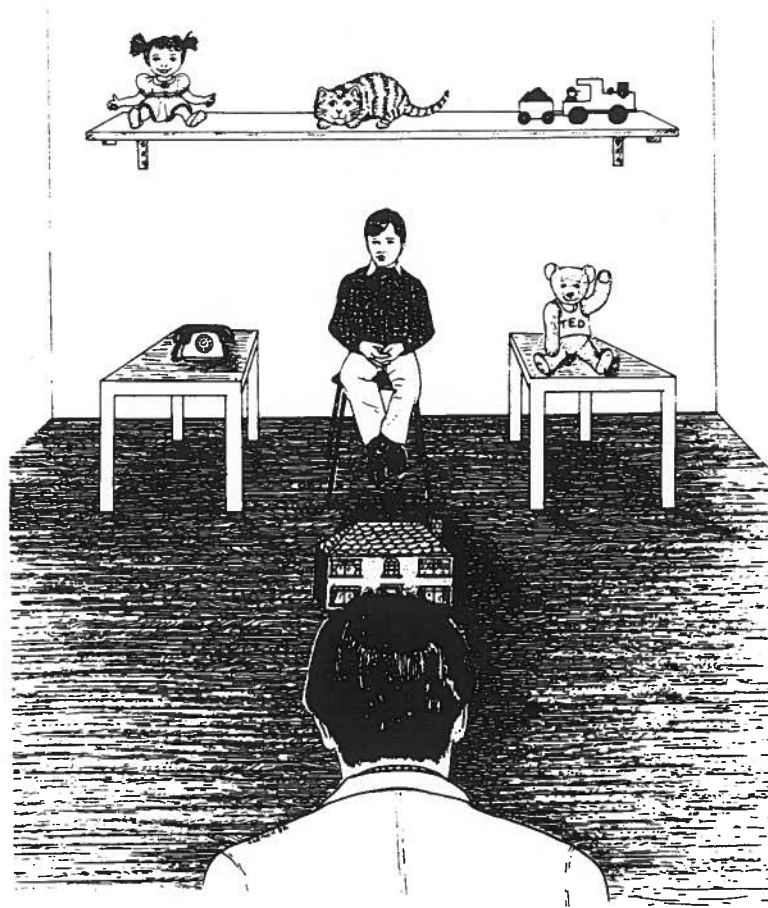


Fig. 1. A perceptual role-taking task. (Reproduced from Baron-Cohen, 1989a.)

tion diagnosis, I mean the ability to represent not only if another person can see an object, but also if that person is *interested* in (i.e., prefers to attend to) that object. Understanding joint-attention behaviors in another person seems to involve understanding that the person is interested in a particular object.

It seems reasonable, then, to posit that in order for a child viewer to represent another person as being interested in an object or a state of affairs, the child needs to represent not only the geometry of the person in relation to those objects in the environment, but also that the person is representing the object/event as interesting. One way in which this could be achieved is for the child to *represent another person's representation* of an object as being tagged with

a positive or negative valence (i.e., interesting or uninteresting). If this analysis is correct, then understanding joint-attention behaviors in others would require a metarepresentational capacity. A similar argument could be made for the production of such behaviors.

Is this unduly extravagant as an explanation? Could metarepresentation really emerge as early as 9 months of age? Stern (1985) has proposed a similar quantum leap in development around the age of 7–9 months, with the emergence of joint-attention behaviors, and he also interprets them as the first unambiguous signs of *intersubjectivity*. He also argues that reciprocal behaviors which others have thought of as involving intersubjectivity before 7–9 months old (see Trevarthen & Hubley, 1978)

do not require such a rich explanation (see Stern, 1985, pp. 134–135). This analysis of joint-attention behaviors in terms of metarepresentation is attractive for another reason: it offers the possibility that the simultaneous impairment of joint-attention behaviors, pretend play, and theory of mind in autism may be understood in terms of a single cognitive deficit.

The Mundy–Sigman Contingency Model of Autism

Mundy and Sigman (1989) posit a totally different explanation for the joint-attention deficits observed in autism. Their explanation attempts to integrate affective and cognitive factors, an important enterprise which I have argued for elsewhere (Baron-Cohen, 1988). On the affective side, they suggest autistic children may be unable to share affect with others. I think that this abnormality in communication is likely to be correct, though it may turn out not to be restricted to the communication of affect. On the cognitive side, in place of the metarepresentation theory, they argue that autistic children may fail to develop “expectations of contingencies between the behaviour of the child and the observable or overt behaviour of other people.” For brevity, I have named this the *contingency model* of autism. (Details of this model are available in Mundy & Sigman (1989).)

This model is, however, difficult to reconcile with existing data from studies of autistic children’s unimpaired understanding of both causal contingencies and overt behavior. Thus, a number of studies show that autistic children’s understanding of physical causality (“if this happens, that results”) is in line with their mental age (Baron-Cohen et al., 1986; Curcio, 1978),

while results from other tests show that when it comes to understanding interpersonal behavioral sequences in which mental state attributions do not have to be made, autistic children also perform in line with their mental age (Baron-Cohen et al., 1986). Sigman and Mundy’s (1989) claim, therefore, of disturbance in “the cognitive processes involved in analysis of behavior contingencies and schema formation” in autism is unsupported by existing data. Autistic children *can* take account of overt behavioral contingencies—indeed, how else could behavior modification programs succeed in changing inappropriate behavior with these children?—and they *can* form schemas of overt behavioral sequences. What they seem to have specific difficulty with is understanding and predicting behavior in situations in which covert mental state attributions are required (Baron-Cohen, 1989a, 1989b, in press; Baron-Cohen et al., 1985, 1986; Leslie & Frith, 1988; Perner et al., 1989; Russell et al., 1989; Swetnam, 1989; and see Hobson, 1986).

The contingency model does not therefore appear to explain the data adequately. Note, however, that the contingency model is only the cognitive half of Mundy and Sigman’s explanation—these criticisms do not apply to their affective hypothesis, which may turn out to be an important part of any explanation. I would argue that an explanation of joint-attention deficits in autism in terms of the metarepresentational theory remains a real possibility and one that future research needs to address. In particular, more research is needed to determine if all joint-attention behaviors involve the same processes. Mundy and Sigman’s article serves as a valuable stimulant in opening up these questions for discussion.

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