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The relationship between joint attention and pretend play in autism

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Abstract
There is considerable evidence that the development of joint attention and pretend play skills are impaired in children with autism. Some accounts of autistic psychopathology give a crucial role to early impairments in joint attention and suggest that these lead to impoverished development of the representational abilities that underlie the later emerging impairments in pretend play and theory of mind. Other accounts of impairments in joint attention and pretend play see them merely as symptoms of a more basic underlying cognitive deficit, in attention or executive function. This review examines the evidence for the possible relationships that may exist between joint attention and pretend play and the later development of a theory of mind. It also suggests directions for future work to clarify the relationship between the two skills and to identify the nature of the underlying primary deficit in autism.

There is considerable evidence that children with autism are impaired in their development of a theory of mind (Baron–Cohen, Leslie, & Frith, 1985; see Baron–Cohen, Tager–Flusberg, & Cohen, 1993; for a review). The empirical evidence for such a conclusion is provided by studies showing that, in comparison to mental age-matched children with a mental handicap and normally developing children, children with autism are specifically impaired in their ability to impute false beliefs to others or to themselves (Baron–Cohen et al., 1985; Leslie & Frith, 1988; Perner et al., 1989; Russell, Mauthner, Sharpe, & Tidswell, 1991). It has also been demonstrated that children with autism are specifically impaired in their understanding of knowledge (Baron–Cohen & Goodhart, 1994; Leslie & Frith, 1988; Perner et al., 1989; Reed & Peterson, 1990) and in their comprehension of complex emotions (Baron–Cohen, 1991b; Baron–Cohen, Spitz, & Cross, 1993) and desires (Phillips, Baron–Cohen, & Rutter, 1995).

Several theoretical accounts of the impaired development of a theory of mind in autism emphasize the crucial role played by the earlier emerging abilities of joint attention and pretend play (e.g., Baron–Cohen, 1993, 1994; Hobson, 1993a,b; Leslie, 1987, 1994; Mundy, Sigman, & Kasari, 1993). Other accounts ascribe no special role to impairments in joint attention and pretend play, but rather see them as evidence of a more basic underlying cognitive deficit in attention or executive function (e.g., Harris, 1989, 1991, 1993; Hughes & Russell, 1993; Hughes, Russell, & Robbins, 1994; McEvoy, Rogers, & Pennington, 1993; Ozonoff, Pennington, & Rogers, 1991; Ozonoff, Strayer, McMahon, & Filloux, 1994; Russell et al., 1991; Russell, Jarrold, & Potel, 1994). One central piece of evidence—albeit inconclusive—for the important role ascribed to joint attention and pretend play in the impaired development of a theory of mind in autism, is the fact that children with autism are specifically impaired in their development of

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both joint attention behaviors (Baron–Cohen, 1989a, 1993; Mundy et al., 1986, 1993) and pretend play skills (Baron–Cohen, 1987; Sigman et al., 1986). Comprehensive reviews are available elsewhere (Baron–Cohen, 1994; Jarrold, Boucher, & Smith, 1993; Mundy, 1995), but a brief summary of the empirical evidence for the joint attention and pretend play impairments in autism will be given here.

Joint Attention

Joint attention behaviors develop prelinguistically and involve the triadic coordination of attention between the infant, another person, and an object or event (Bakeman & Adamson, 1984). An important separation has been made between *imperative* triadic exchanges, in which the child's behavior has an instrumental function, and *declarative* triadic exchanges, in which the child's behavior serves to share awareness, or the experience, of an object or event (Gómez, Sarria, & Tamarit, 1993; Mundy et al., 1993). Following the convention adopted by others (Baron–Cohen, 1993, 1994; Mundy, 1995; Mundy et al., 1993), in this article we shall call the former *requesting acts*, and the latter *joint attention acts*. Joint attention acts can be further divided into acts that involve the child's *following* an adult's focus of gaze and those that involve *initiating* joint attention bids.

There is substantial experimental evidence for impairments in both the production and comprehension of joint attention behaviors in children with autism. Ricks and Wing (1975) and Curcio (1978) first observed that children with autism tended to display fewer joint attention gestures than requesting gestures. Wetherby and Prutting (1984) found that children with autism were able to use gestures to request objects and engage in social action routines, but did not use gestural acts to indicate or share awareness of objects or their properties. Mundy and Sigman (Mundy et al., 1986; Sigman et al., 1986) found that while in several domains—frequency of eye contact, engagement in rough-and-tumble play, and requesting gestures—children with autism produced comparable amounts of behavior to mental handicap controls, they were specifically impaired in turn-taking, response to invitations from the adult, and pointing, showing, or making eye contact while holding an object or watching an object in motion. Baron–Cohen (1989a) demonstrated that children with autism have intact perceptual perspective taking, and are unimpaired in their production and comprehension of protoimperative pointing, while exhibiting a specific deficit in both the comprehension (following a point for interest) and production (pointing to or sharing interest in an object) of protodeclarative pointing. Other studies employing differing methodologies have found the same pattern of impaired and intact social gestures (Attwood, Frith, & Hermelin, 1988; Loveland & Landry, 1986). Phillips, Baron–Cohen, and Rutter (1992) found that children with autism did not make eye contact with an adult following an ambiguous action, such as offering a toy and then removing it from the child's grasp. Leekam et al. (1995) reported that children with autism were able to engage in visual perspective taking, in which a child computes and reports what another person is looking at, but were specifically impaired in following, or monitoring, gaze.

However, evidence from a recent longitudinal study that followed children with autism from 2 to 5 years of age suggests that the developmental picture might be less straightforward (DiLavore & Lord, 1995). Although very young children with autism were impaired, relative to controls, in requesting gestures, gaze monitoring, and initiating triadic joint attention episodes, by the age of 5 years children with autism differed from control groups *only* on initiation of joint attention. In a group of older children with autism, Phillips et al. (1995) found children with autism impaired in requesting behaviors that involved treating the person as a subject (gesture combined with eye gaze), but intact in requesting behaviors that involved treating the person as an object. Mundy, Sigman, and Kasari (1994) reported that although deficits in child-initiated joint attention behaviors were found for *both* low and high mental age preschoolers with autism, deficits in responding to, or following, adult-initiated joint attention behaviors were *only* apparent for the low mental age

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group. Although our understanding of the mechanisms involved in the comprehension and production of joint attention acts in both normal and abnormal development is incomplete, a review of the research indicates that at least some aspects of joint attention—in particular the initiation of triadic joint attention acts—are severely impaired in autism. Other aspects—such as requesting behaviors and gaze monitoring—may be impaired only in younger, or lower functioning, children with autism. Whether this reflects a true dissociation between initiating (productive) joint attention behaviors and following (comprehensive) joint attention behaviors of others in autistic development, or whether it represents a developmental pattern in which the expression of a single underlying deficit is different at different ages, remains unclear. However, research is now more clearly addressing both the *function* and the *form* of such gestural communication. Possible directions for further work in this area are discussed below.

Pretend play

Pretend play is behavior that is simulative or nonliteral (Fein, 1981), acting *as if* something is the case when it is not (Leslie, 1987). Leslie (1987) described three forms of pretend acts: object substitution, attribution of false properties, and attribution of presence to imaginary objects. Most studies examining the play abilities of children with autism have shown that they produce very little pretend play under spontaneous, or free, play conditions. Wing et al. (1977) found that while some children with autism exhibited stereotyped play, none showed symbolic play. Baron–Cohen (1987) found that while children with autism were near ceiling in their production of functional play, they were impaired in their production of pretend play, compared with mental handicap and normally developing controls. Other studies assessing the production of pretend play in unstructured or free-play conditions have produced similar results (Atlas, 1990; DeMyer et al., 1967; Doherty & Rosenfeld, 1984; Gould, 1986; Power & Radcliff, 1989).

Under more structured conditions, impairments in the production of pretend play by children with autism have also been found. Ungerer and Sigman (1981; Sigman & Ungerer, 1984) found that children with autism produced fewer symbolic acts than controls under both spontaneous and structured conditions. Autism-specific deficits in symbolic play were also found under similar structured testing situations by Wetherby and Prutting (1984) and Riguet et al. (1981). However, some studies have shown intact pretend ability under prompted, or structured, conditions. Lewis and Boucher (1988) found that although very little spontaneous play was produced by either the autism or the control groups in a spontaneous condition, under an elicited, or instructed, condition children with autism produced as many symbolic acts as the controls. Charman and Baron–Cohen (in press) found that when maximal cues were provided, children with autism were able to produce simple pretend (object-substitution) play, but generated less *novel* pretend acts compared to mental handicap controls. Similar findings have been obtained by Jarrold, Boucher, and Smith (1996) and Lewis and Boucher (1995).

Functional play is "the appropriate use of an object or the conventional association of two or more objects, such as a spoon to feed a doll, or placing a teacup on a saucer" (Ungerer & Sigman, 1981; p. 320). Some studies have found that children with autism produced fewer functional acts than mental handicap controls (e.g., Mundy, Sigman, & Kasari, 1990; Sigman & Ungerer, 1984; Ungerer & Sigman, 1981), while others have found that children with autism produced as many functional acts as controls under both spontaneous and structured conditions (e.g., Baron–Cohen, 1987; Lewis & Boucher, 1988). Thus, while most theoretical attention has focused on the impairments in pretend, rather than functional, play in autism, the relationship between the cognitive abilities required for functional and pretend play are poorly understood, and deserve further attention (see Mundy et al., 1993).

Evidence from screening studies

Recent studies have demonstrated that the combination of impairments found in joint at-

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tention and pretend play in autism may be of potential clinical use in screening for autism at an earlier age than it is commonly diagnosed (Gillberg et al., 1990). Baron–Cohen, Allen, and Gillberg (1992) employed a new instrument, the Checklist for Autism in Toddlers (CHAT), as a screening instrument for childhood autism. The CHAT checks for the presence of pretend play and joint attention behaviors, as well as unrelated developmental accomplishments, such as rough and tumble play. Baron–Cohen et al. (1992) found that while some of a group of 50 randomly selected toddlers between 17 and 21 months of age still lacked protodeclarative pointing, and some lacked pretend play, none lacked both. Forty-one siblings of already diagnosed children with autism were also screened with CHAT between the ages of 18 and 21 months. For genetic reasons (Bailey et al., 1995; Folstein & Rutter, 1977; Steffenberg et al., 1989) 2–3% of these children would be expected to go on to develop autism themselves. As such, this second group constituted a "high risk" group for autism. Four of these children lacked *both* pretend play and joint attention at 18 months. From both groups these 4 children *only* went on to receive a diagnosis of autism at the age of 30 months. A similar screening method has recently been employed on a population of randomly selected 18-month-olds in the South East of England (Baron–Cohen et al., 1996). Of the 16,000 children screened, just 12 children failed the three key items on the CHAT—protodeclarative pointing, gaze monitoring, and pretend play—on two administrations of the CHAT. Of these 12 cases, 10 received a diagnosis of autism, using standardized diagnostic criteria. However, of a comparison group of 22 children who failed *only* a joint attention item (protodeclarative pointing) but *not* pretend play, 15 were diagnosed as developmentally delayed, but none went on receive a diagnosis of autism. Swettenham et al. (1995) have also shown that in the same population, children who showed pretend play deficits *only* (with intact joint attention) did not go on to receive a diagnosis of autism. Baron–Cohen et al. (1996) concluded that children who fail *both* joint attention and pretend play items at 18 months of age are at high risk of developing autism. Although the coexistence of these deficits does not necessarily mean that they are related, nor necessarily specifically related to the development of autistic psychopathology, such findings have opened the possibility that joint attention and pretend play may play a key role (or be key markers) in the development of autism.

Thus, the empirical evidence from cross-sectional studies with children already diagnosed as autistic, and from prospective screening studies, indicates that impairments in the development of joint attention and pretend play may play a crucial role in the early natural history of autism. The recognition of the possible importance of joint attention and pretend play in the development of a theory of mind has led to a number of different theoretical accounts that consider how the two are developmentally related, and how their impaired development in children with autism is linked (Baron–Cohen, 1993, 1994; Hobson, 1993a,b; Leslie, 1987, 1994; Mundy et al., 1993). At first sight, this might seem somewhat surprising, because at face value joint attention behaviors and pretend play skills appear to be separate and rather different developmental abilities. They appear to emerge at different times in infancy (see Fein, 1981; and Moore & Dunham, 1995; for reviews) and might, therefore, rely on separate underlying affective and cognitive developments. This review will examine the claims made by the theoretical accounts, which link the development of joint attention and pretend play in the abnormal developmental course shown by children with autism, and will consider to what degree the available empirical evidence supports such claims. It will outline the possible causal relationships that may exist between the two skills and identify aims for future research.

Leslie's account

Leslie (1987, 1994) proposed that pretend play is an early manifestation of the child's capacity for metarepresentation, directly linking the cognitive capacities involved in pretending to the later development of a theory of mind. Leslie's (1987) basic premise is that pretense is an early symptom of the mind's

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ability to characterize and manipulate its own attitudes to information. In his seminal article on pretend play and representation, Leslie (1987) elucidated a model that placed metarepresentations at the center of the cognitive processes necessary for pretense. His thesis was that pretend play requires the pretender to suspend, or decouple, their primary representational attitude to a pretend proposition (famously: *I pretend* that this banana "is a telephone"). Thus, the pretend attitude entertained is a representation of a representation —metarepresentational thought (Leslie, 1987, 1994). Leslie (1987, 1994) argued that metarepresentational thought is also required for a theory of mind to develop.

Leslie and Happé (1989) characterized the joint attention skills that emerge toward the end of the first year of life as forms of *ostensive communication* that require recognizing someone else's communicative intention—which involves an early understanding of someone else's mental state (Bretherton, McNew, & Beeghly–Smith, 1981; Grice, 1957). They suggest that ostensive communication might be evidence for an early-emerging metarepresentational capacity, before the emergence of pretend play at the end of the second year of life. Leslie and Happé (1989) argued that pretend play acts are only comprehensible to an observer because they are signaled as pretend by an exaggerated enactment, which signals the intention to communicate. They argued that perception of such intention or goal directedness is direct but that, while the display is directly perceived, the content or message of such displays cannot be directly perceived and can only be inferred by a central mechanism that can metarepresent. This applies not only to pretend play acts but also to communicative acts such as joint attention gestures. "This is a further link between pretense and gestures like pointing as forms of ostensive communication. In both cases, the displayed acts trigger the metarepresentational mechanisms, which may allow the actor's intention to be inferred" (Leslie & Happé, 1989; p. 210). For Leslie (1994) the interpretation of an agent's behavior in terms of underlying intentions is the key to the origins of a theory of mind. The process of computing the metarepresentation necessary is carried out by a cognitive mechanism that he called the Theory of Mind Mechanism, and according to Leslie it is this module that is impaired in autism, leading to the observed impairments in joint attention and pretend play, as well as in the later development of a theory of mind.

Baron–Cohen's account

Baron–Cohen (1989b) also argued that joint attention behaviors which emerge at 6 to 9 months of age, before metarepresentational ability is evidenced in pretend play at the age of 14 to 18 months (Leslie, 1987), may also reflect a capacity for metarepresentation. As evidence for these claims, Baron–Cohen (1989b) contrasted the intact ability for perceptual role-taking in autism (Baron–Cohen, 1989a; Hobson, 1984) with their impaired joint attention behaviors (Baron–Cohen, 1989a; Mundy et al., 1986; Sigman et al., 1986). Baron–Cohen (1989b, 1991a) argued that joint attention behaviors involve representing not only that the other person sees an object (as in perceptual role-taking) but that the other person is *interested in* an object. The child represents the other person's representation of the object as being tagged with a positive or negative valence—Baron–Cohen (1989b) argued that this requires metarepresentation. Baron–Cohen (1991a, 1993, 1994) elaborated his position in later articles. He focused on the role of the early understanding of attention and goal, both of which possess a degree of intentionality, as the bedrock for the later understanding of more complex intentional concepts such as desire, pretense, knowledge, and belief (Baron–Cohen, 1993). Indeed, Baron–Cohen (1993) suggested that for a 9- to 12-month-old, attention and goal may act as a very simple theory of mind, in that from such concepts one can predict (some of the time) another person's actions. For Baron–Cohen, one piece of supporting evidence for the developmental link between these concepts is that children with autism have been found to be impaired in their comprehension of goal and attention, as well as desire, pretense, and belief (see Baron–Cohen, 1993; for a review).

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Recently, Baron–Cohen (1994) has further elaborated his model, detailing the architecture of joint attention as a developmental precursor to a theory of mind. He proposed the Shared Attention Mechanism (SAM), as the fulcrum. Baron–Cohen (1994) argued that while joint attention develops via inputs from primitive perceptual mechanisms, such as an Intentionality Detector (Premack, 1990) and an Eye Direction Detector, it is the *triadic* representations that SAM processes that directly facilitate the development of Leslie's Theory of Mind Mechanism (Leslie, 1994; Leslie & Thaiss, 1992; Leslie & Roth, 1993). In Baron–Cohen's (1994) account, the representations which SAM processes are triadic in that they include an embedded element which specifies that the agent and self are *both* attending to the same object: [I-see-(mummy-sees-the-bus)]. Baron–Cohen (1994) argued that the development of these triadic representations processed by SAM underlies the impaired development of joint attention, pretend play, and later theory of mind abilities shown by children with autism. He has also suggested that the triadic representations produced by SAM have dedicated neural architecture, which is selectively damaged in autism (see Baron–Cohen & Ring, 1994). However, there are reasons to question Baron–Cohen's architectural account, in particular his idea that it is the triadic nature of the representations involved in declarative joint attention gestures that is specifically impaired in autism. Charman (1994) has argued that some triadic representational relationships, such as the classic Piagetian mountains visual perspective taking, which involves understanding the relationship [Child-sees-(Doll-sees-the-church)], are intact in autism (Baron–Cohen, 1989a, 1991a; Hobson, 1984). Although at times Baron–Cohen (1991a) emphasizes the *function* of joint attention behaviors—saying that joint attention involves representing that the other person is *interested in* an object—his architectural account appears to emphasize the *form* of such behaviors. Additionally, the recent findings of Phillips et al. (1995) and DiLavore and Lord (1995), that earlier in development children with autism may have impairments in requesting as well as declarative gestures, also challenge the specificity of Baron–Cohen's account.

Mundy and Sigman's account

Mundy and Sigman (Mundy & Sigman, 1989a,b; Mundy et al., 1993) have provided an alternative account to the metarepresentational thesis proposed by Baron–Cohen and Leslie to link joint attention and pretend play. Although all these accounts share some common ground, important differences exist. Mundy and Sigman (1989a) argued that impairments in nonverbal joint attention skills found in autism emerge before the onset of metarepresentational skills in normal development: referential looking and protodeclarative pointing emerge between 6 and 12 months in normally developing children (Butterworth, 1991; Leung & Rheingold, 1981; Walden & Ogan, 1988), before pretend play emerges between 12 and 24 months of age (Fein, 1981; Leslie, 1987). Further, they provide evidence that joint attention and pretend play skills are not positively correlated in autism, as would be expected if both relied on an underlying metarepresentational ability (Mundy et al., 1987). They argued that a social communication disorder exists in autism prior to the possible contribution of metarepresentational deficits and that the metarepresentational deficit does not cause autism but is a sequelae of autistic developmental disturbance (Mundy & Sigman, 1989a).

For Mundy and Sigman (1989a,b; Mundy et al., 1993) *interdependent* cognitive and affective deficits exist in autism. As evidence, they cited the impaired coordination of affect and gaze shown by children with autism (Dawson et al., 1990; Kasari et al., 1990). Joint attention involves the expectation of the affect of other people in object-focused interactions that develop out of the emerging understanding of the contingencies between a child's own affective display and the affective displays of others. Mundy et al. (1993) argued that support for their thesis is provided by the impairments that children with autism show in processing information in social interactions due to overarousal (Dawson & Lewy, 1989). Mundy and Sigman's (1989b; Mundy

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et al., 1993) account differs from that provided by Hobson (see below) in that they did not propose that basic primary affective deficits necessarily cause secondary cognitive deficits, as Hobson did (Hobson, 1989a,b, 1993a,b), but rather that an early disturbance of affect interacts with developmental delays in a separate cognitive system (akin to Leslie's ToMM) to yield the specific pattern of deficits found in autism. Mundy et al. (1993) elaborated on their thesis further, by directly explaining how joint attention and affective sharing contexts relate to the later developing metarepresentational cognitive ability: "... the child is afforded an opportunity to compare proprioceptive affective information elicited by an external referent with the same perceived affective information emanating from others relative to the same referent." (Mundy et al., 1993, p. 195). Such a comparison yields suitable information for the cognitive system of the child to begin to develop symbolic representational schemes for understanding the covert psychology of others. This account shares similarities with those put forward by Rogers and Pennington (1991) and Meltzoff and Gopnik (1993)—although in these two accounts the role of imitation is given greater prominence. So for Mundy and Sigman (Mundy et al., 1993) joint attention skills are not an early manifestation of purely cognitive symbolic or metarepresentational abilities, but part of a process of integrating self- and other-affect that initially involves primary affective experience, which ultimately contributes toward the development of the symbolic representational skills necessary for the development of pretend play, and the later development of a theory of mind. Mundy (1995) has also developed a neurobiological account, which suggests that a specific neurological subsystem is responsible for regulating and promoting social–emotional approach behavior—such as initiating joint attention acts—and that this subsystem is selectively impaired in autism.

Hobson's account

Hobson's (1989a,b, 1993a,b) account of the impairments in joint attention, pretend play, and theory of mind found in autism differs from Mundy and Sigman's in the primary role he gives to affect. He criticizes Mundy and Sigman's (1989a) account for confounding the affective information available in the face-to-face affect sharing experiences—which Mundy and Sigman argue are crucial to the development of joint attention—with cognitive development. For Hobson (1989a,b, 1993a) it is the special nature of *affective information* itself that allows the infant to differentiate people from objects and embark on a line of development toward more explicit understandings of the mental life of self and other. These experiences lead to an understanding of persons as subjects of experience relating to the world, which underlies the sharing of attention and communicating found toward the end of the first year of life in behaviors such as joint attention and social referencing (Bretherton et al., 1981; Feinman, 1992). For Hobson (1989a,b) the capacity to recognize the psychological co-orientation of self and other acts as a basis for a more general capacity to adopt multiple orientations to a given object or situation—as is necessary for pretend play. Hobson cited emotional-recognition (Hobson, 1986a,b; Hobson, Ouston, & Lee, 1988a,b, 1989; Weeks & Hobson, 1987) and expression deficits in autism (Dawson et al., 1990; Kasari et al., 1990; Yirmiya et al., 1989) as evidence that children with autism lack the biologically based capacity for affective perception of, and contact with, other people, and argued that this impairment underlies their impaired development of joint attention behaviors and pretend play skills, and the later emerging impairments in theory of mind.

Alternative accounts

Harris (1989, 1991, 1993) has developed an alternative account which, while concentrating more on the development of pretend play in autism, does propose a unifying underlying cause of joint attention and pretend play impairments. Harris (1989, 1993) argued that since children with autism *are* capable of some types of pretend play acts when prompted (Lewis & Boucher, 1988), Leslie's

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(1987) notion of a universal decoupling deficit in autism cannot be justified. He further suggested that only *some* types of pretend acts are found under even prompted conditions. When prompted, children with autism can treat one object as another, and they can treat a doll as if she were a person who talks and walks and sees. However, even when prompted, children with autism do not attribute pretend desires, beliefs, or emotions to dolls. Harris (1989) suggests that the latter, but not the former, require imagining a mental state that they are not currently experiencing—and it is this form of imagining that is difficult for children with autism.

Harris (1991, 1993) suggested that it is this inability to imagine hypothetical situations that conflict with current reality that underlies the impairments that children with autism have in understanding false belief and the appearance–reality distinction. He also related his account to the problems with executive and planning tasks shown by children with autism (see below). Although Harris focused on pretend play more than joint attention, he made it clear that these difficulties with counter-factual hypothetical imagination underlie not only the pretend play and mental state understanding deficits shown by children with autism, but the deficits in joint attention, too. Harris (1989) argued that the ability to perform pretend play acts that require such counter-factual hypothetical imagination will correlate with performance on tasks involving mental state attribution, including joint attention tasks, although his prediction remains untested.

Harris' account shares some common ground with other accounts, which propose that difficulties with executive control and planning abilities underlie autistic impairments in pretend play and mental state understanding (Hughes & Russell, 1993; Hughes et al., 1994; McEvoy et al., 1993; Ozonoff et al., 1991a; Ozonoff et al., 1994; Russell et al., 1991; Russell et al., 1994). Like Harris' account, these explanations concentrate more on the development of pretend play than joint attention skills, but all suggest that executive and planning difficulties are the primary developmental impairments underlying the range of social–communication impairments found in autism—including deficits in joint attention, pretend play, and theory of mind. Russell and his colleagues (Russell et al., 1991, 1994) found that 3-year-olds and children with autism performed poorly on a measure of strategic deception, and that performance on this task correlated with performance on a standard false belief task. Russell suggested that both tasks are difficult because they require subjects to inhibit reference to a salient object—and that such executive skills are impaired in children with autism. Hughes (Hughes & Russell, 1993; Hughes et al., 1994) has demonstrated that in addition to mental disengagement from an object, another separate element of executive abilities—response perseveration—is impaired in autism. Ozonoff and colleagues (Ozonoff et al., 1991, 1994) have shown that high-functioning individuals with autism (including subjects with a diagnosis of Asperger's syndrome) who passed theory of mind tasks were impaired on tasks that measure planning ability and ability to inhibit prepotent responses, and that both executive and theory of mind skills improved very little over time (Ozonoff & McEvoy, 1994).

Ozonoff (1995) suggested that an impairment in the ability to access and hold a mental representation on-line—as evidenced by poor performance on executive, or frontal, tasks such as the Tower of Hanoi—may underlie the social deficits characteristic of autism. She argued that poor performance by individuals with autism on theory of mind tasks, such as false belief tasks, may be caused by a failure to disengage from the external context and use an internal representation (someone else's belief), rather than an inability to take another's perspective. Ozonoff (1995) also suggested that imitation, emotion perception, and pretend play deficits in autism may be secondary to an executive dysfunction and argued that this provides a better explanation for the onset of autistic symptoms in infancy than the theory of mind account.

To date, only one study has directly studied the relationship between executive function and joint attention skills (McEvoy et al., 1993). McEvoy et al. (1993) found that children with autism were impaired, compared to

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controls, in executive function skills and in joint attention skills. More important to the current discussion, initiating joint attention bids, but *not* requesting behaviors, predicted executive dysfunction scores (a measure of response perseveration). McEvoy et al. (1993) suggested that the ability to shift cognitive set may be important for the development of joint attention behavior. That is, joint attention may involve inhibition of a prepotent response to look at an interesting object in order to turn and share the experience with someone else. Further evidence for a possible causal relationship between a basic cognitive deficit and impairment of the development of joint attention behavior is provided by Caplan et al. (1993). The integrity of frontal functioning in young children with seizure disorders was correlated with joint attention (but not requesting) behaviors. The notion that set-shifting may underlie joint attention and other social communication abilities also receives support from accounts proposing that the core deficits in autism are those of attention focusing or attention shifting, and proposing that impairments in such basic cognitive operations underlie the social communication and behavioral impairments characteristic of autism—including joint attention and pretend play (Burack, 1994; Courchesne et al., 1994).

Can the accounts be integrated?

Although the various accounts outlined above may appear somewhat disparate, they can be grouped into two sets:

1. The first set includes those that propose a *special role* for joint attention in the development of pretend play and the later development of a theory of mind—and thus afford a special role to joint attention in pathological development in autism. In these accounts, the representational system impaired in autism is dedicated to psychological reasoning—specifically reasoning about the cognitive or affective states of others—rather than a more general cognitive impairment. Although the accounts vary in the emphasis they place on the cognitive and affective elements of the representations involved in joint attention, all agree that the impaired representational system has a specific social function in development and underlies later theory of mind ability. Baron–Cohen's account (1994) gave a special role to the triadic representations formed by SAM. For Mundy and Sigman (1989a,b; Mundy et al., 1993) the special nature of the information afforded by the opportunity to compare self- and other-affective information in joint attention enables the child's cognitive system to develop the symbolic representational schemas necessary for pretend play. For Leslie (1987, 1994), both joint attention and pretend play acts require the operation of the ToMM, which enables actor's intention in the act to be inferred. Hobson (1989a,b, 1993a,b) argued that the experience of joint attention encounters provides the infant with the capacity to recognize the psychological coordination of self and other, which is the basis for a more general capacity to adopt multiple orientations to an object or situation—as demonstrated in pretend play.

2. The alternative accounts do *not* elucidate a special relationship between joint attention and pretend play (and other mentalizing) deficits. Rather, they propose that a general basic cognitive deficit in autism underlies the social communication impairments in joint attention, pretend play, and theory of mind. In these accounts, joint attention has no special role in development as a marker of developing psychological reasoning that requires dedicated cognitive–affective representational abilities. Joint attention is impaired due to underlying deficits in more basic cognitive processes that are required for social and nonsocial development alike. Harris (1989, 1991, 1993) proposed that the inability to imagine hypothetical situations that conflict with reality underlies both pretend play and joint attention deficits in autism. Those who support an executive dysfunction or attention shifting account propose that problems in response perseveration, an inability to inhibit prepotent responses, or problems in cognitive set shift-

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ing, account for both joint attention and pretend play deficits in autism (Burack, 1994; Courchesne et al., 1994; Hughes & Russell, 1993; Hughes et al., 1994; McEvoy et al., 1993; Ozonoff, 1995; Ozonoff et al., 1991; Russell et al., 1991, 1994).

What evidence would help us to decide between the accounts that propose that the basic deficit in autism, as evidenced by impaired development of joint attention, pretend play, and a theory of mind, is an impaired development of psychological reasoning—specifically reasoning about the cognitive or affective states of others—and those that propose that these impairments are the symptoms of a more general cognitive impairment, that is *not* dedicated to the development of psychological and social reasoning? Following a neuropsychological research tradition (Shallice, 1988), the identification of subjects who showed impairments in one domain (psychological reasoning) but not the other (counterfactual reasoning, executive functioning, or attention shifting), and vice versa, would be important evidence to support one set of accounts and weaken the claims of the other.

Further investigation into the relationships between executive and theory of mind abilities in autism is needed. Although there is a good evidence for impairments of some executive abilities in autism (McEvoy et al., 1993; Ozonoff et al., 1991, 1994; Ozonoff & McEvoy, 1994), others may be intact. Ozonoff et al. (1994) found that while children with autism were impaired on a task measuring cognitive flexibility, they were intact on a task measuring inhibition of response. Contrary to this, the study (reviewed above) by McEvoy et al. (1993) found that response inhibition deficits in a young sample of children with autism correlated with joint attention deficits. Other studies have found children with autism to be intact on tasks that require some disengagement from reality, such as false photograph and false drawing tasks (Charman & Baron–Cohen, 1992; Leekam & Perner, 1991; Leslie & Thaiss, 1992). Contrary to Harris's (1989, 1991, 1993) proposal that it is the inability to imagine hypothetical situations that conflict with current reality that underlies the impairments that children with autism have in understanding false belief, a recent study has shown that children with autism are able to pass logical and analogical reasoning tasks, while failing false belief tasks (Scott & Baron–Cohen, 1996). In summary, the empirical evidence for the universality and specificity of an executive deficit in autism remains contradictory, and further research is required. However, studying children and adults with autism alone may not provide sufficient evidence to support one view over the other because *both* sets of abilities are impaired in autism (Ozonoff et al., 1991, 1994; Ozonoff & McEvoy, 1994). This is especially true because it is likely that autism is caused by an underlying dysfunction in more than one cognitive system (Baron–Cohen & Ring, 1994; Bishop, 1993; Goodman, 1989; Harris, 1993; Ozonoff & McEvoy, 1994), and thus separate systems that subserve psychological reasoning and executive or attention processes may be independently damaged.

However, studying other clinical populations may reveal double dissociations of impairment that would provide an answer. The identification of other neurodevelopmental disorders in which there are impairments in attention and executive abilities in the absence of impairments in joint attention, pretend play, and theory of mind would provide such evidence. Although less comprehensively studied than autism, some supporting evidence is beginning to emerge, but some contradictory results have also been obtained, and further research is needed. In some studies, children with Attention Deficit and Hyperactivity Disorder (ADHD) have been shown to perform worse than controls on measures of executive function (Chelune et al., 1986; Felton et al., 1987; Grodzinsky & Diamond, 1992), although in others no differences have been found (Fischer et al., 1990; Loge, Staton, & Beatty, 1990; see Pennington & Ozonoff, 1996; for review). It is also true that children with ADHD *do* have social difficulties—including difficulties with social perspective taking—albeit somewhat different and less pervasive than those found in children with autism. Similarly, children with

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Phenylketonuria (PKU) have also been shown to perform worse than controls on measures of executive function (Welsh et al., 1990). To date, theory of mind abilities have not been systematically measured in children with ADHD and PKU—and this should be a goal of future research. Further work to identify the precise pattern of intact and impaired abilities in children with ADHD and to document the relationship between any executive deficits, and their socializing and theory of mind abilities is required. Children and adults with Gilles de la Tourette Syndrome (GTS) have also been shown to be impaired on measures of executive ability, including response perseveration (Bornstein, 1991), planning (Baron–Cohen et al., 1995) and intention editing (Baron–Cohen et al., 1994). Further, several recent studies have shown that these executive impairments coexist with an *intact* ability on theory of mind tasks in patients with GTS (Baron–Cohen et al., 1995; Baron–Cohen & Robertson, 1995). Thus, at least some patients with executive function deficits do *not* show theory of mind deficits, a result that—if confirmed—would challenge the claims of the accounts that suggest that joint attention, pretend play, and theory of mind development are the result of an impairment in the more basic cognitive processes of executive function or attention. However, other studies have found no deficit in inhibition of response in children with GTS (Ozonoff et al., 1994; Sutherland et al., 1982; Yeates & Bornstein, 1994; see Pennington & Ozonoff, 1996; for a review). Further work examining the executive function and attention deficits in other abnormal populations and their relationship to the development of joint attention, pretend play, and theory of mind is clearly needed to provide a more complete answer. For example, will the seizure disorder children described by Caplan et al. (1993) who showed joint attention impairments, go on to develop intact or impaired pretend play and theory of mind abilities?

A significant advance in the field may be provided by Ozonoff's (in press) suggestion that an information-processing approach to executive function deficits in developmental disorders is required. Ozonoff (in press) advocates a component process analysis approach to measurement of cognitive functions—tasks are decomposed into their elementary operations, rather than lumped together under one heading. Deficits in executive abilities and social impairments may be neither unitary nor uniform, either across or within different developmental disabilities. Subgroups of children with ADHD, GTS, and untreated PKU may exist with specific deficits in executive abilities that should relate in some way to their particular social impairments, and one goal of future research should be to identify such subgroups. This line of work has already started in the field of autism, with differences in theory of mind abilities but not executive function being found between individuals with high functioning autism and Asperger's syndrome (Ozonoff, Rogers, & Pennington, 1991), and comparisons being made between the social and cognitive difficulties of individuals with Asperger's syndrome and those with nonverbal (or right hemisphere) learning disabilities (Klin et al., 1995).

An important avenue for future research are studies that examine the early development of joint attention and pretend play skills in autism. Some of the work reviewed above suggests that in addition to impairments in joint attention and pretend play abilities in autism—which some accounts relate to the development of specifically psychological reasoning and the representational abilities required to produce such behavior—there may also be impairments in requesting behaviors and functional play, at least in younger and less able children with autism (DiLavore & Lord, 1995; Mundy et al., 1994; Mundy et al., 1990; Sigman & Ungerer, 1984; Ungerer & Sigman, 1981). None of the accounts that propose that the representational system impaired in autism is dedicated to psychological reasoning, rather than a more general cognitive impairment, include requesting behaviors or functional play as evidence of representational ability dedicated to psychological reasoning (Baron–Cohen, 1994; Hobson, 1989a,b, 1993a,b; Leslie, 1987, 1994; Mundy & Sigman, 1989a,b; Mundy et al., 1993). Indeed, Baron–Cohen and Leslie specifically contrast the more complex metarepresentational ability

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required for pretend play with the representational ability required to produce functional play. Thus, the possibility is opened that in younger and less able children with autism, behaviors such as functional play and request behaviors may be impaired due to more basic attention or executive impairments. Further work to investigate the relationship between functional and pretend play, and between requesting and joint attention behaviors, in both children with autism and in normally developing infants is required to assess the competing claims of the theories outlined above.

Another important aim of future work should be to extend the precision of definition and measurement of play and joint attention behaviors into their constituent parts [i.e., to adopt an information processing approach, in a similar manner to that advocated by Ozonoff (in press) for executive functions]. Global recording of behaviors as "requests" or "pretend acts" should give way to a more fine-grained analysis that precisely details both the *function* and the *form* of the behaviors. For instance, we already know that not all requesting behaviors are alike. Phillips et al. (1995) found that although children with autism were impaired on requesting behaviors that involved combining gesture and eye gaze (which they label "treating the person as subject"), they were intact on requesting gestures that did not involve eye gaze (which they label "treating the person as object"). Further, the findings on pretend play in autism have shown that while some simple object substitution pretend play is seen under structured conditions, subjects with autism remain impaired in generating novel pretend acts even when prompted (Charman & Baron–Cohen, in press; Jarrold et al., 1996; Lewis & Boucher, 1995). Thus, the representational abilities required for different *forms* of joint attention or pretend play behaviors, under different conditions, may not be the same. Further, overt similarity of form at a behavioral level may disguise differences in the *function* of a joint attention or pretend act in any particular social interaction. The same criticisms that Pennington and Ozonoff (1996) apply to the concept and measurement of executive function abilities—lack of theoretical specificity, confounding of component processes, and lack of information on reliability—can also be applied to our theoretical definitions of joint attention and play and to the paradigms employed to measure these abilities. Further work to detail the precise form and function of the behaviors that children with autism do find difficult—and the cognitive and affective, and executive and attentional, capacities required to produce such behaviors under different conditions—is needed.

A further aspect that remains to be fully explored is that of the effect of the social context in which behaviors occur. It is clear from the research reviewed above that there are differences between generating play and joint attention behaviors de novo, and the production of such behaviors in response to cues or scaffolding from the social context or setting. Indeed, these differences may well be explained by the differing executive demands placed on the child in the different contexts (see Harris, 1993; for a discussion of the role of cues in the production of pretend play). Systematic study of the relationships between the production of play and joint attention behaviors in contexts that differ in the executive demand and cues provided is required in children with autism and in normally developing children.

Another area where further research is needed is the development of functional and pretend play and requesting and joint attention behaviors in normal children. While some aspects of the development of joint attention skills in infancy, under both naturalistic and experimental conditions, have been well described (e.g. Moore & Dunham, 1995); others remain poorly understood. For example, relatively little recent work has looked at the emergence of pretend play in infants—leaving questions about the timetable of the onset of pretend play, and its comparability to the onset of joint attention, unanswered (Fein, 1981; Harris, 1993).

In summary, work examining the *concurrent* and *predictive* relationships between basic cognitive processes such as attention shifting and executive functioning, and more complex social behaviors such as joint attention and pretend play skills, is required in

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both normal and abnormal populations. Future research should also focus on infancy, when the behaviors under study are emerging, to clarify the developmental relationship between these different abilities, and to assess what role they play in psychopathological development in autism, and in the development of normal social–cognitive abilities.

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