SOCIAL DEFICITS IN AUTISTIC CHILDREN: THE ROLE OF EMOTION AND EMPATHY

Research Plan

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A. Specific Aims

Recent neurobiological and neuropsychological evidence suggests that the profound social deficits observed in early infantile autism may be more effectively viewed as the abnormal development of a distinct functional system or area of the brain that subserves social interaction and imaginative activities. Current theories of emotional "intelligence" indicate that understanding of one's own self and one's relation to others consist of two essential "core" abilities. Intrapersonal abilities include (a) one's affective range and intensity, (b) the ability to discriminate among the emotions, (c) the ability to label them appropriately, and (d) the ability to use them to guide one's behavior. Interpersonal abilities include (a) the ability to decode feelings, intentions, and motivations in others, (b) recognize characteristics among people (e.g., age, gender, ethnicity) and (c) influence others to behave in desired ways. Autistic children's social impairment appears to involve deficits in both intrapersonal and interpersonal abilities. If this is so, then past attempts to characterize autism as arising from central cognitive deficits (e.g., memory, cross-modal processing, visual-spatial skills, development of object permanence or lacking a "theory of mind") are theoretically inadequate to account for the social deficits in behavior found in autistic children.

Objective. The objective of the proposed research is to examine these "core" intrapersonal and interpersonal abilities in autistic children and the nature of the developmental and maturational changes in these social impairments over the early childhood (2-5 years) and middle childhood (6-9 years) years.

Its relevance to birth defects and reproductive health. Autism, a rare but devastating disorder of early childhood, results in profound social impairment, wide-ranging deficits in verbal and nonverbal communication, and extensive behavioral stereotypies in infants and young children that collectively interfere with social and emotional development. All major neuropathological theories of autism place its

genesis in abnormalities during the prenatal and/or perinatal periods, that is, a congenital birth defect that frequently goes undiagnosed until the early childhood years.

The hypotheses to be tested. Our working hypotheses are that autism is the result of either deficits in emotional recognition or empathic awareness or both. The study thus addresses the following two hypotheses: The central pathology in autism is (a) a defect in the ability to discriminate and symbolically elaborate upon the emotions and/or (b) a defect in the ability to attribute and decode feelings in others, that is, impaired empathic understanding.

Experimental procedures and design. In order to investigate the emotional core of the social deficits, autistic children will be matched for both chronological and mental age with Down's Syndrome (MR) children along with control groups of CA- and MA-matched normal children. All four groups will consist of two age groups of children: those in the early childhood years (3-4 years-of-age) and those in the middle childhood years (6-7 years-of-age). In Experiment 1, a series of tasks will investigate intrapersonal abilities using measures of emotional recognition to access the decoding of affect with and without symbolic mediation (labeling emotions and recognizing faces, respectively). Another series of tasks will examine interpersonal abilities. Tasks will assess the ability to empathize with others using measures that require little symbolic mediation (e.g., attributing feelings to inanimate objects) to those that require extensive symbolic elaboration (e.g., identification of affect in a story character). As a result, it will be possible to separate deficiencies in symbolic skills (i.e., cognitive and language development) from deficits in the decoding of intrapersonal and interpersonal affect (hence, the need for a comparison group of MR children). Experiment 2 will test the hypothesis that when socioemotional cues are provided, autistic children will display enhanced performance on tasks that assess their ability to attribute beliefs to others (that is, dispute the "theory of mind" hypothesis). Experiment 3 is a naturalistic observation of both free-play and language production in each of the autistic, mentally-retarded, and normal child groups.

B. Background and Significance

Autism, a rare but devastating disorder of childhood, was originally defined as a constitutional inability to make emotional contact with people (Kanner, 1943). More than a decade later, it was widely agreed that the two central deficits in autism were social impairment and insistence by the child on sameness in behavioral routines (Eisenberg and Kanner, 1956). Currently, the received view designates a triad of symptoms as central to the autistic syndrome: Social impairment, deficits in verbal and nonverbal communication, and behavioral stereotypies (American Psychiatric Association, 1994). The nature of the social deficits has increasingly taken front stage in studies of autism (e.g., Fein, Pennington, Mackowitz, Braverman, & Waterhouse, 1986). Moreover, newer theories of intellective processes indicate that social "intelligence" consists of two essential components (Gardner, 1983). Intrapersonal abilities include (a) one's affective range and intensity, (b) the ability to discriminate among the emotions, (c) the ability to label them appropriately, and (d) the ability to use them to guide one's behavior. Interpersonal abilities include (a) the ability to decode feelings, intentions, and motivations in others, (b) recognize characteristics among people (e.g., age, gender, and ethnicity) and (c) influence others to behave in desired ways. Autistic children's social impairment appears to involve deficits in both intrapersonal and interpersonal abilities.

Social abilities are profoundly important for autistic children's adjustment and success in the classroom, in forming social relationships with peers, and for understanding and interacting with the social world around them. Long-term social adaptation of autistic children indicates that their social and emotional handicaps continue well into adolescence and adulthood (DesLauriers, 1978; Kanner, 1971; Kanner, Rodriquez, & Ashenden, 1972). Even with improvements on standard IQ tests the core handicaps continue throughout life. Moreover, changes in self-concept, an important aspect of intrapersonal abilities, affects social adaptation in the later adolescent years (Kanner, 1971). Autistic adolescents tend to become more aware of their social oddities and may begin to make conscious effort to work on their social problems. Nonetheless, the social impairments still remain. Unfortunately, there has been little, if any, research to date on the emotional underpinnings of social impairment in autism. The objective of the proposed research, therefore, is to study the underlying deficits in both intrapersonal and interpersonal abilities.

Despite the profound emotional impairment found in autistic children, some

researchers (Baron-Cohen, in press; Baron-Cohen, Leslie, & Frith, 1985; Leslie & Frith, 1988; Perner, Frith, Leslie, & Leekam, 1989) have claimed that there is instead a central cognitive deficit in social understanding (e.g., imputing beliefs to others). However, these theoretical claims fail to account for the emotional nature of the social deficits. Specifically, they have ignored autistic children's failure to use emotions as a source of knowledge. Their claims fail to take account of numerous reports and frequent observations (e.g., Seitz, 1988) that there are profound deficits in the decoding, range, expression, and symbolic labeling of the emotions as well as their interpersonal elaboration (e.g., empathic understanding). Regarding intrapersonal abilities, autistic children show a preference for pairing facial expressions with nonaffective stimuli and using the lower half of the face in recognition of peers unlike normal children who use the upper half of the face. They are also poor at matching various graphic representations of emotions with facial expressions. However, many of these latter tasks involved intermodal recognition of emotion that may have confounded the results. As a consequence, little conclusive evidence can be drawn from these studies. With regard to interpersonal abilities, autistic children are poor in understanding humor, in detecting social deception in picture stories, in differentiating the social categories of age and gender, and in role-taking tasks that require empathic understanding. However, the empathy tasks administered to autistic children are marred by floor effects and argue for the development of better instruments for the assessment of empathy.

The social deficits, moreover, appear to affect the class of symbolic skills that autistic children acquire. That is, autistic children's social deficits appear to interfere with the acquisition of symbolic skills dependent on social processes (e.g., communicative language, symbolic play, and empathy). For example, the word 'apple' serves as a label (a symbol) for the actual physical object. In like manner, a child may use a broomstick to represent a horse in play, and may offer to another child a toy as symbolic of his feelings toward the child. The literature on language development, development of symbolic play, and growth of empathic awareness in early childhood, indicates that these symbolic skills arise largely as a result of social interaction with others. However, other symbolic skills acquired in the early childhood years are largely independent of social processes (e.g., visual-spatial skills, attainment of object permanence, number skills, cross-modal processing of stimuli) and appear not be compromised to the same extent in autistic children. The development of these skills does not require extensive emotional processing by areas of the brain that subserve social interaction. As a result, it can be argued that cognitive and social abilities are dissociable in autism. Autistic children demonstrate enhanced performance on some

cognitive tasks in contrast to poorer performance on many social tasks. Nevertheless, practically nothing is known about the emotional deficits and their intrapersonal and interpersonal expression in autistic children. Tasks of emotional recognition have been limited in scope and often the results have been confounded with other factors. Tasks of interpersonal abilities, specifically empathy, have been poor measures of the construct they have purportedly been designed to assess. There is a pressing need to understand social processes in autistic children, and this research will address this need while addressing autistic children's strengths in cognitive areas, essential to rehabilitative efforts.

The objective of the research described in this proposal is to examine intrapersonal and interpersonal abilities in autistic children. In addition, autistic children will be assessed on standard measures of intellective skills to establish a baseline index of cognitive abilities. One series of tasks will investigate intrapersonal abilities using measures of emotional recognition to assess the decoding of affect with and without symbolic mediation (labeling an emotion, recognizing faces, respectively). Another series of tasks will examine interpersonal abilities. Tasks will assess the ability to empathize with others using measures that require little symbolic mediation (attributing feelings to inanimate objects) to those that require extensive symbolic elaboration (e.g., identification of affect in a story character). As a result, it will be possible to separate the effect of symbolic mediation from the deficits in the decoding of intrapersonal and interpersonal affect. Our working hypothesis is that autism is a result of either deficits in emotional recognition or empathic awareness or both. The study thus addresses the following two hypotheses:

> The central pathology in autism is (1) a defect in the ability to discriminate and symbolically elaborate upon the emotions and/or (2) a defect in the ability to attribute and decode feelings in others, that is, impaired empathic understanding.

The research should pinpoint more clearly the central problems of autism and thus suggest more fruitful therapeutic interventions. It should thus enable educators, and others involved with behavioral intervention in the classroom, to more effectively address the cognitive strengths of autistic children while at the same time remedying their social impairments. It should also add immeasurably to our understanding of how the emotions function in human development as well as how they interact with social processes.

C. Preliminary Studies/Progress Report

In reviewing the literature we will be examining three key areas. First we will review evidence that brain mechanisms subserving emotional behavior are central to autism. Then we will review the evidence for deficits in intrapersonal and interpersonal abilities, specifically empathy. Finally, we will examine evidence that symbolic skills that are heavily reliant on social interaction processes in development are compromised to a far greater extent than other cognitive skills in autistic children.

1. Brain mechanisms subserving emotional behavior. A review of experimental evidence suggests that the core social deficits in autism are a result of abnormal development of brain mechanisms subserving emotional behavior. Despite previous claims for a central cognitive deficit the evidence indicates that mechanisms subserving emotional behavior may be primary.

Recent neurobiological (Courchesne, Yeung-Courchesne, Press, Hesselink, & Jernigan, 1988) and neuropsychological (Fein, Pennington, Markowitz, Braveman, & Waterhouse, 1986) evidence suggests that the profound social deficits (e.g., communicative language, symbolic play, and empathy) observed in early infantile autism may be more effectively viewed as the abnormal development of a distinct functional system or area of the brain that subserves social interaction and imaginative activities (Wing & Gould, 1979). In fact, there may be two distinct neural mechanisms that (1) link facial expressions to subjective feeling and (2) subserve the conveyance of emotional information in a deliberate manner to others (Gardner, 1983). This so-called modular approach contends that the brain is divided into separate processing areas or systems. On this view, there is a division of the brain into systems subserving cognitive and social abilities with the latter further divisible into its intrapersonal and interpersonal components (Gardner, 1983). It this is so, then past attempts to characterize autism as arising from central cognitive deficits (e.g., memory, cross-modal processing, visual-spatial skills, development of object permanence) are theoretically inadequate to account for the social deficits in behavior found in autistic children. Even so, other theorists taking a more moderate position (Rutter, 1985) suggest that autistic children's social abnormalities are the result of central cognitive and linguistic deficits that underlie the processing of symbols and indices that carry social or emotional meaning. The latter position, however, is not supported by the neuropsychological evidence. For instance, deficits in intrapersonal and interpersonal abilities have been found in various clinical pathological syndromes including auditory affective agnosia (inability to understand emotion in the voice), aprosodic-

agestural syndrome (inability to express emotion through gesture or prosody), and alexithymia (inability to perceive the emotions of others because of a lack of awareness of one's own feeling states). Moreover, it appears that an important limbic region of the brain, the amygdala, "generates rapid and specific autonomic and endocrine patterns in response to complex social signals," receiving information from secondary and tertiary sensory association areas, and thus "imparting emotional tone to the analysis of sensory data" (Brothers, 1989). Neurophysiological research indicates that the development of empathy may (1) evolve in parallel with brain development and (2) involve specific brain mechanisms mediating social response to emotional signals (Brothers, 1989).

The argument for core emotional deficits underlying autism gains further support from magnetic resonance imaging experiments. Courchesne et al. (1988) found developmental hypoplasia of the vermal neocerebellum suggesting autism occurs early in brain development principally in subcortical areas. Defective development of the neocerebellum, they suggest, would affect neurogenesis involved in hippocampal formation and related limbic structures involved in emotional behavior and memory. As a result, autistic children would not make use of affective experience and prior knowledge in comprehending interpersonal situations and in developing a sense of self and personal identity.

An alternative hypothesis, however, suggests that cortical rather than subcortical areas may be involved. Geschwind (1984) and others (LeBoyer, Osherson, Nosten, & Roubertoux, 1988) argue that autism is a case of anomalous hemispheric dominance. Dominance refers to the capacity of one hemisphere to store and process information of a certain type to a greater degree than the other hemisphere. According to the anomalous dominance hypothesis, the male hormone, testosterone, or some related factor slow the development of the left hemisphere leading to greater development of corresponding areas in the right hemisphere. However, areas adjacent to these in the right hemisphere are in direct neural competition and may suffer as a result. These sites may include areas believed to be dominant for emotional recognition, pragmatic features of language, and possibly logical thought (Geschwind, 1984). It is just these processes that appear to be compromised in autism and thus suggest the involvement of right hemisphere cortical functions in autistic symptomatology. Hence, the above evidence points to the role of cortical or subcortical mechanisms or both in the genesis of emotional impairment in autism.

Additional evidence indicates that neural pathways subserving the processing of the affective significance of external stimuli are distinct from pathways that are involved with evaluating the objective stimulus features of objects and events (LeDoux, 1984). Autistic children are quite good at, for example, learning reversal/nonreversal shifts, dimensionality, line position, and length of line; stimuli that highlight objective features of experience (Sigman, Ungerer, Mundy, & Sherman, 1987). However, it is precisely those features that are involved in subjective evaluation that are impaired. For instance, imputing belief states to inanimate objects (Baron-Cohen, Leslie, & Frith, 1985) and conspecifics (Leslie, & Frith, 1988). Analysis of the affective significance of external stimuli requires both the capacity to evaluate incoming information for its subjective import and act appropriately on that information (LeDoux, 1984). The former may be carried out in one set of limbic structures (hippocampus and mammillary bodies) while the latter in another set (amygdala and septum). The research of Courchesne et al. (1988) indicates that the normal development of these structures may be compromised during neurogenesis.

2. The primacy of emotional deficits. A case is made for the claim that autistic children fail to use emotions as a source of knowledge. As a result, it is hypothesized that the central pathology in autism is (1) a defect in the ability to discriminate and symbolically elaborate upon the emotions and/or (2) a defect in the ability to attribute and decode feelings in others, that is, impaired empathic understanding. Our definition accords well with previous studies of social abilities that have looked at measures of social behavior, social understanding, and empathy in normal adolescents and adults (Ford & Tisak, 1983; Keating, 1978; Walker & Foley, 1973).

It has been argued that, "in daily life, classification of things by feeling is often more vital than classification by other properties" (Goodman, 1976). On the one hand, it has been suggested that affective deficits in autism may impair some cognitive and linguistic processes despite higher intellective functioning in other areas. On the other hand, deficits in both cognitive and affective processes may leave the autistic child with an abnormally functioning "logico-affective state" (Hermelin & O'Connor, 1985). To be sure, observational studies (Ricks & Wing, 1975; Seitz, 1988) indicate that autistic children show only extreme forms of the core emotions (e.g., pleasure, distress, fear, and anger) which are seen in normal children in the first year of life (Malatesta, Culver, Tesman, & Shepard, 1989). They appear to lack the capacity to recognize emotional states in others and thus may fail to act in an appropriate social fashion (Hermelin & O'Connor, 1985). We will now review evidence that autistic

children fail to discriminate and symbolically elaborate upon emotional states, that is, their deficits in intrapersonal abilities.

In one experiment using photographs (Jennings, 1974), autistic children were required to match human faces depicting various emotions to either nonaffective (hats) or affective stimuli (facial expressions). The results indicated that autistic children showed a preference for pairing human faces with nonaffective stimuli. In another series of experiments (Hobson, 1986a, 1986b, 1987, 1991) autistic children were poor at matching gestural drawings of emotions (happy, unhappy, angry, and afraid) to both auditory vocalizations and facial expressions of the same emotions. Likewise, they were poor at matching schematic drawings and photographs of facial expressions to both auditory vocalizations and live mimed gestures of the same emotions. There were, however, no correlations with standard tests of cognitive abilities including nonverbal analogical reasoning skills (Raven's Progressive Matrices) and receptive language (Peabody Picture Vocabulary Test). Nonetheless, autistic children were much better at matching gestural drawings of emotions to videotaped gestures of the same emotions. The latter suggests that gestural representation of emotions may be better preserved in autistic children. However, the recognition tasks presented greater difficulties insofar as intermodal recognition of emotions was required and may have confounded the interpretation of the results (Baron-Cohen, 1988). Other studies (Langdell, 1978), however, indicate that autistic children tend to use the lower half of the face in recognizing their peers in photographs unlike normal children who use the upper half of the face. Research on facial expression has shown that the mouth area is more important in emotional expression whereas the eyes convey a person's identity (Hermelin & O'Connor, 1985). The interpretation of the results with respect to autistic children is far from clear, however. We now turn to evidence that there is a defect in the ability to attribute and decode feelings in others, that is, deficits in understanding humor, social deception, and empathy.

Humor is not well understood by autistic children or, if understood at all, interpreted literally (Ricks & Wing, 1975). Surprise and coherence have been identified as the two crucial components of a joke (Appelo, 1989). That is, emotional factors figure prominently in the appreciation of humor. Similarly, autistic children are poor in understanding that another child has been deceived in picture stories (Shah & Wing, 1986). The decoding of emotional cues would appear to involve three factors: the decoding of subject's feelings, linking the subject's feelings to interpersonal context, and matching up the former two with past experience. The

inability to appreciate social deception may be due to an inability to interpret masked facial expressions as well as make emotional sense of the interpersonal context and match up these facts with memories of similar events. Right-hemisphere damage in adult patients results in deficits in deciding the emotional tone of spoken and written material, appreciating the humor in cartoons, and recognizing human faces. Moreover, there is a drop in sensitivity to both the overall polarity of emotions (e.g., happy/sad) and the spatial organization of emotional concepts. Although the subject can infer an emotion within an interpersonal context, the inference while permissible is anomalous to the depicted situation (Cicone, Wapner, & Gardner, 1980).

3. The development of empathy. Empathy has been defined as a "largely involuntary, vicarious response to affective cues from another person or his situation" (Hoffman, 1978). There are a number of distinct modes of empathic arousal that appear to evolve in a fairly well-defined developmental sequence: reflexive crying, bodily transfer of caretaker's affect, somatic mimicry (imitation of postural and facial expression), direct environmental use of cues, symbolic mediation (e.g., use of language), and metarepresentation (mental representation of oneself in the other's situation). By the fourth year of life, young children use imagination in empathic arousal culminating in full metarepresentational capacity by late childhood (Hoffman, 1978). Empathic distress is considered the basic prosocial affect that differentiates in development into both compassion and guilt (Hoffman, 1978, 1982, 1984). Other research (Lewis, Sullivan, Stanger, & Weiss, 1989) emphasizes the important contribution of cognitive factors and social rules of conduct in the emergence of self-other differentiation, the self-conscious emotions (e.g., embarrassment and empathy) and the self-evaluative emotions (e.g., guilt and shame). Nonetheless, empathy has been claimed to be the central and primary pathology in autism (Brothers, 1989; Goleman, 1989).

There appear to be two cognitive prerequisites of empathic arousal in normal children; the decoding of emotions in others and affective role-taking (Feshbach & Roe, 1968; Strayer, 1987). Children with histories of emotional maladjustment are poor at both judging others' emotions and in empathic responding (Strayer, 1987). In normal children, Strayer (1987) reports significant associations between children's empathy with characters in a story and both identification and role-taking of character's emotions. Hoffman (1978, 1982, 1984), nonetheless, emphasizes the importance of identifying cues responsible for eliciting different modes of empathic arousal. Facial and bodily cues would educe motor mimicry whereas narrative events would elicit symbolic associations.

There have been two approaches to the study of the development of empathy. One perspective maintains that the roots of empathy lie in infancy (Goleman, 1989). Stern, Barnett, & Spieker (1983) claim that the vicarious emotional response is the core of empathic arousal and is innate. Protoempathic phenomena thus exist in infancy. Dimensional (gradient) aspects of emotional expression (e.g., intensity, activity, and hedonics), however, arise earlier in development than (Darwinian) categorical aspects (e.g., joy, sadness, and anger). Infants must learn to discriminate between true and emblematic expressions (expressions not experienced internally) through detection of intermodal associations (e.g., mother's vocal prosody matching infant's physical activity level) and by way of social imitation. Both processes utilize gradient aspects of emotional expression. Stern et al. (1983) allege that in autism "there is a constant under- or overamplification of the gradient features of human behavior" resulting in an inability to discriminate true from emblematic expressions and thus the learning of social signals. Nonetheless, earlier approaches have maintained that normal children do not experience empathy until their cognitive abilities allow seeing things from another's point of view. Presently, adherents of this view investigating autism assert that the social impairments are related to deficits in social cognition (Dawson & Fernald, 1987). These investigators examined perceptual, affective, and conceptual role-taking tasks in a sample of autistic children ranging in age from six to 14 years. The conceptual role-taking task was found to be better related to scores on the Vineland Social Maturity Scale and the Childhood Autism Rating Scale. However, the task involved a gift-giving paradigm (i.e., choosing gifts for family members) that involves a heavy affective component since gifts are a form of social exchange. Moreover, the results could be explained based on perceptual matching (e.g., necklace for mom, necktie for dad) not on conceptual understanding. The affective role-taking task involved use of Borke's (1971) empathy tasks that, as the authors suggest, are probably too difficult for autistic children. Moreover, they ran no control groups of normal children. As a result, the experiment tells us little about the role of empathy in autism.

4. Social processes involved in the acquisition of symbolic skills. Present modular views of the brain partition intellective skills into cognitive and social abilities. The latter abilities are argued to be affected by social processes in their acquisition particularly as they bear on symbolic skills reliant on these abilities (e.g., symbolic play, communicative language, and empathy). Vygotsky's (1978) theory of the development of higher psychological functions proposes that symbolic skills are first acquired on a social level between individuals, the interpsychological level,

before being incorporated within the child on the intrapsychological level. The primary function of speech, for example, is to communicate with others, establish social contact, and affect the social surround. As a symbolic skill, it is acquired through exposure to the surrounding social and cultural milieu (Wertsch, 1985). We review evidence that social processes have often been ignored in understanding deficits in symbolic skills in autistic children.

Fein et al. (1986) have claimed that across a range of childhood disorders--autism, Down's syndrome, developmental aphasia, and maternal deprivation--there is a dissociation between cognitive and social abilities. For instance, language and symbolic play are heavily reliant on social interaction whereas sensorimotor abilities are more independent of social learning. Autistic and maternally deprived children often exhibit higher scores on performance measures on IQ tests than on measures of social knowledge and skills. The inverse obtains in Down's Syndrome and aphasic children who perform poorly on cognitive and language tasks as measured by standard IQ tests but have fairly intact social skills showing much more normal social development (Cullen, Cronk, Pueschel, Schnell, & Reed, 1984). Moreover, the rarity of disorders of social isolation in childhood (e.g., autism, schizoid disorder of childhood) suggests a specific mechanism in ontogenesis that affects the acquisition of symbol systems reliant on social interaction (e.g., language, pretend play, symbolic evaluation of emotional behavior).

Our working hypothesis is that social deficits may interfere with the acquisition of symbolic skills dependent on social processes (e.g., Werner & Kaplan, 1963/1984). For instance, experiments on attachment behavior in autistic children indicate that symbolic skills are significantly affected by the level of attainment in social skill use. Despite previous claims of a complete absence of attachment behaviors, Sigman and Ungerer (1984) found that autistic children direct more social behaviors and physical contact to their caregivers than to strangers. However, the relationship was positively correlated with the level of symbolic play. Autistic children who showed an increase in attachment behaviors as a response to separation and reunion episodes also displayed more advanced symbolic play. These latter children may thus have more opportunities for social interaction that foster development of cognitive skills. The development of social skills and empathy is also associated with imaginative (fantasy) play (Gartein & Lord, 1986). Moreover, social deficits would no doubt influence language acquisition. Recent research indicates that the normal development of symbolic skills in the third year is predicated on event/role structuring arising out of early social interactions involving replica play (e.g., a toy dinosaur for a real dinosaur)

and imaginative (fantasy) play (e.g., pretending there is juice in a cup when there is not; Gardner & Wolf, 1983) or knowledge of social scripts (Bretherton & Beeghly, 1982). Event/role structuring (i.e., the learning of family, character, and functional roles) is argued to provide the foundation for symbolic representation whereas social understanding may be more dependent upon script knowledge (e.g., knowledge about what one does and in what order in a restaurant). Moreover, children's knowledge of internal states (e.g., pain) is inextricably intertwined with the comprehension and production of language, one of the central symbolic skills of childhood (Bretherton & Beeghly, 1982). Internal states need to be labeled by the parent in order for the child to make the connection between internal states and external real-world referents. It is understandable, then, that autistic children have problems with imputing beliefs and feelings to others when possible precursors of these abilities (labeling internal states, parent-child social interactions) are most likely part and parcel of these deficits.

Another important cognitive skill, self-knowledge, is presumably mediated by interactions with others providing role, script, and trait attributions to self and others and thus abetting the development of the conceptual and interpersonal self (Neisser, 1988). A rudimentary indicator of self-knowledge is self-recognition behavior. As it turns out, autistic children show clear differentiation of the self in a mirror unless undermined by low cognitive function as measured by standard psychometric tests (Ferrari & Matthews, 1983). That is, autistic children will touch and explore their rouge-altered noses when placed in front of a mirror. Although self-recognition remains intact, higher level self-knowledge skills such as the development of a sense of self and the formation of a personal identity are, no doubt, compromised in children with autism. Nonetheless, Kanner (1946) claimed that autistic children use metaphorical expressions that are grounded in concrete personal experiences (e.g., "Dogs don't cry"). However, it is likely that social deficits interfere with the acquisition of higher-order relations based on the cross-categorization of psychological-physical (e.g., "She was a warm person") and taxonomic (abstract) properties (e.g., "The canary sang like a violin"). Normal children are able to accomplish these tasks by middle childhood (Seitz, 1996a, 1996b). Of the nine examples that Kanner cites, four are conditioned responses, one a linguistic overgeneralization, one a spatial analogy, one based on personification, and two are figurative expressions that are metonymic in character (part for whole). None relied on the understanding of higher-order abstract or psychological-physical relations among individuals and objects on our account.

Social processes also figure prominently in the communication of linguistic and

gestural symbol systems and both areas are substantially impaired in autism. Although phonological and syntactic development in autistic children is delayed it follows the same ontogenetic sequence as in normal children (Tager-Flusberg, 1981). Autistic children, however, violate semantic and pragmatic constraints on language (Baron-Cohen, 1988; Tager-Flusberg, 1981). For instance, deictic categories (linguistic attention-management) are poorly handled and there is a lack of socially appropriate language use as compared to normal children (Bruner, 1983). Likewise, there are deficits in prelinguistic communication during infancy, particularly in the use of gesture. Autistic children show a complete absence of expressive gestures to communicate feelings (Hermelin & O'Connor, 1985) or symbolic gestures to describe pretend states (Hammes & Langdell, 1981). They rely instead on mostly instrumental (regulation of other people's behaviors) with some deictic use of gestures (indicating behaviors as in pointing)(Hermelin & O'Connor, 1985). Yet, they fail to acknowledge shared interest in a toy object or event (Sigman, Mundy, Sherman, & Ungerer, 1986) leading the authors to suggest a deficit in affective contact.

5. Conclusions. Three areas of evidence were reviewed. The biological evidence indicates those brain mechanisms subserving both emotional recognition and the detection of social signals in others may be impaired in autism. Behavioral studies of autistic children indicate that, among other things, they are poor at matching graphic representations of emotions with facial expressions. However, many of these tasks involved intermodal recognition of emotion that may have confounded the results. As a consequence, little conclusive evidence can be drawn from these studies. Similarly, empathy tasks administered to autistic children have been marred by floor effects and again no clear results can be drawn. Finally, the development of symbolic skills in autistic children suggests that cognitive and social abilities are dissociable. If this is so, then autistic children should display differential performance on tasks either dependent upon (e.g., communicative language, empathy, symbolic play) or independent of (e.g., visual-spatial skills, number skills) social processes.

Previous attempts to characterize autism as, for example, failure to impute beliefs to others, have not adequately addressed the emotional core of the social deficits. The evidence reviewed strongly suggests that the central pathology in autism is a defect in the ability to discriminate, symbolically elaborate, and decode feelings in others.

In order to investigate the emotional core of the social deficits, autistic children will be matched for both chronological and mental age with Down's Syndrome (MR)

children along with a control group of normal children. The children will be followed over the early childhood years in order to study whether there are changes in the social impairments as a result of development and maturation. We hypothesize that the core capacities, either deficits in intrapersonal or interpersonal abilities or both, will be relatively impaired compared to normal and MR children. On the other hand, autistic children will perform better on cognitive tasks that are relatively independent of social processes such as visual-spatial and number skills. They will therefore evidence a dissociability between cognitive and social abilities. By contrast, MR children have frequently been observed to display adequate social skills relative to their mental age (Cullen, Cronk, Pueschel, Schnell, & Reed, 1984). We hypothesize that they will perform better on measures of social abilities as compared to autistic children because these core capacities have been relatively spared. MR children, however, will show to a greater extent the characteristic cognitive deficits when compared to autistic children lacking in mental retardation.

D. Research Design and Methods

To investigate the emotional core of the social deficits in autism we describe below the subject population, procedure, design, and data analytic techniques to be brought to bear on the resulting score data. In Experiment 1, four tasks are described that will test the hypothesis that autistic children are impaired in intrapersonal abilities and four tasks are described that test the proposition that autistic children are impaired in interpersonal abilities. Experiment 2 will test the hypothesis that when socioemotional cues are provided, autistic children will display enhanced performance on tasks that assess their ability to attribute beliefs to others, that is, dispute the "theory of mind" hypothesis. Experiment 2 is, in effect, a compensation task for the perceived deficiency in social understanding in the autistic sample and thus should eliminate some of the differences in performance between groups (Cole & Means, 1981). Experiment 3 is a naturalistic observation of both free-play and language production in each of the autistic, mentally-retarded, and normal child groups. It will provide additional evidence for the claim that styles of symbol use and language use typically observed in normal children in early childhood, may show remarkable similarities (and differences) with autism.

Experiment 1

I. Subjects

There will be four groups of children. The first group will consist of children diagnosed for autism with little or no mental retardation (high functioning) using the criteria in DSM-IV (APA, 1994) and the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1986). The second group will consist of Down's Syndrome children with an IQ between 50 and 70 (mildly retarded) matched for chronological age. The third and fourth groups will consist of normal children matched for chronological and mental age, respectively. There will be two age groups (three and seven years) with 12 subjects at each age and condition (Autistic, CA-matched MR children, CA- and MA-matched normal children). However, the younger group of autistic children (two-and-a-half to three years of age) will probably fall in the moderately retarded range (Sigman, Ungerer, Mundy, & Sherman, 1987). The latter authors indicate that younger autistic children are almost always more severely retarded and that diagnoses are not usually reliable before 36 months. Control groups for autistic children in their third year will include MA-matched MR children, and MA- and CA-matched normal children. All groups, including experimental and control groups, will include children from a broad range of ethnic groups. Since autism is a male-biased disorder (3.3:1), the majority of subjects will consist of male children.

II. Procedure and Design

All children will receive a standard test of intelligence, the McCarthy Scale of Children's Abilities (MCA), in order to provide an index of mental age. In addition, all children will receive the Preschool Embedded Figures Test (PEFT) and Beery's Test of Visual-Motor Integration (VMI) as measures of visual-spatial skills. Items on the McCarthy Scale will be used to quantify short-term auditory and visual memory, sensorimotor skills, drawing abilities, numerical skills, and language ability. The Conceptual Grouping Test will be used to assess children's ability to categorize objects by color, shape, and size; a measure of logical classification skills.

The standardized tests of cognitive abilities (McCarthy Scale, PEFT, and VMI) will be administered on the first day of testing in randomized order. On the second day of testing, approximately one week later, subjects will receive in a fixed order the tasks of intrapersonal and interpersonal abilities. A fixed order was chosen because each set of tasks (Tasks 1-4 and Tasks 5-8) increases in difficulty and the more difficult tasks will receive the benefit of familiarity.

Tasks of intrapersonal abilities. The decoding of intrapersonal affect will be

assessed with the following measures. Task 1 provides a baseline measure of facial recognition. Task 2 assesses the child's capacity to discriminate among different facial expressions. Task 3 measures the child's ability to provide a verbal label in discriminating facial expressions and thus provides an index of symbolic mediation of emotion. Task 4 assesses the child's capacity to discriminate among situations differing in emotional tone. The tasks are adapted from Cicone et al. (1980).

1. Matching faces task. The initial task will require children to match a target face (photograph) to one of four other faces in a match-to-sample design. This task will provide a baseline measure of facial recognition. The photographs will be presented to the child on a table directly in front of him or her. The four choices will be laid out in a line directly above the target face, all flat on the table facing the child. The photographs will be 12.5 cm X 17.5 cm in size and in color, frontal head shots of people consistent in age and gender, bearing a neutral expression. Six different match-to-sample items will be presented.

2. Matching facial expressions. The task will require children to recognize the same emotional expression from photographs of faces of different individuals in a match-to-sample design. Again there will be a target and four faces. Stimuli will include the following emotions: happiness, surprise, sadness, anger, fear, disgust, and a neutral expression. These emotions are present in normal infants in the first nine months of life (Malatesta et al., 1989). Two of the expressions are positive in emotional tone (happiness, surprise) while four are negative (sadness, anger, fear, disgust). Six different match-to-sample items will be presented. The child will be instructed (by example, by gesture, and by words) to "choose the face that has the same feeling." The four selections will include the correct choice, a face positive in emotional tone, a face negative in emotional tone, and a neutral expression. The photographs will have the same size and characteristics as in Task 1.

3. Matching named emotions to facial expressions. The task will require subjects to match appropriate named emotions to photographs of faces. This task is a measure of the child's capacity to symbolically elaborate on the emotions by use of a verbal label. There will be six match-to-sample items. Again there will be a target stimulus (emotion word) and four faces. The emotions will be the same but the faces will differ from Task 2. The child will be instructed (by example, by gesture, and by words) to "choose the face that is the same as _____ ." The word will be pointed to and read to the child. Named emotions to accompany the photographs will be selected from chronological word norms for emotion words derived from Ridgeway, Waters,

and Kuczaj (1985). Only basic level terms (earliest labels used to designate emotional states) from the top 75 will be used. The four selections will include the correct choice, a face positive in emotional tone, a face negative in emotional tone, and a neutral expression. Again, the photographs will be the same size and characteristics as before.

4. Matching situations similar in emotional tone. The task will require children to match a target situation (drawn) with four other drawn situations one of which is similar in emotional tone. There will be six match-to-sample items. The correct choice will consist of a colored drawing with the same visual features as the target and similar in emotional tone. The three foils will include (1) a colored drawing with the same visual features but opposite in emotional tone, (2) a colored drawing with the same visual features but neutral in emotional tone, and (3) a colored drawing with unrelated visual features and neutral in emotional tone. The situational content of these stimuli will consist of the following emotions: happiness, excitement, love, fear, anger, and sadness. The drawings will be reproduced by an artist on 12.5 cm X 17.5 cm heavy, white art-supply paperboard using colored pencils. The drawings will consist of simple outline drawings with judicious use of color and shading.

Tasks of interpersonal abilities. The following tasks will assess interpersonal abilities using measures of interpersonal affect and empathy. Task 5 is a measure of the child's ability to attribute feelings to inanimate objects. Task 6 assesses the child's ability to empathize symbolically with an animated toy puppet by means of a donating task. In addition, children's use of temporal and situational cues will be examined. Autistic children have been purported to have difficulties in the temporal sequencing of information in both the visual and auditory modalities (Sigman, Ungerer, Mundy, & Sherman, 1987; Tager-Flusberg, 1981). Whereas normal children use temporal order to recode visual and auditory information into abstract (e.g., linguistic) representations, autistic children have been reported to make more effective use of visual-spatial information in recall and resemble children with sensory handicaps (Frith & Baron-Cohen, 1987). Narrative events (e.g., storytelling) make use of temporal cues whereas pictorial (visual-spatial) depictions make use of situational cues. In order to test the hypothesis that autistic children will perform better on tasks highlighting situational cues from tasks highlighting temporal ones, temporal and situational cues will be included in Tasks 7 and 8, respectively. This will allow the separation of temporal sequencing from the assessment of interpersonal abilities.

5. Attribution of feelings to inanimate objects. The task will require children

to attribute feelings to inanimate objects represented in pictures (e.g., weeping willow tree). The task measures children's metaphoric abilities in making physiognomic attributions (visual-affective) to inanimate objects (Seitz & Beilin, 1987). The materials have been previously studied in normal children by the principal investigator and the same materials with a simplified procedure will be followed. Each child will be presented with 10 photographs of everyday objects (e.g., frontal views of cars, trees, and flowers) and asked to recount (by example, by gesture, and by words) what they see in the photographs. Additional verbal probes (e.g., "Does this picture look like anything else to you?") will be used to assess their ability to make physiognomic attributions to the picture. It has been claimed that autistic children are capable of using metaphoric language (Kanner, 1946) and would thus possess some capacity for understanding metaphorical relations, although no research to date has investigated the basis for this claim. The task is also a measure of empathic arousal highlighting elements of somatic (motor) mimicry. For example, a weeping willow tree is sad because we form a motor (postural-gestural) representation of a limp body while viewing it (Hoffman, 1978; Stotland, 1984).

6. <u>Donating task</u>. The task will present to the child a salient toy or object. Mothers will be asked to supply a toy or object that is a particular favorite of the child at home. The child will be allowed to play with the object for three minutes. Then the child will be asked to "donate" the toy or object (by example, by gesture, and by words) to a "peer puppet" (an animated green frog named "Wally") who has no toy or object with which to play. The donating task is a measure of empathic arousal highlighting components of symbolic mediation. That is, the giving of a toy to the "peer puppet" is a form of social exchange that symbolically mediates the reciprocal interchange of a physical object for a positive affect state.

7. <u>Identification of affect in a story character using temporal cues</u>. Children will be presented with a narrative series of four drawings in which they will be required to infer what the protagonist is feeling. The child will then be given four choices of affective labels and asked to identify the affect that goes best with the story character. Six different narrative series of four items will be presented. Each series will depict another child experiencing some kind of fortune or loss (e.g., receiving a present; losing his or her favorite toy). The individual drawings will be 7.5 cm X 12.5 cm in size, hand drawn on art-supply paperboard by a commercial artist using colored pencils. The affect labels, 2.5 cm in height, will be printed on the same size paperboard. The four affect labels will consist of the correct choice, a positive emotion, a negative emotion, and a neutral label. The emotions will include positive

(happy, surprise) and negative feelings (anger, fear, sadness, disgust). The task will be explained to the child by example and through use of gesture and words. Affect labels will be pointed to and named aloud. The task is a measure of empathic arousal involving mental representation of oneself in the other's situation, that is, metarepresentation.

8. Identification of affect of a story character using situational cues. The task will require the child to identify the affect of a story character depicted in a particular pictorial situation. She or he will then be given four choices of affective labels and asked to identify the affect that goes best with the story character. The target picture will be 7.5 cm X 12.5 cm in size, hand drawn on art-supply paperboard by a commercial artist using colored pencils. Six different pictorial situations will be presented along with four choices of affect labels. Each pictorial situation will depict another child experiencing some kind of fortune or loss as in Task 7 using the same affect labels and procedure.

III. Data Analysis

Measures of cognitive abilities. Standardized scores will be derived from the McCarthy Scale of Children's Abilities, the Preschool Embedded Figures Test, and the Test of Visual-Motor Integration. Pearson Product-Moment Correlations will assess the intercorrelations among the five groups of children (autistic, MA- and CA-matched MR children, MA- and CA-matched normal children) at both ages (three and seven years). In addition, scores on subtests of the McCarthy Scale will be intercorrelated using Pearson Product-Moment Correlations across age and subject groups.

Measure of social abilities. On the four tasks of intrapersonal abilities (Tasks 1-4), the child will receive a zero for an incorrect response and a one for a correct response. Subtotals will be derived for each child and subject group as well as a total score summed across tasks. Quantitative analyses using univariate analyses of variance will be performed on the resulting score data entering Task (4), Age (2), and Group (5) as between-subject variables.

Task 5 will be analyzed as outlined in Seitz & Beilin (1987). Children's answers will be categorized by type of metaphor and then analyses of variance will be performed on resulting group scores entering Group (5) and Age (2) as independent variables. Task 6 will be simply scored as yes (1) or no (2). Group scores will be subjected to analyses of variance using Group (5) and Age (2) as between-subject

variables. On Tasks 7 and 8 subtotals and total scores will be derived. Quantitative analyses using univariate analyses of variance will be performed on the resulting score data across groups and tasks.

Finally, qualitative analyses of the error patterns will be performed on Tasks 2-4 and Tasks 7 and 8. An analysis of patterns of performance within the groups being compared may shed additional light on the nature of the social deficits in autism (Cole & Means, 1981).

Experiment 2

I. Subjects

Depending upon the patterns of performance in Experiment 1, one of three autistic groups will comprise Experiment 2. There are three possible outcomes on measures of intrapersonal (IA) and interpersonal (IE) abilities as follows: LO/LO, LO/HI, or HI/LO where LO equals fair-to-poor performance on at least three of four tasks and HI equals good performance on at least three out of four tasks. "Fair-to-poor" and "good" will be operationally defined in relation to performance by normal children on tasks of social abilities. However, if autistic children show differential performance on the IA and IE tasks, more than one autistic group may result.

One or more groups of 12 autistic children at seven years-of-age will be compared with equal numbers of MA-matched MR children and MA- and CA-matched normal children.

II. Procedures and Design

Three differently colored hiding places (three small boxes; each 15 cm in height, width, and depth) will be introduced to the child by either of two adult experimenters (the order will be varied) named, "Bob" and "Mary." Bob (or Mary) will then display one of the child's favorite toys (from Task 6 in Experiment 1) saying, "Mary, will you place this _____(name of toy) under one of the boxes?" Mary will then place the toy under one of the boxes as she says, "I"m going to place the _____(name of toy) under this box" (points and places) smiling broadly. She will then leave the room. Then, Bob will ask the child, "Where did Mary place the toy?" (Memory question 1). Then only after a correct response, Bob will hide

the toy under a different colored box, saying "Aha, (shows surprise) I"ll place it where Mary can't find it" (points and places) using broad facial expressions and bodily gestures. The child will then be asked a series of questions (by Bob) pointing to the new hiding place. "Does Mary know the _____(name of toy) is under here?" (Knowing question). "When Mary comes back where will she look for the _____(name of toy)?" (Prediction question). "Where did Bob place the _____(name of toy)?" (Memory question 2). Then Mary will re-enter the room. "Where does Mary think the _____(name of toy) is?" (Thinking question). "Where will Mary look for the _____ (name of toy)?" (Looking question). The task will be carried out in a small room with which the child is familiar after spending at least 10 minutes acclimating to the two adults. The task is adapted from Leslie and Frith (1988).

III. Data Analysis

Scores will be added up for each question (zero for an incorrect response, one for a correct response) for each group of children. Analyses of variance with post-hoc comparison of means will constitute the principal statistical analyses with Group (4) X Question type (6) as between-subject variables. Qualitative analyses of the error patterns and types of responses to each question type will be also performed.

Experiment 3

I. Subjects

Autistic, mentally-retarded, and normal children will be drawn from the same subject pool as in Experiment 1. Twelve children at each age matched for mental and chronological ages will constitute the child samples.

II. Procedure and Design

Earlier research (Shotwell, Wolf, & Gardner, 1980) has isolated two cognitive styles in 12 to 18 month-old children, patterners and dramatists, that appear to be empirically and conceptually related to other variables (referential/expressive word use) reported in various studies (e.g., Nelson, 1973). Patterners display strong interest in configural (visual-spatial) aspects of materials, their design, structure, and mechanical potential, with language use limited to

labeling objects and events based principally an object similarities. There is a relatively low incidence of fantasy play. Dramatists, on the other hand, tend to ignore the physical aspects of materials preferring instead to make contact with the social surround by drawing materials into thematic organization around emotionally significant events and routines. Moreover, there is a high incidence of fantasy production.

Children will be observed individually in a 15-minute free-play session in which an analysis will be made of the type of play they engage in (object-dependent transformational play, with or without pretend, and object-independent fantasy play). Free-play materials will include 3-D construction materials (Lego blocks, clay), stuffed animals, plastic dinosaurs and dolls, a toy doctor's kit, and drawing paraphernalia. Individual 5-minute segments will be coded for each child for type of play observed using criteria specified in Wolf and Grollman (1982). They define make-believe or imaginative play as the use of language or gesture to alter the communicational or actual constituents of the present situation the child is engaged in. Object-dependent instances of imagination include those that refer to extant events, objects or persons (e.g., the child makes a "cake" out of play dough). Object-independent instances evoke nonpresent events, objects or persons (e.g., the child pretends to sprinkle some imaginary sugar over a cake).

In addition, 15 minute segments of the free-play sessions will be audiotaped (using a SONY M-760V portable audio recorder) in order to code for referential and expressive word use using the criteria outlined in Nelson (1973). Past research supports its empirical validity through early and middle childhood. That is, Nelson's distinction appears to be related to conversation and play activities observed in older children to connote an object or people orientation (Jennings, 1975). Specifically, Nelson notes that in the first 50 words that children produce, one can distinguish between an object language (referential word use) and a social interaction language (expressive word use). Moreover, the mean number of phrases is longer for expressive ($\underline{M}$ = 12.6; range = 8-16 phrases) than for referential children ($\underline{M}$ = 2.4; range = 0-5 phrases). Whereas referential children show greater use of specific nominals (people, animals, and objects) and action words, expressive children show greater use of function words, pronouns, and personal-social uses of language. That is, they are more apt to use language to express feelings, needs, and social forms (assertives, social-expressives).

III. Data Analysis

Frequencies of instances of object-dependent play (both fantasy and non-fantasy) and object-independent play will be calculated for each group of children. Chi-square tests of association will assess the relation between the two play categories across the three groups of children (autistic, MR, and normal children). Children's language productions will be coded for use of nominals (naming people and objects), pronouns, action words, function words, assertives, and social-expressive language. Chi-square tests of association will assess the relation between uses of different language categories across the three groups of children.

Literature Cited

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: American Psychiatric Association.

Appelo, T. (1989, September/October). Comic relief. [Review of Laughing matters: A serious look at humor]. The Sciences, 44-48.

Baron-Cohen, S. (1988). Social and pragmatic deficits in autism: Cognitive or affective? Journal of Autism and Developmental Disorders, 18(3), 379-402.

Baron-Cohen, S. (in press). Are autistic children "Behaviorists"? An examination of their mental-physical and appearance-reality distinctions. Journal of Autism and Developmental Disorders.

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

Borke, H. (1971). Interpersonal perception of young children: Egocentrism or empathy? Developmental Psychology, 5(2), 263-269.

Bretherton, I., & Beeghly, M. (1982). Talking about internal states: The acquisition of an explicit theory of mind. Developmental Psychology, 18(6), 906-921.

Brothers,,L. (1989). A biological perspective on empathy. American Journal of

Psychiatry, 146(1), 10-19.

Bruner, J. S. (1983). Child's talk: Learning to use language. NY: W. W. Norton.

Cicone, M., Wapner, W., & Gardner, H. (1980). Sensitivity to emotional expressions and situations in organic patients. Cortex, 16, 145-158.

Cole, M., & Means, B. (1981). Comparative studies of how people think. Cambridge, MA: Harvard University Press.

Courchesne, E., Yeung-Courchesne, R., Press, G. A., Hesselink, J. R., & Jernigan, T. L. (1988). Hypoplasia of cerebellar vermal lobules VI and VII in autism. The New England Journal of Medicine, 318(21), 1349-1354.

Cullen, S. M., Cronk, C. E., Pueschel, S. M., Schnell, R. R., & Reed, R. B. (1984). Social development and feeding milestones. In S. M. Pueschel (Ed.), The Young child with Down syndrome (pp. 227-252). NY: Human Sciences Press.

Dawson, G., & Fernald, M. (1987). Perspective-taking ability and its relationship to the social behavior of autistic children. Journal of Autism and Developmental Disorders, 17(4), 487-498.

DesLauriers, A. M. (1978). The cognitive-affective dilemma in early infantile autism: The case of Clarence. Journal of Autism and Childhood Schizophrenia, 8(2), 219-232.

Eisenberg, L., & Kanner, L. (1956). Early infantile autism. American Journal of Orthopsychiatry, 26, 556-566.

Fein, D., Pennington, B., Markowitz, P., Braverman, M., & Waterhouse, L. (1986). Toward a neuropsychological model of infantile autism: Are the social deficits primary? Journal of the American Academy of Child Psychiatry, 25(2), 198-212.

Ferrari, M., & Matthews, W. S. (1983). Self-recognition deficits in autism: Syndrome-specific or general developmental delay? Journal of Autism and Developmental Disorders, 13(3), 317-324.

Feshbach, N. D., & Roe, K. (1968). Empathy in six- and seven-year-olds. Child Development, 39(1), 133-145.

Ford, M. E., & Tisak, M. S. (1983). A further search for social intelligence. Journal of Educational Psychology, 75(2), 196-206.

Frith, U., & Baron-Cohen, S. (1987). Perception in autistic children. In D. J. Cohen, A. M. Donnellan, & R. Paul (Eds.), Handbook of autism and pervasive developmental disorders (pp. 85-102). NY: Wiley.

Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. NY: Basic Books.

Gardner, H., & Wolf, D. (1983). Waves and streams of symbolization: Notes on the development of symbolic capacities in young children. In D. Rogers & J. A. Sloboda (Eds.), The acquisition of symbolic skills (pp. 19-42). NY: Plenum Press.

Garfin, D. G., & Lord, C. (1986). Communication as a social problem in autism. In E. Schopler & G. B. Mesibov (Eds.), Social behavior in autism (pp. 133-151). NY: Plenum Press.

Geschwind, N. (1984). The biology of cerebral dominance: Implications for cognition. Cognition, 17, 193-208.

Goleman, D. (1989, March 28). Researchers trace empathy's roots to infancy. The New York Times, pp. Cl, C9.

Goodman, N. (1976). Languages of art: An approach to a theory of symbols (2nd ed.). Indianapolis: Hackett.

Hammes, J. G. W., & Langdell, T. (1981). Precursors of symbol formation and childhood autism. Journal of Autism and Developmental Disorders, 11(3), 331-346.

Hermelin, B., & O'Connor, N.(1985). Logico-affective states and nonverbal language. In E. Schopler & G. B. Mesibov (Eds.), Communication problems in autism. NY: Plenum Press.

Hobson, R. P. (1986a). The autistic child's appraisal of expressions of emotion. Journal of Child Psychology and Psychiatry, 27(3), 321-342.

Hobson, R. P. (1986b). The autistic child's appraisal of expressions of emotion: A further study. Journal of Child Psychology and Psychiatry, 27(5), 671-680.

Hobson, R. P. (1987). The autistic child's recognition of age- and sex-related characteristics of people. Journal of Autism and Developmental Disorders, 17(1), 63-79.

Hobson, R. P. (1991). Against the theory of "Theory of Mind". British Journal of Developmental Psychology, 9, 33-51.

Hoffman, M. L. (1978). Toward a theory of empathic arousal and development. In M. Lewis & L. A. Rosenblum (Eds.), The development of affect (pp. 227-256). NY: Plenum Press.

Hoffman, M. L. (1982). The measurement of empathy. In C. E. Izard (Ed.), Measuring emotions in infants and children (pp. 279-296). Cambridge: Cambridge University Press.

Hoffman, M. L. (1984). Interaction of affect and cognition in empathy. In C. E. Izard, J. Kagan, & R. B. Zajonc (Eds.), Emotions, cognition, and behavior (pp. 103-131). Cambridge: Cambridge University Press.

Jennings, K. D. (1975). People versus object orientation, social behavior, and intellectual abilities in preschool children. Developmental Psychology, 11(4), 511-519.

Jennings, W. B. (1974). A study of the preference for affective cues in autistic

children (Doctoral dissertation, Memphis State University, 1973). Dissertations Abstracts International, 8, 4045B-4046B.

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

Kanner, L. (1946). Irrelevant and metaphorical language in early infantile autism. American Journal of Psychiatry, 103, 242-246.

Kanner, L. (1971). Follow-up study of eleven autistic children originally reported in 1943. Journal of Autism and Childhood Schizophrenia, 1(2), 119-145.

Kanner, L., Rodriguez, A., & Ashenden, B. (1972). How far can autistic children go in matters of social adaptation? Journal of Autism and Childhood Schizophrenia, 2(1), 9-33.

Keating, D. P. (1978). A search for social intelligence. Journal of Educational Psychology, 70(2), 218-223.

Langdell, T. (1978). Recognition of faces: An approach to the study of autism. Journal of Child Psychology and Psychiatry, 19, 255-268.

Leboyer, M., Osherson, D. N., Nosten, M., & Roubertoux, P. (1988). Is autism associated with anomalous dominance? Journal of Autism and Developmental Disorders, 18(4), 539-551.

LeDoux, J. E. (1984). Cognition and emotion: Processing functions and brain systems. In M. S. Gazzaniga (Ed.), Handbook of cognitive neuroscience. NY: Plenum Press.

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

Lewis, M., Sullivan, M. W., Stanger, C., & Weiss, M. (1989). Self development and self-conscious emotions. Child Development, 60, 146-156.

Malatesta, C. Z., Culver, C., Tesman, J. R., & Shepard, B. (1989). The development of emotion expression during the first two years of life. Monographs for the Society for Research in Child Development, 54, (1-2, serial no. 219).

Neisser, U. (1988). Five kinds of self-knowledge (Rep. No. 14). Atlanta: Emory University, Department of Psychology, Emory Cognition Project.

Nelson, K. (1973). Structure and strategy in learning to talk. Monographs of the Society for Research in Child Development, 38, (1-2, serial no. 149).

O'Connor, N., & Hermelin, B. (1988). Low intelligence and special abilities. Journal of Child Psychology and Psychiatry, 29(4), 391-396.

Perner, J., Frith, U., Leslie, A. M., & Leekam, S. R. (1989). Exploration of the autistic child's theory of mind: Knowledge, belief, and communication. Child Development, 60, 689-700.

Ricks, D. M., & Wing, L. (1975). Language, communication, and the use of symbols in normal and autistic children. Journal of Autism and Childhood Schizophrenia, 5(3), 191-221.

Ridgeway, D., Waters, E., & Kucazj, S. A. (1985). Acquisition of emotion-descriptive language: Receptive and productive vocabulary norms for ages 18 months to 6 years. Developmental Psychology, 21(5), 901-908.

Rutter, M. (1985). Infantile autism and other pervasive developmental disorders. In M. Rutter & L. Hersov (Eds.), Child and adolescent psychiatry: Modern approaches (2nd ed., pp. 545-566). Oxford: Blackwell.

Schopler, E., Reichler, R. J., & Renner, B. R. (1986). The childhood autism rating scale (CARS): For diagnostic screening and classification of autism. NY: Irvington Publishers.

Seitz, J. A. (1988). Report of a psychological evaluation of an autistic child.

Unpublished manuscript.

Seitz, J. A. (1996a). Metaphor, symbolic play, and logical thought in early childhood. General, Social, and Genetic Psychology Monographs.

Seitz, J. A. (1996b). The development of metaphoric understanding: Implications for a theory of creativity. Creativity Research Journal.

Seitz, J. A., & Beilin, H. (1987). The development of comprehension of physiognomic metaphor in photographs. British Journal of Developmental Psychology, 5, 321-331.

Shah, A., & Wing, L. (1986). Cognitive mechanisms affecting social behavior in autism. In E. Schopler & G. B. Mesibov (Eds.), Social behavior in autism (pp. 153-169). NY: Plenum Press.

Shotwell, J. M., Wolf, D., & Gardner, H. (1980). Styles of achievement in early symbol use. In M. L. Foster & S. H. Brandes (Eds.), Symbol as sense: New approaches to the analysis of meaning (pp. 175-199). NY: Academic Press.

Sigman, M., Mundy, P., Sherman, T., & Ungerer, J. (1986). Social interactions of autistic, mentally retarded and normal children and their caregivers. Journal of Child Psychology and Psychiatry, 27(5), 647-656.

Sigman, M., & Ungerer, J. (1984). Attachment behaviors in autistic children. Journal of Autism and Developmental Disorders, 14(3), 231-244.

Sigman, M., Ungerer, J. A., Mundy, P., & Sherman, T. (1987). Cognition in autistic children. In D. J. Cohen, A. M. Donnellan, & R. Paul (Eds.), Handbook of autism and pervasive developmental disorders (pp. 103-120). NY: Wiley.

Stern, D. N., Barnett, R. K., & Spieker, S. (1983). Early transmission of affect: Some research issues. In J. D. Call, F. Galenson, & R. L. Tyson (Eds.), Frontiers of infant psychiatry. NY: Basic Books.

Strayer, J. (1987). Affective and cognitive perspectives on empathy. In N. Eisenberg & J. Strayer (Eds.), Empathy and its development. Cambridge: Cambridge University Press.

Tager-Flusberg, H. (1981). On the nature of linguistic functioning in early infantile autism. Journal of Autism and Developmental Disorders, 11(1), 45-56.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Werner, H., & Kaplan, B. (1984). Symbol formation: An organismic-developmental approach to the psychology of language. Hillsdale, NJ: Erlbaum. (Original work published 1963)

Wertsch, J. V. (1985). (Ed.). Culture, communication, and cognition: Vygotskian perspectives. Cambridge: Cambridge University Press.

Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: Epidemiology and classification. Journal of Autism and Developmental Disorders, 9(1), 11-29.

Wolf, D., & Grollman, S. H. (1982). Ways of playing: Individual differences in imaginative style. Contributions to Human Development, 6, 46-63.