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## A Psychological Approach to Understanding the Social and Language Impairments in Autism

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### Abstract

This paper surveys current research on the social and communicative impairments in autism. In diagnostic schemes, the criteria for identifying autism in these domains include overlapping features. One approach to interpreting this overlap is to consider that social and communicative impairments reflect the same underlying cognitive deficit, referred to as the ‘theory of mind’ hypothesis of autism. On this view autism involves primary difficulties in identifying mental states in other people, and in interpreting behavior and action in relation to a person’s mental state. Studies on the relationship between social behavior, communicative functioning, and theory of mind in children with autism are reviewed, emphasizing the connections between these areas of impairment that are central to the definition of the autistic syndrome.

### Primary Deficits in Autism

Autism is diagnosed on the basis of three primary areas of impairment: social functioning, language and communication, and repetitive and stereotyped patterns of behavior, interests or activities (APA, 1994). Research on autism and other neurodevelopmental disorders suggests that the social and communication impairments are unique and specific deficits, that define the autism phenotype. In this context, communication refers to the full range of both verbal/linguistic and non-verbal (including gesture and intonation) means for interacting with others. In contrast, repetitive behaviors and interests are also found among individuals with other neurodevelopmental disorders such as fragile X syndrome (e.g., Hagerman, 1999; Mazzocco & Reiss, 1999), and may emerge somewhat after the social and communicative deficits are already apparent (Cox et al., in press; Stone et al., 1999). What is the nature of these defining social and communication features in autism? Are the two separable or are there overlapping features that are used to diagnose social and communicative impairments in autism? To what extent may they be interpreted as being part of the same underlying deficit? In this paper I address these questions from the perspective of a psychological model of autism, which posits that the social and communicative impairments reflect fundamental difficulties in understanding other people as mental beings – the so-called “theory of mind” hypothesis of autism. Evidence for this view is presented with particular emphasis on the research that explores the relationship between language, communication and theory of mind in children with autism.

### Defining the Social, Language and Communicative Deficits in Autism

Across different individuals with autism, there is a wide range in the expression of the social, language and communicative deficits. Some of this variability may be related to cognitive level and to the age at which the child is examined. There may also be differences in the degree to

which language (which refers to the formal linguistic code that we acquire as our primary means for communication, including the speech sound, meaning and grammatical components of language) is impaired across children with autism. We still lack a developmental perspective that might be used to interpret some of the changes that take place within children with autism over the course of childhood.

In both the social and communication areas a variety of characteristic features are used to define autism, and these may vary across different diagnostic classification schemes and instruments. Fortunately, after decades of changing diagnostic guidelines, there is finally a convergence among the criteria that are used to define autism and related disorders in the DSM/American psychiatric community (APA, 1994) and the ICD/International psychiatric community (WHO, 1993). There is a general consensus among researchers and clinicians that both DSM-IV and ICD-10 criteria are empirically based and represent levels of sensitivity and specificity that cover a wide range of developmental levels (Volkmar, 1998; Volkmar, Klin, & Cohen, 1997).

According to DSM-IV and ICD-10 the criteria for defining qualitative impairments in social functioning and in language and communication include the features delineated in Table 1. It is interesting to note that there are significant parallels between the features that are diagnostic of the social and the communication impairments. Consider, for example, the items from the ADI-R that form part of the diagnostic algorithm (Lord et al., 1989). Table 2 presents features used in the algorithms for the social and communication domains that appear to be overlapping.

These examples illustrate that social interaction and communication are in some ways inextricably linked to one another, especially during the crucial developmental stages that mark the point when autism becomes strikingly evident. For example, by the second year of life, infants' and toddlers' interactions with others center on patterns of communication that includes their directing attention to themselves or to people or objects in the environment using vocal or gestural means. Early peer interactions during the toddler and preschool years focus on play, beginning with simple imitation of actions then moving toward incorporating pretend or imaginative play and activities. The absence of these behaviors marks the triad of impairments in social, communication and imaginative activities that are at the heart of the autism diagnosis at these developmental stages.

## Cognitive Deficit in Theory of Mind

How can we interpret this overlap between the features delineated in Table 2 that are important in identifying the social and communicative impairments in autism? One approach to understanding neurodevelopmental disorders uses explanatory models or frameworks that include different levels of analysis that are hierarchically organized (Morton & Frith, 1995; Happé, 1994a; Pennington, 1999; Pennington & Welsh, 1995). These levels include: etiology, brain mechanisms, underlying cognitive deficits, and clinical features of the phenotype. Cognitive psychology is particularly concerned with the last two levels, in which a range of behaviors used in the diagnosis of a disorder may be interpreted as manifestations of a unitary underlying cognitive deficit. Within autism this approach has been used to interpret some of the social, play<sup>1</sup>, and communication deficits, as shown in Figure 1. According to cognitive theorists, one underlying deficit that explains the range of deficits in these domains (though clearly not all the clinical features of autism) is the ability to understand minds: the theory of mind hypothesis of autism.

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<sup>1</sup>It is interesting to note that on diagnostic schemes, play and imaginative activity are listed under the social and communicative domains (see Table 1), whereas cognitive theorists consider these a third dimension, separate from social interaction and communication.

First introduced to the autism literature fifteen years ago, theory of mind refers to the ability to attribute mental states, such as desire, knowledge, and belief, to oneself and other people as a means of explaining behavior. This ability emerges by the end of the first year, when infants view people as intentional, or goal-directed in their behavior. By 3, children understand desires and simple emotions in themselves and others, and can talk about a person's actions in relation to the mental states that cause them. By age 4, children understand more complex mental states, specifically belief, including the notion that people may hold beliefs that conflict with reality. This understanding of what is termed false belief marks an important cognitive developmental stage in children, reflecting their understanding that minds are not just copies of reality but are representations that may be true or false (Astington, 1993).

The hallmark test for theory of mind at this stage is called the false belief test. Baron-Cohen, Leslie and Frith (1985) conducted the first study demonstrating that autism involves specific difficulty in understanding minds. They compared autistic, Down syndrome and normally developing children on the following task. The children were introduced to two dolls, Sally and Anne, who were placed in a diorama in which the experimenter enacted a scene. Sally placed a marble in her basket, and left the room, leaving the marble behind. Then Anne took the marble from the basket and put it in a box. The child was then asked to predict where Sally would look for the marble when she returned. To answer correctly, the child must disregard his own knowledge of reality (that the marble is now in the box) and respond that Sally, who did not witness Anne's action, will look in the basket, where she last saw it. In Baron-Cohen et al.'s study 80% of the children with autism failed this test question, although they could correctly answer control questions about where the marble was originally and to where it was moved. This failure rate was far higher than in the comparison groups, in spite of the fact that the autistic children's mental ages were well above 4 years old.

This experiment has been replicated many times by other researchers, with different samples of autistic children, a variety of comparison groups (including Down syndrome, normally developing preschoolers, non-specific mental retardation and specific language impairment), using similar or comparable tasks (Baron-Cohen, Tager-Flusberg, & Cohen, 1993). Across all these studies the children with autism perform worse on theory of mind tasks than language or mental-age matched comparison children. This body of research is taken as strong evidence that autistic children have a specific impairment in interpreting human action within a mentalistic framework – what Baron-Cohen refers to as “mindblindness” (Baron-Cohen, 1995). Children with autism cannot predict or explain human behavior within a psychological causal model that refers to constructs such as intention, desire or belief.

Although, the idea that autism involves specific deficits in theory of mind has been generally accepted among researchers and clinicians who work with this population, critics have argued that perhaps too much emphasis has been placed on false belief and other related tasks as key measures of this impairment. This is principally due to two reasons. First, some children with autism pass these tasks, despite their continuing social and communicative impairments. Studies have demonstrated that performance by autistic children on false belief tasks, and other tasks that tap a representational understanding of mind, is closely related to language ability (Happé, 1995; Tager-Flusberg, 1997; Tager-Flusberg & Sullivan, 1994), and perhaps also to executive functions such as response inhibition and working memory (Hughes & Russell, 1993; Russell 1997; see also paper by Joseph in this volume). Second, it is clear that autism emerges much earlier than age 4 when children are first able to pass these kinds of cognitive tasks, suggesting that deficits in theory of mind must predate this stage of development if it is to be used to provide a cognitive explanation of autism (Klin, Volkmar & Sparrow, 1992; Klin & Volkmar, 1993).

In response to these concerns, there has been shift toward incorporating a broader conception of theory of mind. Taking a developmental perspective, theory of mind is now viewed as emerging in late infancy, with its development extending well beyond the preschool years (Wellman & Lagattuta, in press). The roots of understanding intentionality lie in young infants' strong interest in people, as is evident in their attention to human faces and speech. From birth, infants engage in eye contact with other people, and within a few weeks come to respond to affective expressions in both face and voice. According to developmental researchers, these behaviors provide the foundation on which the cognitive achievements of theory of mind are based (e.g., Hobson, 1993; Wellman & Lagattuta, in press). Taking this broader perspective provides a clearer framework within which early signs of autistic impairment may be interpreted. Studies of toddlers who later receive a diagnosis of autism have identified problems in eye gaze, affect, responsiveness to other people, and attention to language as important early markers of this disorder (Lord, 1995; Stone et al., 1999).

## Theory of Mind and Social Deficits in Autism

A deficit in theory of mind is central to how we interpret the social impairments in autism because human social behavior depends on our understanding that people with whom we interact are intentional, mental beings. Thus, for autistic children, the social world remains complex and hard to negotiate because they have difficulty understanding the reasons for other people's actions, which may seem highly unpredictable and uninterpretable.

Contrary to earlier views, we now know that autistic children do not completely avoid people; nor do they fail to demonstrate any social interest or affection especially toward close family members. Social behaviors and interaction with others are not absent in autism, but they can be strikingly deviant. One of the key factors that is important in interpreting the findings on social behavior is the role of familiarity, routines and structure in understanding when and how children with autism will engage in social behavior (Lord, 1993). Routines and structure reduce the complexity and unpredictability of the social world, which may be especially important for children who do not understand the mentalistic reasons for other people's actions. Thus social interactions are more frequent when the autistic child interacts with familiar people, who behave in predictable ways, in their environment. This need for reduced complexity and uncertainty may also help to explain the rigidity in autistic children's behavior

Studies of social motivation have shown that autistic children typically do not respond to the social overtures of friendly strangers or acquaintances (Le Couteur et al., 1989). However, in the context of routine situations (e.g., mealtimes, playing games) with family members, autistic children are much more interested and responsive to the approach of other people (Lord, 1984), although their behavior even in these contexts is still not comparable to normal children. For example, they do not engage in reciprocal conversation, nor do they continue to play games over an extended time period, even when they understand them. As children with autism get older parents report that they become more willing to help others within structured social routines such as cleaning up or setting the table (Lord, 1993), perhaps because these routines require little social interaction. Similar findings have been reported in studies of autistic children's behavior in the classroom. For example, McHale and her colleagues (McHale, Olley & Marcus, 1981) reported that autistic children directed more spontaneous initiations towards teachers and classmates in highly structured small group activities than in less structured settings. Clark and Rutter (1981) also found that highly structured activities, in which the teacher was very directive, led to greater cooperation and more social behavior in autistic children.

Certain kinds of simple social skills do develop in some autistic children, for example turn-taking in the context of games or other structured reciprocal play activities (Lord, 1993). These

skills do not entail a mentalistic understanding of the social partner; rather they depend on learning basic behavioral contingencies. However, deficits in elicited and spontaneous imitation, which often are the earliest forms of peer interaction, are evident in quite young children with autism (Curcio & Piserchia, 1978; Dawson & Adams, 1984; Stone & Caro-Martinez, 1990). Some theorists have argued that imitating the behavior of others is one of the primary routes to the development of an understanding of mind (e.g., Rogers & Pennington, 1991; Meltzoff & Gopnik, 1993), thus suggesting a connection between theory of mind and this aspect of social deficit in autism.

Difficulties with social relationships are especially evident in the difficulties that autistic children have in interactions with peers. Peers are generally less able than adults to compensate for the social limitations of the autistic child. Children and adolescents with autism initiate far fewer approaches towards others in unstructured social contexts or environments, such as during free play or on playgrounds (Atwood, Frith, & Hermelin, 1988; Lord & Magill, 1989). These impairments are even more striking within sustained or reciprocal interactions (Lord, 1990) which demand a greater capacity to interpret the behavior of the other child in order to maintain the social contact. Even when children with autism do make overtures toward other children, Lord and Magill (1989) found that these overtures were less likely to be sustained for even one minute, and were often not responded to at all by the other children. One reason for this may be because of qualitative abnormalities in their social approaches. Children with autism were found to be less likely to coordinate non-verbal gestures and eye contact with verbal behaviors when they approached other children (Lord & Magill, 1989).

The result of these deficits in social skills is that children and adults with autism have great difficulty with peer relationships, and few ever make friends. Lord and her colleagues (Lord et al., 1989) report that one of the clearest features from their study that discriminates high functioning autism from language impairment is that the autistic children in their study were unable to describe what a friend is. Individuals with autism fail to appreciate that friendship goes beyond mere acquaintance or social contact; that it encompasses a deeper connection based on sharing experiences, thoughts and feelings, and involves a caring and commitment that requires a mentalistic view of the other person. Theory of mind impairments clearly have a profound impact on the social world of the autistic child.

## **Theory of Mind and Language/Communication Deficits in Autism**

The theory of mind hypothesis of autism has also been important in our interpretation of the language and communicative impairments in autism. The central difficulties encountered by all children with autism are in the pragmatics of language: the ability to use language appropriately in social contexts. Deficits in particular aspects of pragmatic functioning are evident at all developmental stages, even in highly verbal adults with autism (Lord & Paul, 1997). In autism, there are unique and specific problems in understanding that language is a means for interacting with others, and for sharing information, thoughts or feelings between a speaker and listener (Tager-Flusberg, 1992, 1993). Related to this, people with autism at all ages have difficulty taking into account the listener's perspective, which affects their ability to engage in conversations in a sustained or meaningful way (Tager-Flusberg, 1996). They tend to lecture about their own interests without regard to their listener's role in the conversation.

From the beginning, communication is rooted in the infant's ability to understand that people are intentional volitional beings whose experience and attention to the world around them may be different from their own view. The earliest manifestations of communicative impairment in autism may be found in selective deficits that reflect a lack of understanding of mind. Thus, both naturalistic and experimental studies have shown a selective paucity of protodeclarative

communicative gestures (i.e., pointing to objects in order to direct another person's attention to it) in both preverbal and older verbal children with autism (Baron-Cohen, 1989; Mundy, Sigman, Ungerer & Sherman, 1986; Wetherby, 1986). Unlike protoimperative gestures, which may only involve an expression of the child's needs or desires, protodeclaratives critically involve joint attention and require an understanding of intentionality, both of which are profoundly impaired in young children with autism (Loveland & Landry, 1986; Mundy, Sigman & Kasari, 1994). When language is acquired in autism, verbal communication continues to be primarily limited to the expression of requests and needs, or simple labeling (Tager-Flusberg, 1996). While autistic children do use language to maintain some social contact (Wetherby & Prutting, 1984), they rarely comment on ongoing or past activity, use language to seek or share attention, provide new information, or express intentions, volition or other mental states (Tager-Flusberg, 1992, 1993, 1997). Thus, autism is characterized by significant limitations in the range of functions served by language; limitations that can be directly attributed to an impaired understanding of other minds.

As noted earlier, children with autism exhibit significant difficulties in conversational contexts. Their impairment in understanding the speaker-listener relationship is illustrated in pronoun reversal errors (Lee, Hobson, & Chiat, 1994; Tager-Flusberg, 1994). These errors reflect difficulties in conceptualizing notions of self and other, as they are embedded in shifting discourse roles between listener and speaker. To use a pronoun such as "I" the child must realize that the referent of "I" changes constantly in a reciprocal conversation depending on who is the speaker. They also have difficulty conforming to conversational rules (Ball, 1978; Baltaxe, 1977; Fine, Bartolucci, Szatmari & Ginsberg, 1994) such as initiating conversations, and engaging in reciprocal conversations, rather than, for example, simply lecturing about their own interest. They cannot appropriately maintain an ongoing topic of discourse (Tager-Flusberg & Anderson, 1991); instead they introduce irrelevant comments or fail to extend a topic by adding new relevant information. One recent study found that there was a significant correlation in children with autism (but not in controls) between performance on theory of mind tasks and the ability to respond to a conversational partner with contingent relevant new information (Capps, Kehres, & Sigman, 1998).

Conversational deficits in autism reflect fundamental problems in understanding that communication is about the expression and interpretation of intended rather than literal meaning (Happé, 1993; Sperber & Wilson, 1986). Several studies have found that even older high-functioning people with autism have great difficulty interpreting non-literal or figurative speech (e.g., Happé, 1993; 1994b; Minschew, Goldstein, & Siegel, 1995). Happé (1993) found that there was a close relationship between understanding metaphor or irony and performance on theory of mind tasks. In a later study Happé (1994b) again found a strong relationship between the ability to explain a variety of non-literal messages (e.g., lies, jokes, pretence, irony, sarcasm, double bluff) and theory of mind. Using a more structured task, Mitchell, Saltmarsh and Russell (1997) also found that children with autism had difficulty interpreting a speaker's intended meaning when presented in a conversational context. Unlike matched controls, the children with autism in their study interpreted utterances in a literal way instead of in relation to the speaker's stated desire. For example, in one task, a girl placed yarn in a drawer. Unbeknownst to her, the yarn was moved to the closet. When the girl asked someone to bring her the stuff from the drawer, the autistic children did not interpret her intended meaning, to obtain the yarn, and instead took her utterance literally.

Communication in other, non-conversational, discourse contexts has also been investigated in children and adolescents with autism. Several studies have explored narrative discourse, particularly storytelling. Telling a good story that focuses on human experience entails the ability to weave together a sequence of events according to a hierarchical organizational structure (the 'landscape of action') with what Bruner (1986) refers to as the 'landscape of

consciousness' – the motivations, thoughts and feelings of the main characters in the story. Baron-Cohen, Leslie and Frith (1986) were the first to show that, compared to control subjects, children with autism provided fewer mental state terms in their narratives for a sequence of pictures depicting a simple false belief scenario. In a more detailed study, Loveland and her colleagues asked their subjects to retell a story presented in the form of a puppet show or video sketch (Loveland, McEvoy, Tunali, & Kelley, 1990). The children with autism were less able than controls to consider their listener's needs and produced more bizarre or inappropriate utterances. Some of the children with autism were unable to even understand the story as a representation of meaningful events, suggesting that they lacked a cultural perspective underlying narrative (Bruner & Feldman, 1993; Loveland & Tunali, 1993). Tager-Flusberg (1995) also found that children with autism told impoverished stories in response to a wordless picture book. Furthermore, none of the children with autism in this study provided any causal explanations for the events in the stories.

In general, these findings on narrative deficits in autism have been interpreted as reflecting deficits in theory of mind (Bruner & Feldman, 1993; Loveland & Tunali, 1993). However, only one study has directly explored the relationship between narrative and theory of mind performance (Tager-Flusberg & Sullivan, 1995). Using another wordless picture book, narratives were elicited from adolescents with autism and matched controls with mental retardation. Only for the subjects with autism was theory of mind performance significantly correlated with a number of different narrative measures including length, number of connectives, emotion and cognition terms. In addition, in response to probe questions, the subjects with autism gave significantly fewer appropriate explanations for the emotional states of the story characters. These studies all support the hypothesis that autism involves particular problems in telling stories; problems that have been closely linked to the capacity to understand other minds (both of the listener and of the characters within the story).

Thus, pragmatic impairments in autism are found across different discourse contexts. These impairments include: a narrower range of functions served by language; problems understanding that communication is about intended rather than literal or surface meaning; failure to view conversations as a means of modifying and extending the cognitive environment of a conversational partner; and failure to view narratives as a means for communicating about both events and psychological states. Across these studies the close connection between pragmatic knowledge and theory of mind has been highlighted. At both a theoretical (cf. Locke, 1993; Sperber & Wilson, 1986; Tager-Flusberg, 1993) and empirical level these domains seem to be inextricably linked together. What is striking about these impairments in communication is that they occur to some degree across the entire spectrum of autistic disorder. Across all ages, ability levels, and language levels, deficits are found in some or all of these aspects of pragmatics and communication. They are even considered to be one component of the broader autism phenotype, found among some proportion of first degree relatives of individuals with autism (Landa, Folstein, & Isaacs, 1991; Landa, Piven, Wzorek, Gale, Chase, & Folstein, 1992; Piven, Palmer, Landa, Santangelo, Jacobi & Childress, 1997; see also Piven, this volume).

At the same time, it is important to note that not all aspects of pragmatic functioning are impaired in autism. Studies have demonstrated that the deficits in pragmatics are selective, rather than across-the board, with some functions remaining fairly intact. For example, the use of language to obtain desired objects is not selectively impaired in autism. Detailed studies on the development of linguistic form and pragmatic function in the language of autistic children find dissociations between form and function with selective impairment in those functions that entail an understanding of other minds (Mermelstein, 1983; Paul, 1987; Tager-Flusberg, 1994, 1997).

One source of evidence for these specific form/function deficits comes from a longitudinal study of six young children with autism (all boys) and six with Down syndrome (four boys and two girls) conducted by Tager-Flusberg and her colleagues (Tager-Flusberg, Calkins, Nolin, Baumberger, Anderson, & Chadwick-Dias, 1990). The autistic and Down syndrome children were individually matched at the start of the study on age (ranging from 3 to 7 years old) and expressive language level. The children were visited bimonthly in their homes and were videotaped while they played with their mothers. They were followed for one or two years, and the transcripts of these visits formed the primary data for this study. These data were then used to study the development of different constructions, focussing within each construction on the acquisition of grammatical forms and pragmatic functions. Findings on the development of two linguistic constructions, negation and questions, will be used to illustrate this approach.

One of the earliest words that children learn is “no.” Within a few years they acquire the complex syntax of sentential negation, which involves mastery over the auxiliary verb system of English, and negation can be used to express a range of functions, including rejection, nonexistence and truth-functional denial (Bloom, 1970). Tager-Flusberg and Keenan (1987) analyzed the development of negation using the data from this longitudinal study. All spontaneous non-imitative (i.e., non-echolalic) utterances containing a negative morpheme were extracted from the transcripts and coded on syntactic and functional dimensions. The two groups of children did not differ in the development of syntactic aspects of negation; both followed the same pathway as normally developing children but only one of the subjects (a 7 year-old autistic boy) was able to consistently use correct grammatical forms of negation by the end of the study.

The set of negation utterances were then evaluated using Bloom's (1970) functional categories of non-existence (e.g., *No more twinkies; No fever for you*); rejection (e.g., *No, I don't want this; I don't want a snack*); and denial (e.g., *No, not cheese from milk* [= cheese isn't made from milk]; *No, it's green* [after mother has stated object is blue]). During the early stages most negation utterances for both groups of children fall into the categories of non-existence and rejection. At later stages, the children with Down syndrome begin using negation to express denial, following the pattern reported for normally developing children. In contrast, the children with autism almost never express this function. Clearly, the primary difference in children with autism is their very rare use of denial negation. This paucity of denial reflects impairments in theory of mind: to deny the truth of another person's statement entails the understanding that the other person may hold different beliefs, or that language is itself a representation of reality, not reality itself. These aspects of mental state understanding are specifically impaired in autism and it is therefore not surprising that this function of language, denial, is almost never used by young children with autism.

A similar approach was used to explore the development of questions. During the earliest stages children depend primarily on rising intonation to convey questions. Two major question types are used: yes/no questions and wh-questions. Both require complex syntactic knowledge, including the insertion of an appropriate auxiliary verb, inverting the subject and auxiliary verb, and in the case of wh-questions, inserting the wh- word (e.g., *what, where, why*) at the front of the sentence. Both types of questions are used to express a range of functions, including information seeking, conversation regulation (e.g., agreement, clarification) and directives (James & Seebach, 1982).

Using the data from the longitudinal study, all spontaneous, non-imitated questions were extracted from the transcripts, using context and prosodic contours to identify them (Tager-Flusberg, 1989, 1997). On average, the children with autism asked 34 questions per 1000 utterances (including both spontaneous and imitative), compared to 49 for the children with



Down syndrome. This difference between the groups did not reach statistical significance. However, there were statistically significant differences in the types of questions that the two groups of children asked. While the majority of the questions asked by the children with Down syndrome were wh-questions (questions that begin with *what, where, when, why* etc.), the children with autism asked about equal numbers of yes/no (e.g., *Can I have a cookie?*) and wh-questions. Compared to the children with Down syndrome, the children with autism asked significantly fewer wh-questions. In order to examine the development of the syntactic form of questions, we tallied the percentage of well-formed yes/no and wh- questions. "Well-formedness" was defined as the correct use of the auxiliary verb in an inverted position in the sentence. The children with autism in later stages of development tended to use more well-formed questions than the children with Down syndrome, primarily because the latter had particular difficulty acquiring the auxiliary verb system - use of for example, *is, do, or can*, together with a main verb (cf. Fowler, Gelman, & Gleitman, 1994). Thus, children with autism were not specifically impaired in acquiring the syntactic form of questions.

The functions of all questions were then coded into the following mutually exclusive categories: (a) information seeking; (b) test questions (for which the child knew the correct answer); (c) requests (for permission, for an object or activity); (d) directing mother's attention to objects or events of interest; and (e) conversation regulation (seeking agreement or clarification). The children with autism asked significantly fewer questions aimed at seeking information or regulating conversation. Most information and conversational questions typically use wh- forms, whereas requests typically involve yes/no questions. Thus the differences in the types of questions asked by the two groups reflects the different functions expressed by them. It is precisely those functional categories of questions that entail an understanding that another person may have access to different knowledge (information-seeking), or attitudes (seeking agreement or clarification) that were used significantly less frequently by the children with autism. In contrast, requests, test questions and attention-seeking questions only entail an understanding of how language can be used to effect another person's behavior, not their mental states.

Taken together, the findings from this longitudinal study illustrate that when autistic children do acquire language, the main stages of grammatical development can be characterized as delayed but not different from the stages found in either typically developing children or children with Down syndrome. Autism-specific impairments that were highlighted in this study all involved the selective impoverished uses of language functions that entail some understanding of mental states in others. This profile of language functioning in autism highlights the importance of theory of mind in language acquisition. Impairments in theory of mind are reflected in the limited ways that language is used by the child with autism.

## Conclusions

Over the past decade, the theory of mind hypothesis of autism has been viewed as providing an important theoretical integration for our understanding of key features in this disorder (Baron-Cohen et al., 1993; Happé, 1994a). This review has highlighted the significance of this hypothesis in the interpretation of core deficits in both the social and language domains of this disorder. However, it is also clear that not all aspects of the autistic syndrome can be interpreted within this framework. Many symptoms are not reflections of an underlying deficit in interpreting people from a mentalistic perspective. For example, deficits in executive functions or weak central coherence (see paper by Joseph, this volume), and repetitive behaviors and interests are viewed as being outside the explanatory power of the theory of mind hypothesis.

More significantly perhaps, some aspects of language impairment in autism are also not likely to be the result of impairments in theory of mind. While the pragmatic impairments reviewed

here are considered to be unique to autism, it is also clear that some children with autism also have language deficits that extend beyond the inability to use language appropriately in social contexts. Significant problems in the acquisition of grammar and vocabulary are evident in at least some children with autism, though these have not been the focus of much research (Lord & Paul, 1997). In one ongoing study, we found that subgroups of children with autism showed significant delays in language beyond what would be expected for both their age and cognitive level. This subgroup comprised about 25% of the high functioning autistic population (Tager-Flusberg & Joseph, 1999); among mild or moderately retarded children, the subgroup included approximately 40% of the population (Kjelgaard & Tager-Flusberg, 1999). These data illustrate that not all aspects of the language deficit in autism are explained by the theory of mind hypothesis.

Autism is a complex disorder that encompasses multiple areas of impairment. While many of the social and communicative symptoms may be theoretically interpreted as reflecting underlying deficits in the development of theory of mind, autism is not just a disorder in this cognitive domain. Future research on the social, language, and cognitive functioning in children and adults with autism will bring about a more comprehensive understanding of this neurodevelopmental disorder, which will guide the development of new interventions and therapies to improve their daily lives.

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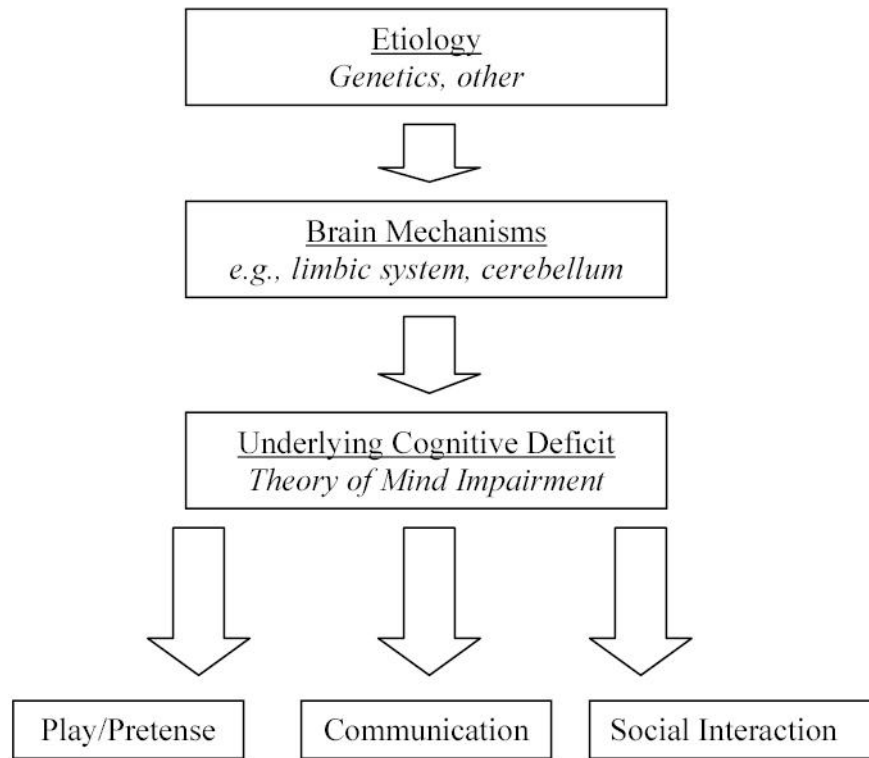
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**Figure 1. Psychological Model of Autism**

**Table 1**  
DSM-IV Criteria for Defining the Social and Communication Deficits in Autism

Social Deficits	Language and Communication Deficits
Impairments in the use of eye gaze Impairments in facial expression  Impairments in body posture and gesture Failure to form peer relationships at appropriate developmental level Lack of spontaneous sharing of enjoyment, interests, or achievements with others Lack of social-emotional reciprocity Impaired response to other people's emotions Lack of adapting behavior to different social contexts Weak integration of social, emotional, and communicative behaviors	Delay or absence of spoken language Marked impairment in the ability to initiate or sustain conversation with others Idiosyncratic use of words or phrases Lack of varied spontaneous pretend play Lack of social imitative play at younger developmental stages



**Table 2**  
Overlapping Features in the Social and Communication Domains on the ADI

Social Domain	Communication Domain
<ul style="list-style-type: none"><li>• Shares enjoyment and interest with others</li><li>• Shows and directs and attention</li><li>• Imaginative play with peers</li><li>• Interest in other children</li></ul>	<ul style="list-style-type: none"><li>• Points to express interest</li><li>• Uses conventional instrumental gestures</li><li>• Imaginative play</li><li>• Imitative social play</li></ul>