A Comparative Study of Communication Intervention for Nonverbal Children With Autism.

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A COMPARATIVE STUDY OF COMMUNICATION INTERVENTION FOR NONVERBAL CHILDREN WITH AUTISM

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Communication Sciences and Disorders

by

Kelly C. Higgins
B.S., University of Oklahoma, 1982
M.S., University of Southwestern Louisiana, 1987
December, 1998

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ABSTRACT

Communication intervention for 3 nonverbal children with autism was compared in an alternating treatment design. Subjects were three males, ages 4-7, 3-6, and 3-5 who met diagnostic criteria for Autism and who were considered to be nonverbal according to developmental history, parent/teacher report and behavioral observation. Alternating treatment conditions included the established treatment format that each subject was receiving in his school setting (Treatment A) and a developmentally-integrated format of intervention structured to facilitate integrated cognitive, social and communicative development (Treatment B). Each intervention was characterized according to profiles of Traditional-Behavioral or Semantic Pragmatic-Developmental intervention formats. Characteristics of adult interaction were examined to identify the interaction style and to define the intervention conditions. Measures of child behavior were examined according to: a) a behavioral hierarchy of cognitive, social and semiotic development, b) supportive measures of eye gaze behavior and play elaboration, and c) qualitative ratings of the subjects' enjoyment and interactivity during alternate treatment conditions. Results indicated that all subjects: a) evidenced more communicative behaviors, b) achieved higher levels of integrated development across cognitive, social and communicative domains; and c) exhibited more elaborated play in terms of numbers of toys, actions upon toys, sequenced play, and functional play characteristics; d) exhibited more eye gaze toward the adult; and e) were perceived to be happier and more interactive during the conditions of developmentally-integrated intervention as compared to the established treatment paradigms. Examination of the integrated profiles of functional behavioral levels indicated that one subject achieved a pattern of synergistic cognitive, social and communicative behavior during the developmentally-integrated format, as evidenced by the same
level of complexity of behavior exhibited across behavioral domains. Results were related to intervention issues for children with autism including the efficacy of Traditional-Behavioral vs. Semantic-Pragmatic intervention formats, and patterns of developmental progress for children with autism.
INTRODUCTION

Speech language pathologists and others who provide communication intervention for children with autism are faced with many practical and theoretical challenges. Leo Kanner (1943) first introduced the term "early infantile autism" over 50 years ago, but the syndrome remains enigmatic. Over the course of half a century, the theory of deficit for the syndrome of autism has evolved from psychologically-based factors such as poor parenting and psychosis, toward organic factors such as auditory processing disorders and vitamin deficiency. Currently, there is a general consensus that neurobiologic differences underlie autism; however, a unifying theory of the etiology and developmental course of autism is unresolved.

Theoretical bases for intervention for children with autism have also evolved from paradigms which were strictly behavioral toward naturalistic, functional approaches. With the impetus of social-pragmatic and developmental theory, contemporary theorists recognize cognitive, social, and communication development as synergistic, mutually-dependent processes and recognize the role of developmental precursive behaviors in the emergence of communicative competence (Schuler & Prizant, 1989, Prizant & Weatherby, 1989). As a result of the social-pragmatic and developmental revolution, a range of approaches for enhancing communication for young children with autism have evolved that have been described along a continuum ranging from "Discrete Trial, Traditional Behavioral" (DT-TB) to "Social-Pragmatic, Developmental" (SP-D) (Prizant & Weatherby, in press).

As research in autism increasingly supports a functional approach to intervention, a gap has emerged between intervention theory and intervention practice. Traditional approaches to autism intervention are rooted in operant
conditioning paradigms that do not address intervention within an integrated, developmental framework (Lovaas, 1977). Although proponents of current approaches in the literature acknowledge the need to adapt traditional intervention approaches toward naturalistic frameworks (Koegel & Koegel, 1995; Weatherby & Prizant, 1990a) the intervention paradigms proposed fail to adapt to the unique profile of cognitive, social and communicative development that is typical of children with autism, and fail to provide an intervention framework which aims to integrate the child's cognitive, social and communicative level of functioning (Koegel, O'Dell & Koegel, 1987, Weatherby & Prizant, 1989). Norris and Hoffman (1990) have proposed that many intervention paradigms do not address the developmental needs of children with severe handicaps because they structure interaction at levels of developmental competence that children with severe handicaps may not have achieved.

The unique developmental profile of children with autism intensifies the need for intervention during early development. Weatherby and Prutting (1984) demonstrated that children with autism present a profile of cognitive and social-linguistic development that is quantitatively and qualitatively different from the normal development of children at similar stages, and proposed that the unique profile of development of children with autism may preclude the development of referential speech. There is evidence that children with autism lack many of the skills and behaviors that are considered to be developmental precursors of language, evidencing a lack of joint attention skills, eye gaze, and turn taking that are evident in typically developing children at early ages (Paul, 1987; Sigmund, Ungerer, Mundy & Sherman, 1987). It is estimated that 50% of children with autism never develop functional language skills, and the likelihood that children with autism will not achieve functional speech is increased if language has not
developed by 5 years of age (Frankel, Leary & Kilman, 1987; Sigmund, Ungerer, Mundy & Sherman, 1987). These factors magnify the need for developmentally-appropriate intervention for nonverbal children with autism to provide a framework for the integrated cognitive, social and communicative development that is the path of typical development.

Interventionists who provide services to young children with autism are challenged to provide appropriate and effective intervention for children with autism in spite of the lack of resolution in autism theory and the theoretical diversity of intervention practice. With the expansion of federal mandates to provide early education to handicapped children, there is an increasing demand nationwide for intervention for young children with autism. This increasing demand for early intervention has emphasized the need for intervention paradigms that address the developmental needs of the child. There is a need for research regarding the most effective intervention practice for young children with autism which coordinates social-pragmatic and developmental theory. The goal of this integrated approach is to provide a framework for intervention that can support optimum developmental growth simultaneously across cognitive, social and communication domains.

The purpose of this study was to compare cognitive, social and communicative behaviors of nonverbal children with autism that occur during different intervention paradigms. Three subjects receiving services in school settings utilizing intervention formats consistent with the DT-TB/SP-D continuum participated in an alternate treatment study utilizing a developmentally-integrated intervention technique in an alternating treatment paradigm. The developmentally-integrated format provided two critical elements necessary for appropriate intervention for children with autism: first, by adapting to the developmental level

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of the individual child, and second, by providing a framework of intervention structured to facilitate integrated cognitive, social and communicative development. The developmentally-integrated format focused on dyadic interaction and joint action routines as a basis for the development of precursive skills to language development. Behaviors of both the interventionists and the subjects during dyadic interaction were analyzed. Characteristics of adult interaction were described according to categories of verbal behavior. The cognitive, social and communicative behaviors of the child were characterized according to a developmentally-based behavioral hierarchy within each intervention format. The developmentally-based interaction technique on which this model is based uniquely fills the gap between current views in intervention theory and intervention paradigms. To understand the current view, the evolution in theory of deficit in autism, current theoretical bases for intervention, a review of prevalent intervention paradigms in the literature, and failures of current approaches for communication intervention will be explored.

The Evolution of Theory of Deficit

Over the past 30 years debate has raged over the primary deficit underlying the syndrome of autism. Kanner’s first description based developmental deficits on disordered psychological development (Kanner, 1943). Since that time theories have evolved from a focus on psychological development toward cognitive development, and more currently, toward social development. After decades of research, theories of singular areas of deficit have not been able to account for the full spectrum of autistic behaviors. The theoretical tide is turning toward recognition of the complexity of interactive systems, as research is illuminating the mutual influence and interdependence of cognitive, social and communicative development. The most prominent deficits specific to children with autism are
being seen to center in areas of higher-level processing, in which integration across
domains is involved (Frith & Baron-Cohen, 1987; Green, Fein, Joy & Waterhouse,
1995; Sigman, Ungerer, Mundy & Sherman, 1987). To illuminate the
perspectives from which the deficits in autism have been approached, the study of
cognitive, social, communicative, and integrative deficits will be reviewed.

**Cognitive Deficits**

The areas of cognitive focus in autism are numerous. Issues in cognitive
processing in autism have addressed discrete cognitive processes, as well as
higher-level integrative cognitive processing. The cognitive functioning of children
with autism has been examined according to the acquisition of conceptual
milestones as well as through play studies. These areas of study, as well as issues
which reveal the relationship between cognitive and social development, will be
reviewed.

**Lower Level vs. Integrative Cognitive Processes**

Research on cognition in individuals with autism began largely with studies
of discrete processes of perception, learning, and memory (Sigman, Ungerer,
Mundy & Sherman, 1987). Frith and Baron-Cohen (1987) concluded from their
review of studies of perception in autistic children that lower-level perceptual
processes are intact in autistic children; instead, a more integrative central
cognitive deficit is implicated. Sigman and colleagues also concluded that lower
level cognitive processes relative to discrimination learning and memory are not
dysfunctional in autism, as has been demonstrated under experimental conditions
that use no verbal cues, utilize three-dimensional stimuli and tangible rewards
(Prior, 1979; Prior & Chen, 1975). From their review of cognitive studies, these
authors concluded the most defining deficits specific to the syndrome of autism are
those which involve transforming information into symbolic representations. The
development of symbolic representation has been proposed to emerge from the integration of cognitive and social learning, as a function of social interaction.

**Integrative Deficits in Information Processing**

In their review of the literature, Lincoln, Allen and Kilman (1995) adapted an information processing model which illustrates how deficient integrative processing results in deficits in higher-order cognitive abilities. Within this model, cognition is divided into three interdependent functional systems that are not localized in the brain, but rather involve the interaction of brain structures in concert (Luria, 1966). In this model, Block I is proposed to include the functions of arousal and attention. Block II involves functions such as coding, memory, and sequential and simultaneous processes. Block III includes higher-order executive functions such as representational capacity, inferential ability, verbal reasoning, hypothesis generation and context recognition. Impairment in children with autism in processes associated with Blocks I and II have been proposed in the literature, such as disorders of sensory modulation, attention and sequential processing (Courchesne, Townsend, Akshoomoff, Yeung-Courchesne, Press, Murakemi, Lincoln, Jams, Saitoh, Haas & Schreibman, 1993; Dawson & Lewy, 1989; Ornitz 1974). Lincoln et al. suggest that these deficits in attention, coupled with sequential processing deficits, lead to a lack of integration between the three cognitive systems. The cognitive deficits in higher level Block III abilities can be seen in part as a result of poor integration between the three systems. They further conclude that the subsequent developmental consequences due to that lack of integration may greatly impede developmental processes necessary for normal intellectual functioning.
Conceptual Knowledge vs. Integrative Development

The conceptual knowledge and skills of individuals with autism have also been examined. From a Piagetian framework, the literature evidences the achievement of lower-level conceptual knowledge and skills related to object knowledge in children with autism, with deficits emerging in higher-level cognitive processes that are associated with social knowledge. Children with autism have been shown to achieve adequate knowledge of object permanence and object use, considered by Piaget (1952) to underlie the development of social relationships and metarepresentation (Curcio, 1978; Sigman & Ungerer, 1981). However, children with autism fail to demonstrate typical social-cognitive and metarepresentational abilities (Sigman, Ungerer, Mundy & Sherman, 1987).

Play Studies and Integrative Deficits

The interaction of social factors on cognitive developmental deficits has also been demonstrated in play studies of children with autism. The play of children with autism has been shown to be qualitatively and quantitatively different from age-matched as well as mental age and language age-matched children. In studies by Sigman and Ungerer (Sigman & Ungerer, 1984; Ungerer & Sigman, 1981), children with autism showed a paucity of symbolic and functional play, which dominated the play of MA-matched mentally retarded and normal children. The autistic children did not exhibit functional sequences of three or more related acts during play with objects, which were typical of the comparison populations. Sigman et al. argue that children with autism acquire the necessary knowledge of object use and object permanence simply through manipulation of objects, while the acquisition of pretend play and functional play requires the integration of a critical social component, derived by watching and learning from others.
Standardized intellectual assessment of children with autism is complicated by factors of motivation, attention and conceptualization that question validity and reliability (Lincoln, Allen, & Kilman, 1995). However, a general profile of functioning on the Wechsler Intelligence Scale for Children has emerged in the literature that supports stronger object-based perceptual skills, and poorer skills involving knowledge that is socially acquired. Typically, children with autism will demonstrate a better Performance IQ than Verbal IQ, characterized by relatively good performance on object assembly, block design, and digit span subtests. However, children with autism perform relatively poorly on the subtests of comprehension, similarities, and vocabulary, involving the integration of socially acquired language based knowledge.

Although arguments can be made for a general profile of strengths and weaknesses in the syndrome, there is great heterogeneity of cognitive ability among individuals with autism. Even in higher intellectually functioning individuals with autism, however, deficits which reflect poor metarepresentational ability, pragmatic communication and social knowledge are evident (Green, Fein, Joy & Waterhouse, 1995). Green and colleagues argue that many of the processes presumed to be purely cognitive are part of a larger dynamic system, indicating broader involvement across social and communication domains as well.

**Social Deficits**

The social behavioral differences of children with autism are well known, and social dysfunction has remained a definitive element in diagnostic criteria (Volkmar, Carter, Grossman & Klin, 1998). Deficits in maintaining joint visual attention and sharing emotional experience, as well as lack of emotional aspects of affect and empathy are hallmarks of the syndrome. Even the highest intellectually-functioning individuals exhibit deficits in social knowledge. They typically exhibit
only rudimentary social relationships (Kanner, 1943; Volkmar, 1987), and if they have developed functional speech, exhibit distinct deficits in social/pragmatic language usage (Paul, 1987).

**Socio-Cognitive Integration**

Many of the conclusions derived from cognitive studies implicate the role of dysfunctional social development in autism. Areas of relative cognitive strength in visuospatial and sensorimotor abilities represent what can be considered to be the least socially-dependent aspects of cognition. Many of the most prominent deficits in autism related to play, social cognition, and language are those that develop in a social context.

Mundy et al. (1986) and Sigman et al. (1986) concluded from their studies of social interactions of children with autism that they had the most difficulty when they were required to integrate cognition with social activity, during events that required triadic attention between self, another, and an object or event (Mundy, Sigman, Ungerer & Sherman, 1986; Sigman, Mundy, Sherman & Ungerer, 1986). Deficits in joint attention, in which the child shares with another person the experience of a third object or event, are among the most discernible and persistent characteristics in young children with autism.

**Early Social Deficits**

In a summary of their research, Sigman, Yirmiya and Capps (1995) highlighted the differences evident in young children with autism, stating "the area in which they were most startling deviant was any form of social responsiveness that involves the beginnings of social knowledge" (pg. 159). Whereas normal infants evidence social orientation from an early age, Sigman et al. concluded that children with autism fail to learn from the faces of others, and do not exhibit early social referencing and joint attention skills that typically-developing infants
demonstrate within the first year. A large body of literature documents differences in the ability of children with autism to recognize human features and behavior and to process affective stimuli (Volkmar, 1987). Sigman, Yirmiya and Capps (1995) closely link the development of social and emotional affect in early normal development. The young normal infant begins in the second half-year of life to look at others for information, and to share emotional experiences (Sigman, Yirmiya & Capps, 1995). Whereas normal infants have been shown to interrupt activity and stare at an individual who shows strong negative emotions of fear or distress, young autistic children may not even glance at individuals showing distress or fear, and if they do, they do not seem very interested (Sigman et al., 1991). Research has illuminated deficiencies in conceptualizing and processing affect (Fein, Lucci, Braverman, & Waterhouse, 1992; Hobson, 1986a, 1986b; Hobson & Lee, 1989). Children with autism have been seen to rely on superficial aspects of appearances (i.e., hair color or clothing) rather than facial characteristics when classifying or describing pictures of people, and have difficulty recognizing typical age or sex-appropriate behavior and contexts (Hobson, 1987). These findings suggest a lack of awareness of the social environment and failure to use or comprehend socially salient stimuli.

Many parents of children with autism have reported that social-behavioral differences were present in their children from infancy. In a relatively large study of infants suspected to have autism, Gillberg et al. (1990) longitudinally studied twenty-eight children ranging in age from 8-35 months with a preliminary diagnosis of autistic disorder. These children were followed up after a period of time ranging from several months to several years, and a diagnosis of autistic disorder was confirmed in 75% of the cases. The data from Gillberg and colleagues revealed that the characteristics that were most strongly associated with
the children who were later diagnosed with autism included abnormalities of play, autistic aloneness, and peculiarities of gaze and hearing. The authors concluded that it was aspects of social development that were the most abnormal in infants who were later confirmed with a diagnosis of autism.

Children with autism are reported to lack many of the basic early skills that evolve from early experiences in parent-child dyadic interaction and from which prelinguistic communication skills are learned. Bruner (1975) emphasized the role of dyadic interaction for subsequent linguistic development, referring to language as a specialized and conventionalized extension of cooperative action. During early parent-child social games, typical infants exhibit selective attention to social stimuli, demonstrate temporal patterns of gazing and vocalizing, and learn to distinguish facial expression and affect. Children with autism have been noted to exhibit little ability for early reciprocal social games such as "peek-a-boo" and "pat-a-cake" (Klin, 1992).

**Dyadic Play Studies**

A study by Sigman, Mundy, Sherman and Ungerer (1986) provides insights into the social interactions of children with autism with caregivers during play. In this study, 18 autistic children between the ages of 34 and 75 months of age were compared with 18 mentally retarded (both chronological and mental age matched) and 18 normal children (mental age matched). Social behaviors were videotaped during a 12-minute caregiver-child play situation involving 5 different play situations: free play, play with symbolic toys (doll, bottle and bed), play with a puzzle, a social game (such as pat-a-cake), and putting away toys. Each child's play was rated on communication behaviors (social interaction, indicating and requesting), social responsiveness (in terms of compliance, non-compliance, or rejection of caregiver commands or suggestions) and social interactions (duration
of seven behaviors including child looks at caregiver, caregiver and child look at each other, child smiles, child avoids eye contact, child and caregiver in physical contact, child vocalizes, child frets, child walks away from the caregiver and child engages in the task). The authors reported that the most striking characteristic of the social behavior of autistic children was their infrequent sharing of attention with their caregivers, and the infrequency of indicating gestures. These behaviors were in contrast to the communicative acts of the developmentally matched retarded and normal children. The autistic children displayed a much lower frequency of attention sharing behaviors, such as pointing to or showing objects to their caregivers. Relative to social responsiveness, the autistic children gave many fewer compliant responses to maternal suggestions than the children in the two other groups. The extent to which the autistic children complied with suggestions was felt to correspond with their receptive language capacities. The autistic children and their parents were less engaged in mutual eye contact than the other groups. Further, the autistic children were more avoidant in structured play situations than the comparison populations, but were not more avoidant during the unstructured free play situation and during episodes of putting the toys away.

Not only does this study support findings of deficits in joint attention/sharing behaviors, mutual eye gaze and social avoidance, it also highlights key elements of dyadic interaction that are significant for intervention. Parent behaviors were found to have a significant impact on the involvement and responsiveness of the autistic children. Specifically, the involvement of the children was shown to be at least partly a function of parental efforts, such as providing scaffolding and maintaining some form of physical contact.

Sigman et al. also concluded that autistic individuals present varying cognitive and emotional requirements for social interaction based on their "level of
maturity" (page 654), highlighting the appropriateness of examining the situations presented to children with autism not only in terms of their cognitive demand but also in terms of the developmental level of the child.

**Social Development as Primary Deficit**

Many current theorists view the spectrum of behavioral and cognitive strengths and weaknesses as rooted in social impairment. Shah and Wing (1987), in a review of studies of social abilities in autism, suggested that autistic persons cannot normally derive meaning from social experience, and emphasized that it is the social impairment that is the hallmark of this pervasive disorder. Hobson (1993) argued that it is the deficient capacity for and experience of "personal relatedness" that is the primary feature of the disorder of autism.

A prominent theory rooting the deficits of autism in social cognition is "theory of mind" (Baron-Cohen, Leslie & Frith, 1986), which refers to the ability of individuals to attribute thoughts and feelings to oneself or others. Baron-Cohen (1996) has coined the term "mindblindness" to represent the lack of this basic ability, which he believes to be biologically endowed in typically developing children. According to the theory of mind hypothesis, all the social and communicative deficiencies associated with the spectrum of autism are rooted in mindblindness. Baron-Cohen has proposed that mindblindness stems from deficits in attending to social stimuli that are apparent from the time of birth, and results in the failure to develop second-order representation. Deficits in metarepresentational ability result in a lack of ability to make sense of the world in social terms, leading to an inability to predict the actions of others, understand belief, desire and intention. Consequently, commonly reported behaviors such as "objectifying" other people, that is utilizing people as tools or means for acquiring objects or activities, are believed to be symptoms of this deficit. The lack of pretend play is
also a symptom, based on the mentarepresentational requirement of differentiating one's own thoughts as imaginary versus real (Leslie, 1987). Although Baron-Cohen's theory of mindblindness has stimulated many paradigms investigating the perspectives of children with autism, his theory is not universally accepted.

One major criticism is its failure to account for deficits in social orientation that are already evident in early infancy, prior to the age at which metarepresentational skills are expected to develop in typical children. However, others have proposed theories for these early social deficits that are consistent with subsequent theory of mind deficits. Evolutionary psychology theorists Cosmides and Tooby (1992) have proposed the existence of discrete brain modules for different aspects of social interchange, including one for orienting and recognizing the faces of others, which may be absent in autism. Others have maintained that "prewired" propensities for social relationships are deficient at birth, resulting in a lack of motivation or desire to be with others (Mayes, Cohen & Klin, 1992).

It can be seen that dysfunctional social development is evidenced by far-reaching behavioral differences in children with autism, and the spectrum of strengths and weaknesses supports the theoretical position that social dysfunction significantly impacts cognitive and language development as well. Although the primacy of social developmental dysfunction in the course of autism is a point of debate, there is ample evidence to believe that the ability to learn from human interaction is impaired in autism from early infancy.

The attempt to illuminate a primary deficit in autism within separate domains of development can be seen to highlight the interplay of cognition, affect and the social context. Green, Fein, Joy and Waterhouse (1995) illustrate an integrated perspective of deficit in terms of developmental significance:
"Cognition and affect should be understood as developing interdependently, both at the neural and the psychological level, as symptoms that are inextricably woven within our development as fundamentally social beings. Perhaps the appropriate question is not whether socioaffective mechanisms filter cognitive abilities or whether cognition determines socioaffective functioning, but at what point in their dynamic interdevelopment the deficit arises, and how the mutual disruption proceeds as the child develops." (p. 25)

Communication Deficits

In light of the significant observable communication deficits in children with autism, it is not surprising that language deficiencies have been proposed as the primary cause of autistic withdrawal (Rutter, Bartak, & Newman, 1971). Yet, it is perhaps in the development of communication that the integration of cognitive and social development can most easily be seen. Schopler and Mesibov illustrate the dynamics of this interdependent relationship, describing social development and cognitive development as "the two areas inextricably bound to each other through communication and language, cognitive functions that are social by definition" (pg. 4).

Perhaps the most distinctive feature of autistic disorder is that of language impairment. It is estimated that about 50% of children with autism remain mute their entire lives (DeMyer et al., 1974; Frankel, Leary & Kilman, 1987). It is estimated that only 25% of autistic children develop functional language skills by adolescence, and of these, social/pragmatic skills remain impaired (Paul, 1987).

Language as a Cognitive-Based Deficit

Language deficits are commonly attributed to cognitive weaknesses, such as a lack of conceptual development or abstract symbolization. Frith (1989) conceptualized the language deficit in childhood autism as "a consequence of subtle but far-reaching cognitive dysfunctions" (p. 123). Prizant (1982a) has suggested that the echolalic language of children with autism is a product of a
"gestalt" cognitive processing style, constraining language use to the production of holistic chunks of unanalyzed language forms with little appreciation of their internal structure. Mykelbust (1995) suggested that the lack of language development in autism is related to an inability to acquire inner language, the processes involved in associating a unit of experience with associated verbal symbols.

**Language as a Socially-Based Deficit**

A different conclusion was reached by Tager-Flusberg (1989) who suggested that it is the functional use of acquired conceptual knowledge rather than the lack of conceptual knowledge that represents the language impairment in autism. Of the children with autism who have acquired some level of language skill, it is in the areas of socio-linguistic competence and usage that they are most deficient. Aspects of pragmatic language use are by far the most impaired aspect of language in autism, and are reported to be strong differentiators between autistic and other groups of children (Green, Fein, Joy & Waterhouse, 1995). Paul (1987) reported that they are unable to use language appropriately for sharing or requesting information. Conversational skills, including initiation of topics, turn taking, and use of referents are generally absent or limited in autistic children (Green, Fein, Joy & Waterhouse, 1995).

**Structure vs. Meaning in Language Development**

The course of language development in autism reflects areas of language delay and language deviance. Children with autism have been shown to acquire the phonemes of speech in typical order but at later ages (Bartak, Rutter & Cox, 1975). They also have been shown to display normal acquisition of grammatical morphology, but at later ages and with less variety of morpheme usage. Verbal autistic children have been found to exhibit fairly well-developed syntactic
structures in spontaneous language (Paul, 1987; Waterhouse & Fein, 1982). Despite these typical aspects of development, children with autism have been shown to fail to use meaning to guide comprehension of language, inappropriately relying on the superficial interpretation of word order without regard for context or semantic relations (Paul, Fisher & Cohen, 1988). They tend to fail to use meaning to guide their expression of acquired morphemes, grammatical structure or vocabulary (Green, Fein, Joy & Waterhouse, 1995). Echolalia is the most frequently cited characteristic of autistic children who acquire speech (Prizant, 1983). Echolalia, characteristic of many children with autism who are verbal, frequently is perceived by the listener to lack any meaningful association with the context in which it was spoken.

**Nonverbal Communication and Communicative Intent**

The study of nonverbal gestural communication in children with autism has indicated the presence of broader communication deficits that are not restricted to language impairment. Mundy, Sigman, Ungerer and Sherman (1986) concluded that the lack of indicating skills is a significant feature of social deficit exhibited by young autistic children. Children with autism have been observed to imitate gesture, but fail to use it meaningfully for communication (Myklebust, 1995). In comparisons of autistic and aphasic children, Wing (1971) found children with autism showed a generalized lack of use of gesture, as well as a lack of comprehension and concept development for gestures. Children with autism have been known to exhibit protoimperative gesturing, involving the use of gaze and or gestures to gain assistance in obtaining an object (such as a box of cookies on a shelf), but lack protodeclarative gesturing for calling another person's attention to an event or object without an instrumental purpose (Volkmar et al., 1998). These
observations highlight the broad cognitive and social factors that are bound to language use and are intrinsic to human communication.

Damasio and Maurer (1978) concluded:

"These are defects that do not derive from impairment of primary linguistic processing...Rather, these defects seem to derive from lack of initiative to communicate and from a lack of 'orientation' toward stimuli and are suggestive of an underlying impairment...more generally, in overall cognitive organization." (p. 779)

**Integrative Deficits**

The lack of integration and overall organization that is being evidenced in the literature on autism has been proposed to reflect generalized inability to gain coherence and meaning from experience (Frith, 1989; Myklebust, 1995). Some theorists have suggested that the condition of autism appears to impair the typical integrative capacities that allow children to organize multiple stimuli into meaningful, coherent experience. Frith (1989) illustrates the effects of an organizational system that fails to integrate experience meaningfully in a process of coherence:

"In the normal cognitive system there is a built-in propensity for coherence over as wide a range of stimuli as possible...it is this capacity for coherence that is diminished in autistic children. As a result, their information-processing systems, like their very beings, are characterized by detachment." (p. 100)

Frith further comments "If the ability to achieve central coherence or meaning is extremely limited in autism, then detachment and fragmentation into meaningless activities are inevitable consequences" (p. 117).

Damasio and Damasio (1989) illustrate a neurological process of active, flexible integration inherent in the process of acquiring meaning:
"Meaning is arrived at by widespread multiregional activation of fragmentary records pertinent to a stimulus, wherever such records may be stored, in a distributed manner, within a large array of sensory and motor structures. A display of the meaning of a stimulus does not exist in a permanent fashion; it is recreated for each and every instantiation." (p. 63)

They further concluded that there is "an integrative operation capable of bringing together multiple brain activity fragments within a sensory modality and across separate modalities. Without such multiple modality integration, it would not be possible to generate coherent experience" (p. 65).

The lack of multiple modality integration at a neurological level in children with autism is indicated by studies showing that autistic children function more at the level of intraneurosensory processing that at the level of interneurosensory processing as normal children do (Frith and Hermelin, 1969; Killen, 1975; Myklebust & Morinaga 1990). Myklebust (1995) has suggested that the condition of autism seems to alter cognitive functioning so that information is perceived from only one sensory avenue at a time and concludes that parallel processing may not be possible. Difficulties coordinating input from multiple sensory channels has been reported by adults with autism.

The neurological basis for acquiring meaning or "coherence," whether in autism or in general, is a controversial issue. Although the neurological processes involved in the acquisition of meaning or coherence are not observable to us, much can be inferred by the functional behavior of children with autism. As research illuminates the mutual influences of cognitive, social and communicative development in the deficits of autism, theorists are moving away from issues of primary deficit toward a conceptualization of deficit within an integrative framework. This evolution in theory is beginning to evolve in theoretical bases of intervention for children with autism as well.
The Evolution of Theoretical Bases for Intervention

Just as theory of deficit in autism has evolved over time toward an emphasis on the integrative deficits in development, the theoretical bases for intervention in autism can also be seen to have evolved toward an emphasis on integrative developmental approaches. One of the most conspicuous deficits in autism is communication development. It is for deficits in communication that most children with autism are introduced to intervention.

The Continuum of Approaches for Communication Intervention

Prizant and Weatherby (in press) have described a continuum of approaches for communication enhancement for young children with autism/pervasive developmental disorders along which the variety of current intervention approaches can be placed. At one end of the continuum, Discrete Trial-Traditional Behavioral (DT-TB) approaches emphasize behavioral teaching practices and rely primarily on repetitive practice of isolated skills using a discrete trial format. At the other end of the continuum, Social-Pragmatic Developmental (SP-D) approaches emphasize naturally occurring activities and reciprocal interaction with the goal of increasing social-communicative competence. Prizant and Weatherby delineate the distinctive characteristics of these two approaches, which are differentiated in theoretical basis, goals, and format.

DT-TB approaches are characterized by the following elements:

1. The teaching structure is highly prescribed relative to the stimuli presented, the responses targeted, and the consequences provided.
2. The focus is on teaching discrete and objectively defined behaviors.
3. The adult determines the activity and focus of attention, often following a prescribed sequenced curriculum.
4. Criteria for correctness of response are predetermined.
5. The emphasis is on adult control and child compliance, followed by lessening of adult control.

6. Curricula may not be theoretically based on principals of child language and communication development.

7. There is minimal contextual support and teaching is largely directed through oral language.

SP-D approaches emphasize initiation and spontaneity, following the child's attentional focus, and building on a child's current communicative repertoire through natural activities and events that support the development of children's social communication abilities. Prizant and Weatherby emphasize the following distinctive characteristics of SP-D approaches:

1. The focus is on teaching spontaneous social communication within a more flexible structure, and more varied and motivating activities.

2. Emphasis is on building multi-modal communicative repertoires (speech, gestures, AAC) to enable children to have a range of strategies to express intentions.

3. Interactions are characterized by shared control, turn-taking, and reciprocity when possible.

4. Learning contexts involve meaningful activities or events.

5. Unconventional means to communicate are acknowledged; the relevance of the child's response is considered relative to the ongoing context.

6. Use of a variety of social groupings is desirable.

7. Information about the sequences and processes of child development is used to frame the sequence of goals and to measure progress in a broader developmental context.
8. Contextual supports (visual, gestural) are seen as essential to help children "make sense" of activities and interactions.

9. There is a focus on helping children acquire socially acceptable means for social control (i.e. protest, make choices, etc.).

10. Emotional expression and affect sharing are seen as central to the interactive and learning process.

During the 1960's and 70's, dominant intervention paradigms for children with autism followed traditional discrete trial teaching formats (Lovaas, 1977; Prizant & Weatherby, in press). As developmental theory and holistic language theory gained prominence, more contemporary behavioral approaches have adopted aspects of both ends of the intervention continuum. The most current paradigms introduced in the literature are considered to be based on pragmatic, developmental theory. This section discusses examples of current intervention formats in the literature.

The Traditional Operant Approach

Traditional approaches to speech/language intervention for children with autism are rooted in operant learning techniques that involve shaping speech to criterion using imitation, verbal prompts, and reinforcement of approximations. Some of the earliest studies presenting language acquisition procedures for an autistic child utilized imitation of nonvocal movements followed by or chained together with vocal responses (Baer, Peterson & Sherman, 1967; Hewett, 1965).

Perhaps the most widely known and used traditional approach to language acquisition is that of Lovaas (1977). In an outline of the traditional behavioral approach to language acquisition, Lovaas and colleagues (Lovaas, 1977; Lovaas, Shreiberman & Koegel, 1974) describe the techniques for establishing control over autistic children's verbal responses and development of basic language by
extinguishing deviant behaviors and establishing attending behaviors, nonverbal imitation, and verbal responses to stimuli through operant principles. By this method, the acquisition of receptive language is demonstrated by a nonverbal response to a verbal command, whereas the acquisition of expressive language is demonstrated by a verbal response to either a verbal or nonverbal stimulus. For mute children, Lovaas recommends a process of shaping vocalizations through reinforcement and vocal prompts. Initially, the interventionist reinforces all vocalizations, then reinforces vocalizations which follow a verbal prompt. Gradually, responses are shaped by reinforcing closer and closer approximations to the therapist's discriminative stimulus until criterion is reached. The child is then taught verbal labels in response to the presentation of objects and a verbal prompt, such as "What is it?" Over time, verbal prompts are faded. Following this format, more complex phrases may be trained by requiring a longer response (such as "It is cookie") for reinforcement.

One study which is often cited as evidence of the effectiveness of this format is a follow-up study of 19 children who received at least two years of "intensive behavioral intervention" reportedly following the Lovaas program (McEachin, Smith, & Lovaas, 1993). The authors concluded that nine of the children had "recovered" from autism based on follow-up measures that found them to be indistinguishable from peers. However, this study has been criticized in aspects of methodology, interpretation of results, and lack of specificity regarding the intervention and child characteristics prior to treatment (Prizant & Weatherby, in press). Another well-publicized account from a parent (Maurice, 1993) who claimed two siblings "recovered from autism" using a program based on Lovaas, also included additional components to the children's program of intervention that were more social-pragmatically oriented (Prizant & Weatherby, in press).
The traditional operant approach to developing autistic children's language skills has been reported as increasing the frequency of response in children with autism, although most studies are conducted utilizing children who already exhibit some level of verbal ability, a factor which has been shown in the literature to be a critical precursor in the subsequent development of speech and language. Nonverbal subjects have been the least successful to respond to this approach (Charlop & Haymes, 1994). Although most investigators have reported some level of success with this format, investigators have also seen limitations in the ability of children to generalize speech from training situations to the natural environment (Fay & Schuler, 1980; Prizant, 1982), the limitation of verbal skills to rote responses and answers (Charlop & Milstein, 1989), and the lack of spontaneity, in that children speak only in response to others speaking to them (Charlop, Schreibman, & Tryon, 1983). Lovaas (1977) himself stated "the training regime...its use of 'unnatural' reinforcers, and the like may have been responsible for producing the very situation-specific, restricted verbal output which we observed in many of our children" (p. 170).

**Modified Traditional Approaches**

As more professionals conceded the limitations in spontaneity and generalizability in the traditional approach, functional assessment also came into the forefront of behavioral therapy for interpreting the variables that influenced problematic behavior. These currents in behavioral psychology converged with the upsurge in developmental pragmatics, in which nonobservable factors such as communicative intent, and internal motivation became points of focus for communication intervention. From this convergence of factors, behavioral approaches began to reflect modifications to broaden the milieu of the traditional
paradigm to promote more natural transactions and to increase initiations by the child.

**Observational learning paradigm.** In an effort to improve the generalizability of training, some researchers have utilized an observational learning paradigm. One such paradigm including autistic children was presented by Varni, Lovaas, Koegel and Everett (1979). Once a subject was oriented toward a peer model, the teacher instructed the model to engage in a particular behavioral sequence, such as manipulating an object named by the adult. The model received social approval and food for performing the task. The data from Varni and colleagues demonstrated that modeling was not successful with the "low-functioning" autistic children in this study—they failed to acquire most of the target responses. These investigators attributed the lack of the subjects' acquisition of targeted language to the autistic children's inability to learn from their natural environment. Given our knowledge of children with autism, particularly their limitations in social orientation, socio-cognitive learning, and difficulty coordinating attention to people and objects in their environment, this conclusion is not surprising.

**Time delay paradigm.** Another approach which adapts the traditional behavioral paradigm in an effort to increase spontaneity utilizes time delay. Using this procedure, a delay is inserted between the presentation of the target stimulus, such as an object, and the presentation of the prompted response. One study utilizing these methods to facilitate spontaneous speech was conducted by Matson, Sevin, Box, Francis and Sevin (1993). In this study, Matson and colleagues utilized visual cue fading and graduated time-delay to increase self-initiated language in three 4-5 year old children diagnosed with autism and mental retardation. Results of the study indicated the subjects could successfully produce
the target phrases "play with me," "hello," "excuse me," and "help me," in response to specific nonverbal stimuli (such as presentation of a game to elicit "play with me;" presentation of an adult as an obstacle to a wanted item to elicit "excuse me"). However, it should be noted that these subjects did exhibit some limited language skills prior to intervention. Even in light of the limited success of this paradigm, the efficacy of this paradigm in resolving the lack of spontaneity of children's language usage operant paradigms is questionable. Although these children were able to utilize requested verbal responses to trained situations, they still can be seen as trained responses in trained situations rather than self-initiated communication. Given these results, this paradigm offers little for providing the child with a foundation for integrated social, cognitive and communicative development.

**Incidental learning paradigm.** Dawson and Adams (1984) have introduced an incidental learning framework for intervention for "low imitating" children with autism in an effort to establish developmental precursors to cognitive, social and communicative development. These authors introduced a technique in which adults provided a simple level of social/cognitive stimulation and interaction by directly imitating the children as they manipulated toys. Although these authors reported increased ability to manipulate toys and increased gaze behavior in their subjects, the qualitative value of these changes toward synergistic cognitive, social and communication development is negligible. These authors did not find significant changes relative to communicative intent or communication for social purposes. As such, these results provide little basis to support the validity and efficacy of this intervention format.

**Operant Parent Training Paradigm.** Harris, Wolchik and Weitz (1981) trained parents in operant procedures for teaching speech to 11 nonverbal
preschool children with autism. All subjects participated in two pre-training assessments over a period of time ranging from 3 to 9 weeks. Pre-training assessment consisted of obtaining a developmental history, administering a developmental profile, and a three-part behavioral assessment. This behavioral assessment consisted of a 20-minute free-play period, a structured teaching task, and the administration of a language skills hierarchy to determine the child's current language abilities. This hierarchy (see Appendix A) consisted of 21 steps ranging from good sitting and eye contact to complex grammatical forms, and can be seen in Appendix E. Only the hierarchy data were reported in this study. The hierarchy was scored discretely and sequentially, and after three failed items, the hierarchy was discontinued. An item was considered passed if the child emitted the target behavior following parent command. Parents provided verbal praise for "good work." No other reinforcement was provided.

Following pre-assessment, each group met once a week for 10 weeks for training in behavior modification skills and teaching speech. In addition to the weekly group meetings, a home visit was conducted once every two weeks during which the staff modeled procedures, observed the parents, gave suggestions, and answered questions.

The hierarchy data for each child were analyzed in two ways: the highest step passed and the total number of passes earned. Results were compared utilizing analysis of variance for the total number of items passed and the highest item passed during pre-assessment and post-assessment. Analysis revealed statistically significant differences for group by time measures for both the highest step passed and total number of passes, with no significant differences between groups. The groups were subdivided between children who were judged to have acquired at least minimal verbal imitative skills and those who had not. A comparison of
verbal ability by time indicated that the verbal children earned significantly higher scores than the nonverbal. There were no significant changes in the nonverbal group over time. This finding is consistent with the conclusions of Charlop and Haymes (1994) regarding the poor response of nonverbal children to traditional intervention formats, and the conclusions of Howlin (1981), who reviewed studies of operant language therapy with autistic children and concluded that the effects of therapy vary according to the linguistic competence of the children involved.

While the Harris, Wolchik and Weitz (1981) study achieved statistical significance, the clinical significance of the findings is far less reliable. In their discussion, the authors indicated that all children made some progress as a result of training. However, descriptive analysis of individual results reveals minimal or no progress in the complexity of the children's behaviors along the language skills hierarchy for most subjects. Descriptive analysis of the "nonverbal" children in the study revealed that two subjects stayed at the same level, two subjects increased by only one item, and one subject decreased by one item. The most progress exhibited by a nonverbal subject was evidenced by an increase by four items on the hierarchy, including: a) good sitting, b) eye contact, c) gross motor imitation, and d) looking at objects. As such, this intervention offers little of value in an effort to address the needs of nonverbal children with autism in integrating functional and perceptual knowledge, or providing a basis for integrated cognitive, social and communicative development.

Descriptive analysis of the progress of "verbal" subjects indicates one subject actually decreased the items passed between pre- and post-assessment; one verbal subject stayed at the same level at pre- and post-assessment; and one verbal subject only increased to item 2 on the hierarchy, encompassing "good
sitting," and "eye contact." These results indicate very minimal progress for one subject only, and again these behaviors offer little as functional intervention.

Only two verbal subjects exhibited more conspicuous increases: one progressed from 0 items passed to 7 items passed at post assessment. These behaviors included the four items listed above as well as items requiring pointing to objects, verbally imitating vowels, and verbally imitating consonants. One verbal subject progressed through item 13 at post-assessment encompassing the 7 items previously mentioned as well as five "functional speech" items pertaining to nouns, verbs, adjectives, prepositions, and social questions. Although the success of these two subjects may be viewed by the authors as functional progress, the achievement of these limited skills under a structured imitative paradigm falls to the common criticism of operant formats relative to the lack of communicative intent, initiation and generalizability.

This study illustrates the shortcomings of some operant formats that have been reported as successful interventions for children with autism, but fail under descriptive analysis to provide the means for more complex cognitive, social and communicative behavior. In addition, this study illustrates how statistical analysis of a subject population with variable characteristics may lead to misperceptions relative to the success of all individuals within the group. As such, this study illuminates the value of descriptive analysis in evaluating the success and progression of children with autism, a population which evidences wide heterogeneity in developmental ability among its individuals.

**Natural language paradigm.** One of the most prominent approaches in the literature is the natural language paradigm (NLP) introduced by Koegel, O'Dell and Koegel (1987) in an effort to incorporate natural language interactions and motivational techniques into traditional operant paradigms. Koegel and colleagues...
noted that although factors such as turn-taking, sharing materials and tasks, and using familiar objects and activities were common elements of naturalistic language intervention, they have not been systematically incorporated into a treatment program for clinical intervention in language treatment for autistic children. These authors presented a study which compared two formats for improving verbal language acquisition for nonverbal autistic children. One format involved a "traditional analogue format" in which the therapist presented objects and instructions, prompts, and reinforcers (social and edible) for correct responses. In the second format, traditional techniques were manipulated to structure a "natural language paradigm." In this paradigm the clinician presented items that were selected by the child (through eye gaze, touching, pointing, etc.), and stimulus items could be varied from trial to trial according to the child's apparent interests. The clinician played with the toy while modeling a target response, then repeated the play and model procedure as a prompt. Reinforcement in the form of praise and the opportunity to play with the toy was given for all attempts to respond verbally. Subjects were two autistic children (ages 4 years 5 months and 5 years 8 months) who were reported to be completely nonverbal but made vocalizations consisting of a limited set of consonant and vowel sounds. Results revealed that both children produced more imitative utterances with the NLP than with the analogue format, but generalization to spontaneous utterances occurred only with the NLP.

Although this study evidences the advantages of adding some elements to accommodate the child's choice of objects, to provide play with the object as a reinforcer, and to reinforce the verbal attempts of the child, the success of these results is of reduced significance when viewed in terms of the definitions and contexts of language usage. "Spontaneous utterances" were defined within a
delayed imitation context, relative to a 5 utterance delay of modeling by the therapist, and were reported to be "generalized" if they were observed during a break outside the therapy room embedded in the therapy session. As such, the authors' definitions of spontaneous utterances and generalized utterances are narrowly distinguished from direct imitation or echolalia, which may reflect surface structure without true intention or meaning. This study appears to evidence advantages in evoking imitative utterances from the children when using more naturalized interactions as compared to the more traditional behaviorist paradigm. However, the "naturalization" of interactions continues to represent basic operant formats, in which the child is expected to produce targeted responses on the basis of prompts.

Laski, Charlop and Schreibman (1988) utilized the NLP designed by Koegel et al. (1987) for parent training in a comparison of four nonverbal and four echolalic autistic children. However, it should be noted that the classification of the language abilities of the children is questionable. The children classified as "nonverbal" were described as being able to imitate sounds and a few words, to exhibit some initiated speech and to have receptive vocabularies of approximately 15 words. The "echolalic" children, although described as having speech repertoires consisting primarily of highly specific, previously trained responses, were also described as having larger vocabularies and occasionally using short phrases. Only one subject was described as "functionally mute" with no receptive vocabulary. Developmental assessment of the children at onset was vaguely characterized as "deficient in academic skills and social and play behaviors." A control group of six nonhandicapped children, approximately matched for chronological and mental age were also tested at baseline and during the intervention process.
Parent training involved successive 15-minute individual parent-training sessions during which the parents participated in a discussion of the NLP procedures, observations of therapists conducting the NLP with the child, and in vivo training. Parents participated in training sessions until they were considered to be competent in conducting the NLP format along four criteria: direct reinforcement of verbal attempts, turn-taking with the stimulus material, task variation and multiple examplars, and shared control.

Laski et al. (1988) utilized a multiple baseline design across subjects. Each subject participated in two to ten baseline probes obtained during weekly 10-minute sessions. Posttreatment probes began one week after parents met NLP criterion. Videotapes from sessions were scored using a ten-second continuous partial interval scoring procedure. Three categories of behavior were observed: parent verbalizations, child verbalizations and echolalia. It should be noted that a somewhat indistinct delineation of intent was inferred for child verbalizations. "Echolalia" was defined as inappropriate repetitions, such as a child echoing the parent question "What do you want?" However, "imitations" were considered appropriate in situations such as the parent modeling "The ball is red" and the child responding "The ball is red."

Results indicated that following training, parents increased the frequency with which they required their children to speak (defined as percentage of measured intervals in which the parent presented a discriminative stimulus to which their child could respond vocally), and correspondingly, all autistic children (nonverbal and echolalic) increased the frequency of their verbalizations. These results indicate that parents provided more opportunities for their children to respond to stimuli, and that the responses of the children with autism increased.
All children increased vocalizations characterized as imitation, three increased vocalizations characterized as echolalia.

Again, this study highlights that adding some naturalistic principles effects greater responsiveness from the children. This study illustrates the premise that the interactiveness of the adult can affect the interactiveness of the child: as the parents provided more opportunities for response, the children responded more. However, the significance of the children's increase in imitative/echolalic behaviors is questionable, in light of the initial characteristics of the children. Seven of the eight children were known to exhibit imitative, even limited spontaneous language, prior to the study. As has been noted, previous verbal ability has been shown to be a crucial variable in the subsequent increase of language development for children with autism.

"Integrative" Approaches to Intervention

An integrative view of intervention requires recognition that communication development has origins in both cognition and socialization, based on the child's ability to conceptualize aspects of the world, and to conceptualize self in relation to others. Viewing communication competence as inextricably bound to cognitive and social development; therefore, the theoretical bases of intervention must be founded on an understanding of the interrelationship of emerging cognitive, social and communication skills.

An integrative developmental philosophy. Prizant and Weatherby (1989) have translated an integrative developmental philosophy of communication development into theoretical principles for enhancing communication development in children with autism. They advocate a cognitive approach that takes into account the current knowledge and conceptualizations of the individual, to provide opportunities for successful learning in a context that makes sense to the individual
involved. In structuring appropriate language intervention, these authors reinforce the need to understand and support prerequisite developmental processes to enhance communication. Based on this perspective, these authors propose that intervention should focus on strengthening the social and cognitive underpinnings of language. These authors support a model of language learning based on Sameroff's (1987) transactional model in which development is seen as a dynamic process of interplay between the child and context over time. Following the arguments of Prizant, Weatherby and colleagues, the implications for intervention with prelinguistic children with autism are clear: intervention must reinforce social and cognitive prerequisites for communication by structuring opportunities for learning at the child's level of development in a dynamic, interactive format.

Prizant and Weatherby (1989) set forth these guidelines for communication assessment and intervention for prelinguistic children with autism. These guidelines reflect current theory that views communicative competence as the outcome of synergistic development in social, cognitive and linguistic domains:

1. Intervention must be structured at an appropriate level of development, relative to a child's social, cognitive and linguistic capacities.
2. Intervention must be structured within a dynamic, interactive context; the unit of analysis of an individual's communication skills should be interactive exchanges between persons, with verbal and nonverbal communication being adjusted to an individual's level of comprehension.
3. Establishing communicative intent should be the primary focus of communication intervention.
4. Naturalistic intervention must foster the development of preverbal communication skills as necessary precursors to verbal communication.
5. Intervention must be founded on the child's natural motivation to communicate within the context of the interaction.

6. Interventionists should impute intent to unconventional behavior; because young children learn how to communicate intentionally by observing others reacting to their behavior as if it were intentionally communicative, these authors encourage clinicians to respond to inferred intent, imputing intent to the behavior of children whose communicative attempts may be unconventional.

7. Intervention should utilize a facilitative style. Prizant and Weatherby propose that interaction should be modified to afford more opportunities for student initiation and control of social interaction, preferring what they refer to as a "facilitative" as opposed to a "directive" style.

**The "communicative temptations" paradigm.** Prizant and Weatherby (1989) have applied their guidelines for intervention for children with autism in a method of communicative assessment and intervention that is designed to focus on eliciting communicative intent. Under their model, children with autism are stimulated by "communication temptations" in which an adult provides the child with opportunities to initiate communicative intention by tempting the child with motivating situations. These authors recommend procedures such as eating a favorite food but not offering any to the child, or activating and deactivating toys.

Weatherby and Prutting (1984) utilized the "communicative temptations" paradigm to compare children with autism to typically developing children. Subjects were recorded during a free play condition and a structured communication period. During the free play period, a group of toys was placed before the child for a minimum of two minutes. The structured communication condition utilized the "communicative temptations" technique. The groups were
compared according to different measures of behavior: communicative intent (gestural and vocal), tool use, imitation (gestural and vocal), play (combinatorial and symbolic), and language comprehension. Typically developing children evidenced synchronous development across the communicative and cognitive-social abilities measured. As is consistently reported for children with autism, the autistic subjects evidenced more advanced development in tool use than did the normal subjects, and exhibited more advanced combinatorial play than symbolic play behaviors. Regarding communicative functions, the children with autism exhibited a more limited repertoire of functions, and their communicative acts were considered to be primarily noninteractive in nature, such as self-stimulation or vocal play.

Although Prizant and Weatherby's theoretical guidelines for intervention are well-founded, the premise for communicative temptations as an intervention paradigm or as a motivator for communication is a precarious one, based on the contingency that autistic children are interested and able to process information in their environment, and to coordinate attention to both objects and the actions of people. The communicative temptations paradigm as presented in this situation provides an isolated format for interaction that does little to facilitate developmental progression. For example, during the structured communication condition, the interactants refrained from using language to engage the child or to talk about what was being presented. As a result, this condition was structured to remove language from a condition that was intended to facilitate naturalistic processes of communication. The free play period imposed a noninteractive format, evaluating the behaviors of the child in situations devoid of social or communicative interaction. In addition, children with autism have been known to take instrumental actions to obtain what they want. From this standpoint, the
child's communication with the adult can be seen as an instrumental act, rather than a socially motivated act of communication.

**The Failure of Existing Paradigms of Intervention**

Prominent interventionists in the area of autism have criticized traditional approaches to intervention in light of the new theoretical perspectives which focus on pragmatic and developmental theory. Schuler and Prizant (1987) have emphasized the need for a new perspective in intervention, arguing that efforts to teach functional communication skills to individuals with autism based on more traditional behavioral orientations have achieved only limited success. Traditional paradigms typically view positive steps toward the development of language as the achievement of imitative responses under adult direction, rather than allowing the child to actively organize his environment to provide the foundation for natural communication skills to emerge. The limitations of imitative responses as a reflection of intentional social communicative behavior are expressed by Bruner (1973) who stated that "The ordinary operant conditioning paradigm—choose any operant and bring it under the control of the reinforcer—is no more revealing of the growth of a skill than the rate of learning of paired associates is relevant to the learning of language" (p. 10).

Prizant and Weatherby (1989) have viewed some traditional approaches for enhancing communication as diametrically opposed to current beliefs about the nature of communication development. The processes of task analysis and teaching discrete skills can be seen to fragment the natural processes of language learning, and fail to resemble the natural routines and interactions that establish the precursive skills for language development. Traditional paradigms often focus on isolated skills, such as eye gaze or training attention skills, rather than facilitating natural processes of shared attention, a key deficit for children with autism. In
fact, Prizant and Weatherby (in press) emphasize that traditional approaches fail to address the core deficits observed in autism, including deficits in joint attention, initiating preverbal and verbal communication, symbolic play, and social/affective development.

**Developmental Considerations**

Developmentally based literature suggests the prevailing orientations for language intervention have excluded individuals functioning at prelanguage levels (Prizant & Schuler, 1987, Schuler, Prizant & Weatherby 1997). Schuler et al. emphasize that not only are many children with autism functioning at prelinguistic levels of communication development, they are also at preintentional levels of language development. They highlight that not only do children with autism need to learn more effective means to communicate, they often, and more importantly, need to understand the basic notion of communication in order to become intentional communicators. These processes are evidenced when children begin to anticipate the outcomes associated with their own behavior, and utilize behaviors to effect outcomes that are mediated by others.

**Joint attention, intentionality, and the expansion of communicative competence.** Bruner (1975) emphasizes the role of joint attention in dyadic play in the emergence of intentional communication and language learning. During repeated joint action routines, the infant first learns prelinguistically to segment and sequence the elements, and begins to insert nonstandard signals for which the adult interprets the child's intentions. Over time, with the adult scaffolding the child, the signaling becomes more intentional and conventional. Not only does early interaction involve the development of signaling but also turn-taking and role shifting. Bruner argues that in early dyadic play transactions "... play has the effect of drawing the child's attention to communication itself and to the structure of the
acts in which communication is taking place" (pg. 10). The successful interaction between the prelinguistic child and the adult in joint action routines becomes a vehicle by which communicative intentionality and conventionality is learned.

Joint action routines within dyadic interaction can be seen as a primary context for social and communicative learning. Schuler, Prizant and Weatherby (1997) emphasize that contexts of predictable routines are essential in "setting the stage" for intentional communication for prelinguistic children with autism. They suggest that facilitating anticipatory behaviors on the part of the child, which indicate they are starting to make predictions about the sequence of events and communication behaviors that are necessary to reach desired goals during events, should be the initial focus of intervention. Because communication is centered on the expectation of outcomes of one's own and of others' behavior, progress can be inferred when the child starts to anticipate particular outcomes in association with his behavior, such as hand and body movements. Schuler et al. propose that the child begins to exhibit intentional communication when the child begins to look for the effect of his or her actions, particularly when those outcomes are mediated by the actions of the communication partner.

Pragmatic approaches promote facilitating early communicative development through multiple communicative means to serve multiple communicative functions via scaffolded interactions with adults (Schuler, Prizant & Weatherby, 1997). The literature supports that acknowledging unconventional means of communication, both verbal and nonverbal, is a critical aspect of intervention for children with autism. The evidence that the development of typical verbal communication is less likely in this population supports the development and expansion of natural gesture as a goal. Schuler and colleagues suggest some of the ways to enhance communicative competence which lends
itself to joint action routines: to request social games or routines or continuation of games or routines; to expand behavioral regulation by facilitating acceptable ways to request objects and actions and to make choices among alternatives; to provide opportunities to give or transfer objects or to follow another person's focus of attention.

**Affective learning and motivation.** Through the context of joint action routines, the child can learn to communicate for social purposes and participate in shared experiences, increasing initiation, reciprocity and the mutual enjoyment of communication, and thus providing the foundation for affective learning. In typical development, infants share affective exchanges in early face-to-face interaction and in early social games, laying a foundation for the association of affect with emotion and experiencing and interpreting affect in others. Joint attention is associated with the display of positive affect (Sigman & Mundy, 1993). Joint action routines therefore can provide one of the primary naturalistic experiences for children with autism, who are known to exhibit significant limitations in emotional and affective interpretation.

Studies have shown that children and adults participating in more naturalistic formats of intervention exhibit more positive expressions of affect (Koegel, Bimbea & Schreibman, 1996; Shreibman, Kaneko & Koegel, 1991) Studies have suggested that when strategies such as increasing shared control, acknowledging unconventional communicative attempts, and utilizing child-directed activities are incorporated in intervention, children will exhibit increased levels of interest and enthusiasm. The expression of positive affect has been linked to increased motivation in children with autism and has in turn been linked to the increased success of communication intervention as indicated by increased communicative attempts (Koegel & Egel, 1979; Koegel & Mentis, 1985). Koegel
et al. (1985) suggest that motivation may be a key variable in the acquisition, generalization and maintenance of targeted skills.

**Play and symbolization.** Joint interaction routines not only provide a medium for social and communication learning, they also provide the foundation toward cognitive growth and more functional and symbolic play. The integration of social and cognitive understanding into symbolic systems are manifested earliest in play behaviors (Sigman & Mundy, 1983). Contexts of face-to-face interaction become expanded to triadic play involving attention to people and objects. Following developmental guidelines for play development, the child learns to attend to objects, to manipulate objects, to learn more functional uses of objects, and to relate objects together. As synergistic cognitive, social and communicative capacities improve, the child learns to attend to people and events in his environment and the ways objects are functionally used, developing the benchmarks that precede the development of symbolic play.

Piaget (1954, 1955) described the processes of abstract cognitive development arising from a state of egocentrism, in which there is no separation of the self from immediate surroundings, to a process of decategorization, in which the child begins to separate self from his environment. Through repeated exposure to objects, the child begins to discriminate between objects and form mental representations or schemata that allow the child to attend to objects in his environment. As the child interacts with objects, he learns their properties and functions and begins to understand objects in relation to each other. As the child develops the means to internally represent objects and actions, thought becomes more distanced from the physical here and now, providing the basis for symbolization.
The progression of play skills from earliest object awareness to relational play to symbolic play is consistent and prevalent in the literature. The characterization of symbolic play, however, is considerably varied and studies have adopted a variety of functional behavioral definitions. Sigman and Mundy (1993) describe "truly symbolic" play as that in which the child pretends that one object is another, carries out an action with an imaginary object, or attributes animacy to a doll so that the doll carries out actions of her own. Fein (1981) defines symbolic play as simulative or nonliteral; Leslie (1987) as acting "as if" something is the case when in reality it is not. Piaget (1962) proposed that the emergence of symbolism marks the end of sensorimotor development as a distinction grows between signifier (present object/action) and signified (absent object/action). In their review of symbolic play in autism, Jarrold, Boucher and Smith (1993) describe the gradual development of symbolism in play in three developmental trends: decentration—moving from self as agent to other as agent in pretence; decontextualization—moving away from using realistic objects in pretence; and integration—combining pretend acts to form sequences.

Functional definitions have been adopted for various studies of symbolic abilities in children with autism. In their study profiling the communicative and cognitive-social abilities in autistic children (discussed above), Wetherby and Prutting (1984) scored the symbolic play behaviors of their subjects (children with autism at prelinguistic and early stages of language development and normal children at similar stages of language development) along a hierarchy ranging from least complex to most complex behavior:

1. Child uses simple motor schemes on objects.
2. Child manipulates physical properties of objects.
3. Child uses realistic objects conventionally, may or may not use invisible substance; applies scheme to self only (e.g., combs hair, brushes teeth, eats from spoon).

4. Child uses miniature objects conventionally, may or may not use invisible substance, applies scheme to self or other.

5. Child uses objects conventionally with invisible substance; applies scheme to self and other (e.g., feeds doll with bottle then puts bottle to own mouth).

6. Child uses one object to stand for another; applies scheme to self and other (e.g., uses stick as tooth brush and brushes own teeth and adult's teeth, uses block as food and feeds block to adult with spoon and then feeds block to self).

In their hierarchy, these authors considered critical the variables of motor schemes, physical manipulation, conventional use of realistic objects or miniature objects, use of invisible substances, and applying play scheme to self and/or others.

In a study investigating the use of Pivotal Response Training to teach symbolic play skills to children with autism, Stahmer (1995) assessed symbolic play, complexity of play behavior and creativity of play. Stahmer defined symbolic play as any of the following behaviors: (a) using an object as if it were another object, and/or (b) attributing properties to an object that it did not have, and/or (c) referring to absent objects as if they were present. Play was considered to be "complex" if the child performed a sequence of at least three actions related to the same pretend theme. Play was considered "creative" if the child performed symbolic play themes not learned during training.

In her study, Stahmer utilized the Pivotal Response Training strategies used in the Natural Language Paradigm of Koegel et al. (1987) discussed above. In
this paradigm, the trainers modeled symbolic play actions with toys rather than providing verbal prompts, and reinforced (with the opportunity to play with toys and verbal praise) attempts at symbolic play rather than verbal attempts. Stahmer concluded from her analysis that the 7 subjects with autism learned to perform complex and creative symbolic play actions at levels similar to that of language-matched typical controls after symbolic play training using PRT. In evaluating her results, however, it should be noted that subjects exhibited receptive and expressive language skills of at least 2.5 years, therefore, as stated by the author, the children in this sample may have higher language and intellectual abilities than the typical autistic child. Additionally, the training and assessment involved minimal attentional coordination by requiring attention only to the modeled actions performed on objects. Language training was conducted separately from the PRT training for symbolic play.

In another study comparing the symbolic play skills of children with autism, Down's syndrome and typical development matched for mental age, Riguet, Taylor, Benaroya and Klein (1981) utilized an unelaborated 5-point play scale: 1-motor, 2-transitional, 3-symbolic, 4-animation or nonanimated symbolic sequence, 5-animated sequence. "Symbolic fluency," defined as the number of different substitute symbolic uses of objects, was assessed for each child, such as using a pill container as a cup to give a drink to a doll or toy animal. In this study the mean language age of 2.6 years on the Peabody Picture Vocabulary Test (PPVT) was obtained for all three groups. However, three of the ten children were assigned the lowest possible test scores because of failure to respond or failure to follow instructions for making a response, suggesting low functional language competence. Subjects underwent two play sessions consisting of a structured play period in which symbolic play was modeled, followed by trial periods in which the
occurrence of play (defined as any use of playthings as long as the child was attending to them) were measured.

This study may represent a closer reflection of nonverbal children with autism, as a low level of language functioning is suggested for subjects who could not reliably respond to the PPVT. Results indicated that while the level of play of the autistic children improved following modeling, it did not reach the level of the Down's and normal comparison groups due to their poor ability to imitate. The best performance scored for the subjects with autism was considered to be a "literal imitation of the demonstration." Symbolic fluency as measured in test trials after modeled structured play for the subjects with autism was considered to be impoverished relative to the other subject group:

It can be seen from the above studies that there is not a consensus regarding the theoretical basis or the definitive characteristics of symbolic play in the literature. However, it appears that children with autism have demonstrated some ability to achieve more complex play skills in limited situations. Children with some level of existing measurable language skills have been most successful; the success of prelinguistic children with autism is less clear. Results of improved symbolic play studies have not only focused on children with some level of language skills, they have also examined these skills in limited contexts of object manipulation. Providing more complex interaction paradigms would allow interpretation of the development of these skills within a more functional synergistic framework. Therefore, these studies do not contribute significantly to the question of whether or not these skills emerge as a result of internal social/cognitive growth, or whether these skills may reflect continued asymmetrical development of object knowledge. As was pointed out by Huttenlocher and Higgins (1978), while object play may often appear symbolic, it may well have
been learned directly from adults: the fact that a child pushes a toy truck for example, does not assure that the child sees the toy as being symbolic of a real truck. Although the status of what constitutes symbolic play is obscured in the literature, addressing play skills as a reflection of social and cognitive development would seem to be more fruitful in synergistic paradigms in which our means of inferring social/cognitive development would be more strongly supported from a theoretical perspective.

**Developmental growth as deviance or delay.** A central controversy in the literature regarding the syndrome of autism regards the question of whether the asynchronous development of skills typical in the syndrome represent developmental deviance or developmental delay (Baron-Cohen, 1992; Burack, 1992). Children with autism present a profile of cognitive and social-linguistic development that is quantitatively and qualitatively different from the development of typical children at similar stages. This profile of development has been associated with the preclusion of development of referential speech and aspects of pragmatic/social understanding (Bates, 1979; Baron-Cohen, 1995, 1992).

Although many studies such as those described here have reported the achievement of skills within specific domains, the examination of cognitive, social and communicative growth within a developmentally-appropriate format focusing on the synergistic development of these skills could shed light on the delay vs. deviance debate as well as provide information that may be significant for prognosis and intervention for the syndrome.

**Developmentally-appropriate intervention.** The interaction methods of existing paradigms do not provide developmentally appropriate accommodation for the egocentric cognitive, social, and communication behaviors typical of nonverbal children with autism. As illuminated by Norris and Hoffman (1990), it
may be assumed that children with severe handicaps have achieved higher levels of
cognitive and social development based on chronological age and maturation.
Many children with severe handicaps have not developed the cognitive ability to
decenter, to process information in their environment, but rather remain at
egocentric levels of processing. In effect, these paradigms are demanding that
children at prelanguage and often preintentional stages of development make a
cognitive leap to integrated and meaningful language use within complex contexts.
Because of assumptions of decentered cognitive ability, these paradigms fail to
facilitate learning at an appropriate developmental level such that synergistic
learning can occur.

**Filling the gap: Norris and Hoffman's SDS Model**

Norris and Hoffman propose a model of intervention that uniquely fills the
gap between proposed theoretical bases for intervention with autistic children and
intervention paradigms currently in practice (Norris, 1990; Norris & Hoffman,
1990b; Norris & Hoffman, unpublished document). In her recommendations for
providing developmentally appropriate intervention to infants and young children
with handicaps, Norris (1990) points out that most interventions with severely
handicapped children are structured at too high a level of cognitive, social, and
communicative complexity. Although many severely handicapped children have
not developed a level of cognitive processing that integrates objects, people and
events in their environment, many intervention frameworks for intervention are
structured to require the child to be interested and able to socially attend to people,
to coordinate attention to people and objects at the same time, and to
communicate intentionally to initiate and maintain interaction (Norris, 1990).
Although these abilities are typically developed within the first year in normal
development, children with severe handicaps such as autism often have not
developed the cognitive decentering and displacement to learn from environmental events and the actions of others. Although they demonstrate relative strengths in perceptual aspects such as obtaining and manipulating toys or other objects, they show little interest and often demonstrate aversive reactions to attending to people. The diminution of social learning and functional cognitive development limits the child's ability to progress beyond sensori-motor learning. This distortion between cognitive, social and semiotic development effects and perpetuates what Norris refers to as a "negative learning cycle." Because of this negative learning cycle, they are unable to develop appropriate functional play schemes, coordinate perceptual and functional knowledge, and understand the content, form and function of language.

To accommodate children at lower levels of development, Norris and Hoffman's model of intervention is set within the context of adult-child dyadic interaction that is the natural learning context of early normal development (Norris, 1990). The adult structures interaction with the child at an appropriate level of cognitive displacement and complexity. In the context of a social game, the adult structures interaction at an appropriate level of social decentration that allows the child to remain an active participant in social events, facilitating the process of coordinating people and objects. The adult structures a context in which the child can learn communicative behaviors that have meaning and purpose by responding to the child as if he or she is initiating intentional communication. Through this process, the child is scaffolded through increasing levels of conventionality and intentionality. Interactions with toys are structured to integrate perceptual and functional aspects of play, providing opportunities for both types of cognitive development to occur. Following these principles, the child is assisted to incorporate interactions with objects and people, to coordinate
perceptual and functional knowledge, and to learn the content, form and function of language through a naturalistic, developmental context.

Norris and Hoffman (1990b) provide guidelines for organizing interaction through levels of increasing complexity of cognitive, social and communicative development based on their Situational-Discourse-Semantic (SDS) Model, presented in Appendix B. The adult structures interaction relative to the variables of the situation, the level of discourse and the semantic complexity according to the child's behaviors exhibited during interaction. Utilizing Norris and Hoffman's SDS model as a guideline, interaction may initially be structured at an egocentric cognitive level beginning with stimulation on the body (Situational level 0-1 month). Egocentric nonverbal children may not have learned basic social principles of interaction, such as attending to others, reacting and taking turns; therefore, the adult may structure interaction to interpret behaviors of the child as if they are active social participants, initiating interactional turns in order for the child to learn social control and purpose (Discourse level 0-1 month). Because low-functioning children such as nonverbal children with autism may be preintentional and noninteractive (Semantic level 1-4 months), the adult may initially structure interaction with the child as if the child is intentionally expressing meaning, imparting meaning to fortuitous movements of the child, in order for the child to learn the effects of his actions as a communicator. As the child becomes an active participant, the adult may add complexity to the interaction by structuring events which require the child to attend to objects or actions in close proximity to the child, requiring decentration of attention (Situational level 3-10 months). In this way the child is scaffolded to share discourse control and learn intentional and conventional communication skills in contexts of increased cognitive complexity.
The adult presents interaction in a three-step approach consisting of 1) providing appropriate organization; 2) providing a communicative opportunity; and 3) providing consequences (Norris & Hoffman, 1990b). As the child becomes a successful interactant (as demonstrated by active participation) the complexity of the interaction is structured at a higher developmental level. If the child is not demonstrating attentive behaviors such as eye contact, turn taking and pleasurable responses to consequences, the level of interaction is lowered to a simpler level of interaction. Specific guidelines and examples of interaction are presented in Appendix C.

This format ideally fits the need for appropriate developmentally-based intervention that addresses the deficits of children with autism. This approach emphasizes communication as a synergistic process inherently bound to and interactive with cognitive and social development. This model of interaction facilitates communication precursors such as joint attention and turn-taking, and is presented within a context of parent-child interaction, the context from which the foundations for social learning, metarepresentation and communication are laid, and from which typical verbal development emerges. This model emphasizes the development of communicative intent in a naturalistic approach in which language is ultimately used to communicate meaning, is initiated by the child, and is reinforced naturally by the act of communicating. By providing a format for synergistically integrating cognitive and social development as foundations for communicative competence in the context of dynamic social interaction, this model is consistent with current theoretical bases for intervention for children with autism.

Norris and Hoffman (1990a) presented their model of naturalistic interactive language intervention for handicapped prelinguistic children in a
comparison of a traditional adult-initiated format and a naturalistic child-initiated format. Norris and Hoffinan utilized five multiply handicapped children between the ages of 2:6 and 2:10 who exhibited prelinguistic levels of communicative abilities. Each child participated in a single 50-minute session of interaction, consisting of two 25-minute conditions under each treatment format. In the traditional adult-initiated format, the adult presented a toy stimulus and a prompt for imitated verbalization, based on the child's level of functioning. Consequences of attempted vocalization included assistance in manipulating the toy, and verbal praise. Examples of interaction in the adult-initiated and child-initiated formats can be seen in Appendix D.

Norris and Hoffman sampled the middle 15-minute segment of each videotaped interaction condition by analyzing the final 2 minutes of each 5-minute interval, resulting in 6 minutes of analyzed behavior for each subject per condition. Written transcriptions were made describing the behaviors of both the adult and the child. The behaviors exhibited by the child were then scored using a comprehensive, developmentally-based scale of communicative behaviors corresponding to the substages of sensorimotor development identified by Piaget (Infant Scale of Nonverbal Interaction, see Appendix E). The scale provided for the categorization of a child's communicative behaviors into the categories of communicative vocalizations, limb actions, and facial/body postures.

Results of analysis indicated that all subjects exhibited more total communicative behaviors in the child-initiated model of interaction. Further results indicated that these prelanguage children exhibited communication behaviors at a higher developmental level under these conditions. Specifically, these subjects exhibited more intentionality and maintenance of the interaction in child-initiated conditions as indicated by behaviors such as attempting to imitate
speech sounds, imitations of gestures, vocalizations or gestures with an intent to elicit action or assistance, and smiles.

Norris and Hoffman's study provides evidence of the effectiveness of their model of naturalistic intervention in facilitating more complex interaction and communication behaviors in young prelinguistic children with handicaps. It provides a framework for analyzing broad aspects of behavior according to a synergistic developmentally-based framework. Although this study illustrates the immediate benefits of this form of interaction, the study is limited in that it did not compare the effects of this interaction over time. Norris and Hoffman acknowledged the need to explore longer-term effects to determine if this model of interaction is effective in facilitating the development of speech and language.

Summary

A review of the literature pertaining to theory of deficit in autism and intervention guidelines for children with autism illuminates a gap between theoretical bases and intervention practice. Current paradigms in the literature have failed to provide intervention that is founded on our knowledge of communication development as a synergistic process rooted in cognitive and social development. Norris and Hoffman's model of developmentally-integrated intervention provides an ideal intervention model for adapting to children with autism at prelinguistic levels of development. This study examined the effects of this intervention as compared to other formats of intervention currently in practice.
METHOD

This study compared the behaviors of three nonverbal children with autism during alternating treatments of communication intervention. The subjects' established communication intervention format was compared with a developmentally-integrated intervention format. Established communication intervention formats were characterized along a continuum ranging from Discrete Trial-Traditional/Behavioral to Semantic/Pragmatic-Developmental continuum (DT-TB/SP-D) according to intervention goals and interventionist style. The interventionists' style was identified through analysis of elements of verbal interaction according to descriptive categories based on Bruner (1983). Behaviors of the subjects were analyzed according to a hierarchy of cognitive, social and semiotic behaviors. The design was utilized to address three research questions:

1) If interaction is structured at an appropriate developmental level (i.e., a level that integrates cognitive, social and communicative development), will children with autism evidence more cognitive, social and/or communicative progress than under the conditions of the established intervention paradigms?

2) If intervention structured in this framework facilitates developmental progress, will the children evidence a profile of synergistic progress in cognitive, social and communicative domains, or will the children evidence an asynchronous pattern of progression?

Additional elements of the study were designed to address a third question:

3) Are children perceived to be happier and more willing to interact in the condition of developmentally-integrated intervention?

Research Design

An alternating treatment design (Barlow & Hayes, 1979) was selected to determine the relative effectiveness of different treatment methods in a short
duration of time (Hegde, 1987; Kearns, 1986). A single subject experimental design was selected for its advantages with a low-incidence subject pool, as well as the heterogeneity of children with autism (McReynolds & Thompson, 1986). The existing paradigm of communication intervention that the subjects were receiving within their school settings served as treatment A for each subject. A developmentally-integrated paradigm of communication intervention based on Norris and Hoffman's (1990b) principles and strategies served as the alternate treatment B.

Subjects were seen for ten sessions of 30 minutes. A 15-minute segment of each alternate treatment was implemented within each session. Subjects were seen according to their established schedule for speech-language intervention, usually two times per week. Subjects were sometimes seen one to three times per week due to fluctuations in the subjects' school attendance or school scheduling conflicts. The course of the study was completed within 5 weeks for all subjects. Sessions were conducted in the designated setting in which each of the subject's established intervention occurred.

Factors that could influence treatment effectiveness were counterbalanced in an attempt to distribute equally any effects on the treatment outcomes. To minimize order effects, the order of treatment sequences was alternated in an AB BA design. However, some alterations of this sequence were inevitable due to schedule constraints of the subjects, the school interventionist, or the school's activities. The alternating schedule within sessions for each subject can be seen in Table 2-1.

For subjects B and C, the number of AB and BA treatment sequences were equally balanced. The treatment sequences for Subject A were not equally balanced due to scheduling constraints; however, equal counterbalancing is not a
Table 2-1

Alternating Treatment Schedule Per Subject

<table>
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<tr>
<th>SUBJECT</th>
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necessity as long as the treatments precede and follow more than once and the sequences are roughly comparable in number (Hegde, 1987).

Counterbalancing of interventionists providing treatment is generally recommended in alternating treatment designs; however, the use of separate interventionists has been suggested in the literature as a "discriminative stimulus" for alternating treatments (McReynolds & Kearns, 1983). Separate interventionists for each intervention paradigm were used in this study to avoid "carryover" of intervention style across intervention paradigms. As a control measure, the investigator (B treatment interventionist) conducted a sample therapy session with each subject utilizing the style and format of each subject's A treatment. Sample therapy sessions were conducted after a minimum of five sessions to allow the intervention style of the A treatment to be established and replicated during the control sessions. Measures from control sessions were compared to measures during A treatment sessions according to the interventionist's verbal interaction and the child's cognitive, social and semiotic behaviors.
Subjects

Subjects were three boys, ages 4 years, 7 months (Subject A), 3 years, 6 months (Subject B) and 3 years, 5 months (Subject C) at initiation of the study. Subjects were selected based on the following criteria:

2. Subjects were considered to be nonverbal according to parent and or teacher report and behavioral observation.
3. Subjects were under the age of 5 years.
4. Subjects were currently receiving established communication intervention services in their school settings.
5. Subjects had received a multi-disciplinary evaluation no more than one year prior to the onset of their participation in the study that did reflect deficient cognitive, social, and communication skills typical of the developmental profile of autism.

Criteria Rationale

Subjects were considered to meet criteria for the diagnosis of autism if there was agreement between a minimum of three representatives of different professional disciplines who were familiar with the child, including a medical doctor, licensed and certified school psychologist, licensed and certified social worker, licensed and certified speech-language pathologist, and/or certified early education teacher. Diagnostic criteria for autism were in accordance with published diagnostic criteria widely accepted across professional disciplines from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.
These criteria can be seen in Appendix F.

This study utilized children with autism who were considered to be nonverbal to address a study population in prelinguistic stages of development. Prelinguistic children with autism are prime candidates for intervention that focuses on providing developmentally-appropriate intervention as this is the stage at which the developmental foundation for language is established. The literature reports that children with autism lack many precurricular skills and behaviors for communication and language development that are evident in typically-developing children at early ages (Paul, 1987; Sigmund et al., 1987). Further, the asynchronous profile of social, cognitive and communication development in children with autism has been proposed to possibly preclude the development of referential speech (Weatherby et al., 1984). This intervention aims to provide interaction which facilitates the integration of cognitive, social and communication development thus providing the foundation from which typical communication and language skills can emerge.

Additionally, this study targeted nonverbal children for intervention as they are typically the population that exhibits the poorest response to current intervention paradigms. A comparative study of treatment paradigms for this population provides information relative to intervention characteristics which might best facilitate responsiveness and developmental growth for these children. Subjects were considered to be nonverbal if they had been known to exhibit no more than one instance of apparent verbal usage according to the current speech/language interventionist, teacher and parent.Subjects also exhibited no verbal behavior during observation of the child in his classroom environment by the investigator prior to the initiation of the study.
Children under the age of five years were selected based on information which suggests a "critical period" for language emergence for children with autism. Statistics indicate the likelihood that children with autism will not achieve functional speech is increased if language has not developed by 5 years of age (Frankel et al., 1987; Sigmund et al., 1987). As an increasing focus on early intervention has emerged, there is an increasing demand nationwide for intervention for children with autism under the age of five. With the expansion of federal educational mandates, the numbers of preschool-aged children receiving intervention from public school systems is increasing. There is a need for research regarding the most effective intervention practice which can support optimum cognitive, social and communication growth for preschool-aged children.

Subjects were selected who were already participating in an established format of communication intervention within their school setting. This criterion was used to provide a realistic sampling of current practice. At the time of the onset of the study, each subject had been receiving services utilizing an established format of intervention for a minimum of six months within that current school year.

Subjects were selected who had participated in a multi-disciplinary evaluation within one year of the onset of the study to provide developmentally-based information relative to cognitive, social and communication skills. Evaluations were consistent with the guidelines of Bulletin 1508, Louisiana state guidelines for student evaluation. Subjects met criterion described in Bulletin 1508 as "impaired in functioning to either a mild/moderate or severe/profound degree as compared to his expected level according to chronological age or developmental stage in one or more of the following areas including: a) Social, which includes play, peer interaction, adult interaction, environmental interaction and expression
of emotions; and b) Perceptual/cognitive, which includes language, 'concrete, abstract,' perceptual discriminations, categorization and sequencing, task attention, and memory." Each subject had been evaluated according to developmental criteria utilizing a standardized evaluation instrument and reflected a pattern of deficient cognitive, social and communication skills. Subjects' cognitive skills as assessed ranged between 12 and 35 months below chronological age level. Subjects' language skills as assessed ranged between 20 and 33 months below chronological age level. Subjects' social skills as assessed ranged between 9 and 35 months below chronological age level.

**Subject Selection**

Subjects were recruited through the voluntary participation of practicing school-based speech/language interventionists within a parish-wide school district in southwestern Louisiana. The subject criteria were presented with an invitation for voluntary participation. Interventionists who wished to participate obtained parental consent for the children to participate in the study and to be videotaped for educational and/or research purposes. An example of the parental consent forms can be seen in Appendix G. There were no girls in the potential subject pool, however, statistical representation of the population indicates a 3:1 boy to girl ratio. Following parental consent, potential subjects were observed within their classroom setting by the investigator. One potential subject was observed in his home setting. Through this process, four boys were selected to participate. Following the observation, one potential subject withdrew from the study to pursue auditory integration therapy in another town, leaving three subjects who participated in the study.
Subject Descriptions

Subject A

Child characteristics. Subject A was diagnosed with autism by medical evaluation which cited characteristics of ritualistic activities, restricted interests, lack of social interest, lack of representational play and regression of language skills by parental report. Multidisciplinary evaluation by the school system at the chronological age of 43 months estimated cognitive skills at 8 months, language skills at 10 months, and "self-help" skills at 15 months utilizing the Early Learning Accomplishment Profile for Developmentally Young Children (EARLY-LAP (Glover, Preminger, & Sanford, 1988) and the Preschool Language Scale (Zimmerman, Steiner, & Pond, 1979). Regarding communication skills, the mother reported that Subject A exhibited some words and phrases at approximately 18 months of age, but had stopped talking since that time. His speech was characterized by the mother as "gibberish." At the time the study began, one incident of verbalization since the child's language regression been reported during the child's interaction with his school interventionist, which was described as singing part of the song "Happy Birthday to You" when he saw a picture of a birthday cake. The subject's mother reported his play skills to be primarily playing outside in the sand and mud, and swinging.

Regarding classroom participation, Subject A had been placed in a Noncategorical Preschool Handicapped classroom for nine months preceding the initiation of this study. It was reported that Subject A did not participate in many activities. However, it was reported that he would sit for classroom activities and was not considered to be a behavior problem.

Behavioral sample. On initial observation in his classroom setting, Subject A sat at a table in a small group of children who were doing hands-on art
activities. Subject A sat at the table, staring blankly around the room. He did not look at other people or vocalize. He did not participate in the art activity. The teacher indicated this was typical behavior for subject A.

Subject B

Child characteristics. Subject B, when evaluated by multidisciplinary evaluation in his school system at the age of 36 months, was found to exhibit cognitive skills at a 6 month level, communication skills at a 4 month level, and social skills below a 1 month level according to the Vineland Adaptive Scales (Sparrow, Balla, & Cicchetti, 1984). Regarding communication skills, it was reported that Subject B had never verbalized any words. A restricted range of interests and ritualistic activities were reported including humming, grunting, rocking in a chair, gritting his teeth, and holding his hands over his ears. Regarding play activities, Subject B was reported to spin toy plates, and to "handle" a stuffed dinosaur, but did not exhibit any creative play skills. He was reported to prefer isolation, and did not play with other children.

Regarding classroom participation, Subject B had been placed in a Noncategorical Preschool Handicapped classroom for the previous six months. It was reported that initially he had adjusted very poorly to the classroom, spending each day screaming and crying. At the time of this study, Subject B had not exhibited play skills with any objects. He preferred to handle bits of thread from the rug or his clothes, and would often walk a repetitive circle around the room touching objects unless held on the lap of the teacher.

Behavioral sample. During initial observation by the examiner, Subject B walked a repetitive course touching objects in the room until an adult intervened. Subject B did not play with or around other children, and did not watch other children or maintain eye contact with others. Vocalizations consisted of
inconsistent squeals or jargon-like phrases. The teacher indicated this was typical behavior for Subject B.

**Subject C**

**Child characteristics.** During multidisciplinary evaluation at the age of 33 months, Subject C's cognitive skills were estimated to be at the 21 month level; language skills were estimated to be at 13 months, and social/emotional skills were estimated to be at the 24 month level according to the EARLY-LAP and the early interventionist's report. It was reported that he did not imitate simple words, vocalize his wants, or use words spontaneously. He was reported to need and expect rituals and routines, and his play preferences were described as stereotypic. At the time of the onset of the study, it was reported by the school interventionist that Subject C had verbalized the word "apple" in the context of a musical toy apple. Following Subject C's multidisciplinary evaluation, he was diagnosed with autism by a pediatric neurologist.

Subject C had been placed in a Noncategorical Preschool Handicapped classroom which he attended two to three days a week for approximately six months preceding the study. Subject C was experiencing difficulty conforming to classroom routines and expectations, and teachers reported that his tendency was to run around the room.

**Behavioral sample.** During an initial observation, Subject C was observed to walk or run randomly around the room full of toys and play stations. He did not play with any of the toys, but rather picked up the lid of a jar and turned it in his hand for several minutes. When the teacher redirected him to a computer, he repeatedly touched the same key and watched the effect on the computer screen until redirected from the computer by an adult. His teacher indicated this was typical behavior for Subject C.
School Interventionists

Each subject's school-based interventionist also participated in the study. All interventionists met standards established by the State Board of Education and the Louisiana Board of Examiners for Speech Pathology and Audiology for the provision of services in school settings. Subject A's school-based interventionist held a restricted license and had eleven years of experience as a speech therapist in school settings. The school interventionist for Subject B was a speech-language pathologist with a Master's degree who had a provisional license while working on her Clinical Fellowship Year for certification by the American Speech-Language-Hearing Association. This interventionist had a variety of clinical experiences in a variety of environments throughout her graduate training. Subject C's school interventionist held a provisional assistant license, and had six years of experience providing services in the school systems.

Intervention Paradigms

Established Intervention Formats (Treatment A)

Subject A

Subject A had been seen for speech therapy services within his school setting for seven months preceding the initiation of the study. Communication goals from Subject A's Individualized Educational Plan (IEP) targeted behaviors including: pointing to an object, person or event in pictures; and responding with a vocalization and gesture to simple questions. Subject A's interventionist described the established intervention format as "selecting objects, matching pictures, and requesting labeling." Subject A was typically seen for speech therapy twice a week for thirty minutes in the interventionist's classroom.

Materials used during this intervention format included a Memory game with a set of 24 matched pairs of pictures representing common objects. On one
occasion a miniature toy truck with six miniature pigs was utilized. The interventionist and child sat side-by-side at a table. Therapy interaction was characterized primarily by the interventionist giving a directive prompt to the subject, followed by a repetition of the prompt or verbal feedback depending on the action of the child. Prompts typically involved the presentation of one of the paired pictures and a verbal directive such as "Put the _____," "Give me the _____," or "Where's the _____?" This intervention paradigm's goals and format are consistent with the Traditional/Behavioral end of the intervention continuum.

A sample of interaction typical of this format is presented in Table 2-2.

Table 2-2
A Sample of Treatment A Intervention for Subject A

<table>
<thead>
<tr>
<th>INTERVENTIONIST (I)</th>
<th>SUBJECT A (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[I and I are sitting side by side at table.]</td>
<td>[S and S are sitting side by side at table.]</td>
</tr>
<tr>
<td>(Extends open hand toward S)</td>
<td>(Putting picture cards in a line on the table...)</td>
</tr>
<tr>
<td>Show me the puppy.</td>
<td>Show me the puppy.</td>
</tr>
<tr>
<td>Show me the puppy.</td>
<td>Give me a puppy.</td>
</tr>
<tr>
<td>No, I want just the puppy.</td>
<td>(Puts all the cards in I's hand)</td>
</tr>
<tr>
<td>(Puts cards on table in front of S.)</td>
<td>Look.</td>
</tr>
<tr>
<td>Look.</td>
<td>Puppy.</td>
</tr>
<tr>
<td>(Puts puppy card on S's hand)</td>
<td>(Takes card, aligns cards on table...)</td>
</tr>
<tr>
<td>No, you give me the puppy.</td>
<td></td>
</tr>
<tr>
<td>Put puppy.</td>
<td></td>
</tr>
<tr>
<td>(Points to her open hand)</td>
<td></td>
</tr>
<tr>
<td>Put puppy.</td>
<td></td>
</tr>
<tr>
<td>T _____ [says S's name]</td>
<td>T _____ [says S's name]</td>
</tr>
</tbody>
</table>

Subject B

Subject B had been seen by the school interventionist for six months preceding the study. Communication goals according to his Individualized
Education Plan targeted behaviors including: "responding to communication from familiar adults during naturally occurring events and routine activities by gesturing, signing, vocalizing, following requests, and/or attending;" and "initiating communication and showing active interest in person/object by using gestures, signs or vocalizations during naturally occurring events and routine activities."

This therapy paradigm incorporated developmentally based strategies such as utilizing naturally occurring events, focusing on communication initiation, attending to people and objects, and acknowledging multiple communication modes, therefore representing a paradigm more closely aligned with the Semantic Pragmatic-Developmental end of the intervention continuum. Subject B was typically seen for 30 minutes two or more times a week in his classroom.

Materials used for this intervention format involved toys that were available in the classroom including rubber blocks, puzzles, small cars, a toy farm set, a push button toy with doors that open, and a shape sorter. The therapist typically sat on the floor supporting the child in her lap. Therapy interaction was characterized primarily by the interventionist modeling play with the toys, and prompting him with hand-over-hand assistance. The interventionist talked about the objects and actions taking place, providing parallel talk and language models. A sample of interaction during this format is presented in Table 2-3.

Subject C

Subject C had been seen by the school interventionist for approximately six months. Communication goals according to his Individualized Education Plan targeted behaviors including: "making choices appropriate to the learning situation through set ups directed by teacher/therapist"; "imitate/approximate words on command and use functionally in teacher/therapist directed activities"; and "respond appropriately to directives: do this, look at me, give me, etc." Subject C
was typically seen twice a week for 30 minutes in his classroom.

Materials used for this intervention format involved plastic cups colored to resemble milk and orange juice, a picture of a glass of milk, a bowl, plastic fruits, a ball, a doll, a small toy car, a miniature clown riding a bicycle, and a teddy bear. Typically the interventionist sat on the floor face to face with the child. During some sessions the child was placed in a chair with a snap-on lap tray. Intervention Table 2-3.

A Sample of Treatment A Intervention for Subject B

<table>
<thead>
<tr>
<th>INTERVENTIONIST (I)</th>
<th>SUBJECT B (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Places 2 blocks in front of S)</td>
<td>[Sitting in I's lap on floor]</td>
</tr>
<tr>
<td>Build?</td>
<td>(Looks at blocks)</td>
</tr>
<tr>
<td>(Stacks 2 blocks on top of each other)</td>
<td></td>
</tr>
<tr>
<td>(Puts third block on)</td>
<td></td>
</tr>
<tr>
<td>(Takes S's hand, knocks down blocks)</td>
<td></td>
</tr>
<tr>
<td>You knocked it down!</td>
<td>(Reaches for blocks)</td>
</tr>
<tr>
<td>(Restacks 3 blocks, holding S's hand away)</td>
<td>(Reaches for another block)</td>
</tr>
<tr>
<td>You wanna build with this one?</td>
<td></td>
</tr>
<tr>
<td>(Gives a different block to S)</td>
<td>(Holds block in hand)</td>
</tr>
<tr>
<td>Come on.</td>
<td></td>
</tr>
<tr>
<td>Come on.</td>
<td></td>
</tr>
<tr>
<td>Let's build</td>
<td>(Puts block on floor, rocking it with his hands)</td>
</tr>
<tr>
<td>(Places a different block on the stack)</td>
<td>(Picks up and holds the block I just placed)</td>
</tr>
<tr>
<td>Let's build.</td>
<td></td>
</tr>
<tr>
<td>Let's put it on</td>
<td></td>
</tr>
<tr>
<td>Good boy.</td>
<td></td>
</tr>
<tr>
<td>(Places a block on top of the block S is holding; holds block down)</td>
<td>(Pushes against the block held by I...)</td>
</tr>
<tr>
<td>(Struggles to hold block on stack...)</td>
<td></td>
</tr>
<tr>
<td>Let's put it on</td>
<td></td>
</tr>
<tr>
<td>You can knock it down after we build it up.</td>
<td></td>
</tr>
</tbody>
</table>
was typically characterized by the interventionist presenting a toy, and asking questions about it. When the child performed an action with the toys, the interventionist would talk about the child's actions and ask questions about the actions. The goals of this intervention format specify teacher-directed activities, and target responses to directives and responding on command. As such, these goals are consistent with the Traditional/Behavioral end of the intervention continuum. A sample of typical interaction under this format is presented in Table 2-4.

**Developmentally-Integrated Format (Treatment B)**

The developmentally-integrated format that served as treatment B is based on the organizational principles and strategies for naturalistic intervention specified by Norris and Hoffman (1990b). Within this intervention paradigm, the goal is to structure activities within a social context which allow the child to attend to and organize for himself meaningful aspects in his environment within a context of social interaction. As the child organizes cognitive and social aspects within events, communicative behaviors emerge in which the child learns the effect of his behavior on others, and learns to achieve goals via communicative behaviors. These experiences in which the child is an active participant provide the child with autism with a foundation for establishing communicative intentionality. Having laid a foundation for the child to organize cognitive and social interaction and to establish communicative intentionality, the child is provided with a basis from which to develop more refined and conventionalized communicative behavior. The focus of intervention therefore is not to directly teach language, but rather to provide the child with the means to understand and learn the processes of communication from a theoretically and developmentally sound framework. This format of intervention is considered to be developmentally integrated in that it
Table 2-4

A Sample of Treatment A Intervention for Subject C

<table>
<thead>
<tr>
<th>INTERVENTIONIST (I)</th>
<th>SUBJECT C (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Sitting in chair with snap-on lap tray on floor, facing I]</td>
</tr>
<tr>
<td>Which one do you want?</td>
<td>(Holding up a cup and a picture of a cup)</td>
</tr>
<tr>
<td>Picture of the milk?</td>
<td>(Reaches for picture)</td>
</tr>
<tr>
<td>Look at the picture of the milk?</td>
<td></td>
</tr>
<tr>
<td>Umm, that's some good milk.</td>
<td>(Reaches for cup...)</td>
</tr>
<tr>
<td>Look at the pictures?</td>
<td></td>
</tr>
<tr>
<td>(Puts cup behind her)</td>
<td>(Looks at picture)</td>
</tr>
<tr>
<td>(Holds up picture and cup)</td>
<td></td>
</tr>
<tr>
<td>Which do you rather?</td>
<td>(Grabs cup and picture)</td>
</tr>
<tr>
<td>Want the glass...oh you want both of them.</td>
<td>(Glances at picture, looks around room, glances at cup)</td>
</tr>
<tr>
<td>Are they the same?</td>
<td>(Manipulates cup, turns in hands, rubs on cheeks, puts to mouth)</td>
</tr>
<tr>
<td>(Puts picture on the floor)</td>
<td></td>
</tr>
<tr>
<td>Wanna drink something?</td>
<td>(Reaches for and gets the picture on the floor)</td>
</tr>
<tr>
<td>Are you thirsty?</td>
<td>(Takes cup from S)</td>
</tr>
<tr>
<td>(takens cup from S)</td>
<td></td>
</tr>
<tr>
<td>Are you really thirsty?</td>
<td>(Takes picture from S)</td>
</tr>
<tr>
<td>(takes picture from S)</td>
<td></td>
</tr>
<tr>
<td>Look, which one do you rather?</td>
<td>(Holds up brown cup and orange cup)</td>
</tr>
<tr>
<td>(Holds up brown cup and orange cup)</td>
<td>(Takes both cups)</td>
</tr>
</tbody>
</table>

is structured to assist the child in integrating cognitive, social and communicative learning. The interventionist assists the child to attend to and coordinate cognitive, social and communicative events by scaffolding the child according to the complexity of the event and the response level of the child. This is accomplished through a three step process: a) providing appropriate organization; b) providing a
communicative opportunity; and c) providing consequences (Norris & Hoffman, 1990b).

Providing Appropriate Organization

The first step, providing appropriate organization, involves organizing an activity or situation at an appropriate level of play. The level of play is guided by a hierarchical continuum of play development involving increasing cognitive decentration, symbolization, and elaboration. Within the first level, exploratory/egocentric play, the child reacts to events that involve perception and sensation, and the adult interprets fortuitous behaviors as meaningful communication. The second level, relational/social play, involves the ability of the child to relate objects together in functional ways (i.e., the hammer pounds a peg, blocks are stacked together). The third level, symbolic/parallel play, involves representative actions performed on or with objects (a car drives, the hoarse eats from the trough). The fourth level, imaginative/cooperative play, involves the enactment of events utilizing a plan or theme (all the farm animals go in the corral). The last level, creative/interactive play, involves elaboration of sequences in which schemas and scripts are followed (what the farmer does in the morning).

The interventionist determines an appropriate level of play by observing the child's attention, initiation and responsiveness. When the child is not interactive and attentive, the complexity of play within the situation may be considered to be too high, and the interventionist adjusts to an activity at a lower level of play. As the child maintains an active role in play routines, the situation may be increased in complexity. The level of play is not predetermined by the adult, but rather follows the lead of the child. The level of play is adjusted according to the behaviors of the child, as an indication of his ability to organize the interaction.
One way in which the complexity of the activity may be increased is by introducing aspects that involve a higher level of cognitive organization in the play. For example, a child who is reacting to on-the-body motions during patty-cake (egocentric play), might be provided the opportunity to attend to objects providing sensorimotor stimulation (such as a puppet tickling his hands), requiring a higher level of decenteration. A child who is coordinating simple actions toward or on objects (such as banging a block) may be provided the opportunity to use two objects relationally (such as stacking two blocks together). As the child organizes cognitive and social events, the activity might be organized for the child to accomplish symbolic play, involving pretense with the toys as if they were real objects (feeding dolls, walking animals into a pen). The complexity of play can be raised by increasing the number of objects with which the child interacts (feeding dolls and stuffed animals), or adding sequential dimensions to play (brush the doll's hair and put on her hat). Similarly, the activity may be organized at a simpler level of cognitive complexity along the hierarchical levels of play.

**Providing a Communicative Opportunity**

The second step of the intervention framework involves providing an opportunity for the child to regulate control within the activity. Bruner (1975) describes the development of social control and communicative intentionality during prelinguistic stages of development within the context of joint action routines. During repetitive play schemes, the child first learns to segment the routine into elements and begins to insert nonstandard signals, which are attributed intentionally by the mother. Over time within the context, signaling becomes more intentional, and the child is able to regulate the social interaction.

The interventionist might provide a communicative opportunity by assisting the child in organizing an action within repetitive segments of the activity. These
actions can be interpreted as a request to initiate an event or maintain turns. At first, the interventionist may interpret a fortuitous movement. As the child learns the effects of his actions, the child learns to purposefully act within the event to achieve his own goals. As the child learns how to regulate and control the social interaction, the child learns to act intentionally as a communicator according to the social rules conventionalized between the adult and child within the activity. As the child experiences being a communicator, the interventionist scaffolds his actions to introduce new events and activities that serve to broaden the context and function of his actions. For example, if a child is actively participating by gesturing during his turn within a tickling game with a hand puppet, the adult might attribute purpose to these gestures, such as requests or commands. The adult might then broaden the context and function of the child's actions by providing the opportunity to interact with two different objects, a puppet and a stuffed animal. In this situation, the adult might scaffold the child by interpreting differential gestures as a choice. The child's communicative actions may be scaffolded toward more culturally conventional gestural and verbal communication as the adult elicits more refined gesture and vocalization/verbalization. Within this process, the child organizes increasingly complex social interaction and broadens communicative functions and semiotic specificity.

**Providing Consequences**

The third step of the intervention framework involves providing consequences or feedback to the child based on his actions. This step is governed by the principle that communication behavior is naturally reinforced when the child's purposes and intents are met. Therefore, the child is facilitated to achieve the natural consequences of his intention. If a child's gesture is interpreted as a request, the child is provided the opportunity or action requested. For example, a
nonverbal child who reaches for the interventionist's hands when provided the opportunity to maintain the interaction, would be consequented with another turn within the interaction.

In addition to providing natural consequences related to the child's communicative act, feedback plays an important role in elaborating the child's contexts and functions in communication. Norris and Hoffman describe processes of elaborating a child's message in terms of his utterances involving expansion, expatiation and extensions. Expansion refers to an elaboration of the child's utterance using a higher level of language. Expatiations involve elaborating the child's message to include more information or clarification. Extensions add new ideas or a new event to add complexity within a topic. For a nonverbal child, the adult may expand the consequences of the child's communicative gesture by elaborating his intentions ("Oh, you want to go again faster!"). The adult can expatiate the child's communicative gesture by modeling examples of the concept ("You want to brush the doll's hair and your hair!"). The adult can extend the communicative gesture by adding objects and events to the context ("You want to brush the doll's hair and give her a drink!"). In this way, new meaningful relationships related to the event are provided for the child. The child's communicative act is consequented meaningfully, is expanded in terms of context and intention, and the child is provided with language models within the event.

The adult may facilitate elaboration and refinement of the child's gesture before interpreting the intent of the action and consequenting it accordingly. This process serves to present the child with a request for communicative repair and an opportunity to attempt a more specific communicative behavior. For example, when the child is actively participating in a routine, the adult might provide the opportunity for the child to elaborate or refine his gesture by providing a delay
before interpreting the intent of the action. The adult might exhibit an affect of confusion, introducing affective cues within the interaction. Actions which represent an attempt to refine or elaborate a communicative act for the adult illustrate the child's growing understanding of his gestures as signs communicating referential specificity and differentiation as well illustrating the child's growing social/pragmatic awareness.

**Summary**

The developmentally integrated format of communication intervention that was utilized as Treatment B for all subjects provides an organizational framework to foster the integration of cognitive, social, and semiotic development by adapting to the developmental level of the child. The goal of this intervention is not to achieve specific communication products, but rather to facilitate the communication process, providing the developmental foundation from which communication and language skills naturally emerge. The intervention format is provided with organization and structure by utilizing the three step process of a) providing appropriate organization, b) providing communicative opportunities, and c) providing consequences. A sample of typical interaction under this format is presented in Table 2-5.

**Procedure**

All intervention sessions were videotaped. Videotapes were then transcribed and analyzed. Procedures for data collection and analysis will be described.

**Data Collection**

All intervention sessions were videotaped for later transcription. A video camera was set-up prior to the therapy session, usually in a corner of the therapy area. The camera was distanced as far back as possible to avoid distracting the
Table 2-5

A Sample of Treatment B Intervention

<table>
<thead>
<tr>
<th>INTERVENTIONIST (I)</th>
<th>SUBJECT C (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Holds up dog puppet on hand in front of S)</td>
<td>[Sitting on floor facing I]</td>
</tr>
<tr>
<td>Now what?</td>
<td>(Hands are on his belly)</td>
</tr>
<tr>
<td>(Waits)</td>
<td>(Watches I, laughs)</td>
</tr>
<tr>
<td>On your tummy!</td>
<td>(Puppet tickles belly)</td>
</tr>
<tr>
<td></td>
<td>He got your tummy!</td>
</tr>
<tr>
<td>(Holds up puppet)</td>
<td>(Raise shirt)</td>
</tr>
<tr>
<td>Now what?</td>
<td>(Laughs)</td>
</tr>
<tr>
<td>(Waits)</td>
<td>(Rolls away briefly)</td>
</tr>
<tr>
<td>(Holds up puppet)</td>
<td>(Looks at I)</td>
</tr>
<tr>
<td>Now what?</td>
<td>(Reaches to puppet)</td>
</tr>
<tr>
<td>(Waits)</td>
<td></td>
</tr>
<tr>
<td>On your fingers?</td>
<td>(Grabs puppet, tries to put on, drops puppet)</td>
</tr>
<tr>
<td>(Puppet counts fingers)</td>
<td></td>
</tr>
<tr>
<td>(Holds up brush and puppet)</td>
<td></td>
</tr>
<tr>
<td>You want to brush his fur?</td>
<td>(Reaches for brush, takes brush, takes puppet, brushes puppet)</td>
</tr>
<tr>
<td>Brush.</td>
<td>Pretty.</td>
</tr>
<tr>
<td>Brush his fur.</td>
<td></td>
</tr>
</tbody>
</table>

subjects while still allowing a reasonable view of the child’s face and eye gaze.

During Intervention A sessions, the investigator monitored the camera position as the movements of the child and interventionist required adjustment. Videotaping was sometimes monitored during Intervention B sessions by the school interventionist. These videotaped sessions were identified by subject letter, session number, and alternate treatment designation, such as A10B.

Prior to the study, school interventionists were informed that the study would be comparing two types of intervention for each subject. Interventionists
were not informed about the structure, goals or philosophies incorporated in Intervention B. Interventionists were asked to maintain their intervention structure and style throughout the ten sessions of the study. Prior to each session, interventionists were instructed to interact with the subject in their usual way.

**Data Analysis**

Video sessions were segmented for analysis. Each 15 minute therapy session was segmented into 5 minute portions. The middle two minutes of each five minute segment were isolated for transcription utilizing the chronological time markers in minutes and seconds on the videotape. This rendered the following chronological segments: 1:30 - 3:30 (Segment 1); 6:30 - 8:30 (Segment 2); and 11:30-13:30 (Segment 3). In some sessions, irregularities occurred in the length of the sessions. In these instances, the total length of the session was divided into three sessions, and the middle two minutes from each segment were used for transcription.

Videotape segments were transcribed by the investigator utilizing a tape editor with frame by frame viewing. Both verbal and nonverbal interactions of the adult and the child were recorded. Methods of transcription can be reviewed in Appendix H.

**Categorizing Adult Interaction**

The utterances of the interventionists were described according to discourse categories as a descriptive analysis of the adult's interaction with the child. This descriptive information was compared to characteristics of traditional behavioral and semantic/pragmatic-developmental intervention formats, and to the behavioral measures of the subjects during interaction.

The verbal interaction of the interventionists transcribed from the videotapes was characterized based on discourse categories suggested by Bruner.
These categories, based on adult-child interaction during storybook reading, were adapted and expanded to incorporate a broader range of responses for adults during interactive play. The descriptive categories used in this study and exemplary utterances for each can be seen in Table 2-6.

Table 2-6
Descriptive Categories and Exemplars of Adult Interaction

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DEFINITION</th>
<th>EXAMPLE</th>
</tr>
</thead>
</table>
| Attentional      | Any utterance used for the purpose of establishing joint focus or directing  | "Look.
| Vocative         | attention to objects, people, pictures, or actions                          | Saying child's name. Labelling object to direct attention: "Puppy. Puppy."
| Directive        | Any utterance which serves to direct the behavior of the child              | "Sit down."
|                  |                                                                             | "Put the frog in the box."
|                  |                                                                             | "Show me the puppy."
| Query            | Any utterance which invites a contingent response from the child            | "Now what?"
|                  |                                                                             | "What do you want?"
|                  |                                                                             | "Is that an apple?"
| Feedback         | A semantically contingent response to the communicative act of the child.   | "You want some more."
|                  | May be an acknowledgement, positive or negative verbal feedback, or a request| (Acknowledgement) "Very good." (Positive Feedback)
|                  | for communicative repair                                                    | "No, not like that." (Negative Feedback)
|                  |                                                                             | "What?" (Request for repair)
| Elaboration      | Remarks which elaborate on a topic; includes modelling, labeling, describing| "Good milk."
|                  | objects or actions                                                          | "Bounce the ball."
|                  |                                                                             | "Pretty ball."
|                  |                                                                             | "He jumped out fast!"

The utterances of adults were classified according to these descriptive categories and the number of occurrences were converted to percentages of total utterances for each intervention format. Utterances that were not directed to the child or which were unintelligible were not categorized. These percentages were used for three areas of descriptive comparisons: a) to compare adult measures and subjects behavioral measures across intervention formats during the course of
Therapy (Intervention A and B comparisons) b) to compare the adults’ interaction during the alternating conditions for each subject (within-subject comparisons); and c) to compare characteristics of adult interaction during control sessions to Intervention A conditions (control comparisons).

For the first area of comparison, the proportions of Attentional Vocatives, Directives, Queries, Responses and Feedbacks in adult utterances were compared and contrasted for Intervention A and Intervention B formats. These comparisons were completed to provide information for differentiating the intervention style between A and B treatments. These comparisons also provided descriptive information to relate the adult’s interaction to the determined goals of each intervention format, and to relate each format to the DT-TB/SP-D continuum.

For the second area of comparison, adult measures between Intervention A treatments and control sessions were compared for similarity of interaction style. The mean percentages of adult utterance categories across Intervention A sessions for each subject were compared to the percentages of adult utterance categories that occurred during each subject’s control session.

For the final area of comparison, the proportions of specific categories of adult interaction were related to corresponding child behaviors. These comparisons included: a) the proportion of Attentional Vocatives relative to the number of eye gaze behaviors of the child; and b) the proportions of Directives, Queries and Feedbacks relative to the number of communicative behaviors of the child.

**Measures of Child Behaviors**

Child behaviors were examined across intervention formats. To address the four proposed research questions, these measures provided a) information regarding the cognitive, social and semiotic functioning of the children during each
intervention format; and b) qualitative information regarding the child's enjoyment and willingness to interact with the adults. In addition to these measures, further analyses were conducted to support the data. These included measures of eye gaze and play complexity.

To provide information regarding the cognitive, social and semiotic functioning of the children during each intervention format, measures of the child's behavior were derived from a hierarchy of skills based on Norris and Hoffman's SDS model. This hierarchy provided four levels of complexity for cognitive, social and semiotic functioning according to the behaviors of the child. Happiness and interactivity measures were obtained through ratings provided by naive viewers of videotape segments of treatment sessions. Information regarding the child's eye gaze toward the adult, the triadic attention of the child, and the complexity of play routines were derived from the transcribed video segments. The procedures for obtaining and comparing these measures will be described.

Analyzing Cognitive, Social and Semiotic Behaviors

Measures of child behavior were scored according to a behavioral hierarchy based on Norris and Hoffman's SDS model. The hierarchy used in this study scaled four levels of behavior in cognitive, social and semiotic domains. These four levels represent changes in complexity from the lowest levels of egocentric cognitive processing and passive social and communicative behavior through stages that reflect symbolic representation, the use of coordinated action sequences and differentiated social/pragmatic strategies, and semiotic differentiation. These four levels were selected because they represent critical stages for the prelinguistic child. As the child achieves the cognitive, social and semiotic skills represented in Level 4, he is equipped to learn language from his
environment in more conventional ways. These levels of cognitive, social and semiotic complexity are profiled in Table 2-7.

**The cognitive scale.** In the cognitive domain, these four levels of behavior are related to the complexity of cognitive abstraction. These levels are consistent with four levels of complexity in play: egocentered, decentered, relational and symbolic. At the first level, the Egocentered level of development, the child does not actively attend to the environment, but rather attends to sensation on the body. The child might respond to movements of his own body, such as hand games, or attend to toys that act on his body, such as tickling. As the child learns to attend to objects and actions that are in his proximity, he achieves the ability to attend to his environment. At the Decentered level of cognitive development, the child begins to watch people and explore objects. At this stage of play, the child might reach for objects and manipulate them using sensorimotor schemes. As the child experiences his environment, he begins to learn about the functional relationships and actions that can occur with objects. At this third level on the cognitive scale, Relational, the child demonstrates relational play by putting objects together in functional ways, such as putting a brush to his hair, or stacking blocks together. At the highest level of the hierarchy, the Symbolic level, the child exhibits the ability to bestow pretend characteristics upon objects. The child may elaborate the complexity of play by incorporating an increasing number of objects, sequencing routines, and organizing play with schema and scripts.

**The social scale.** The social scale represents four levels of complexity in social discourse. At the first level, termed Discrete Event, the child responds to stimulation perceived as discrete unrelated events. The adult maintains the responsibility for maintaining social interaction. At the Collection level, the child begins to associate actions with events to achieve the consequences of those interactions.
<table>
<thead>
<tr>
<th>LEVEL 1</th>
<th>COGNITIVE SCALE</th>
<th>SOCIAL SCALE</th>
<th>SEMIOTIC SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGOCENTERED</td>
<td>Child attends to stimuli touching the child (movements of body, action of toys on body).</td>
<td>Child responds to stimulation as discrete events (interaction maintained by adult).</td>
<td>Child exhibits reflexive, undifferentiated actions to stimuli such as watching, smiling (adult imputes meaning).</td>
</tr>
<tr>
<td>LEVEL 2</td>
<td>DECENTERED</td>
<td>COLLECTION</td>
<td>INDICATION</td>
</tr>
<tr>
<td>Child attends to stimuli presented at a distance (toys held in front of the child, actions in close proximity).</td>
<td>Child organizes events by action schemes, uses purposeful action for consequences of own action (touches toys, pushes buttons).</td>
<td>Child's responses are in accordance with short term conventionalized meaning within routine with others; engages in self-imitation (holds up hands to continue pat-a-cake; lifts body part for tickle).</td>
<td></td>
</tr>
<tr>
<td>LEVEL 3</td>
<td>RELATIONAL</td>
<td>DESCRIPTIVE LIST</td>
<td>CONVENTION</td>
</tr>
<tr>
<td>Child relates two objects together by appropriate action (puts brush to hair, stacks block on block).</td>
<td>Child uses intentional response to maintain social interaction; child shares responsibility for interaction (repeats a gesture or sequence of gestures in turn-taking interaction).</td>
<td>Child demonstrates semiotic differentiation of communicative attempts (refines, elaborates or &quot;repairs&quot; gesture according to cultural convention); imitates adult.</td>
<td></td>
</tr>
<tr>
<td>LEVEL 4</td>
<td>SYMBOLIC</td>
<td>ORDERED SEQUENCE</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>Child uses pretense in action with objects or others; performs functional actions with miniatures (i.e., push truck, puts hat on doll; uses pretend objects or actions).</td>
<td>Child organizes events by action sequences; uses culturally recognized social/pragmatic strategies differentially (giving, indicating choice or preference, protest, etc.).</td>
<td>Child attempts to use conventional words, protowords or manual signs in context.</td>
<td></td>
</tr>
</tbody>
</table>
actions. The child may reach for interesting toys, or push a button on a toy for its interesting effect. At the third level, Descriptive List, the child begins to organize and share responsibility for maintaining topic-related social interaction by using intentional responses. At this level, intent may be inferred when the child anticipates socially mediated consequences resulting from the repetition of a gesture or sequence of gestures established as meaningful during interaction. At the Ordered Sequence level of this hierarchy, the child's knowledge of social discourse is elaborated by coordinating sequences of actions within events, and utilizing differentiated social/pragmatic strategies for social purposes such as giving, indicating preference, and protesting.

The semiotic scale. Levels on the semiotic scale represent the complexity of behaviors evidencing referential understanding for communication purposes. First, at the Reaction level, the child reacts passively to interaction with the environment. The child may reflexively watch or smile as the result of social interaction, but does not respond differentially to social events. The adult must impute meaning to the behavior of the child. At the second level, Indication, the child is able to use actions that serve as indications to others according to the short term meaning established within the interaction. He may reach his hands up when a pat-a-cake game is stopped, or may lift up a body part for tickling. At the Intention level, the child evidences true communicative intent and semiotic differentiation. The child may elaborate or refine a gesture to clarify and differentiate the meaning for the adult, or to make a communicative repair. At the fourth level of the scale, Description, the child exhibits attempts to utilize conventional words and/or protowords. For the purposes of this study, vocalizations were considered to be attempts to utilize conventional words if: a) the utterance was constructed of at least a consonant and vowel (CV) or vowel

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reduplication (/o/ /o/); and b) the child's utterance was appropriate within the interaction context. Subsequent repetitions of words within the same utterance were not scored. Each word in multiple word utterances were scored separately.

Scoring child behaviors according to the hierarchy. All behaviors of the child that were related to the context of interaction were scored. Behaviors exhibited that did not pertain to the social context presented by the adult were not scored. For example, if the adult was presenting a toy as the joint focus of attention for interaction, and the child picked up another toy and manipulated it, this behavior would indicate Decentered play (Cognitive Level 2), but it would not be scored because it did not relate to the context of social interaction. However, if the child offered the toy to the adult, this behavior would be considered to be related to the social context and would be scored. Therefore, all behaviors that were scored involved a level of social interaction. Each behavior was evaluated relative to the situation of the context (relating to the Cognitive scale), the discourse level of the child's interaction (relating to the Social scale), and the semantic level of the child's communicative behavior (relating to the Semiotic scale). Each of these scored behaviors was assigned a number associated with a level on the Cognitive, Social and Semiotic Scales.

A behavior scored at the lowest level on the three scales might occur if the adult were to impute meaning (a request, protest) to a fortuitous behavior of the child within a context of on-the-body play, such as tickling, or pat-a-cake. This behavior would be scored at Level 1 on the Cognitive Scale; Level 1 on the Social Scale, and Level 1 on the Semiotic Scale. In this situational context of Egocentered play, the child exhibited an undifferentiated response to the adult's interaction (Discrete Event), and the adult imputed meaning to the behavior (Reaction). A behavior scored at the highest levels on the three scales might be
exhibited in a situation of symbolic play. For example, if the child were participating in a routine in which he was provided the opportunity to choose for a doll whether to put on a new hat or new shoes, the child might attempt to use the word "hat" or "shoe" to communicate a choice. This behavior would be scored at Level 4 on all three scales: for Symbolic play on the Cognitive Scale, for social interaction at the Ordered Sequence Level, and for Descriptive behavior on the Semiotic Scale.

A child's score for a behavior would not necessarily be equivalent across the Cognitive, Social and Semiotic Scales. For example, a behavior might be scored at a higher level on one scale than on the other two scales. An instance such as this might occur if the adult modeled relational play with a shape sorter box, and presented the opportunity to place a shape in the sorter box to the child. The child might exhibit a purposeful action by taking the offered toys and attempting to put the shape in the box. This behavior would be scored at Level 3 on the Cognitive Scale, for Relational play. On the social scale this behavior would be scored at Level 2, Collection, for the child's organization by action scheme and apparent purpose to achieve the goals of his action. On the Semiotic Scale, this behavior would be scored at Level 2, Indication. The child indicated to the adult by reaching for the toys, in accordance with conventionalized meaning established within the interaction.

To provide the child with the opportunity to interact at higher social and semiotic levels, the adult might replicate this joint action routine by taking the toys, and again offering them in play to the child. If the child were to again take the toys and put the shape in the box, the child's action could be interpreted at the Intention level, by intentionally repeating a sequence of gestures to maintain turn-taking in the interaction. The adult can provide the opportunity for more complex
interaction by then presenting the opportunity for the child to make a choice between two toys, scaffolding the child's social behavior at the Ordered Sequence level. Or, the adult could pause and wait before consequenting the child's communicative attempt, providing the opportunity for the child to elaborate or refine his gesture (Level 3) or to attempt conventional words (Level 4), thus increasing semiotic complexity.

All scored behaviors of the child were tallied according to each level on the behavioral hierarchy, and according to the total number of scored behaviors. These scores were then compared across Treatment A and Treatment B conditions for each subject. Behaviors that occurred during control sessions were also compared with behaviors that occurred in Treatment A sessions.

**Enjoyment and Interactivity Measurements**

An additional aspect of the study was designed to evaluate qualitative aspects of the children's responsiveness to the alternating intervention paradigms. An aspect of the study was designed to investigate the third research question, whether children are perceived to be happier and more willing to interact in the condition of developmentally-integrated intervention. Recent literature has linked qualitative measures of interaction to higher motivation on the part of children with autism, and in turn has linked higher motivation to positive increases in language performance and generalization (Koegel & Mentis, 1985; Schuler, Prizant & Wetherby 1997; Prizant & Weatherby, in press). Additionally, the expression of positive affect has been linked to socio-emotional development for children with autism. The design was modeled after Koegel, Bimbela, and Schreibman (1996) who utilized rating scales to measure qualitative aspects of interaction between parents and children with autism.
**Viewer procedures.** For this study, viewers who were naive about the study were asked to make ratings of their perceptions of the subjects' happiness and willingness to interact with the interventionist in videotape samples. Raters were communication disorders undergraduate students enrolled in an introductory course for clinical observation. Students were invited to participate on a voluntary basis; however, extra credit was offered by the course professor for participation. Seven raters participated.

Videotape was prepared for viewing by assigning a Subject letter (A, B, C) and number (1-10, representing the session) to each videotape sample. Videotape samples from Sessions 1, 5 and 10 were selected to provide segments representing a chronological range for the course of therapy for each subject. Segments of videotape viewed represented the middle two minutes of each five minute segment of each intervention format, for a total of 6 minutes per intervention format per subject.

The raters participated in three separate observation sessions, each consisting of six segments of videotape. These six segments of tape within each observation were counterbalanced according to subject (one session per subject per observation) and the chronological course of therapy (one initial session, one middle session, and one final session per observation). The order of presentation of the alternate treatments within each intervention session was consistent with the order in which therapy occurred. Each observation session therefore consisted of six segments representing one session for each subject, including two treatments per session, counterbalanced according to initial, middle and final sessions of therapy. For example, in the first observation session, the viewers rated Subject A's, fifth session (in alternate treatment order B, A); Subject B's first session (in...
alternate treatment order (A, B); and Subject C's tenth session (in alternate treatment order A, B).

At the beginning of the first observation, the investigator briefly reviewed characteristics of autism according to DSM-IV (American Psychiatric Association, 1994) guidelines, and informed the viewers that children with autism may behave unconventionally. Raters were told that they would be viewing different interventionists interacting with nonverbal children with autism, and that no questions or details of the interventions could be discussed until after the final viewing. Viewers were invited to write any comments regarding what was viewed on their rating sheets. The rating scale and procedure were explained. No other initial training was provided.

After viewing each intervention format, the raters were asked to make judgments regarding the child's "enjoyment level" and "willingness to interact with the adult." These areas were adapted from Koegel et al. (1996) who measured levels of "happiness," "interest," "stress," and "communication style" during family interactions. Measures of the child's enjoyment level and willingness to interact with the adult were selected to evaluate qualitative aspects of the child's responsiveness during intervention treatments, to provide information regarding affective/motivational characteristics, and to provide qualitative information reflecting the social focus of the dyadic interaction.

**Rating scale.** Viewers were asked to make ratings along a 6-point Likert scale modeled after Koegel et al. (1996). Each scale was divided into three categories ranging from negative (1-2), neutral (3-4) and positive (5-6). These three categories were ascribed functional definitions according to "happiness" and "willingness to interact with the adult." A sample rating scale with operational definitions can be seen in Appendix I.
**Evaluation of results.** These rating scores were tallied and averaged for each treatment for each subject. These averages were compared across intervention formats for each subject.

**Additional Measures of Interaction**

The measures described above were designed to answer the four primary research questions addressed for this study. In addition to these measures, further analyses were conducted to provide descriptive information used to support the data. These included measures of eye gaze and play routine complexity. These measures were also compared across treatments for each subject.

**Measures of eye gaze.** In an effort to quantify measures of the subjects’ eye gaze toward the adult, the number of verbal interactions in which the subject was looking at the face of the adult were counted. These instances were documented on the transcriptions, and were verified by video review. In some instances, the focus of the child’s eye gaze may have been somewhat ambiguous due to the distance of the child from the camera or his facial expression. Only instances in which eye gaze was judged to be unambiguously focused on the adult were counted. The number of instances were tallied and compared across treatments for each subject.

**Measures of play elaboration.** In an effort to describe the elaboration of the play evidenced by the subjects across the course of therapy, descriptions of the number of actions used with different objects and the number of sequences in play routines were compiled by documentation on the transcriptions. The number of different objects and the actions used with different objects were tallied and compared for each subject across treatments. Additionally, the number of single step, two-step, three-step and four-step play sequences exhibited by the children were tallied and compared across treatments for each subject.
Reliability

Reliability measures were obtained for the transcription of verbal and nonverbal events from the videotape, for categorizing adult interaction, and for analyzing child behaviors.

Training

To determine the reliability of data analysis, a graduate student in speech-language pathology was trained in the procedures. The investigator and graduate student reviewed the transcription and analysis procedures. Demonstration, practice, and feedback utilizing a sample videotape and transcription were provided until at least 90% point-by-point agreement on transcribed events and coded behaviors was achieved for the sample.

Random Selection

Segments of videotape were selected to obtain reliability measures. All of the analyzed video segments (a total of 320 2-minute segments) were coded for identification. Segments were coded according to subject (A, B, C), session number (1-10), and alternate treatment designation, (A or B), as well as according to the sequence of the three 2-minute segments within each session (i, ii, iii, representing first, second, and third segments, respectively). The coded videotapes were divided into two pools for each subject. These two pools represented the first five sessions and the last five sessions of therapy for each subject. From each of these pools, a coded videotape was drawn at random for each intervention format. This resulted in twelve selections, representing a 2-minute segment for each intervention format for each subject during the first half and last half of the course of therapy.
Transcription Agreement

Transcription agreement was obtained by presenting the graduate student with a transcribed copy of the videotaped segment. The student then watched the videotape and marked any discrepancies in observed verbal and nonverbal behaviors on the transcripts. Interrater agreement was determined by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100. Criterion of acceptance was 90% or greater agreement.

Agreement for adult and child measures was obtained by reviewing the transcripts. All utterances of the adult were characterized according to category and were marked on the transcripts. All behaviors of the child were reviewed for scoring. Behaviors which met criteria according to the scoring procedures were scored according to the behavioral hierarchy following the scoring procedures. Cognitive, Social and Semiotic scores were marked on the transcript. Interrater agreement was determined for each of the adult and child measures by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100. Criterion of acceptance was 90% or greater agreement. Interrater agreement for all variables examined is reported in Table 2-8.

Summary

An alternating treatments design was utilized to compare the behaviors of three nonverbal children with autism in the conditions of a) a developmentally-integrated intervention format; and b) each subject's established communication intervention format. Analysis of the adults' verbal interactions were utilized to characterize intervention formats according to the Traditional Behavior or Semantic Pragmatic-Developmental continuum. Measures of child behavior were examined analyzed according to the subjects' cognitive, social and semiotic behaviors and according to ratings of the subjects' enjoyment and interactivity.
Table 2-8

Interrater Agreement by Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcription of significant verbal and nonverbal events</td>
<td>100%</td>
</tr>
<tr>
<td>Adult interaction measures (characterization of adult utterances)</td>
<td>99%</td>
</tr>
<tr>
<td>Child behavioral measures (scoring cognitive, social and semiotic behavior)</td>
<td>97%</td>
</tr>
<tr>
<td>Eye gaze</td>
<td>100%</td>
</tr>
<tr>
<td>Play elaboration measures (number of actions used with objects, number of sequences in play routines)</td>
<td>100%</td>
</tr>
</tbody>
</table>

within sessions. These analyses were completed to address the following research questions:

**Question 1:** If interaction is structured at an appropriate developmental level to integrate cognitive, social and communicative development (i.e., a level that integrates cognitive, social and communicative development), will children with autism evidence more cognitive, social and/or communicative progress than under the conditions of the established intervention paradigms?

**Question 2:** If intervention structured in this framework facilitates developmental progress, will the children evidence a profile of synergistic functioning in cognitive, social and communicative domains, or will the children evidence an asynchronous pattern of functioning?

**Question 3:** Are children perceived to be happier and more willing to interact in the condition of developmentally-integrated intervention?
RESULTS

This study was undertaken to answer three research questions: a) If interaction is structured at an appropriate developmental level (i.e., a level that integrates cognitive, social and communicative development), will the child with autism evidence more cognitive, social and/or communicative progress than under the conditions of the established intervention paradigms? b) If intervention structured in this framework facilitates developmental progress, will the children evidence a profile of synergistic functioning in cognitive, social and communicative domains, or will the children evidence an asynchronous pattern of functioning? and c) Are children perceived to be happier and more willing to interact in the condition of developmentally-integrated intervention?

This study examined aspects of adult interaction and child behavior during the alternate treatments. Adult behaviors were examined to determine how interactions were structured and if the interactions occurred at an appropriate developmental level. Measures of child behavior were examined to characterize the subjects' cognitive, social and semiotic functioning during the conditions of the alternate treatments. Additional measures of the subjects' eye gaze, play complexity, and triadic attention were examined to provide descriptive information to support the data. Finally, ratings of the subjects' happiness and willingness to interact with the adult during the conditions of the alternate treatments were examined.

Characterizing Adult Interactions

The adult analyses involved categorizing utterances according to communicative functions (i.e., questions, vocatives, directives and so forth) to identify the adult interaction style and the intervention conditions. An adult interaction style that is more directive and adult structured expects the child to
respond to the communications produced by the adult. An interaction style that is more responsive indicates that the adult views the child as the communicator and then structures actions to enable the child to learn through the consequences of their behaviors. These characteristics of adult interaction were utilized to assign each intervention profile (A and B) to either the Traditional-Behavioral or Semantic-Pragmatic-Developmental format, to demonstrate that the two treatment conditions were meaningfully different from each other.

The interaction profiles also were used to address the question of whether the treatment conditions resulted in differences observed in child behavior, or whether the differences were related to the individuals conducting the treatment. To address this variable, the interventionist for Treatment B conducted one session with each child using the interaction patterns of the interventionist who typically implemented Treatment A. For these control sessions, the goals and interaction patterns typical of Treatment A were adopted and the resulting child behaviors were analyzed. If the treatment made a difference, the child should display a pattern of responses consistent with Treatment A under the control conditions.

**Characteristics of Adult Interaction**

The utterances of the adults were categorized according to their discourse function to profile the patterns of adult interaction. The profile was used to compare the adult's actual pattern of interaction to the stated goals of each intervention condition. The profile then was used to indicate whether the interactions should be classified as most characteristic of the Traditional-Behavioral (i.e., discrete trial and adult directed) or Semantic-Pragmatic (i.e., turn-taking, adult responsive) paradigm.

Profiles of adult interaction were determined according to the mean percentages of adult utterances assigned to each discourse category. The
percentages of adult utterances by category were averaged across all sessions for each subject's alternate treatments. These mean percentages are presented in Table 3-1. The resulting classification for treatment condition A is presented first for all three subjects, followed by treatment condition B.

Table 3-1

Mean Percentages of Adult Utterances By Discourse Category Across Alternate Treatments

<table>
<thead>
<tr>
<th>DISCOURSE CATEGORY</th>
<th>SUBJECT A</th>
<th>SUBJECT B</th>
<th>SUBJECT C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Attentional Vocatives</td>
<td>21%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Queries</td>
<td>19%</td>
<td>22%</td>
<td>16%</td>
</tr>
<tr>
<td>Directives</td>
<td>24%</td>
<td>13%</td>
<td>24%</td>
</tr>
<tr>
<td>Feedbacks</td>
<td>15%</td>
<td>31%</td>
<td>25%</td>
</tr>
<tr>
<td>Elaborations</td>
<td>21%</td>
<td>26%</td>
<td>28%</td>
</tr>
</tbody>
</table>

Treatment Condition A

Treatment condition A was implemented by the interventionist who provided services at the school according to the child's IEP. The intervention sessions that occurred during the 10 weeks of the study were used to generate the profile of discourse categories.

Subject A

The percentage of adult utterances by category within this intervention condition can be seen in Table 3-1. It should be noted that all results for Subject A were based on nine intervention sessions. The videotape from session 9 was damaged due to videotaping difficulty.
The communication goals for Subject A from his Individualized Educational Plan targeted behaviors including pointing to an object, person, or event in pictures, and responding with a vocalization and gesture to simple questions. Subject A's interventionist described the established intervention format as "selecting objects, matching pictures, and requesting labeling." The intervention goals for Subject A reflect a Traditional-Behavioral perspective in which the child is directed to respond to questions or to perform specific actions such as pointing or matching.

Examination of the mean percentages in Table 3-1 indicates these are consistent with the Traditional-Behavioral paradigm. The utterances which characterize the adult interaction during this intervention reflect a high proportion of Directives and Attentional Vocatives to direct the child's behavior. To a lesser degree, the interventionist utilized Queries to elicit responses from the child. Consistent with an adult-directed perspective, the category of Feedbacks, which are responses contingent on the behavior of the child, are the smallest proportion of adult interaction. The small proportion of Elaborations, which include language teaching behaviors such as modeling, labeling, and describing, reflects an emphasis on teaching discrete and objectively defined behaviors, consistent with Traditional-Behavioral paradigms.

A chi-square analysis was conducted by comparing the total of the mean percentages of the directive categories (i.e., Attentional vocatives, Queries, and Directives) with the total of the mean percentages of the facilitative categories (i.e., Feedbacks and Elaborations). Results revealed a significant difference between these totals ($\chi^2 (1) = 7.84, p < .01$), indicating this treatment was consistent with the Traditional-Behavioral paradigm.
Subject B

The communication goals for Subject B from his Individualized Educational Plan targeted behaviors including "responding to communication from familiar adults during naturally occurring events and routine activities by gesturing, signing, vocalizing, following requests and/or attending," and "initiating communication and showing active interest in person/object by using gestures, signs or vocalizations during naturally occurring events and routine activities."

As seen in Table 3-1, the proportions of discourse categories for this interventionist reflect the highest proportion of Elaborations. This pattern is consistent with the determined goals of this format, which frames intervention in terms of naturally occurring events and activities. The high proportion of Elaborations exemplifies principles of naturalistic adult-child verbal interaction, which typically involves talking about the objects and events in the context of interaction by describing, modeling and labeling. High and fairly consistent percentages of Queries and Feedbacks are also used, suggesting that the interventionist elicited responses from the child and provided feedback to the child's behavior in roughly equal proportion. This suggests a perspective which fosters shared control and reciprocity within interactions. Contrary to the traditional-behavioral oriented format of Subject A, the proportion of utterances for this subject reflect the smallest percentages in the adult-directed categories of Attentional Vocatives and Directives. The adult interaction of this format is consistent with Semantic-Pragmatic Developmental principles of child-directed, naturalistic interaction.

A chi-square analysis was conducted by comparing the total of the mean percentages of the directive categories (i.e., Attentional Vocatives, Queries, and Directives) with the total of the mean percentages of the facilitative categories
(i.e., Feedbacks and Elaborations). Results revealed no significant difference between these totals \(X^2(1) = .36, p > .05\). That is, unlike Subject A, the intervention was not primarily directive but rather was characterized by a comparable level of facilitative remarks. These results and the profile of mean percentages indicate that the interaction was in the direction of the Semantic-Pragmatic paradigm along the intervention continuum.

**Subject C**

Communication goals for Subject C from his Individualized Educational Plan targeted "making choices appropriate to the learning situation through set ups directed by the teacher/therapist;" "imitate/approximate words on command and use functionally in teacher/therapist directed activities," and "respond appropriately to directives: do this, look at me, give me, etc." The goals for this intervention format are Traditional-Behavioral oriented as illustrated by the specification of teacher/therapist direction, the elicitation of words on command, and responses elicited by directives.

Table 3-1 shows a profile of adult utterances in this format where the predominant strategy used for directing the child's behavior was by eliciting responses through Queries. The combined proportion of directive behaviors, including Queries, Directives and Attentional Vocatives, accounts for more than half of the adult interactions. In comparison, the proportion of Feedbacks is comparatively low, suggesting a deemphasis on responding to the behavior of the child. The orientation of the goals and the interactions of this interventionist are consistent with the adult-directed orientation of Traditional-Behavioral formats.

A chi-square analysis was conducted by comparing the total of the mean percentages of the directive categories (i.e., Attentional Vocatives, Queries, and Directives) with the total of the mean percentages of the facilitative categories.
(i.e., Feedbacks and Elaborations). Results revealed a significant difference between these totals \(X^2 (1) = 12.96, p < .01\), indicating this treatment was consistent with the Traditional-Behavioral paradigm.

**Treatment Condition B**

Examination of Table 3-1 shows the percentages of adult utterances by discourse category for Treatment B were similar across the majority of sessions for all three subjects. The discourse category with the highest percentages was Feedbacks, followed by Elaborations. The categories of Attentional Vocatives, Queries and Directives are represented in the lowest proportions.

A chi-square analysis was conducted by comparing the total of the mean percentages of the directive categories (i.e., Attentional Vocatives, Queries, and Directives) with the total of the mean percentages of the facilitative categories (i.e., Feedbacks and Elaborations) for each subject. Results revealed a significant difference between these totals for Subjects B and C (Subject B \(X^2 (1) = 16\), Subject C \(X^2 (1) = 16, p < .01\)). This indicates that the interactions with all three subjects were not Traditional-Behavioral and therefore in the direction of the Semantic-Pragmatic paradigm.

The goal for Semantic Pragmatic-Developmental intervention formats as characterized by Prizant and Weatherby (in press) is to increase communicative competence by emphasizing naturally occurring activities and reciprocal interaction. The high proportion of Feedbacks, Elaborations and Queries in conjunction with a low proportion of Directives and Attentional Vocatives illustrates the child-directed framework of this intervention format. Feedbacks encompass almost half of the interactions, emphasizing the shared control which characterizes this format and promotes reciprocal interaction. The high proportion of Elaborations characterizes naturalistic adult-child interaction, which typically
involves talking about the objects and events in the interaction context. The low proportion of Directives and Queries also illustrates the naturalistic framework and emphasis on reciprocal interaction.

**Treatment Comparisons**

Adult behaviors were examined to determine how interactions were structured and if the intervention conditions represented meaningfully different treatments. The profiles of discourse functions for Subjects A and C demonstrated sharply contrasting treatments. Treatment A in both cases was strongly characteristic of Traditional-Behavioral interventions, while Treatment B was strongly characteristic of Semantic-Pragmatic interactions. Chi-square analysis of the mean proportions of directive and facilitative behaviors between treatments A and B for these subjects revealed statistically different patterns of interaction (Subject A: directive behavior $\chi^2 (1) = 4.12$, facilitative behavior, $\chi^2 (1) = 4.74$ p < .01; Subject C: directive behavior $\chi^2 (1) = 9.9$, facilitative behavior $\chi^2 (1) = 7.87$, p = < .01).

The profile of discourse functions for Subject B was less differentiated between treatments A and B. Both interventions produced Feedbacks and Elaborations as the most frequent category of discourse functions. The adult-directed categories, Queries, Directives and Feedbacks represented the lowest categories. This reflects similarity between the two interventions that are associated with the Semantic Pragmatic-Developmental end of the continuum. Although similar, the percentages indicate that Treatment B was more child directed and responsive than Treatment A. A chi-square analysis between treatments supported this, showing no significant difference between treatments for the directive versus facilitative categories of interaction (directive behavior $\chi^2 (1) = 3.74$, facilitative behavior $\chi^2 (1) = 2.34$, $p > .05$).

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However, qualitative differences were exhibited between these two treatment conditions. The videotapes revealed that most of the elaborations that occurred in Treatment A consisted of parallel talk, or talk used by the adult to describe the actions performed by the child, while the elaborations in Treatment B consisted of action descriptions and expansions of the child's communications. Most of the feedback in Treatment A consisted of positive and negative reinforcers ("Good job" or "No"), while most of the feedback in Treatment B consisted of consequences for behaviors that were interpreted to be communicative (i.e., child extends an arm and the clinician rolls a car on the arm, replying "You want the car to roll down? OK, here it comes.") Thus, while the percentages of discourse functions were similar, the adult behaviors were qualitatively different in the two treatment conditions.

**Control Comparisons**

Control sessions were conducted by the interventionist utilizing the intervention style of each subject's established intervention paradigm to determine whether treatment profiles could be replicated with different interventionists. The percentages of occurrence of discourse categories were derived from the adult utterances produced during these control sessions. These percentages are presented in Table 3-2.

The percentages of discourse functions obtained in the control session were compared to the mean percentages of Intervention A and Intervention B for each subject. The results indicate that the profile of adult behaviors in the control session were similar to the profiles in intervention condition A. In a few cases the mean percentages were closer to Intervention B, as noted with an asterisk.
Table 3-2

Percentages of Adult Utterances by Discourse Categories During Control Sessions

<table>
<thead>
<tr>
<th>Discourse Categories</th>
<th>SUBJECT A</th>
<th>SUBJECT B</th>
<th>SUBJECT C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attentional Vocatives</td>
<td>18%</td>
<td>*4%</td>
<td>10%</td>
</tr>
<tr>
<td>Queries</td>
<td>1%</td>
<td>*23%</td>
<td>36%</td>
</tr>
<tr>
<td>Directives</td>
<td>36%</td>
<td>17%</td>
<td>8%</td>
</tr>
<tr>
<td>Feedbacks</td>
<td>*35%</td>
<td>29%</td>
<td>*27%</td>
</tr>
<tr>
<td>Elaborations</td>
<td>10%</td>
<td>27%</td>
<td>19%</td>
</tr>
</tbody>
</table>

* Indicates percentages that were closer to Treatment B proportions than Treatment A proportions.

Subjects A and C

For Subjects A and C, the control session resulted in profiles that were similar to Intervention A with the exception of the category of Feedbacks. The percentage of Feedbacks was higher in these control sessions than the mean percentages for either Intervention A or B. This was attributed to the attempt by the investigator to adhere to the characteristic of Traditional Behavioral paradigms in providing positive and negative reinforcement for each child response. The result was a higher level of feedback than was produced by the school interventionist. A chi-square analysis was conducted by comparing the total of the mean percentages of the directive categories (i.e., Attentional Vocatives, Queries and Directives) with the total of the mean percentages of the facilitative categories (i.e., Feedbacks and Elaborations). For both subjects, no significant differences
were found between Treatment A and the control session, indicating the control session was similar in format to the alternate treatment (Subject A: directive behavior $\chi^2 (1) = .06$, facilitative behavior $\chi^2 (1) = .08$, p > .05).

The control session was compared to Treatment B to determine if it was different from the experimental condition. For Subject C, the differences in categories were significant as anticipated (directive behavior $\chi^2 (1) = 6.84$, p < .01, facilitative behavior $\chi^2 (1) = 4.96$, p < .05), indicating this control treatment was consistent with the Traditional-Behavioral paradigm and not the Semantic-Pragmatic paradigm. The difference did not reach significance for Subject A as expected due to a high level of Feedback responses categorized as facilitative behaviors.

However, when Feedback utterances were examined qualitatively for the type of feedback provided (i.e., acknowledgments, requests for repair, positive and negative feedback), the characteristics of the Feedback utterances were closer to Treatment A than Treatment B. This qualitative analysis suggests that a more discriminating categorization of feedback behaviors into two types (i.e., task oriented positive or negative reinforcement versus semantically contingent acknowledgements or requests for repair) may be useful descriptors. When the differences in the feedback types were considered, the control session for Subjects A and B were considered to be a valid representation of the adult interaction style for Intervention A.

**Subject B**

The profile for Subject B also was very similar to Intervention A. For this subject, only the category of Queries was more like Intervention B. In both Treatment A and B, Queries occurred with moderate frequency (16% and 23%, respectively). The control level of 23% was similar to both conditions, although
closer to B. A chi-square analysis supported this, finding no significant difference between the control session and Treatment A ($X^2 (1) = 0.08, p > .05$). The analysis showed no significant difference between the control condition and Treatment B. This was an expected finding since these two treatments were along the same end of the Behavioral vs. Semantic-Pragmatic continuum. Therefore, the control session was considered to be a valid representation of the adult interaction style for Intervention A for this subject.

**Summary**

The utterances of the adults were analyzed according to discourse categories to characterize the adult interaction during the alternating treatments. The distribution of percentages by discourse category, were consistent with the goals established for the interventions, and were consistent with the Traditional-Behavioral or Semantic Pragmatic-Developmental characterization of each intervention paradigm. Some similarities and differences were seen across Intervention A and B formats. Regarding the Intervention A formats, the Traditional-Behavioral oriented formats (Subjects A and C) evidenced the highest proportions of Directives or Queries for directing or requesting information from the child. There was a low occurrence of Feedback proportions in the rank orders. This pattern reflects the adult-directed orientation of these approaches. In contrast, the categories which reflect adult-directed behavior (Queries, Directives and Attentional Vocatives), represented the lowest proportions for the Semantic Pragmatic-Developmental formats.

The Intervention A format for Subject B evidenced the highest proportion of Elaborations, or utterances which are used to model, label and describe within the context of interaction. The developmentally-integrated format (Intervention B) evidenced the highest proportion of Feedbacks, reflecting the emphasis on
responding the behaviors of the child. These patterns reflect the child-directed perspective of these formats.

Comparisons of the adult utterances during the control sessions revealed the percentages of adult utterances were consistent with the mean proportions of the Intervention A formats for most discourse categories. The control sessions were therefore considered to be valid representations of Intervention A adult interaction for each subject.

The results of the adult analyses demonstrate that the treatment conditions A and B were meaningfully different, and that the intervention conditions of Treatment A could reliably be replicated by interventionist B in a control session. This session can be used to examine profile of child behaviors to assure that differences in patterns of child responding are an outcome of the intervention provided and not the person conducting the intervention.

**Measures of Child Behavior**

Measures of child behavior were examined to address the three research questions. The subjects' behaviors were scored and tallied to provide a measure of frequency of occurrence (i.e., total scored behaviors) and to profile the level (i.e., a scale of 1 through 4) of cognitive, social and semiotic functioning of each behavior. Following the analysis of the cognitive, social and semiotic behaviors, the subjects' happiness and interactivity measures will be presented.

**Cumulative Measures of Cognitive, Social, and Semiotic Behavior**

Behavioral measures were tallied and analyzed to profile the cognitive, social and semiotic behaviors of the children within the conditions of the alternate treatments. These measures were examined to answer the first two research questions: a) If interaction is structured at an appropriate developmental level (i.e., a level that integrates cognitive, social and communicative development), will
the child with autism evidence more cognitive, social and/or communicative progress than under the conditions of the established intervention paradigms? and b) If intervention structured in this framework facilitates developmental progress, will the children evidence a profile of synergistic functioning in cognitive, social and communicative domains, or will the children evidence an asynchronous pattern of functioning?

To address the first question, the frequency of occurrence of behaviors, as measured by the total number of scored child behaviors, and the profile of cognitive, social and semiotic functioning (i.e., levels 1 through 4) for each subject within the conditions of the alternate treatments were examined.

**Total Scored Behaviors**

The total number of scored behaviors for each subject during Intervention A and Intervention B were tallied for all intervention and control sessions. All behaviors of the child that were related to the interaction presented by the interventionist (i.e., active turn-taking) were scored. Therefore, the total number of scored behaviors is a reflection of the effectiveness of the interventions according to the related behavior of the subjects. A high number of behaviors indicated a high level of active participation by the child, while a low number reflected more passive participation or disengagement. These measures will be examined for each subject by first comparing the conditions of Intervention A and Intervention B, followed by comparing control sessions to Intervention A and B means.

Figure 3-1 presents a comparative graph of the total scored behaviors produced by each child under Treatment conditions A and B. Comparisons of the total number of scored behaviors during alternate treatments will be examined for each subject.
Figure 3-1. Total number of scored behaviors for each subject.
*Missing data for Session 9.
**Subject A.** For Subject A, the total number of scored behaviors for Intervention B was greater than for Intervention A in 8 out of 9 sessions (note missing data for Session 9). For one session (8) the total scored behaviors for Intervention A exceeded Intervention B by five behaviors. When the treatment were compared using a Sign Test of Probability, Intervention B was found to elicit a statistically higher level of scored behaviors ($p < .02$) than intervention A. For Subject A, Treatment B was more effective in eliciting a higher number of behaviors across the course of treatment.

**Subject B.** For Subject B, the total scored behaviors for Intervention B were greater than for Intervention A in 6 out of 10 sessions. In the early sessions of treatment, the total number of behaviors elicited per session were equal (Session 2) for both treatments, or slightly higher for Treatment A (i.e., in Sessions 3, 5, and 6, the total scored behaviors for intervention A exceeded Intervention B by minimal numbers of 2 to 9 occurrences). Recall that Treatment A for this subject was closest in format to Intervention B and this result was not surprising. However, as intervention progressed, the number of behaviors for Intervention B exceeded Intervention A, increasing to differences of 60 or more occurrences by Session 7. A Sign Test of Probability revealed that the two treatment conditions were not significantly different across the course of treatment ($p > .377$). However, the trends in the data suggest that large treatment differences were beginning to occur in later sessions that would have shown significant differences had the intervention and the trends continued.

**Subject C.** For Subject C, the total scored behaviors for Intervention B were greater than for Intervention A in all ten sessions. When the treatments were compared using a Sign Test of Probability, Intervention B was found to elicit a statistically higher level of scored behaviors ($p < .001$) than Intervention A. For
Subject C, Treatment B was more effective in eliciting a higher number of behaviors across the course of treatment.

**Control comparisons.** As a measure to validate the representativeness of the control session for each subject to their Intervention A treatments, the total number of scored behaviors during control sessions were tallied for each subject. These totals were compared to the mean totals for Intervention A and B. This comparison is presented in Table 3-3.

Table 3-3
Comparison of Means of Total Scored Behaviors During Intervention A, Intervention B and Control Sessions for Each Subject

<table>
<thead>
<tr>
<th>Subject A</th>
<th>Subject B</th>
<th>Subject C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>Control</td>
</tr>
<tr>
<td>17.8</td>
<td>32.9</td>
<td>24</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>Control</td>
</tr>
<tr>
<td>21.9</td>
<td>45.1</td>
<td>28</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>Control</td>
</tr>
<tr>
<td>14.3</td>
<td>34.8</td>
<td>20</td>
</tr>
</tbody>
</table>

As is represented in Table 3-3, the Total Scored Behaviors during the control session for Subject A was 24. This was compared to the mean of Total Scored Behaviors for Intervention A (17.8) and Intervention B (32.9). While the control condition elicited slightly more behaviors than the mean for Intervention A, the Total Scored Behaviors for Subject A was within the range of Intervention A total scored behaviors (5 - 41), and was closer to the mean for Intervention A. The control session for Subject A was therefore considered to be a valid representation of Intervention A treatment as indicated by this measure.

The Total Scored Behaviors during the control session for Subject B was 28. This was compared to the mean of Total Scored Behaviors for Intervention A (21.9) and Intervention B (45.1). The Total Scored Behaviors for this subject was within the range of Intervention A (7 - 40) and was closer to the mean for
Intervention A. The control session for Subject B was therefore considered to be a valid representation of Intervention A treatment as indicated by this measure.

For Subject C, the Total Scored Behaviors during the control session was 20. Compared to the mean of Total Scored Behaviors for Intervention A (14.3) and Intervention B (34.8), the control total was within the range of Intervention A (5 - 28) and was closer to the mean for Intervention A. The control session for Subject C was therefore considered to be a valid representation of Intervention A treatment as indicated by this measure.

**Summary.** Based on the analysis of total scored behaviors, all subjects exhibited more interaction-related behaviors during the conditions of Intervention B. The organizational structure of Intervention B emphasizes providing the child with opportunities to communicate. According to the tallies of total scored behaviors, the children exhibited more communicative behavior related to the context of the interaction during the conditions of Intervention B.

The total scored behaviors during control sessions were analyzed as a measure to validate the representativeness of the control session for each subject to their Intervention A treatments. A comparison of the total scored behaviors during control sessions and the means of total scored behaviors during Intervention A and Intervention B revealed control session totals were closer to Intervention A means for all subjects. Control sessions were therefore considered to be valid representations of Intervention A treatments as indicated by this measure. The similarity of child responses to different adult interaction styles, regardless of who provides the intervention, suggests that the higher frequency of interactive behaviors was a result of the treatment condition and not the individual providing the treatment.
**Distribution of Behaviors by Domain and Level**

To characterize the developmental level of the behaviors elicited from each subject, the total scored behaviors were rated according to the continuum of four developmental levels within the cognitive, social, and semiotic domains. These results are presented in Table 3-4.

The distribution of behaviors reveals that the number of scored behaviors within each domain was greater during intervention B. A chi-square analysis revealed that these differences were higher at the p < .01 level of significance (Subject A $\chi^2 (1) = 18.44$, Subject B $\chi^2 (1) = 80.32$, Subject C $\chi^2 (1) = 93.4$). This occurred because many more scored behaviors occurred during this treatment condition. To determine whether the subjects evidenced more cognitive, social and/or communicative progress under the conditions of Intervention A or B, these distributions were examined for each subject and each domain. The highest level of behavior evidenced within each domain, and the frequency of higher-level behaviors were compared. Subtotals of lower-level behaviors (Levels 1 and 2) and higher level behaviors (Levels 3 and 4) were calculated to facilitate this comparison.

**Cognitive Domain.** Table 3-4 shows that for all subjects, a higher level of lower behaviors were produced under Treatment B, suggesting that more behaviors were elicited under this condition. A chi-square analysis revealed this difference to be reliable (Subject A $\chi^2 (1) = 45$, Subject B $\chi^2 (1) = 124.58$, Subject C $\chi^2 (1) = 47$, p < .01). Of greater interest was the occurrence of higher level behaviors. For Subjects A and B, a greater number of Level 4 (i.e., symbolic) cognitive behaviors were produced under Treatment B, although the frequency under both conditions was minimal. This level of cognitive displacement is recognized as difficult for most children with autism, and even few occurrences
Table 3-4.

**Distribution of Total Scored Behaviors According to Cognitive, Social and Semiotic Levels from Low (Rated 1) to High (Rated 4).**

### COGNITIVE DOMAIN

| Levels | Subject A | | Subject B | | Subject C | |
|---|---|---|---|---|---|
| | A | B | A | B | A | B |
| 1 | 0 | 22 | 2 | 1 | 2 | 23 |
| 2 | 140 | 255 | 164 | 440 | 115 | 225 |
| Total Low | 140 | 277 | 166 | 441 | 117 | 248 |
| 3 | 21 | 11 | 51 | 6 | 0 | 16 |
| 4 | 0 | 2 | 2 | 4 | 21 | 88 |
| Total High | 21 | 13 | 53 | 10 | 21 | 104 |
| Total Domain | 161 | 290 | 219 | 451 | 138 | 352 |

### SOCIAL DOMAIN

| Levels | Subject A | | Subject B | | Subject C | |
|---|---|---|---|---|---|
| | A | B | A | B | A | B |
| 1 | 36 | 74 | 97 | 206 | 35 | 64 |
| 2 | 121 | 36 | 119 | 22 | 63 | 39 |
| Total Low | 157 | 110 | 216 | 228 | 98 | 103 |
| 3 | 4 | 162 | 3 | 203 | 30 | 178 |
| 4 | 0 | 18 | 0 | 20 | 10 | 71 |
| Total High | 4 | 180 | 3 | 223 | 40 | 249 |
| Total Domain | 161 | 290 | 219 | 451 | 138 | 352 |

Table continued
represent an important achievement. When subtotals of higher level behaviors were compared (Levels 3 + 4), both subjects produced more under Treatment A conditions. A chi-square analysis revealed that the difference was reliably different for Subject B but not A (Subject B $\chi^2 (1) = 29.34$, Subject A $\chi^2 (1) = 1.88$). This quantitative evaluation suggests that the Traditional-Behavioral treatment is more conducive to eliciting higher-level behaviors. However, when the actual behaviors are qualitatively examined it is apparent that most of the Treatment A behaviors represented repetitive responses to perceptual stimuli. Subject A rated Level 3 responses for matching pictures in discrete trials, while Subject B rated Level 3 for stacking blocks, both behaviors showing the ability to compare and relate two objects within the same task.

In contrast, the higher rated behaviors in Treatment B represented functional knowledge, such as relating a cup and a puppet through the action of drinking, or a man to a car through the action of driving. These functional Level 3 behaviors are more difficult for children with autism because they require the

<table>
<thead>
<tr>
<th>Levels</th>
<th>Subject A</th>
<th>Subject B</th>
<th>Subject C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>37</td>
<td>77</td>
<td>114</td>
</tr>
<tr>
<td>2</td>
<td>124</td>
<td>168</td>
<td>102</td>
</tr>
<tr>
<td>Total Low</td>
<td>161</td>
<td>245</td>
<td>216</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>42</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total High</td>
<td>0</td>
<td>45</td>
<td>3</td>
</tr>
<tr>
<td>Total Domain</td>
<td>161</td>
<td>290</td>
<td>219</td>
</tr>
</tbody>
</table>
integration of information about people and their actions with objects, as opposed to perceptual knowledge which can be acquired through interactions with objects alone.

Subject C displayed the highest level of cognitive ability, producing frequent symbolic acts under both treatment conditions. However, Treatment B produced nearly five times as many higher level behaviors (i.e., 21 compared to 104), with most of these in the symbolic category related to functional actions. This difference was significant at the p < .01 level ($X^2(1) = 55.11$). Furthermore, the symbolic behaviors in Treatment A were both perceptual and functional. Those that were functional were single action (making an elephant eat cheese) while those in Treatment B were generally more complex (put a driver in a truck cab and objects in the bed, drive the truck and then dump the objects; or put a spoon in a pot, stir the pot with a spoon, and then feed a doll).

The results of the analysis of the cognitive domain were mixed, with a greater frequency of higher level behaviors for two subjects under Treatment A, but limitations in the quality and complexity of the behaviors compared to Treatment B.

Social Domain. For all three subjects, a greater number of socially interactive behaviors occurred under treatment condition B, and a far greater number of higher level behaviors occurred under Treatment B. The majority of social behaviors under Treatment A were lower level responses representing passive participation and no intentional communicative initiations. For Subject A, the number of low level behaviors was significantly higher for this condition ($X^2(1) = 36.88$, p < .01), while for Subjects B and C the differences were not significant (Subject B $X^2(1) = .32$, Subject C $X^2(1) = .12$, p > .05).
For Subjects A and B, only a few behaviors (i.e., 4 and 3, respectively) were social and intentional while 157 and 216 were passive. In contrast, these subjects produced 180 and 223 higher level social interactions under Treatment B. Chi-square analysis revealed that these comparisons were statistically significant (Subject A $X^2(1) = 168.34$, Subject B $X^2(1) = 214.14$, $p < .01$). Subject C was more interactive under both conditions, but even so produced only 40 higher-level behaviors under Treatment A compared to 249 under Treatment B. The chi-square revealed that these differences were significant at the $p < .01$ level ($X^2(1) = 55.11$). These results demonstrate that Treatment B was more effective in eliciting social participation and child-initiated interactions.

**Semiotic Domain.** For all three subjects, a greater number of nonverbal and verbal communicative behaviors (i.e., signs) were produced under Treatment B. In all cases, the frequency of communications was more than twice as often in the semantic-pragmatic condition. Subjects A and B were essentially non-verbal as reflected by the low occurrence of Level 4 behaviors, and all of these verbalizations occurred under Treatment B. Similarly, nearly all of the conventional non-verbal communicative behaviors (Level 3) occurred under Treatment B. Subject C produced verbal and nonverbal conventional behaviors under both conditions, but at a rate over three times as high under Treatment B. Chi-square analysis revealed that both low (Subject A $X^2(1) = 17.2$, Subject B $X^2(1) = 71.44$, Subject C $X^2(1) = 59.84$; $p < .01$) and high-level communicative behaviors (Subject A $X^2(1) = 45$, Subject B $X^2(1) = 35.12$, Subject C $X^2(1) = 35.12$; $p < .01$) were reliably greater for subjects under Treatment B. These results unambiguously demonstrate that Treatment B was more effective in eliciting communicative behaviors.
Subject Profiles. For subject A, Level 4 behaviors across cognitive, social, and semiotic domains occurred only during Interaction B. The highest level of functioning demonstrated by this subject during Intervention A occurred at Level 3 in all domains. These results indicate this subject demonstrated higher levels of cognitive, social and semiotic functioning during the condition of Intervention B.

For Subject B, Level 4 behaviors were infrequent across domains, but occurred more often under Treatment B for both cognitive and social domains. Level 3 behaviors were produced with far greater frequency in the social domain for Treatment B and were also greater for the communicative domain. Therefore Subject B demonstrated more progress during the conditions of Intervention B as evidenced by a higher level of functioning and/or more complex behaviors within each domain.

Subject C exhibited Level 4 behaviors in all domains during both interventions. However, the child exhibited more occurrences (three to six times as frequent) of higher-level behaviors in all three domains for Intervention B. These results indicate Subject C evidenced more cognitive, social, and semiotic progress as evidenced by more complex behaviors within each domain.

Summary. In a comparison of the distribution of the Total Scored Behaviors by domain and level, higher levels of behavior were achieved during Intervention B for Subjects A and B. This included cognitive, social and semiotic domains for Subjects A, and the social and semiotic domains for Subject B. Where equal levels of behavior were achieved, complex behaviors occurred with more frequency during the conditions of Intervention B. This included the cognitive and semiotic domains for Subject B and the cognitive, social and semiotic domains for Subject C. Based on these comparisons, all subjects
evidenced more cognitive, social and communicative progress during the 
developmentally-integrated intervention format than were evidenced during their 
established intervention paradigms.

Profiles of Cognitive, Social and Semiotic Behaviors Across Treatment

To profile the behaviors evidenced by the subjects across treatment, the 
total number of behaviors during Intervention A and Intervention B at each level 
within each domain was plotted across the ten sessions of treatment for each 
subject. These profiles are discussed for each subject by cognitive, social and 
semiotic domain.

Subject A

Cognitive behavior. The profile of cognitive behavior for Subject A is 
presented in Figure 3-2. Regarding Intervention A, behaviors occurred 
predominately at the Decentered level (Level 2), with two sessions evidencing 
some Relational (Level 3) behavior. The high occurrence of Level 2 behaviors 
exhibited during Intervention A is a reflection in part on the interventionist's 
emphasis on requesting or directing the child to perform actions with pictures 
(placing pictures in a tray). The emergence of some Relational interaction 
occurred when the child appropriately matched paired pictures of objects 
together.

Regarding Intervention B, behaviors were scored at all four levels on the 
Cognitive scale. Egocentered behaviors were scored when the child responded to 
on-the-body interaction such as hand movement games or tickling. The majority 
of interactions occurred at the Decentered level. This occurred when the child 
interacted with the interventionist and with toys in close proximity to the child. 
More Decentered behavior occurred during the conditions of Intervention B than 
the conditions of Intervention A for the majority of sessions. In the three sessions
Figure 3-2. Subject A: Total Number Cognitive Behaviors by Session  
*Missing data for Session 9
in which slightly more Decentered behaviors were exhibited in Intervention A, even higher-level behaviors occurred during Intervention B. This included the Relational behavior exhibited during Sessions 8 and 10, and Symbolic behavior during Sessions 7 and 8. The child exhibited relational play by placing body part pieces on a Potato Head toy. Symbolic play was exhibited in behaviors such as dressing dolls, and placing a man in a car to drive.

When results were subjected to a Sign Test of Probability, the higher occurrence of level 1 behaviors in all 9 sessions during Intervention B reached statistical significance ($p < .002$). Although Intervention B elicited more Level 2 behaviors in 6 out of 9 sessions than did Intervention A, these comparisons did not reach statistical significance ($p > .254$) when subjected to a Sign Test of Probability. Insufficient occurrences of Level 3 and 4 behaviors occurred under either condition across the sessions of intervention to subject the data to statistical analysis.

A hierarchical trend in the emergence of the complexity of cognitive behavior was evident in both treatment conditions. During Intervention A, Decentered behavior peaked at Session 7, and Relational behavior emerged at Session 8. During Intervention B, the Decentered behavior peaked at Session 6 and Relational and Symbolic behavior emerged at Sessions 7 and 8.

The peak in Level 2 skills during Intervention A was preceded by peaks in these levels during Intervention B in earlier sessions. From a developmental perspective, this suggests that the increased cognitive organization achieved in the condition of Intervention B may have facilitated the emergence of these behaviors during Intervention A.

**Social behavior.** The profile of social behavior for Subject A is presented in Figure 3-3. Regarding Intervention A behaviors, the predominant
Figure 3-3. Subject A: Total Number Social Behaviors by Session
*Missing data for Session 9.
concentration of behaviors occurred at Level 2, Collection. A peak of behavior at the Collection level occurred from sessions 5 through 8 and 10 for Intervention A. Prior to the child beginning to interact with the pictures during Session 6, very few socially interactive behaviors were exhibited by the child. At the Collection level, the child organizes events by action schemes and exhibits purposeful action for the consequences of the action. This peak was associated with the primary task of therapy in Intervention A, which required the child to respond to commands by placing pictures in a tray. A Sign Test of probability comparing the occurrence of Level 1 and 2 behaviors across interventions A and B revealed no significant differences. Thus, while they occurred with frequency in Treatment A, they also occurred with frequency in Treatment B.

Consistent with the peak at Sessions 7 and 8, the emergence of a few Descriptive List level behaviors occurred. At Level 3, the child exhibited occasional actions that were judged to maintain interaction when the child turned toward the interventionist in expectation of a card before another card was presented to him. In comparison, the predominance of behaviors under Intervention B conditions occurred at the Descriptive List level. The higher frequency of level 3 behaviors during intervention B in all nine sessions was significant at the .002 level. Level 3 behaviors reflect intentional social behavior exhibited by the child to maintain social interaction. These behaviors occurred when the child exhibited an intentional action within the social context for the consequence of social interaction with the interventionist. For example, the child would repeat an action in a repetitive joint action routine, such as indicating which of the toys the child wanted the interventionist to tickle him with, or which article of clothing he would like to put on the doll. This intentional level of social
behavior was strongly and consistently differentiated between Interventions A and Intervention B throughout the course of treatment.

The emergence of social behavior at the Ordered Sequence level of behavior also differentiated the social interaction between the alternating conditions. This elaborated level of social interaction occurred only during Intervention B resulting in more frequent occurrences during intervention B during 6 out of 6 sessions, which was found to be statistically significant at the $p < .01$ level. These behaviors included organizing social events by sequences of action, such as choosing a pieces of clothing offered by the interventionist for the doll, then putting the clothing pieces on the doll. The child also exhibited elaboration of social strategies such as indicating choices of toys to use during social interaction, shaking his head "no," giving toys to the interventionist, and spontaneously hugging the interventionist.

It is interesting to note the peak in Level 1 behavior which occurred at Session 6 was concommitant with the peak in intentional social behaviors at Level 3, and precedes the higher Level 4 behaviors at Session 8. Behaviors of the child that were scored at Level 1 included fortuitous behaviors, or behaviors which did not reflect social organization, that were attributed with meaning by the interventionist. Imputing meaning to undifferentiated actions of the child is a hallmark of the developmentally-based intervention format. The high occurrence of these behaviors at Level 1 occurring with the peak of intentional behavior from the child supports the effectiveness of this strategy in facilitating intentional social behavior.

The peak in Level 3 behavior at session 6 during the conditions of Intervention B preceded the peak in Level 4 behavior at Session 8. This pattern was also evident during Intervention A. The peak in Collection behaviors at
Sessions 7 and 8 were concomitant with the emergence of a few Descriptive List behaviors at Session 8. This suggests hierarchical development in the emergence of the complexity of social behavior.

Again, the peaks in social behaviors during Intervention B preceded the peaks in lower-level behaviors during Intervention A. This suggests that the level of social organization achieved during Intervention A facilitated higher-level social behavior in the conditions of Intervention B.

Comparing the social and cognitive behavior of Subject A, the peak that occurred in Level 2 cognitive behavior at Session 6 and Level 3 and 4 behavior at Sessions 7 and 8 occurred concomitantly with the peak in Level 3 and 4 social behavior. This suggests that as the child was able to accommodate higher-level cognitive skills, higher level social skills were also accommodated. This is supported by the occurrence of behaviors that were scored at higher levels (Levels 3 and 4) in both cognitive and social domains during the conditions of Intervention B.

**Semiotic behavior.** The profile of semiotic behavior for Subject A is presented in Figure 3-4. Regarding Intervention A, a similar profile to the social profile was evidenced at Levels 1 and 2. A relatively low number of semiotic behaviors were evidenced at Level 1, Reaction. These behaviors consisted primarily of glances at the interventionist or the picture which was presented to the subject. The predominant communicative behavior was scored at the Indication level. The majority of these occurred during the last half of the course of therapy, as the subject began to interact in the picture placing task. Behaviors scored at this level included those in which the child engaged in self-imitation of his responses during events. This was reflected in the child's repetitive response in taking cards from the interventionist during the card placing and/or matching
Figure 3-4. Subject A: Total Number Semiotic Behaviors by Session
*Data missing for Session 9.
activity. There were no semiotic behaviors scored above the Indication level for this subject during Intervention A.

Regarding Intervention B, more occurrences of semiotic behavior occurred at the Reaction and Indication levels than during Intervention A for the majority of sessions, however, when submitted to a Sign Test of Probabilities, these differences did not reach significance. During Intervention B, higher-level communicative behaviors also emerged. Conventional behaviors at level 3 occurred in 7 sessions, resulting in statistical significance at the p < .008 level. These behaviors occurred during occasions when the interventionist presented an opportunity for communicative elaboration. In these situations, the subject elaborated his communicative attempts toward more specific semiotic differentiation. For example, in the context of a tickle game with a puppet, the interventionist initially accepted movements of the child toward a body part as communicative behavior. As the interaction progressed, the interventionist paused before responding to the child's initiation. When the interventionist presented the opportunity for communicative elaboration, the subject responded with a more specific and conventionally communicative behavior. Instead of grasping his belly in anticipation of being tickled, the subject utilized a more conventional and specific response, by gesturing toward the puppet with open handed reaching and looking at the interventionist. Attempts such as these were scored at Level 3. Other behaviors included those in which the child imitated the specific communicative gesture of the adult to maintain the play. For example, during a hand movement game to a nursery rhyme, the subject imitated the interventionist by taking the lead, and began to manipulate the interventionist's hands in the motions to continue the play.
During Intervention B, the client exhibited Descriptive semiotic behavior as he verbalized approximations of words in the context of play. These included "Shoe," in interaction involving putting shoes on a doll, and "Zoom" while laughing, in the context of a game in which the interventionist would drive a toy car on the child's body. While none were elicited during intervention A, the number of weeks in which any level 4 behaviors occurred was too infrequent for statistical comparison.

A hierarchical pattern of development for the complexity of semiotic behavior was evident. A peak in behaviors at the Indication level at Session 5 was followed by a peak at the Convention level in Session 6. This peak at the Convention level was concurrent with Descriptive level semiotic behaviors which emerged in Session 6, and were evidenced through Session 8.

The peak exhibited during Intervention B in Indication level behavior was followed by a peak in these behaviors during Intervention A. This suggests that the level of semiotic organization achieved during the conditions of Intervention B facilitated the emergence of these behaviors during the conditions of Intervention A.

The peaks during Intervention A across Sessions 6 through 8 on the Semiotic scale were consistent with the peaks across the Cognitive and Social scales, suggesting synergism in the emergence of these behaviors across domains. The peak during Intervention B in Indication and Convention behaviors at Sessions 5 and 6 are concurrent with peaks in cognitive decentration and intentional social behaviors on the Cognitive and Social scales. In addition, these peaks are associated with a peak in Reaction level behaviors on the Semiotic scale. As higher levels of cognitive, social and semiotic behaviors were evidenced, there was an increase in Reaction level behaviors on the semiotic scale. This illustrates
that as higher levels of cognitive, social and semiotic integration occurred, an increase in interpersonal behaviors such as watching and smiling also occurred.

**Profile summary.** For Subject A, behaviors were exhibited at the highest level of complexity (Level 4) across cognitive, social, and semiotic domains during Intervention B. These behaviors encompassed Symbolic cognitive behavior, social discourse at the Ordered Sequence level, and Description level semiotic behavior. In contrast, during Intervention A the highest levels of behavior occurred at the Relational level on the Cognitive scale (Level 3), the Descriptive List level on the Social scale (Level 3), and the Indication level on the Semiotic scale (Level 2). Subject A achieved higher levels of cognitive, social and semiotic development in the conditions of Intervention B when compared to Intervention A as indicated by higher levels of the complexity of his behaviors.

Higher levels of integration across domains were also evidenced during Intervention B. This was evidenced by the highest level of behavior scored during Interventions A and B. During Intervention A, the highest level of integration was evidenced by behaviors scored at the Relational level on the Cognitive scale (Level 3), the Descriptive List level on the Social scale (Level 3) and the Indication level on the Semiotic Scale (Level 2). In contrast, the highest level of integration achieved during Intervention B was evidenced by behaviors scored at the Symbolic level on the Cognitive scale (Level 4), the Ordered Sequence level on the Social scale (Level 4) and the Convention level (Level 3) on the Semiotic Scale.

Subject A therefore evidenced more cognitive, social and semiotic progress during Intervention B, as indicated by level of complexity achieved within each domain, as well as by the higher level of integration evidenced across domains. Further, the pattern of emergence in levels of complexity achieved indicated a consistent, hierarchical pattern of emergence in which higher level behavior
emerged subsequent to or concurrent with a peak in behaviors at a lower level of complexity. In addition, peaks in behavior during Intervention B consistently preceded peaks in behavior during Intervention A. This suggests that the level of organization achieved during Intervention B facilitated the emergence of behaviors at the same or lower level of complexity within cognitive, social and communicative domains.

**Subject B**

**Cognitive profile.** The profile of cognitive behavior for Subject B is presented in Figure 3-5. Regarding Intervention A, two behaviors were scored at the Egocentered level in Session 1. These were scored when the child smiled during tickling. The predominance of behavior occurred at the Decentered level, when the interventionist attempted to engage the child with toys, such as puzzles, a shape sorter, and a push button toy with opening doors. Relational behaviors were scored when the child placed shapes in the sorter or placed puzzle pieces together. Two behaviors were scored at Level 4. On these occasions, the child imitated the action of the interventionist in pushing a toy truck.

Regarding Intervention B, few level 1 behaviors occurred, consistent with Intervention A. Too few of these behaviors were elicited for statistical comparison. The majority of behaviors occurred at the Decentered level. A strong differentiation in cognitive behavior is apparent from the beginning of the treatment at Session 1 and continued through the majority of sessions. A Sign Test of Probability revealed reliably more behaviors occurred during intervention B than intervention A (8 out of 10 sessions, p < .05). Relational behaviors also occurred, but with less frequency than during Intervention A (1 out of 7 sessions compared, p < .05). This resulted from Intervention B's focus toward functional, socially-oriented play, rather than on perceptual play with little social orientation,
Figure 3-5. Subject B: Total Number Cognitive Behaviors by Session
such as placing puzzle pieces or stacking blocks, which was emphasized during Intervention A. Repetitive perceptual actions such as stacking blocks were nurtured during Intervention A. In contrast, routines which maintained a social orientation within play contexts were nurtured during Intervention B. Slightly more Symbolic behavior emerged during Intervention B, but with insufficient frequency for statistical analysis. Qualitative analysis of these symbolic behaviors that occurred during intervention B revealed more complex play, such as two step routines involving loading the bed of a dump truck, then pushing the truck.

A small peak occurred during Intervention A in Decentered behavior at Session 3. This was followed by an increasing trend in Relational behavior which begins at Session 5 and peaks at Session 7. Similar patterns can also be seen during Intervention B. A peak in Decentered behavior is evident at Session 1. This is sub sequenced by a peak at Session 4 in Relational as well as Symbolic behavior. These patterns across both interventions suggest somewhat delayed hierarchical development in the emergence of the complexity of cognitive behavior.

In a comparison of the peaks in Decentered behavior for both Interventions as they emerge chronologically over time, it can be seen that the initial peak during Intervention B at Session 1 is followed by a peak during Intervention A at Session 3. A smaller peak during Intervention B at Session 4 is followed by a smaller peak during Intervention A at Session 6. This suggests that the cognitive organization achieved by the subject during intervention B facilitated subsequent increases in cognitive behavior during Intervention A.

It is interesting to note that at Session 6, Decentered behaviors occurred with the same frequency during both interventions. Following Session 6, however, Decentered behaviors during Intervention B continued to increase in occurrence, reaching their highest level as treatment ended at Session 10. During Intervention
A, however, a declining trend in Decentered behaviors occurred throughout the remainder of the treatment. Contrast in cognitive decentration is illustrated by the number of behaviors scored during sessions 7-10 during both conditions. During Intervention A, a total of 37 behaviors were scored; during intervention B, a total of 247 cognitively decentered behaviors were scored.

**Social behavior.** The profile of social behavior for Subject B is presented in Figure 3-6. For Intervention A, the majority of social behaviors occurred at Level 1, Discrete Event, and Level 2, Collection. At Level 1, the child does not exhibit organization within social events; rather, interaction is maintained by the adult. At Level 2, the child organizes social events by action schemes. These behaviors were consistent with the activities of therapy, which involved interaction with perceptual toys, such as placing puzzle pieces or putting shapes in the sorter toy. Three behaviors were scored at the Descriptive List level, in which the child was considered to use intentional response to maintain social interaction. These behaviors occurred when the child placed the interventionist's hands on the toys that were the topic of interaction.

Regarding Intervention B, behaviors are seen at all four levels on the Cognitive Scale. A Sign Test of Probability revealed no statistically significant differences between treatments in the occurrence of Level 1 behaviors, although more behaviors occurred during Treatment B during 6 out of 10 sessions ($p < .37$). Statistically significant differences were not revealed for Level 2 ($p < .17$), although a higher frequency of occurrence was exhibited during Treatment B in 7 out of 10 sessions. The predominance of behaviors for Intervention B occurred at the Descriptive List level, in which the child utilized intentional responses to maintain social interaction. The demarcation in the occurrence of intentional social
Figure 3-6. Subject B: Total Number of Social Behaviors by Session
behavior is a strong differentiator between Interventions A and B. The higher level of intentional social behavior in all 10 sessions was significant at the p < .001 level. The level of social discourse during Intervention A was primarily centered on the child's imitating his own action responses to perceptual toys (Collection level behavior).

Additionally, the occurrence of elaborated social discourse behaviors (Level 4) occurred during 8 out of 10 sessions, and occurred only during Intervention B, significant at the p < .05 level. These behaviors at the Ordered Sequence level included utilizing culturally recognized strategies for indicating choice (i.e., the choice of objects with which the adult would interact with the child), as well as spontaneous hugging, and clapping at the end of hand movement games to nursery rhymes.

In comparing the overall profile of social behaviors between Interventions A and B for Subject B, it can be seen that more behaviors which exhibited social intent (Level 3) and conventional social elaboration (Level 4) were exhibited during Intervention B. The preponderance of social behavior during Intervention A occurred at the Discrete Event and Collection Level, reflecting a lower level of social organization.

Comparing the emergence of peaks in behavior across time, a trend was observed in which peaks in higher-level behaviors during Intervention B preceded peaks in lower-level behaviors in Intervention A. As a peak emerged during Intervention B at the Ordered Sequence level in Session 3, a small peak emerged during Intervention A in Descriptive List behavior at Session 5. As Descriptive List behaviors peaked during Intervention B at Session 1, a peak emerged in Collection level behaviors during Intervention A at Session 2. Similarly, a second peak in Descriptive List behaviors during Intervention A at Session 4 preceded an
upward trend in Collection level behaviors during Intervention B that began at Session 5 and peaked at Session 7. This suggests that the levels of social organization achieved during Intervention B facilitated the emergence of lower-level social organizational skills during the conditions of Intervention A.

In comparing the social profile to the cognitive profile for Subject A, particular similarity can be seen in the Cognitive profile at Level 2, and the Social profile at Level 1. This reflects the relationship between the child's ability to cognitively decenter, or attend to people in their environment, and the emergence of social skills. Beginning at Session 7, there is a dramatic increase in these behaviors during Intervention B and decrease during Intervention A. This suggests that, with continued exposure to Intervention B, the child increased cognitive and social responsiveness. However, the level of the child's cognitive and social responsiveness decreased during Intervention A as therapy continued. A total of only 36 behaviors were scored in the conditions of Intervention A during sessions 8, 9, and 10, compared to 211 behaviors exhibited during Intervention B during these sessions.

**Semiotic behavior.** The semiotic profile for Subject B is presented in Figure 3-7. Regarding Intervention A, semiotic behaviors were scored predominately at the Reaction and Indication levels. Reactions are behaviors that the adult imputes with meaning. At the Indication level, the child responds in accordance with the convention of routines. He exhibits self-imitation of responses within routines with others. This occurred in the context of play with perceptual toys, in which the child repeated his action response. Three behaviors were scored at the Convention level. On these instances the child imitated the action of the adult in the context to continue play.
Figure 3-7. Subject B: Total Number of Semiotic Behaviors by Session
Regarding Intervention B, Level 1 behaviors occurred with the same or lower frequency for the first seven sessions of treatment and then increased to 50 or more instances of occurrence for the final three sessions. A Sign Test of Probability found these differences to be nonsignificant (6 out of 10 comparisons, p < .37) but with trends that showed an emerging difference had treatment continued. A greater number of behaviors occurred for level 2 (9 out of 10 comparisons, p < .01). Level 3 behaviors, while favoring Intervention B did not reach a level of significance (5 out of 6 comparisons, p < .06). Subject A did not exhibit any Description level behaviors in the conditions of either intervention format.

In comparing the semiotic profile of this subject to the social profile, critical differences can be seen. On the Semiotic scale, the topography of behaviors within the Indication level for Intervention A resembles that of the Collection level on the Social scale. Similarly, the topography of behaviors at the Indication level for Intervention B resembles that of the Descriptive List level on the Social scale. These similarities reflect the synergistic relationship between social and semiotic skills. However, the differences are reflected in the significant contrast in the social contexts in which these semiotic behaviors occurred. In Intervention A communicative behaviors occurred at a lower level of social organization (Collection); in Intervention B they occurred in the context of intentional social interaction.

**Profile summary.** For Subject B, higher levels (Level 4) of social behaviors were achieved only during Intervention B. Similar levels of complexity were achieved in cognitive behavior (Level 4); however, qualitative analysis of these behaviors revealed more elaborated symbolic behavior (i.e., sequenced symbolic play) during Intervention B. Similar levels of semiotic behavior (Level 3)
also occurred during both treatments. Although more Level 3 behaviors occurred
during 5 out of 6 sessions, this did not reach statistical significance. Overall
comparison of the incidence of higher-level semiotic behaviors across the course of
treatment did indicate significantly more behaviors occurred during Intervention B.
Although the results are mixed, trends in both qualitative and quantitative data
support the emergence of higher level cognitive, social and semiotic development
during intervention B. Since both treatments for Subject B reflected similar
intervention styles (i.e., both treatments adopted a Semantic Pragmatic-Behavioral
approach), some similarity in results is not surprising.

Higher levels of integration across domains were also evidenced during
Intervention B. This was evidenced by the highest level of integrated behaviors
scored during both conditions. During Intervention A, the highest level of
integration was evidenced by behaviors scored at the Relational cognitive level
(Level 3); the Collection level of social interaction (Level 2); and the Convention
Level of semiotic interaction (Level 3). In contrast, the highest level of integration
achieved during Intervention B was evidenced by behaviors scored at the Symbolic
level on the Cognitive scale (Level 4); the Descriptive List level of social
interaction (Level 3); and the Conventional level on the Semiotic scale (Level 3).

Subject B therefore evidenced more cognitive, social and semiotic progress
during Intervention B, as indicated by level of complexity achieved within each
domain, as well as by the higher level of integration evidenced across domains.

Subject C

Cognitive behavior. The cognitive profile of Subject C is presented in
Figure 3-8. During Intervention A, the predominance of behaviors were scored at
the Decentered level. These occurred as the interventionist presented objects for
the child to manipulate. Some cognitive behaviors were also scored at the

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Figure 3-8. Subject C: Total Number of Cognitive Behaviors by Session
Symbolic level. These occurred when the child put a toy cup colored to look like milk or orange juice to his mouth, put a plastic banana to his mouth and the interventionist's mouth, and pushed a toy car and bicycle.

During Intervention B, behaviors were scored at all four levels. At Level 1, more behaviors occurred during 6 out of 9 comparisons during Intervention B; however, a Sign Test of Probability revealed no significant differences (p > .05). More Decentered behaviors occurred during 9 out of 10 sessions during Intervention B (significant at p < .008). Level 4 behaviors also were higher in 7 out of 7 sessions, with the remaining 3 sessions showing comparable levels between treatments (significant at p.008). Level 4 behaviors also were higher in 7 out of 8 sessions, significant at p < .03. Thus the subject in Intervention B exhibited more behaviors in different cognitive contexts, and exhibited behaviors more frequently in more complex cognitive contexts than in the conditions of Intervention A.

Egocentered behaviors occurred during play interaction on the child's body—either hand movement games or interaction with toys such as tickling, or "driving" toys on the child's body. Decentered behaviors occurred when the child interacted with the interventionist or with toys presented as the focus of interaction. Relational behavior occurred when the child put two toys together, such as placing round Tinker Toy wheels in a dump truck, or directing the interventionist's hand, holding a man to be placed in a toy car. Symbolic behaviors were scored when the child brushed the fur or hair of stuffed animals and dolls, pretended to feed himself and the interventionist with a spoon, mixed pretend pots of food with a spoon, placed clothing and body parts appropriately on a Potato Head figure and doll, placed drivers in cars and trucks and/or pushed them, placed
animals in the back of a truck and pushed the truck, and gave drinks to toy animals and dolls.

Symbolic play continued on an upward trend from Session 7 which continued to the end of the course of therapy. During Intervention A, cognitive behaviors declined from Session 8 to the end of the course of therapy. This difference in responsiveness is illustrated by the number of behaviors scored during these sessions during Sessions 9 and 10. During Intervention A, only 23 behaviors were scored and these occurred at the Decentered level. In contrast, 80 behaviors were scored during Intervention B during these sessions, the majority of which occurred in the context of symbolic play interaction.

**Social behavior:** The profile of social behavior for Subject C can be seen in Figure 3-9. During Intervention A, the subject made few changes in the profile of social behaviors across the 10 sessions of treatment. The greatest variation was observed in Level 2, where the child organized social events by action scheme. These occurred as the child manipulated toys. A few behaviors were scored at the Descriptive List and Ordered Sequence levels. These behaviors occurred primarily when the interventionist structured repetitive joint action sequences based on perceptual actions. In one sequence, the subject sequentially pressed the numbers on a toy phone; in the other sequence the subject picked up and put down miniature traffic signs.

Although the child exhibited behaviors in all levels of social discourse in both intervention formats, the complex behaviors of the child (at the Ordered Sequence and Descriptive list levels) during Intervention B exceeded those during Intervention A in terms of quantity as well as quality. A Sign Test of Probability revealed these differences to be significant for both levels (10 out of 10 sessions, p < .001). During Intervention B, the predominance of behaviors occurred in the
Figure 3-9. Subject C: Total Number of Social Behaviors by Session
context of Descriptive List. The demarcation between Descriptive List behaviors is a primary differentiator contrasting Interventions A and B. In Intervention B, 176 responses (50%) were exhibited to intentionally maintain social interaction. During Intervention B, 30 responses (18%) were exhibited to intentionally maintain interaction. Another strong demarcation is seen at the Ordered Sequence level. More Level 4 behaviors were exhibited during Intervention B during every session. Contexts in which these behaviors occurred differed from the perceptual action-based focus of Intervention A. During Intervention A the 10 responses that were scored at the Ordered Sequence level consisted primarily of utilizing social strategies such as indicating a choice of toys to play with, giving toys to the interventionist, and imitating clapping at the end of a push button sequence.

In contrast, during Intervention B the child participated in multiple-step play sequences based on social schemata. For example, the child enacted a cooking sequence by choosing a kitchen utensil, stirring a pot of "food" and "feeding" himself, the interventionist, a doll or stuffed animal. In a working sequence, the child enacted filling a dump truck, placing a man in a truck, driving the truck, then spilling out the contents. The aspect of spilling the contents of the truck stimulated a social sharing strategy noted to be absent in the social interaction of children with autism: looking at the interventionist with surprised affect (often accompanied by verbal approximations of "Uh oh!"). Other social strategies exhibited included indicating a choice of toys to play with, giving toys to the interventionist, clapping at the completion of a joint nursery rhyme routine, protesting putting on a puppet, and hugging the interventionist.

In comparing the social profile and the cognitive profile of Subject C, the topography of the profiles in Decentered behavior on the Cognitive scale is similar to the topography of the social profiles at Level 3 for Intervention B and at Level 2.
for Intervention A. This evidences the synergistic relationship between cognitive and social skills, i.e., the child's ability to decenter and participate in social discourse with others. As can be seen in a comparison of these profiles, during Intervention A, the child's level of participation in social discourse remained at the Collection level. During situations which required cognitive decenteration, the child participated in social discourse by action scheme. During Intervention B, the child was able to integrate interaction requiring cognitive decenteration with intentional social interaction. Higher level integration was also evidenced during Intervention B. Upward trends were evident during Sessions 8, 9 and 10 at Level 4 on both the Cognitive and Social scales. This evidenced that the child was able to integrate higher level social discourse behavior during situations of higher level symbolic complexity. This was evidenced by the occurrence of behaviors scored at Level 4 on both the Cognitive and Social scales.

**Semiotic behavior.** The profile of semiotic behavior for Subject C is presented in Figure 3-10. During Intervention A, the predominance of interaction occurred at the Indication level. At this level, the child's responses are characterized as self-imitation within a routine context. The majority of these behaviors were clustered within Sessions 1, 2 and 8. Fewer than five Indication level behaviors were scored during each of the other sessions. The majority of these behaviors were scored during contexts of taking offered toys (such as taking and/or manipulating the plastic cup) or within the routines in which the child performed perceptual actions such as pushing buttons on the toy telephone. A large proportion of behaviors during Intervention A were scored at the Reaction level. Behaviors at this level are imputed with meaning by the adult, and may include passive reactions such as looking at the adult or the object of interaction. Only 8 behaviors were scored at the Convention level. At this level,
Figure 3-10. Subject C: Total Number of Semiotic Behaviors by Session
the child imitates the action of the adult to maintain play. For example, Subject C imitated biting an apple, drinking from a cup and clapping at the end of the push-button game.

Subject C exhibited 21 word approximations within the context of Intervention A. Some of these consisted of the single verbalization that had been exhibited prior to the study by Subject C, the word "apple." Other verbalizations were imitative consonant-vowel approximations or vowel reduplications for the words "ball," "bear," "dog," "go," "moo," "bounce," "down," and phrases "uh oh," and "all done." Verbalizations fell within the functional categories of labels and comments.

During Intervention B, a greater number of total behaviors were evidenced at all levels, but not for all sessions of intervention for levels 1 or 4. This resulted in nonsignificant differences at these levels according to the Sign Test of probability (5 out of 10 comparisons, p < .62). The clearest distinctions were evidenced at the Indication (Level 2) and Convention (Level 3) levels, in which the frequency of behaviors during Intervention B exceeded the frequency of behaviors during Intervention A for all sessions (significant at p < .001). Particular demarcation between intervention formats is seen at the Convention level. At this level, the child elaborates a communicative response by imitating the adult, or by elaborating his response to indicate more specific referential specification. These communicative behaviors reflect broader conventional aspects of communication learned through social interaction. Only 8 of these behaviors were evidenced during Intervention A as compared to 73 during Intervention B.

Subject C evidenced slightly more verbal approximations during the conditions of Intervention B. These verbalizations consisted of imitative single word approximations of consonant-vowel or vowel reduplication for the words...
"head," "ear," "hat," "moo," uh oh," and "more." However, more complex multisyllabic constructions were also verbalized to approximate the phrases "potato head" and "oh, stay in!" Verbalizations during Intervention B were categorized to fall within the functional categories of labels and comments as well as requests. The verbalizations during Intervention B were therefore differentiated from those during Intervention A by quantity, by complexity of phonological construction, and by functional use.

**Profile summary.** Subject C evidenced higher levels of cognitive, social and semiotic development (Level 4) during Intervention B as evidenced by the quantity and quality of behaviors within each intervention context. For Subject C, behaviors were evidenced on all four levels on the Cognitive, Social, and Semiotic Scales during Intervention B. During Intervention A, no Level 3 behaviors were evidenced on the Cognitive Scale and few Level 4 behaviors compared to Intervention B. During Intervention B, the subject exhibited more behaviors in different cognitive contexts and exhibited behaviors more frequently in more complex cognitive contexts. The child exhibited Relational play only during Intervention B. The Symbolic cognitive behavior demonstrated during Intervention B was elaborated in quantity and quality as compared to Intervention A. Although both conditions evidenced some Symbolic cognitive behavior, during Intervention B symbolic behavior occurred four times more frequently, and was more elaborate in terms of symbolic actions and numbers of toys.

Although behaviors were represented at all four levels of complexity on the Social scale during both interventions, more social behaviors were exhibited by the child in 3 out of 4 levels during Intervention B. These included higher levels of social discourse (Levels 3 and 4). The child exhibited many more intentional (Descriptive List level) behaviors, more elaboration of play sequences based on
socially-acquired schemata (Ordered Sequence level) as well as the use of more conventional social/pragmatic strategies (Ordered Sequence level).

On the Semiotic scale, more behaviors were evidenced at all levels during Intervention B, including higher level Convention and Description behaviors. Slightly more verbalizations occurred during Intervention B than during Intervention A. Verbalizations exhibited during Intervention B were further differentiated in terms of complexity of phonological construction and by functional use.

Although both subjects evidenced some behaviors at Level 4 across domains, Subject C achieved higher levels of integration at this level during Intervention B. This was evidenced by the occurrence of behaviors scored at Level 4 across domains. During Intervention A, the highest level of integration was evidenced by behaviors scored at the Symbolic level on the Cognitive scale (Level 4), the Descriptive List level on the Social scale (Level 3), and the Convention level on the Semiotic scale (Level 3).

Subject C therefore evidenced more cognitive, social and semiotic progress during Intervention B as indicated by the quantity and quality of cognitive, social and semiotic behaviors, as well as by the higher level of integration evidenced across domains.

Control Comparisons

As a measure to validate the representativeness of the subjects' behavior during control sessions to Intervention A treatments, the number of behaviors occurring at each level of complexity within each domain during control sessions were compared to the mean number of behaviors occurring by domain level during Interventions A and B. These comparisons for each subject are presented in Table 3-5.
Table 3-5

Comparison of Subject Behavior Totals During Control Sessions to Interventions A and B Means

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</tbody>
</table>

For Subject A, the number of behaviors at each level was closer to the means of Intervention A for 10 out of 12 comparisons. At the Decentered level, the number of behaviors exhibited during control sessions was slightly closer to the
mean for Intervention B, however, the number fell midway between both Intervention A and B means. In one comparison (at the Indication level) the control number exceeded that of both Intervention A and B means. Because the behaviors exhibited by the child during control sessions more closely resembled the behaviors demonstrated during Intervention A as evidenced by the majority of comparisons, these differences during three comparisons were not considered to be important. A Sign Test of probability supported this, indicating the control session responses were not reliably different (p < .05) from Treatment B.

For Subject B, the number of behaviors at each level was closer to the means of Intervention A for 9 out of 11 comparisons. In one category, Description, no behaviors were scored during any of the conditions. In two comparisons (at the Relational and Egocentered levels) the number of behaviors exhibited during control sessions was closer to the mean for Intervention B, however, this was because no behaviors were scored at these levels during control sessions. Because the behaviors exhibited by the child during control sessions more closely resembled the behaviors demonstrated during Intervention A as evidenced by the majority of comparisons, these differences during two comparisons were not considered to be important. A Sign Test of Probability supported this, indicating the control session responses were not reliably different from Treatment A (p < .01) but were statistically different (p < .05) from Treatment B.

For Subject C, the number of behaviors at each level was closer to the means of Intervention A for 8 out of 12 comparisons. In one comparison (at the Decentered level) the control number fell midway between Intervention A and B means. Some Level 1 behaviors (at the Discrete Event and Reaction levels) occurred with more frequency during control sessions than both Intervention A
and B mean levels. Although the comparison of the control session to Intervention A means did not reach statistical significance, the behaviors more closely resembled the behaviors demonstrated during Intervention A as evidenced by the majority of comparisons.

**Summary**

Measures of the cognitive, social, and semiotic functioning of the subjects' behaviors were analyzed according to cumulative measures and profiles of behavior across treatments. Analysis of cumulative measures were examined according to the Total Scored Behaviors for each subject within each treatment, and the distribution of behaviors by domain and level. Based on the analysis of Total Scored Behaviors, all subjects exhibited more interaction-related behaviors during the conditions of Intervention B.

In a comparison of the distribution of the Total Scored Behaviors by domain and level, higher levels of behavior were achieved in the majority of domains during Intervention B. The greater frequency of higher-level behaviors attributed to intervention A for two subjects was due to repetitive perceptual behaviors. only Treatment B elicited higher-level functional behaviors. Based on qualitative and/or qualitative comparisons, all subjects evidenced more cognitive, social and communicative progress during the developmentally-integrated intervention format than were evidenced during their established intervention paradigms.

To profile the behaviors evidenced by the subjects across treatment, the total number of behaviors during Intervention A and Intervention B at each level within each domain was plotted across the ten sessions of treatment for each subject. Subject A achieved higher levels of cognitive, social and semiotic development in the conditions of Intervention B when compared to Intervention A.
as indicated by higher levels of complexity achieved within each domain as well as by higher levels of behavioral integration across domains. Subject B achieved higher levels of social development, with qualitative analysis supporting more complex cognitive and semiotic development as well as higher levels of behavioral integration across domains during the conditions of Intervention B. Subject C achieved higher levels of cognitive, social and semiotic behavior during Intervention B as indicated by the quantity and quality of cognitive, social, and semiotic behaviors within the levels of complexity in each domain, as well as by higher levels of behavioral integration across domains.

Therefore all subjects evidenced more progress during the conditions of Intervention B as indicated by comparisons of Total Scored Behaviors, the distribution of behaviors across levels within domains, and quantitative and qualitative analysis of the profile of behaviors across sessions during the course of treatment.

Analysis of the subjects' behavioral measures during control sessions were compared to: a) Intervention A and B means for Total Scored Behaviors, and b) the distribution of child behaviors exhibited by level within domains across sessions during the course of treatment. Results indicated that the Total Scored Behaviors that occurred during control sessions fell within the range of the mean scores of Intervention A conditions, and were closer to the mean of Intervention A than to the mean of Intervention B for all subjects. Comparison of the distribution of child behaviors during control sessions to the mean distribution of behaviors by behavioral levels across the course of therapy for the alternate treatments indicated that the control distributions were closer to the distributions of Intervention A for the majority of levels for each subject as indicated by the majority of measures compared and/or statistical comparison. The behaviors exhibited by all subjects
during control sessions were therefore considered to reflect a valid representation of Treatment A behavior.

**Measures of Enjoyment and Interactivity**

To investigate whether children are perceived to be happier and more willing to interact in the condition of developmentally-integrated intervention, viewer ratings were obtained to evaluate qualitative aspects of the children's responsiveness to the alternating intervention paradigms. The viewer ratings for all sessions of each subject were averaged for each subject within each alternate treatment. These results of the mean ratings of the subjects' enjoyment is presented in Figure 3-11.

![Figure 3-11. Mean Ratings of Subjects' Enjoyment During Interventions A and B](image)

The mean ratings of enjoyment for Intervention A conditions for Subjects A and B fell within the Neutral range (e.g., a rating between 2 through 4). The mean ratings of enjoyment for Subject C fell slightly within the positive range (i.e., a rating of 4.4). Neutral ratings suggest that viewers perceived the children as neither enjoying nor disliking the interactions during this treatment condition, appearing passive. In contrast, all mean ratings of the subjects' enjoyment for
Intervention B conditions fell within the Positive Range. The positive rating for Subject C during Intervention B was significantly higher than that of Intervention A.

The results of the mean ratings of the subjects' interactivity is presented in Figure 12. Interactivity, or willingness to interact with the interventionist also was evaluated for both treatment conditions. All mean ratings of the subjects' interactivity for Intervention A conditions fell within the neutral range (e.g., a rating between 2 and 4). In contrast, all mean ratings of the subjects' interactivity for Intervention B conditions fell within the positive range.

![Figure 3-12. Mean Ratings of Subjects' Interactivity During Interventions A and B](#)

To provide further qualitative information regarding the child's enjoyment of the sessions, raters were invited to write comments on the rating forms. Only two comments were provided. Concerning Subject C in Treatment A, a rater commented "He seems happy, but he's not listening to the adult." Concerning Subject A in Treatment A, a rater commented "He interacted but he didn't enjoy." These observations were supported by rater means for Subjects A and C. Subject
A's Enjoyment mean was slightly lower than his Interactivity mean. Subject C's Enjoyment rating fell just within the positive range; however, the Interactivity mean was in the neutral range.

These ratings consistently indicate that all subjects were perceived to be happier and more willing to interact during the conditions of the developmentally-integrated intervention condition.

Supportive Measures

Further analyses were conducted to provide descriptive information used as supporting data. These included measures of eye gaze and play routine complexity. These measures were also compared across treatments for each subject.

Measures of Eye Gaze

In an effort to quantify measures of the subjects' eye gaze toward the adult, the number of verbal interactions in which the subject was looking at the face of the adult were tallied for each subject within each alternate treatment. Results are presented in Table 3-6.

Table 3-6
Subjects' Total Number of Eye Gaze Behaviors During Alternate Treatments

<table>
<thead>
<tr>
<th></th>
<th>Subject A</th>
<th>Subject B</th>
<th>Subject C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention A</td>
<td>15</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Intervention B</td>
<td>145</td>
<td>119</td>
<td>114</td>
</tr>
</tbody>
</table>

All subjects exhibited minimal instances (0 to 15) of eye gaze under Treatment A, and high frequency occurrences (114 to 145 instances) of eye gaze under
Treatment B. Eye gaze under Treatment B spontaneously occurred as the interventionist responded to the child's unintentional or intentional behaviors with some interesting consequence. As the child discovered that his actions were causing the consequences, eye gaze occurred concommitantly with a child-initiated communicative behavior. The eye gazes that occurred under Treatment A did occur spontaneously but were not paired with other intentional communications.

**Play Elaboration**

In an effort to describe the elaboration of the play evidenced by the subjects across the course of therapy, transcriptions were used to compile profiles of the subjects' play. Descriptions including the number of actions used with different objects and the number of steps in elaborated play sequences were derived.

**Subject A.** Examination of the play exhibited by Subject A during his established intervention paradigm revealed a limited number of objects and actions on objects. Across the course of treatment, the child interacted with picture card pairs by a) placing them on a tray and b) matching picture pairs. This represents a limited range of objects and actions with those objects. Play was based primarily on perceptual skills. On one occasion the child manipulated a card with a picture of a frog to "hop". This action modeled by the therapist represents the only action that could be considered to have functional, symbolic characteristics.

In comparison, the play exhibited by Subject A during the developmentally-integrated paradigm reflected more functional, symbolic actions with a broader variety of objects. The play exhibited by Subject A incorporated functional actions with toys such as putting a driver in a car, pushing a truck, putting shoes on a doll, and placing facial features appropriately on a Potato Head figure. Play was characterized primarily by single actions with objects; however, the child exhibited
some two-step play sequences during routines involving selecting facial features presented by the therapist and placing them appropriately on a Potato Head figure. The play exhibited by Subject A during the developmentally-integrated format therefore involved more functional play with a broader variety of objects in more elaborated play sequences.

**Subject B.** Examination of the play exhibited by Subject B during his established intervention paradigm revealed a limited of perceptual actions on a limited number of objects. Subject B pushed buttons on toys, placed shapes in a shape sorter, placed puzzle pieces, and stacked blocks.

In comparison, the play exhibited by Subject B during the developmentally integrated paradigm reflected more functional symbolic play with toys in more elaborate play sequences with the interventionist. Subject B engaged in two-step joint action routines by selecting toys presented by the interventionist to fill the bed of a dump truck, then "driving" the truck away.

**Subject C.** Examination of the play exhibited by Subject C during his established intervention paradigm revealed play characterized by single perceptually-based actions with objects. During the course of Intervention A treatment, Subject C engaged in perceptual play such as bouncing a ball, winding a jack-in-the-box, and pushing buttons on a phone. Other single actions with objects that had symbolic characteristics involved basic functional actions such as drinking from an empty cup, biting a plastic apple, and rolling a car.

In contrast, the play exhibited by Subject C during the developmentally-integrated intervention format evidenced complex multiple step sequences based on functional schemata. Subject C used more objects in play, and performed a variety of functions with each toy. For example, while playing with a monkey puppet, the child brushed the monkey, gave it a drink from a cup, initiated hand
games such as pat-a-cake, and made it dance. Similarly, a plastic cow was made to
walk, to go in a corral, to drink from a bowl, and ride in a truck. This reflects a
broader range of functional actions attributed to the toys. Additionally, toys were
used in multiple step play sequences with the interventionist, such as putting a
driver in a dump truck, filling the bed of the truck, driving it away, and causing the
contents to spill. The play exhibited by Subject C during the developmentally-integrated format therefore involved more functional play with a broader variety of
objects in more elaborate play sequences.

**Summary of Measures of Child Behavior**

Measures of the subjects' behavior during alternate treatments indicated
higher levels of cognitive, social, and semiotic functioning during the conditions of
the developmentally-integrated intervention format according to quantitative
and/or qualitative analysis. Qualitative measures of the subjects' enjoyment level
and willingness to interact with the adult indicate that the subjects' enjoyment and
interactivity was rated in the positive range during the developmentally-integrated
intervention format.

During the established treatment conditions, Subject C's enjoyment was
considered to be just within the positive range. However, the Interactivity rating
of Subject C fell within the neutral range, reflecting that the child's enjoyment was
not related to social interaction. Only under Treatment B conditions where the
adult behaved as if the child were an active communicator and provided semantic-
pragmatic consequences did the child achieve high levels of both qualities. The
Treatment B adult interaction style was better in facilitating the child's enjoyment
and willingness to interact.
Results Summary

This study was undertaken to answer three research questions. Measures of the subjects' behavior within alternating conditions were examined to answer two of these questions: a) If interaction is structured at an appropriate developmental level (i.e., a level that integrates cognitive, social and communicative development), will the child with autism evidence more cognitive, social and/or communicative progress than under the conditions of the established intervention paradigms? and b) If intervention structured in this framework facilitates developmental progress, will the children evidence a profile of synergistic functioning in cognitive, social and communicative domains, or will the children evidence an asynchronous pattern of functioning?

To answer the first question, the results of all behavioral measures, including the total number of intervention-related behaviors that occurred in the alternating treatments, the distribution of behaviors across levels of behavioral complexity within behavioral domains, and profiles of behavior across the course of treatments indicate that more cognitive, social, and communicative progress occurred during the conditions of the developmentally-integrated treatment paradigm.

Additional measures of the subjects' eye gaze and play elaboration were examined to support cognitive, social, and communicative measures. Analysis of the subjects' eye gaze indicated that more eye gaze behaviors were directed at the interventionist under the conditions of the developmentally-integrated intervention format. Since eye gaze is considered to be an important measure of social engagement (Sigman, Ungerer, Mundy & Sherman, 1987), Treatment B was considered more effective in facilitating social behaviors than Treatment A.
Analysis of the play elaboration of the subjects was examined in terms of the number of actions performed with objects and the occurrence of multiple step play sequences evidenced in the subject's play. Results of play elaboration indicated subjects exhibited more functional play in more complex play sequences, usually with a broader variety of objects. This indicates that the level of cognitive and social development of the children as evidenced by their play behavior, was more advanced during the conditions of Intervention B than in the conditions of Intervention A.

To answer the second question, the highest levels of integrative behavioral functioning across cognitive, social, and semiotic domains during the course of treatment were examined for each subject. One subject, Subject C, did evidence a profile of synergistic functioning in cognitive, social, and semiotic domains. Subject C evidenced integrated behavior at the Symbolic level of cognitive behavior (Level 4), the Ordered Sequence level of social discourse (Level 4) and the Descriptive level (Level 4) of semiotic behavior.

The other two subjects evidenced similar but not synchronous patterns of development in the highest levels of integrative behavioral functioning achieved across cognitive, social and semiotic domains. Subject A achieved the Symbolic level of cognitive functioning (Level 4), the Ordered Sequence level of social discourse (Level 4), and the Convention level of semiotic functioning (Level 3). Therefore, a lower level of semiotic functioning was achieved than was attained in the level of cognitive and social functioning for this child. Subject B achieved the Symbolic level of cognitive functioning (Level 4), the Descriptive List level of social functioning (Level 3) and the Convention level (Level 3) of semiotic functioning. Therefore, a lower level of both social and semiotic functioning was achieved than was achieved in the level of cognitive functioning for this child.
DISCUSSION

Recent research in autism has suggested that traditional approaches to the treatment of autism are in opposition to current beliefs about the nature of communication development (Prizant & Weatherby, 1989). The traditional approach, comprised of task analysis and teaching discrete skills, can be seen to fragment the natural processes of language learning, and fails to resemble the natural routines or interactions that establish the precursive skills for language. Instead, these researchers emphasize the need for a new perspective on intervention, focusing on functional communication skills and child-directed interactions (Prizant & Schuler, 1987; Prizant & Weatherby, 1997, in press). These more semantic-pragmatic views of development call for intervention approaches that provide opportunities for communication to occur and consequences that are a natural part of the interactions.

This study examined the efficacy of one developmentally-integrated format for intervention, based on the SDS model developed by Norris and Hoffman (1993). This format was compared to more traditional approaches to determine if it would result in a greater frequency and higher level of social, cognitive and communicative behaviors, as well as more synergistic development across domains. The following discussion will address this by summarizing results relative to the questions of the study.

Addressing the Questions of the Study

The first question of this study examined whether interactions structured at an appropriate, developmentally-integrated level would result in more cognitive, social and/or communicative progress than the other intervention formats. The results of all behavioral measures, including the total number of intervention-related behaviors that occurred, the distribution of the frequency of behaviors
within behavioral domains, and profiles of integrated behavior across the course of treatments, indicated that more cognitive, social and communicative progress occurred during the conditions of the developmentally-integrated SDS format.

This format of communication intervention elicited twice as many communicative behaviors within individual treatment sessions as well as treatment totals across the ten sessions for all three subjects. Similarly, the incidence of higher level communicative behaviors was far greater (45 vs. 0 behaviors for the least communicative child, and over 3 times higher for the most communicative child).

The rates and levels of social and cognitive behaviors that occurred during these interactions were similarly higher for the developmentally-integrated approach in nearly all instances. The totals of high-level social behaviors (Levels 3 and 4) were extremely higher for the developmentally-integrated approach (4 vs. 180 for the least communicative child; 40 vs. 249 for the most communicative child). Total comparisons for higher level cognitive behaviors reveal more Relational (Level 3) cognitive behaviors occurred (due to the perceptual play tasks, such as placing puzzle pieces, etc.) for two subjects during the alternate condition; however, the occurrence of Symbolic cognitive behaviors, though infrequent for these subjects, occurred with twice as much frequency in the developmentally-integrated intervention format. For the third subject, higher level cognitive behaviors occurred with 4 times more frequency in the developmentally-integrated approach.

The second question addressed whether the developmentally-integrated approach would result in a profile of more synergistic functioning among the cognitive, social and communicative domains under the developmentally-integrated format. When the profiles of performance levels within a task were evaluated
across domains, the subjects did exhibit relatively consistent profiles under the developmentally-integrated format. That is, if the cognitive level of the task reached level 4, then the social interactions and the semiotic level of the communicative behavior also was at or just below that level. One subject achieved level 4 across all domains, while two others achieved at this level in two domains during interactions. One subject did not exhibit word use by the end of the study (level 4) but was using conventional communicative behaviors (level 3), and culturally-recognized social/pragmatic strategies to directed social interactions (level 4) within high-level cognitive play (level 4). The most delayed child achieved level 3 in social and communicative behaviors when participating in a level 4 cognitive task.

In contrast, in the opposing treatment conditions the first child could only maintain cognitive functioning at level 4, dropping to level 3 for both social and semiotic behaviors. Likewise, the second child attained lower levels across all three domains, dropping to level 3 for both cognitive and social behaviors and never producing conventionalized communicative behavior, attaining only level 2. The third child performed at a lower level for cognitive (level 3) and social interactions (level 2) with emerging conventional communicative behavior (level 3). Thus, while some integration across domains (i.e., ratings at or near the same levels) was achieved under these intervention formats, the integration occurred at much less mature levels of development and was less consistent for some subjects.

The third question asked whether children would be perceived to be happier and more willing to interact under the developmentally-integrated format. Undergraduate students in communication disorders who were naive to the purpose of the study and to children with autism viewed videotapes of the interactions and rated their perceptions of the child. All three subjects were rated
happier and more willing to participate in the interactions from the developmentally-integrated format than in the other intervention formats.

The three questions of this study revealed that an intervention approach consistent with current semantic-pragmatic theories of communication development was more effective in eliciting a greater frequency and higher level of communicative behaviors that were more integrated with cognitive and social aspects of the interactions, and with greater apparent enjoyment. These findings will be further explored in terms of the developmentally-integrated model of communicative intervention and a) its theoretical foundations for promoting developmental progress and integration, and b) its advantages for addressing the needs of nonverbal children with autism. Following the theoretical discussion, the implications of this study as they relate to current issues in autism literature will be examined. Finally, the limitations of this study and suggestions for future research will be presented.

Theoretical Foundations of Developmentally-Integrated Therapy

The developmentally-integrated model of intervention based on Norris and Hoffman's SDS model (1993) is uniquely suited to provide optimum learning for children functioning at low levels of integrative development. The three organizational principles that form the framework of this intervention are structured to facilitate cognitive development, increased participation in social discourse, and communicative competence. These organizational principles will be explored in terms of their theoretical foundations.

Promoting Developmental Integration and Progression

After decades of autism research proposing a primary deficit in autism rooted in psychological, social, cognitive or communication domains, no theory of primary deficit has been widely agreed upon to explain the array of deficits in the
syndrome. The failure of theories of primary deficit to explain the syndrome, as well as increased awareness of the synergistic relationship between cognitive, social and communicative development, have advanced the current view that there is a lack of developmental integration in the syndrome of autism. This integrative deficit is supported by the asynchronous profiles of the cognitive, social and communication skills of children with autism.

Communication is firmly rooted in both cognitive skills and social skills, and their mutual influences are inseparable. Formats for communication therapy which view communication as the acquisition of discrete skills have been limited in their success and have been criticized for their failure to facilitate generalization, social intention and communicative spontaneity. The existing paradigms of intervention have failed to promote the integration of cognitive, social and semiotic skills from which natural language emerges. This has been demonstrated by the limitations in the theoretical bases as well as the outcomes of current intervention paradigms in the literature. The limitations in the effectiveness of established intervention paradigms were illustrated by the lower functional outcomes exhibited by all three subjects of this study in the conditions of their established intervention formats. The theoretical principles which guide the interaction of the different formats, and the behavioral outcomes for the subjects in the different formats utilized in this study will be discussed.

**Traditional-Behavioral Formats**

The established intervention paradigms for Subjects A and C were consistent with principles of Traditional-Behavioral paradigms. Subject A eventually achieved the product-oriented goal of the intervention task: to place and match picture cards. Although this skill reflects a level of perceptual cognitive skill, the acquisition of perceptually-based skills is generally the area of
development in which children with autism are most capable. These skills can be acquired through interaction with objects detached from social or communicative interaction. The isolation of this perceptual cognitive skill from social/communicative contexts was illustrated in the developmental functioning exhibited by Subject A. The child evidenced an upward trend in decentered cognitive behavior associated with his participation in the card placing tasks. The level of social organization that emerged in conjunction with this task was by the acting scheme associated with the pictures, rather than involving intentional social behavior to maintain social interaction. The isolation of cognitive development from social/communicative contexts was further evidenced by the scope and quality of play behavior. The play was limited to the isolated perceptual-based behaviors directed by the therapist. This reflects the discrete focus and adult-directed characteristics of Traditional Behavioral paradigms.

Few social behaviors occurred outside of this action routine. Only four behaviors considered to be intentional social behaviors occurred throughout the course of treatment. Similarly, very few communicative behaviors occurred other than the indication behaviors that occurred within the routine of placing pictures. The paucity of eye gaze behaviors exhibited during the course of therapy exemplified the lack of social and communicative orientation reflected in the interaction.

The adult-directed principles of Traditional Behavioral paradigms were reflected in the high proportions of directive behaviors (Directives, Attentional Vocatives, and Queries) used by the interventionists who adopted these principles. However, the increased proportions of directive behaviors did not result in increased responsiveness from the subjects, as indicated by the comparatively low
number of related behaviors exhibited by the subjects. For Subject A, fewer than twelve scored behaviors were exhibited during half of the sessions.

Similarly, Subject C's established intervention paradigm was consistent with principles of Traditional-Behavioral oriented intervention. Goals such as imitating words on command and responding appropriately to directives reflect the expectations for limited, passive participation of the child. Similar to the other Traditional-Behavioral oriented format, Subject C's interventionist utilized a high proportion of child-directive behaviors. Similar to Subject A's results, Subject C exhibited fewer than twelve intervention-related behaviors in the majority of sessions. Fewer than two intentionally communicative behaviors occurred in the majority of sessions. Further, the functional behavior of the child evidenced a lack of social integration. The results of play elaboration analysis indicated the child interacted with a variety of objects; however, the single actions on objects represented perceptual skills or actions which reflected limited functional knowledge. As such, the cognitive development of this child as indicated by the child's play was typical of the perceptual play that is evidenced by children with autism without the influence of social mediation. The achievement of perceptually based play lacks socially acquired schemata gained through social attention and interaction such as is exhibited with functional, symbolic play.

The neutral ratings of enjoyment and interactivity further support the passivity of these subjects during intervention. In fact, most interaction occurred with the subjects' body posture directed away from the therapist. Having achieved a level of perceptual cognitive development without increasing the child's social orientation or intentional communication skills provided little means for nurturing the progression of cognitive, social, and communicative skills or the integration of those skills to facilitate communicative competence.
**Semantic-Pragmatic Formats**

The established intervention paradigm for Subject B was consistent with theoretical principles of Semantic Pragmatic-Developmental formats. This paradigm was differentiated from the other Treatment A formats in terms of goals and characteristics of adult interaction. Goals for this format emphasized a child-directed perspective with the child participating in an active role as a communicator, targeting communication initiations and showing active interest in naturally occurring events and routine activities with the interventionist. Consistent with these goals, the adult's interaction emphasized Elaborations and Feedbacks. These behaviors are consistent with a perspective that promotes naturalistic interaction and an emphasis on acknowledging the child's communicative behavior.

Although this format emphasized developmental principles, the outcome as indicated by the child's functional behavior revealed lower levels of cognitive, social and communicative integration than those that were evidenced during the developmentally-integrated intervention format. The play of the child was characterized by perceptual play that can be acquired through simple interaction with objects. The lack of integration of social and communicative development was evidenced by the occurrence of only four intentional social behaviors and conventional semiotic level behaviors. The supportive data regarding play elaboration and eye gaze further differentiated this format from the developmentally-integrated format. That is, the play was characterized by single-action perceptual schemes with no eye contact in the established intervention in contrast to the more functional play with high levels of mutual gaze in the developmentally integrated format. Thus, measures of cognitive, social, and semiotic behavior as well as the supportive measures indicate poor functional progress and developmental integration in the semantic-pragmatic format even
though it was on the same pole of the continuum as the developmentally integrated approach.

The peak of the child's play behavior occurred during the mid portion of therapy, then decentered cognitive behavior declined for the remainder of the course of treatment. Further, ratings of the child's enjoyment and interactivity fell within the neutral range. Although the goals of this intervention paradigm and the verbal interaction of the interventionist reflected Semantic-Pragmatic-Developmental principles, the organization of the intervention was not effective in actively engaging the child over time to facilitate significant developmental integration or progression.

Consequently, the developmentally integrated format of intervention facilitated more developmental progression and developmental integration than any of the subjects' established intervention paradigms, whether the comparison treatment adhered to a traditional-behavioral or a semantic-pragmatic format. Further, positive ratings of the subjects' enjoyment and willingness to interact with the adult were achieved during the condition of developmentally-integrated intervention. The organizational structure of this format and the theoretical bases on which they are founded elicit the child's active participation and support integrated functioning. These organizational foundations will be explored.

**Organizational Foundations of Developmentally-Integrated Intervention**

The developmentally-based intervention for children with severe handicaps proposed by Norris and Hoffman (Norris & Hoffman, 1990a; Norris, 1990) is structured by an organizational framework which includes three basic strategies: 1) providing appropriate organization, 2) providing opportunities to communicate, and 3) providing appropriate consequences. These strategies guide the interaction and support the child to achieve higher levels of integrated functioning.
Providing appropriate organization. The strategy of providing interaction at an appropriate level of organization involves structuring the play so that the child can participate actively. The situational complexity is not determined by the interventionist according to preset criteria; rather, the interventionist follows the child's lead by observing the child's activity and level of participation. Intervention is therefore child-directed rather than adult-directed.

By structuring interaction at the level at which the child can participate actively, intervention fosters an environment that best facilitates learning. Based on principles proposed by Vygotsky (1978), the adult structures interaction within the child's "zone of proximal development" (ZPD). This zone is defined at the lower end as the level at which the child can function independently. At this level, the child can participate actively without social mediation. The upper end of the zone falls just below the level at which the child can no longer learn, even with social mediation, because of lack of prerequisite knowledge and skill. Vygotsky proposed that the optimum learning context is one in which social mediation is provided near the upper limits of this zone.

By providing supported interaction within the child's zone of proximal development, children are enabled to experience interaction at more complex levels than they would achieve on their own. This assists the child to break out of the negative learning cycle, in which they engage in perceptually-based play detached from social or communicative contexts, and become limited by their own perceptual learning. Bruner (1967) recognized the importance of the transactional processes during adult-child interaction in which the adult tailors the interaction to the child's level of functioning to facilitate successful communication. Bruner refers to this process as providing a scaffold, enabling the child to succeed at a higher level of functioning than their independent level of communicative
performance. By adjusting the level of interaction to one in which the child can accommodate cognitive stimulation within a social context, the integration of cognitive and social skills is facilitated. By accepting the behavior of the child within the cognitive and social context as meaningful, the child learns to integrate the process of communication, and learns more conventional communicative behaviors within more complex contexts. Based on the theoretical principles of scaffolding, the child is supported to achieve higher levels of integrated, functional behavior by providing interaction at an appropriate level of organization.

This intervention fosters cognitive growth according to Piagetian principles of development. By providing interaction at a level of cognitive abstraction determined by the functional behavior of the child, the child is assisted to integrate social and communicative behaviors at the child's functional cognitive level. For children who are unable to attend to people or actions in their environment, or to integrate attention to both objects and people, interaction may first be organized for the child at an egocentric level of on-the-body play. As the child demonstrates the ability to integrate both cognitive and social stimuli at this egocentered level (as demonstrated by the child's active turn-taking), play is initiated at a decentered level of interaction, involving the child's attention to people and/or events in close proximity to the child. As the child becomes able to accommodate social interaction which requires decentered cognitive integration, objects may be introduced in the play. As the child interacts with objects, he begins to learn about their function and their relation to other objects. As the child begins to internalize schema acquired through interaction with objects, the child develops the ability to learn beyond the limitations of perceptual, sensori-motor experience. In this way, the child is assisted through levels of egocentric, decentered, relational, and symbolic development.
The organization or the developmentally-integrated therapy format also provides for the acquisition of schema, action patterns proposed by Piaget as forming the early rudiments of cognitive conceptualization. During the Sensorimotor stage of cognitive development, the child learns action strategies for interacting with and exploring objects. Higher levels of conceptualization are inferred when the child adapts these action strategies to different objects and/or contexts. As the child begins to internalize schemata, higher level representational skills are exhibited, providing the foundation for the complex processes of abstraction and symbolization. By providing interaction at an appropriate level of cognitive organization, the child is assisted to actively indicate to the interventionist according to the child's desired consequence. As objects are gradually introduced in the play, the child is assisted to utilize differentiated actions on objects.

Evidence of the child's transcendence through more advanced levels of cognitive complexity was provided by the hierarchical emergence of more complex cognitive behavior exhibited by all three subjects in the developmentally-integrated format. As the children were able to accommodate integrative functioning at a given level of cognitive complexity, higher level cognitive behaviors began to emerge. This was evidenced by the emergence of higher-level behaviors subsequent to or concurrent with a peak in the occurrence of lower-level behaviors.

Evidence of the internalization of schemata acquired during the developmentally-integrated intervention format were seen by the child's ability to utilize the action schemes with different objects and with different people. Evidence of the child's generalization of schema to different objects was provided as the child applied them to different objects (i.e., brush the monkey, brush the
dog, brush his own hair). Evidence that these schemata were also generalized to the alternate treatment conditions occurred as the child interacted with toys in ways first established within routines during the developmentally-integrated intervention condition (such as driving a car on his arms and legs) and initiating joint action routines with the alternate treatment interventionist (such as utilizing communicative indications to initiate playing the hand-movement games).

By providing interaction at an appropriate level of cognitive organization, the child is also assisted to achieve higher level social and communicative integration. Bruner (1975) describes the development of social control and communicative intentionality during prelinguistic stages of development within the context of joint action routines. During repetitive play schemes, the child first learns to segment the routine into elements and begins to insert nonstandard signals, that are attributed intentionally by the mother. Over time within the context, signaling becomes more intentional, and the child is able to regulate the social interaction. Play interaction in the developmentally-integrated intervention format is organized within a context of simple joint action routines. As the child's fortuitous movements are interpreted as meaningful by the adult, the child learns to signal intentionally, and conventionalize his communicative behavior, as well as learning to share social control.

Within the context of joint action routines, joint attention can also be facilitated. As the child accommodates active social and communicative interaction with the adult, the adult may introduce objects into the interaction. By adapting the level of interaction to accommodate the child's ability to attend to objects and actions, the child is assisted to achieve joint attention skills within social interaction. The child is therefore assisted to integrate higher levels of social and communicative development at increased levels of cognitive complexity. In this
study, this was demonstrated by the profiles across domains that were higher in level and more consistent under conditions of developmentally-integrated treatment.

**Providing communicative opportunities.** A critical strategy of developmentally-integrated intervention involves providing the child with frequent opportunities to communicate. This therapy is founded on child-directed principles in which the adult does not predetermine the communicative expectations that the child will meet. Rather, the adult imputes meaning to the behaviors of the child. This principle is in direct opposition to the underlying principles and goals of the traditional behavioral formats examined in this study. The effectiveness of this strategy is supported by the greater responsiveness of all the subjects as indicated by the number of intervention-related behaviors during the developmentally-integrated intervention conditions.

As the adult implements the strategy of providing communicative opportunities and imputing the child's behavior with meaning, the child learns the power of communication; that their behavior is meaningful to others and causes things to happen. Based on the processes described by Bruner, the child learns to become an intentional communicator. This relationship is evidenced by the differences in the frequency of occurrence of intentional behaviors exhibited during the two treatment conditions for each subject. For all subjects, the occurrence of intentional behavior within social contexts occurred with much more frequency during the developmentally-integrated format.

When the child does not exhibit intentional social communicative behavior, there is no context for the child to acquire social/pragmatic skills or for conventionalizing communicative behavior. Providing the opportunity to experience being a communicator within social discourse fosters increased
communicative behavior as well as higher level social/communicative skills. This was evidenced by the more frequent occurrence of higher level social and semiotic behaviors exhibited by these subjects during developmentally-integrated therapy. By providing the child with many opportunities to communicate, the child experiences being a communicator, learns the social purpose of communication, social/pragmatic aspects of communication are nurtured, and communicative behavior is conventionalized, establishing the foundation for typical language and communicative development. Following these principles therefore nurtures the child's communicative competence.

**Providing appropriate consequences.** The last organizational strategy for developmentally-integrated intervention involves providing appropriate consequences. Providing the child with appropriate consequences involves furnishing a natural, functional outcome in response to the child's communicative behavior. In this way, the child is assisted to learn meaningful, functional consequences to his actions. Providing consequences in the traditional form of positive verbal reinforcement (such as "Good job!") provides little functional information for a child who does not exhibit intentional socially-oriented communication, has poor language processing skills, and limited social and functional knowledge. By acknowledging the behaviors of the child as communicative attempts and imputing a functional purpose, the child learns the natural consequences of his actions during social interaction with others. The child's communication behavior is naturally reinforced when the child's purposes and intents are met. Evidence of this natural reinforcement is provided by the increased frequency of communicative behaviors during the conditions of developmentally-integrated intervention.
For children who are not intentional communicators, the adult imputes meaning to the fortuitous actions of the child. The effectiveness of this treatment of the child as an active communicator is evidenced by the appearance of intentional communicative behaviors from the child within a short interval of time. This was seen in this study by the increased levels of intentional behavior in the first sessions for each subject, that continued throughout the course of the study.

In addition to reinforcing communicative behavior, providing consequences in the form of feedback rather than traditional positive verbal reinforcement plays an important role in elaborating the child's contexts and functions in communication. The adult may expand the consequences of the child's communicative gesture by elaborating his intentions, modeling examples of the concept or extending the child's communication to encompass additional objects and events. In this way, new meaningful actions and concepts related to the event are provided for the child.

The adult also can present the child with an opportunity to elaborate or repair a communicative gesture during the process of providing appropriate consequences. In this way, the child is provided the opportunity to conventionalize his communicative attempts, providing evidence of the child's growing understanding of referential specificity and social/pragmatic awareness.

By providing feedback in this way, the child's communicative actions are consequented meaningfully, are expanded in terms of context and intention, and the child is provided with language models within the event. Providing consequences in this way is therefore more productive in increasing the child's functional, semantic, and pragmatic knowledge and facilitating communicative competence.
This format of developmentally-integrated therapy is uniquely suited to the current principles advanced in the literature for intervention with children with autism. Further, its theoretical foundations and organization are advantageous to address the specific profile of deficits that is characteristic of nonverbal children with autism. The theoretical match between this intervention paradigm and theoretical proposals in the literature as well as the paradigm's advantages for addressing the developmental deficits associated with autism will be explored.

**Addressing the Deficits Associated with Autism**

Prizant and Weatherby (1989) set forth guidelines for communication assessment and intervention for prelinguistic children with autism that reflect the current view of communicative competence as the outcome of synergistic development in social, cognitive, and linguistic domains. Norris and Hoffman's developmentally-integrated format of intervention is ideally matched to these theoretical guidelines. By accommodating the theoretical principles and guidelines for communication intervention for children with autism, this intervention format is ideally suited to address the specific cognitive, social, and communicative deficits that are associated with the syndrome.

**Accommodating Theoretical Guidelines for Communication Intervention**

Prizant and Weatherby (1989b) proposed that intervention must be structured at an appropriate level of development, relative to a child's social, cognitive and linguistic capacities. Based on a transactional model of communication, they proposed that intervention must be structured within a dynamic, interactive context, in which verbal and nonverbal communication is adjusted to the child's individual level of comprehension. By following the principles of developmentally-integrated therapy, the adult structures interaction at an appropriate level of organization. Based on the typical progression of
cognitive, social, and semiotic development as structured by the Situational-Discourse-Semantic model (SDS), the adult structures interaction within the child's zone of proximal development. By structuring interaction at an on-going level of organization adjusted to the child's ZPD, and providing opportunities to communicate and natural consequences, the adult provides a scaffold to the child that allows for integration of the cognitive, social and communicative dimensions. The child is thus placed in the role of an active participant within a complex, dynamic context of interaction.

Prizant and Weatherby (1989b) proposed that naturalistic intervention must foster the development of preverbal communication skills as necessary precursors to verbal communication. To do this successfully, the adult must make accommodations for atypical patterns of development such as those exhibited by nonverbal children with autism. Many children with autism have not achieved the ability to actively attend and participate within a context that demands communicative competence within social interaction at complex levels of cognitive processing. The principles of developmentally-integrated interaction are specifically suited to conform interaction to children functioning at prelinguistic levels of development. By organizing interaction within the child's ZPD, interaction may be structured to accommodate children at the most basic levels of cognitive, social, and communicative functioning. Children who function at the lowest levels may display egocentric levels of cognitive development, and may be unable to structure social discourse beyond the level of Discrete Events, or actively communicate with others beyond passive Reaction level behaviors. These children may be accommodated by the adult structuring interaction at the level of on-the-body play, providing the child with opportunities to exhibit active participation, and consequenting the child's randomly occurring behavior as if it is meaningful.
and communicative to a listener. This allows the child to be an active participant in a socially-interactive context suited to prelinguistic levels of development. This model of intervention fosters precursive behaviors by providing a scaffold to the child through levels of presymbolic cognitive development, and by nurturing intentional social and communicative behavior. By accommodating children at preliminary stages of cognitive, social, and communicative levels of developmental integration, this format of intervention fosters precursive milestones of communicative competence.

Prizant and Weatherby (1989b) maintain that the development of communicative intent must be a primary focus of communication intervention. By following the essential principles of organization in the developmentally-integrated format, the child is provided with frequent opportunities to communicate, and is provided with natural reinforcement for their communicative attempts with the ultimate goal of helping the child to realize the function and results of intentional communication. These principles are consistent with the theoretical guidelines of intervention for children with autism proposed by Prizant and Weatherby, that specify that clinicians should impute intent to unconventional behavior, because young children learn how to communicate intentionally by observing others reacting to their behavior as if it were intentionally communicative.

This format of developmentally-integrated intervention is also consistent with Prizant and Weatherby's proposal that intervention must be founded on the child's natural motivation to communicate within the context of the interaction (Prizant & Weatherby, 1989b). By providing consequences or feedback to the child based on his actions, the child is immersed in experiences that provide natural consequences and impute intention. This intervention format reinforces the
principle that communication behavior is naturally reinforced when the child's purposes and intents are met.

Prizant and Weatherby (1989b) further propose that interaction should incorporate a "facilitative" as opposed to a "directive" style. Developmentally-integrated intervention promotes student initiation and control of social interaction. As demonstrated by the results of this study, the children exhibited much more occurrences of intentional communicative behavior and participated much more actively in social discourse during the developmentally-integrated format than in those formats that utilized a more directive style. A directive style of interaction was evidenced by the high proportion of directive behaviors (Attentional Vocatives, Directives, Queries) exhibited by the interventionists who utilized a Traditional-behavioral intervention paradigm. The facilitative style of interaction that is inherent in developmentally-integrated therapy was evidenced by the high proportion of facilitative behaviors (Feedbacks, Elaborations) that characterized the adult's interaction.

The profiles of both adult and child behaviors examined in this study show that the developmentally-integrated format of intervention embodies the theoretical principles proposed in the literature for communicative intervention for children with autism. By meeting these principles, this intervention format is ideally suited to address the specific areas of deficit associated with the syndrome of autism.

Addressing the Developmental Deficits Associated with Autism

The syndrome of autism is associated with specific areas of deficit in cognitive, social, and communication development. The developmentally-integrated format of intervention is uniquely structured to address these areas of deficit associated with autism.
Cognitive Deficits

Many theoretical models designed to explain the cognitive development of children with autism suggest that there are limitations in the representational skills of children with autism as demonstrated primarily by the paucity of symbolic play. Developmentally-integrated therapy facilitates the progression of higher-level cognitive skills by first adapting to the cognitive level of the child, then facilitating the child to integrate interaction at more complex levels of cognitive displacement. The effectiveness of this process was demonstrated in this study by the increased level of cognitive functioning evidenced in the behaviors of the child, the more complex play schemes exhibited, and the hierarchical pattern of development evidenced in the emergence of more complex behaviors across time.

Ultimately, the nonverbal child must achieve a level of symbolic abstraction in order to become a user of language, either verbally or nonverbally. Engaging in symbolic play is an achievement that reflects the development of symbolic abstraction. Evidence of the emergence of symbolic thinking was provided by the occurrence of symbolic behaviors for the children in this study. For Subjects A and B, symbolic behavior occurred only during the conditions of the developmentally-integrated format. For Subject C, the highest functioning of the three subjects, more symbolic behaviors occurred during the developmentally-integrated format, and a broader scope and function in symbolic behavior was exhibited than was evident during the established language paradigm. During Intervention B symbolic behavior occurred four times more frequently, and was more elaborate in terms of symbolic actions and number of toys used in play.

Social Development

Differences in the social behaviors of children with autism are well known. Particular social deficits have been identified in joint attention, eye gaze behavior,
social sharing behaviors, and affective responses. The subjects in this study provided evidence of the effectiveness of developmentally-integrated intervention in fostering the social-cognitive-communicative processes from which these aspects of social behavior emerge. The subjects engaged in more interaction that required joint attention to objects within the context of social interaction with the adult in the condition of developmentally-integrated intervention. Many more specific behaviors seen in typical development which evidence triadic attention, such as the child looking between the object and the adult, were documented in the transcriptions.

Documentation of the child's eye gaze at the adult while the adult was talking evidenced many more of these behaviors during the developmentally-integrated format as compared to the established intervention paradigms. During the established intervention paradigms, there were no incidents of eye gaze behavior for Subject B, only one incident for Subject C, and only 15 incidents for Subject A during the course of therapy. In comparison, these children exhibited 119, 114, and 145 eye gaze behaviors, respectively, during developmentally integrated intervention.

Affective differences were also exhibited during the compared treatments. Although specific incidents were not tallied, many occurrences of laughing and smiling were documented in the transcriptions during the developmentally-integrated format. These behaviors contributed to the documented enjoyment measurements. All subjects were rated positively for enjoyment during the developmentally-integrated format, which was operationally defined as "happy facial expression, may laugh or smile, or seems happy." Subjects during the established intervention paradigms were rated in the neutral range for enjoyment,
which was operationally defined as "child appears passive, may have a blank expression, stare, or seem distant."

The subjects also exhibited many more social/pragmatic strategies for sharing interaction with the adult, such as giving and hugging, during the developmentally-integrated paradigm, as documented by Level 4 social behavior. These behaviors occurred only during the developmentally-integrated format for Subjects A and B, and occurred much more frequently for Subject C.

These aspects of social behavior have been attributed to the lack of "social relatedness" observed in autism. Behaviors such as coordinating eye gaze to the faces of others occurs early in typical development, and underpins normal social interaction. These behaviors evidence increases in social attention, and have been linked to the development of joint attention as well as the processes associated with the development of "theory of mind." The higher occurrence of these social behaviors illustrates the synergistic relationship of social development to cognitive and communicative development.

**Communication Development**

Deficits in communication development are evident across the broad variety of individuals with autism. It is estimated that 50% of children with autism never develop functional language skills, and of those that do, social/pragmatic skills remain impaired (Paul, 1987). The likelihood that children with autism will not achieve functional speech is increased if language has not developed by 5 years of age (Frankel, Leary & Kilman, 1987; Sigmund, Ungerer, Mundy & Sherman, 1987). These factors magnify the need for developmentally-appropriate communication intervention for nonverbal children with autism. A main thrust in communication intervention literature is to promote communicative intention in children with autism (Prizant & Schuler, 1987; Prizant & Weatherby 1989a,
The occurrence of intentional social/communicative behaviors was a main differentiator in the functioning of the subjects during the conditions of the alternate paradigms. All children exhibited intentional social/communicative behavior more frequently during the developmentally-integrated therapy paradigm.

Without establishing communicative intent, the child with autism has no social purpose for communicating, and no medium for conventionalizing his communicative behavior. Without the foundation of communicative intent, the child does not participate in the interactional processes that refine and integrate language content, form, and use. Typical communication development cannot occur without the foundation of communicative intent.

One of the main goals of communication intervention is to facilitate verbal language development in nonverbal children with autism. The condition of developmentally-integrated intervention evidenced more occurrences of verbal approximations of conventional words. Although all subjects were considered to be nonverbal according to developmental history, parent/teacher report and behavioral observation, two of the children evidenced verbal language attempts during the course of the study. Subject A evidenced verbal language only during the conditions of the developmentally-integrated intervention format. Subject C evidenced more word approximations reflecting longer and more frequent word combinations and more semantic relations. Both of these subjects participated in the Traditional-Behavioral formats as their alternate treatments. This suggests that a format that is a) structured to elicit the child's active participation, b) organized to integrate the child's cognitive, social, and semiotic development, and c) adopts a facilitative style of adult interaction, is advantageous in facilitating verbal development.
The third subject, Subject B, did not evidence any verbal language in either condition of treatment. However, he did evidence emergent symbolic behavior as evidenced by Level 4 cognitive behavior only during the developmentally-integrated intervention format. He achieved more higher level cognitive and social communicative behaviors (Levels 3 and 4) during that condition. Subject B evidenced high level integrative behavior at the Symbolic level on the Cognitive scale (Level 4); the Descriptive List level of social interaction (Level 3); and the Conventional level on the Semiotic scale (Level 3). As evidenced by these results, precursive elements that lay the foundation for verbal language and are positive indicators for the development of verbal language, were established during this condition.

These results provide support that this format of intervention is ideally suited to address the communication deficits of children with autism on many levels: by providing a framework for interaction from which integrated cognitive, social, and communicative development can emerge; by fostering communicative intent; and by providing the child with the experience of being a communicator, in order to learn from the transactional processes with others the content, form and use of language.

Implications for Current Issues in the Literature

The results of this study provide several implications for current issues in the intervention literature for children with autism including: a) the debate regarding the efficacy of Traditional Behavioral vs. Semantic Pragmatic-Developmental formats of intervention for children with autism; b) limitations in the spontaneity of language and the generalization of skills gained during intervention; c) the poorer intervention outcomes for nonverbal children with autism; and d) questions regarding deviance or delay in the developmental
progression of children with autism. The implications for these issues as indicated by the results of this study will be discussed.

**Traditional-Behavioral vs. Semantic Pragmatic-Developmental Intervention**

Prizant and Weatherby (in press) bring to the forefront the passion of debate regarding the most effective treatment approaches for young children with autism. Evidence of this debate is prevalent in the literature, in the media, in the homes of children with autism, and in schools across the country. Many professionals have supported Traditional-Behavioral based interventions as the only effective treatment and have viewed other approaches as ineffective (Prizant & Wetherby, in press).

In comparing the effectiveness of intervention paradigms, Prizant & Wetherby (in press) point out that many paradigms are not strictly Traditional-Behavioral or Semantic Pragmatic-Developmental in theoretical principle and/or practice. For the comparison of intervention paradigms in this study, formats were compared to the characteristics of Traditional-Behavioral or the Semantic Pragmatic-Developmental approaches as described by Prizant & Wetherby, and were assigned categorically to one of the other based on the underlying philosophy reflected by the goals, and the characterization of adult interaction according to discourse function.

The results of this study, including: a) all behavioral measures such as the total number of intervention-related behaviors that occurred in the alternating treatments, b) the distribution of behaviors across levels of behavioral complexity within behavioral domains, and c) profiles of behavior across the course of treatments, indicated that more cognitive, social, and communicative progress occurred during the conditions of the developmentally-integrated treatment paradigm. Additional measures of the subjects’ eye gaze and play elaboration
supported this conclusion. These findings support the effectiveness of the intervention paradigm that is based on Semantic Pragmatic-Developmental principles, as compared to paradigms that are based on Traditional Behavioral principles.

Further evidence of the effectiveness of Semantic Pragmatic-Developmental formats was provided by viewer ratings of the subjects' enjoyment and willingness to interact. All subjects were perceived to be happier in the Semantic Pragmatic-Developmental paradigms (i.e., the developmentally-integrated intervention format, and the alternate treatment for Subject B). This demonstrates that children enjoy intervention based on Semantic Pragmatic-Developmental principles more than Traditional-Behavioral based intervention. However, only during the conditions of the developmentally-integrated format did viewers rate the children positively for their willingness to interact with the adult as well as for enjoyment. These ratings, along with the subjects' behavioral measures, demonstrate the unique effectiveness of the developmentally-integrated format of intervention.

**Spontaneity of Language and Generalization of Skills**

Traditional-behavioral paradigms have been criticized regarding the lack of spontaneity of trained language responses, as well as limitations in the generalization of skills acquired during intervention.

During the developmentally-integrated format of therapy, two of the three subjects exhibited approximations of words. For one subject (Subject C), word use was also exhibited during the alternate treatment. However, word use was elicited in different ways during the two different treatments. During the developmentally-integrated format, word use emerged spontaneously during naturalistic interaction with the adult, as opposed to being elicited by questions
and/or directives. During the alternate treatment for Subject C, a perseverative response ("apple") was elicited in response to questions such as "What's that?" Later, after the emergence of words during the developmentally-integrated format during naturalistic interaction with the adult and toys, more naturalistic use of words appeared during the alternate treatment. This suggests that the level of cognitive-social-communicative integration achieved during the developmentally-integrated format was generalized to the alternate treatment condition.

Further evidence of generalization occurred as action schemes established during the developmentally-integrated paradigm were carried over into the alternate treatment conditions. This included some play with toys (such as the subject rolling a car on his arms and legs) as well as the child initiating play with the adult. These actions were recognized as being generalized from the developmentally-integrated format, and were met with comments by the alternate treatment interventions such as "I like what (the investigator) is teaching you," and "No, I don't play (the investigator's) game with you."

Although generalization in other environments was not formally documented in this study, informal comments by teachers and family members provided evidence of carry-over into other behaviors in the classroom and at home. Reports from the parent and teacher of one of the two subjects who exhibited verbal behavior indicated increased word use at home. Two subjects were reported to have generalized to classroom behavior some of the functional play skills that had emerged during the developmentally-integrated conditions of intervention.

During examination of each subject's behavioral profiles, a pattern of generalization of cognitive, social and communicative behaviors was evident, with peaks in behavior occurring during the developmentally-integrated condition.
before peaks in behavior at the same or lower levels appeared under the conditions of the alternate treatments.

These results indicate that generalization of action schemes, social initiation, functional play behavior, and language use that emerged during the developmentally-integrated intervention format occurred across different environments and different treatment conditions.

**The Relationship of Treatment Outcomes to Language Skills**

Results of this study supported the robust finding in the literature that children with even minimal verbal language skills evidence better outcomes than those with none. In this study, all subjects were considered to be nonverbal according to criteria for subject selection. However, two subjects, A and C, had exhibited one reported occurrence of verbal language. This consisted of singing part of the birthday song for Subject A, and the word "apple" for Subject C. Subsequently, these two subjects exhibited verbal language during the conditions of the developmentally-integrated conditions. Subject A exhibited verbal language only in the conditions of developmentally-integrated treatment; Subject C exhibited more instances of verbal language and more complex syntactical constructions during the condition of the developmentally-integrated treatment. Although Subject B did not evidence verbal behavior, he, along with the other two subjects, exhibited evidence of Symbolic cognitive functioning as well as more semiotic behavior at the Conventional level. This demonstrated increasing awareness of the social-pragmatic function of communication as well as increasing awareness of semiotic specificity.

**Issues of Developmental Progression in Autism**

A central question regarding developmental progression in the literature is whether autism is a condition characterized by developmental deviance or
developmental delay. Examination of the patterns of developmental progression for each subject revealed a hierarchical pattern of development in which higher level behaviors emerged subsequent to peaks in lower level behaviors. This pattern indicates that all subjects were exhibiting typical hierarchical development of behavior in the developmentally integrated paradigm. Further, one subject exhibited a synchronous pattern of integrated development across cognitive, social, and semiotic domains. This reflects a pattern of typical, synergistic progression. This suggests that when provided with intervention that facilitates developmental integration, one subject who previously exhibited an asynchronous pattern of development achieved a more typical pattern of developmental progression and synergistic, parallel achievement of integrated cognitive, social, and communicative behavior.

**Limitations of the Study**

Several limitations were inherent in the research methods and outcomes of this study. Some occurred because this was the first study using the SDS theoretical paradigm with autism, and all analysis scales and procedures had to be developed for this purpose. Others occurred because autism is a very low incidence disorder and locating subjects that met criteria was difficult. These limitations will be discussed with recommendations for changes in future research.

Analysis of the classification of adult behavior revealed that the categories did not capture the distinctions as well as expected, particularly in the category of Feedback Behaviors. That is, all types of feedback were grouped into a single category, whether it was simple reinforcement (e.g., "good") or acknowledgements and request for repairs (e.g., "You want some more?"). A division of this category into reinforcement versus facilitative comments would have offered a better differentiation of adult behaviors, and should be used in future research.
Similarly, in the two semantic-pragmatic conditions, one the established intervention paradigm and the other the experimental treatment, any response provided in response to a child's behavior was coded the same. In the established paradigm, this adult response was largely parallel talk, or comments about what was occurring from an observer's perspective. In the experimental treatment the adult response was an action that imputed meaning to the child's behavior, such as bringing a puppet over to tickle the child. These qualitatively different responses were coded the same, thus obscuring differences in the adult behavior that were present and important in differentiating the two treatments. In future studies, a division of these two subcategories may reveal differences more clearly.

While attempts were made to establish reliability by having a second judge check transcriptions and recode data, the judge was not blind to the study. The judge knew the technique that was being studied and recognized the experimenter on the videotapes in Treatment B. This was done because the coding procedure required some technical knowledge and training, which could have been done with a naive scorer if funds had been available to hire and teach the procedure to a trainer who was not on either videotape who could then teach the procedure to a scorer. This would require a considerable investment of time for several individuals. Grant funding would be useful in future studies to achieve a blind check of reliability.

Interrater reliability of child affect also could be obtained by having raters evaluate the same child twice. This percentage of agreement would provide support to the contention that raters can identify engagement and disengagement cues reliably with this population of children.

An attempt was made to control for differences in child behavior that were related to different interventionists implementing the alternate treatments by having
the developmentally-integrated therapist conduct control sessions using the opposite format. While results showed similar child behaviors were elicited regardless of who provided the treatments, differences may have been greater for some interventionists or for some sessions. Furthermore, no other interventionists attempted to implement the developmentally-integrated treatment, so it is unclear if others would achieve similar outcomes. Replication with different interventionists implementing each type of treatment needs to be conducted to address this limitation.

The measure of synchronous behavior used in this study did not capture the effects of treatment as effectively as expected. In this study, synchrony was defined as cognitive, social and semiotic behaviors rated at the same level during a communicative turn (i.e., a rating of "3" across all three domains would be considered synchronous). The overall patterns of integrated behavior were examined for the highest level of integrated behavior that occurred during treatment. The data from this study should be reanalyzed to determine if the number of incidents of synchrony occurring during a given intervention session would reveal a more useful measure of synchrony. This qualitative aspect of functioning for autistic children is important but difficult to quantify, and other measures such as observer ratings may prove useful in future attempts to assess this characteristic of these interactions.

Autism is a low incidence condition, and this created limitations for the study. This study is limited in its generalizability to a larger population due to the small number of subjects as well as the gender representation of the subjects. No females were available for the study. Subjects included a limited age and ability range. Future studies need to systematically replicate this study with subjects
differing in age, ability level, and gender, as well as a replication with similar subjects to determine if comparable results would be achieved.

Some carryover effects were suggested by the pattern of behaviors exhibited by the subjects during the alternate treatment conditions of this study. A treatment design which had provided a time interval between treatments, such as providing one treatment in the morning and one treatment in the afternoon would have been useful to help clarify carryover effects which could be related to design factors rather than treatment variables.

This study was limited by a relatively short interval of treatment of only 10 sessions, over a course of 3 to 5 weeks. This is an extremely short course of intervention for children with autism, who often receive special services across the lifespan. While the trends in the data favored the experimental treatment or efficacy, the long term effects remain unknown. Longer periods of treatment, and follow-up studies to determine the rate and type of future progress need to be conducted to address these questions regarding efficacy.

The functional outcomes for subjects in the study were examined within a limited context (i.e., the intervention setting). Functional outcomes were determined only during the conditions of treatment, and did not address functional outcomes for behavior in contexts such as the classroom or home. Determining if generalization occurs in these functional contexts is critical because treatment is only effective if it makes a meaningful difference in a child's communicative and functional behavior in situations where they spend the majority of their time.

These limitations need to be addressed in future research.

**Suggestions for Future Research**

Generalization of this study is limited due to the small number of subjects, and the limitations in gender representation, age range and the ability range of the
subjects. Future research is suggested to replicate this study with more subjects, including both males and females, representing a broader age range and range of abilities to increase the generalizability of findings.

Future studies with nonverbal subjects should incorporate stringent criteria for subjects to be considered as nonverbal. Results of this study and others have indicated better functional intervention outcomes for children with any incidence of verbal language use. Utilizing more stringent criteria by which subjects are classified as nonverbal would be useful to clarify and further investigate this finding in the literature.

Future studies should investigate functional outcomes for a longer period of treatment as well as the long term effects of treatment. This would include levels of cognitive, social and semiotic functioning achieved, levels and frequencies of integrated behavior achieved, and patterns of developmental progression.

The long term effects on language development for both verbal and nonverbal subjects would be of particular interest for future study. Investigating aspects of semantic and syntactic development as well as social/pragmatic language use is suggested for future study.

Future studies should incorporate broader outcome measures such as the subjects' functional behavior in other environments (i.e., home and/or classroom) and effects on social/communicative behavior with peers and family members.

Because parents are a child's main source for learning communication, it is suggested that future research address the viability of training parents to implement developmentally-integrated intervention with their children.
LITERATURE CITED


modification approach to the treatment of autistic children. Journal of Autism and
Childhood Schizophrenia, 4, 1-129.

Matson, J. L., Sevin, J. A., Box, M. L., Francis, K. L., & Sevin, B. M.
(1993). An evaluation of two methods for increasing self-initiated verbalizations in


psychoanalytic perspective on theory of mind and autism. In S. Baron-Cohen, H
Tager-Flusberg, & D. Cohen (Eds.), Understanding other minds: Perspectives

for children with autism who received early intensive behavioral treatment.
American Journal on Mental Retardation, 97, 359-372.

designs in communicative disorders. Austin, TX: Pro-Ed.

McReynolds, L. V., & Thompson, C. K. (1986). Flexibility of single-
subject experimental designs, part I: review of the basics of single-subject designs.
Journal of Speech and Hearing Disorders, 51, 194-203.

the social deficits of autism: The contribution of non-verbal communication


disabilities, emotional disturbance, autism, and mental retardation. Thalamus, 7(1),
1-38.

to infants and young children with handicaps. Topics in Early Childhood Special
Education, 5.


Norris, J. A. & Hoffman, P. R. Fostering communication in severely disordered children. Video and reader's guide. Louisiana State University.


APPENDIX A

LANGUAGE HIERARCHY
(From Harris, Wolchik & Weitz, 1981)

1. Good sitting
2. Eye contact
3. Gross motor imitation
4. Looking at objects
5. Pointing to objects
6. Verbal imitation—vowels
7. Verbal imitation—consonants
8. Verbal imitation—words
9. Functional speech—nouns
10. Functional speech—verbs
11. Functional speech—adjectives
12. Functional speech—prepositions
13. Functional speech—social questions
14. Functional speech—body part usage
15. Functional speech—object usage
16. Short term retention—recall
17. Beginning academics—counting
18. Functional speech—information
19. Functional speech—"I want"
20. Functional speech—"I am"
21. Functional speech—pronouns
## APPENDIX B

### SITUATION-DISCOURSE-SEMANTIC MODEL (SDS)

<table>
<thead>
<tr>
<th>0-1 month</th>
<th>egocentered</th>
<th>discrete event</th>
<th>reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level la</strong></td>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>DISCOURSE</strong> (Organization)</td>
<td><strong>SEMANTIC</strong> (Meaning)</td>
</tr>
<tr>
<td><strong>COGNITIVE</strong></td>
<td>Object Displacement</td>
<td>Event/Discourse</td>
<td>Perceptual</td>
</tr>
<tr>
<td></td>
<td>Objects noticed only when touching or very near the child; not viewed as separate from the child.</td>
<td>No organization imposed so each moment of stimulation is a discrete event.</td>
<td>Reflexive response to stimuli, no recollection of meaning attached.</td>
</tr>
<tr>
<td><strong>SOCIAL</strong></td>
<td>Self/Other Displacement</td>
<td>Interactional</td>
<td>Functional</td>
</tr>
<tr>
<td></td>
<td>People responded to only when touching or very near child; no separation of self from others.</td>
<td>Adults initiate and respond to engage child in turn-taking.</td>
<td>Undifferentiated action, include motion associated with source of stimuli.</td>
</tr>
<tr>
<td><strong>SEMOTIC</strong></td>
<td>Time/Space Displacement</td>
<td>Locutionary</td>
<td>Convention</td>
</tr>
<tr>
<td></td>
<td>Reactive to immediately present sensory and proprioceptive stimuli; no attempt to reestablish or maintain sensory content.</td>
<td>Adults impute meaning to unintentional reflexive behaviors.</td>
<td>Undifferentiated, vegetative, reflexive and inconsistent.</td>
</tr>
<tr>
<td><strong>SENSORY-MOTOR</strong></td>
<td>Imitative Displacement</td>
<td>Executionary</td>
<td>Fine/Gross</td>
</tr>
<tr>
<td></td>
<td>Child repeats own reflexive schemes.</td>
<td>Short, rapid bursts of sound or movement unusual sequence.</td>
<td>Gross and simple; vocal open oral tract; little oral closure, lingual, or mandible movement.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1-4 months</th>
<th>egocentered</th>
<th>discrete event</th>
<th>reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level lb</strong></td>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>DISCOURSE</strong> (Organization)</td>
<td><strong>SEMANTIC</strong> (Meaning)</td>
</tr>
<tr>
<td><strong>COGNITIVE</strong></td>
<td>Object Displacement</td>
<td>Coordination of schemes: look &amp; reach, hear &amp; look, touch &amp; grasp, grasp &amp; bang.</td>
<td>Perceptual</td>
</tr>
<tr>
<td></td>
<td>Objects noticed and reacted to with attention, excitement, or distress when within immediate environment</td>
<td></td>
<td>Anticipatory reaction to stimuli; react before sound or motion occurs.</td>
</tr>
<tr>
<td><strong>SOCIAL</strong></td>
<td>Self/Other Displacement</td>
<td>Interactional</td>
<td>Functional</td>
</tr>
<tr>
<td></td>
<td>People watched and reacted to within immediate vicinity; child is responsive to others.</td>
<td>Controlled reaction sustained: watches and responds within turn-taking interactions.</td>
<td>Predictable action to familiar event.</td>
</tr>
<tr>
<td><strong>SEMOTIC</strong></td>
<td>Time/Space Displacement</td>
<td>Locutionary</td>
<td>Convention</td>
</tr>
<tr>
<td></td>
<td>Reactive to immediately present sensory and proprioceptive stimuli; no attempt to reestablish or maintain an activity or event.</td>
<td>No intentionality but adult interprets changes in response as meaningful.</td>
<td>Differentiated action and context; response to stimulus consistent although idiosyncratic.</td>
</tr>
<tr>
<td><strong>SENSORY-MOTOR</strong></td>
<td>Imitative Displacement</td>
<td>Executionary</td>
<td>Fine/Gross</td>
</tr>
</tbody>
</table>
| | Repeats own behavior that has been imitated by someone else. | Patterned sounds produced randomly, irregularly | Crude and simple; vocal = crude syllables initiated by.

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### 3-6 months

**Level Ia**

<table>
<thead>
<tr>
<th>SITUATIONAL (Displacement)</th>
<th>DISCOURSE (Organization)</th>
<th>SEMANTIC (Meaning)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Displacement</td>
<td>Event/Discourse</td>
<td>Perceptual</td>
</tr>
<tr>
<td>Objects manipulated to explore properties, including whole objects and their parts. Reach for objects distances or only partially visible.</td>
<td>Organizes experiences by performing action and attending to effects of own action with expectation something will occur.</td>
<td>Primitive concepts of objects based on perceptual features (color, size, shape, sound), sc can discriminate between objects.</td>
</tr>
</tbody>
</table>

**SOCIAL**

<table>
<thead>
<tr>
<th>Self/Other Displacement</th>
<th>Object Displacement</th>
<th>Interactional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observe the presence and actions of people at a distance; interest in body parts and facial features.</td>
<td>One object can be used to explore or manipulate a second object (i.e., means-ends behavior).</td>
<td>Child uses schemes to control own level of input; Participates in simple social games like peek-a-boo, pat-a-cake.</td>
</tr>
</tbody>
</table>

**SENSORY-MOTOR**

<table>
<thead>
<tr>
<th>Imitative Displacement</th>
<th>Imitative Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imitates other’s behaviors if the behavior is already in child’s repertoire.</td>
<td>Imitates unknown behaviors similar to ones in child’s repertoire.</td>
</tr>
</tbody>
</table>

### 7-10 months

**Level Ib**

<table>
<thead>
<tr>
<th>SITUATIONAL (Displacement)</th>
<th>DISCOURSE (Organization)</th>
<th>SEMANTIC (Meaning)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Displacement</td>
<td>Event/Discourse</td>
<td>Perceptual</td>
</tr>
<tr>
<td>One object can be used to explore or manipulate a second object (i.e., means-ends behavior).</td>
<td>Attention coordinated between two objects to maintain an event such as stacking, putting in.</td>
<td>Recognizes objects by properties (things you roll, pull). Track until out of sight.</td>
</tr>
</tbody>
</table>

**SOCIAL**

<table>
<thead>
<tr>
<th>Self/Other Displacement</th>
<th>Object Displacement</th>
<th>Interactional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses other people to achieve personal purpose, such as raising hands up to request adult to lift up (i.e., means-ends behavior).</td>
<td>Uses behaviors to purposefully initiate and terminate interaction with others; maintains own role.</td>
<td>Uses behaviors to purposefully control objects or people, but does not show or share objects with others (i.e., purpose but not intent).</td>
</tr>
</tbody>
</table>

**SENSORY-MOTOR**

<table>
<thead>
<tr>
<th>Imitative Displacement</th>
<th>Imitative Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imitates unknown behaviors similar to ones in child’s repertoire.</td>
<td>Imitates unknown behaviors similar to ones in child’s repertoire.</td>
</tr>
</tbody>
</table>

**CONVENTION**

<table>
<thead>
<tr>
<th>Imitative Displacement</th>
<th>Imitative Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocal closures released into an open vocal tract such as (da) or (ba).</td>
<td>Vocal closures released into an open vocal tract such as (da) or (ba).</td>
</tr>
</tbody>
</table>

---

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10-14 months
Level IIIa

<table>
<thead>
<tr>
<th>COGNITIVE</th>
<th>SOCIAL</th>
<th>SEMOTIC</th>
<th>SENSORY-MOTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Displacement</td>
<td>Sell/Other Displacement</td>
<td>Time/Space Displacement</td>
<td>Imitative Displacement</td>
</tr>
<tr>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>Interpersonal</strong></td>
<td><strong>Locutionary</strong></td>
<td><strong>Executionary</strong></td>
</tr>
<tr>
<td>Objects used in relationships (folk: retrieves pancake) with appropriate use in routines. Uses objects and novel actions to experiment with objects to see what happens.</td>
<td>Recognizes things others can do (open a container). Returns frequently to adult for reassurance during distanced exploration.</td>
<td>Words and responses to objects highly contextualized to immediate environment; finds hidden objects.</td>
<td>Imitates unknown behaviors if the behavior is similar to one in child's repertoire.</td>
</tr>
<tr>
<td><strong>COGNITIVE</strong></td>
<td><strong>SOCIAL</strong></td>
<td><strong>SEMOTIC</strong></td>
<td><strong>SENSORY-MOTOR</strong></td>
</tr>
<tr>
<td>Object Displacement</td>
<td>Sell/Other Displacement</td>
<td>Time/Space Displacement</td>
<td>Imitative Displacement</td>
</tr>
<tr>
<td>Labels objects with appropriate routines. Uses objects and novel actions to experiment with objects to see what happens.</td>
<td>Recognizes things others can do (open a container). Returns frequently to adult for reassurance during distanced exploration.</td>
<td>Words and responses to objects highly contextualized to immediate environment; finds hidden objects.</td>
<td>Imitates unknown behaviors if the behavior is similar to one in child's repertoire.</td>
</tr>
<tr>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>Interpersonal</strong></td>
<td><strong>Locutionary</strong></td>
<td><strong>Executionary</strong></td>
</tr>
<tr>
<td>Maintains extended attention to same event, but rapid change in action or focus. Anticipates next step of a familiar routine.</td>
<td>Uses behaviors to intentionally imitate and terminate interaction with others; adult maintains conversation across several sequences and patterns.</td>
<td>Communicative behavior produced with true intent and social purpose (reject, request object or action, or comment.)</td>
<td>Repeating patterns of verbal and nonverbal behaviors; sounds, actions, gestures.</td>
</tr>
<tr>
<td><strong>COGNITIVE</strong></td>
<td><strong>SOCIAL</strong></td>
<td><strong>SEMOTIC</strong></td>
<td><strong>SENSORY-MOTOR</strong></td>
</tr>
<tr>
<td>Object Displacement</td>
<td>Sell/Other Displacement</td>
<td>Time/Space Displacement</td>
<td>Imitative Displacement</td>
</tr>
<tr>
<td>Labels objects with appropriate routines. Uses objects and novel actions to experiment with objects to see what happens.</td>
<td>Recognizes things others can do (open a container). Returns frequently to adult for reassurance during distanced exploration.</td>
<td>Words and responses to objects highly contextualized to immediate environment; finds hidden objects.</td>
<td>Imitates unknown behaviors if the behavior is similar to one in child's repertoire.</td>
</tr>
<tr>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>Interpersonal</strong></td>
<td><strong>Locutionary</strong></td>
<td><strong>Executionary</strong></td>
</tr>
<tr>
<td>Maintains extended attention to same event, but rapid change in action or focus. Anticipates next step of a familiar routine.</td>
<td>Uses behaviors to intentionally imitate and terminate interaction with others; adult maintains conversation across several sequences and patterns.</td>
<td>Communicative behavior produced with true intent and social purpose (reject, request object or action, or comment.)</td>
<td>Repeating patterns of verbal and nonverbal behaviors; sounds, actions, gestures.</td>
</tr>
</tbody>
</table>

14-18 months
Level IIIb

<table>
<thead>
<tr>
<th>COGNITIVE</th>
<th>SOCIAL</th>
<th>SEMOTIC</th>
<th>SENSORY-MOTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Displacement</td>
<td>Sell/Other Displacement</td>
<td>Time/Space Displacement</td>
<td>Imitative Displacement</td>
</tr>
<tr>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>Interpersonal</strong></td>
<td><strong>Locutionary</strong></td>
<td><strong>Executionary</strong></td>
</tr>
<tr>
<td>Uses familiar objects appropriately and independently of actual routines; Pictures recognized as depicting objects or animals, but not actions. Actions within ongoing events, put objects in containers.</td>
<td>Shares responsibility for the communication, maintaining interaction for several turns, Coordinate object &amp; adult.</td>
<td>True intention to greet, request a game, object, or action, show off, gain attention, acknowledge express feelings, protect self or self interest.</td>
<td>Spontaneous imitation of actions, words in context</td>
</tr>
<tr>
<td><strong>COGNITIVE</strong></td>
<td><strong>SOCIAL</strong></td>
<td><strong>SEMOTIC</strong></td>
<td><strong>SENSORY-MOTOR</strong></td>
</tr>
<tr>
<td>Object Displacement</td>
<td>Sell/Other Displacement</td>
<td>Time/Space Displacement</td>
<td>Imitative Displacement</td>
</tr>
<tr>
<td>Uses familiar objects appropriately and independently of actual routines; Pictures recognized as depicting objects or animals, but not actions. Actions within ongoing events, put objects in containers.</td>
<td>Shares responsibility for the communication, maintaining interaction for several turns, Coordinate object &amp; adult.</td>
<td>True intention to greet, request a game, object, or action, show off, gain attention, acknowledge express feelings, protect self or self interest.</td>
<td>Spontaneous imitation of actions, words in context</td>
</tr>
<tr>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>Interpersonal</strong></td>
<td><strong>Locutionary</strong></td>
<td><strong>Executionary</strong></td>
</tr>
<tr>
<td>Uses familiar objects appropriately and independently of actual routines; Pictures recognized as depicting objects or animals, but not actions. Actions within ongoing events, put objects in containers.</td>
<td>Shares responsibility for the communication, maintaining interaction for several turns, Coordinate object &amp; adult.</td>
<td>True intention to greet, request a game, object, or action, show off, gain attention, acknowledge express feelings, protect self or self interest.</td>
<td>Spontaneous imitation of actions, words in context</td>
</tr>
<tr>
<td><strong>COGNITIVE</strong></td>
<td><strong>SOCIAL</strong></td>
<td><strong>SEMOTIC</strong></td>
<td><strong>SENSORY-MOTOR</strong></td>
</tr>
<tr>
<td>Object Displacement</td>
<td>Sell/Other Displacement</td>
<td>Time/Space Displacement</td>
<td>Imitative Displacement</td>
</tr>
<tr>
<td>Uses familiar objects appropriately and independently of actual routines; Pictures recognized as depicting objects or animals, but not actions. Actions within ongoing events, put objects in containers.</td>
<td>Shares responsibility for the communication, maintaining interaction for several turns, Coordinate object &amp; adult.</td>
<td>True intention to greet, request a game, object, or action, show off, gain attention, acknowledge express feelings, protect self or self interest.</td>
<td>Spontaneous imitation of actions, words in context</td>
</tr>
<tr>
<td><strong>SITUATIONAL</strong> (Displacement)</td>
<td><strong>Interpersonal</strong></td>
<td><strong>Locutionary</strong></td>
<td><strong>Executionary</strong></td>
</tr>
<tr>
<td>Uses familiar objects appropriately and independently of actual routines; Pictures recognized as depicting objects or animals, but not actions. Actions within ongoing events, put objects in containers.</td>
<td>Shares responsibility for the communication, maintaining interaction for several turns, Coordinate object &amp; adult.</td>
<td>True intention to greet, request a game, object, or action, show off, gain attention, acknowledge express feelings, protect self or self interest.</td>
<td>Spontaneous imitation of actions, words in context</td>
</tr>
</tbody>
</table>
### 16-24 months

<table>
<thead>
<tr>
<th>Level IVa</th>
<th>Symbolic</th>
<th>Ordered Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive</strong></td>
<td>Object Displacement</td>
<td>Perform pretend actions with own body, but requires life-size props. Language refers to agents, objects, actions within ongoing event.</td>
<td>Event/Discourse</td>
</tr>
<tr>
<td></td>
<td>Self/Other Displacement</td>
<td>Actively watches others in play but does not participate. Concept of self as individual, differentiates things belonging to self vs others.</td>
<td>Interactional</td>
</tr>
<tr>
<td><strong>Semiotic</strong></td>
<td>Time/Space Displacement</td>
<td>Symbolic reference to objects/events that are not in the immediate vicinity; Talk about whatever draws attention in the immediate environment. Looks for objects in expected locations.</td>
<td>Locutionary</td>
</tr>
<tr>
<td><strong>Sensory-Motor</strong></td>
<td>Imitative Displacement</td>
<td></td>
<td>Executionary</td>
</tr>
</tbody>
</table>

### 19-25 months

<table>
<thead>
<tr>
<th>Level IVb</th>
<th>Symbolic</th>
<th>Ordered Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive</strong></td>
<td>Object Displacement</td>
<td>Attends to symbols (pictures, toys) that look like real objects. Talk about own action, comment on changes within ongoing event. Meaning unclear outside of context.</td>
<td>Event/Discourse</td>
</tr>
<tr>
<td></td>
<td>Self/Other Displacement</td>
<td>Plays near others, but engaged in different activities (parallel). Talk includes adult by asking for actions or assistance (tie my shoe). Much independent self-help action.</td>
<td>Interactional</td>
</tr>
<tr>
<td><strong>Semiotic</strong></td>
<td>Time/Space Displacement</td>
<td>Language may representational, can refer to objects or persons not present within very familiar context. (Where go? Puppy all gone.)</td>
<td>Locutionary</td>
</tr>
<tr>
<td><strong>Sensory-Motor</strong></td>
<td>Imitative Displacement</td>
<td></td>
<td>Executionary</td>
</tr>
</tbody>
</table>
APPENDIX C

GUIDELINES AND EXAMPLES OF INTERACTION UTILIZING NORRIS & HOFFMAN'S INTERVENTION MODEL
(Unpublished manuscript)

LEVEL I. This level begins with an invitation from the adult. The adult pauses, and invites the child to "communicate" or initiate a game by saying "Now what?" or "What should we do?" and looking expectantly at the child.

*Communication* - at Level I, the child is not capable of intentionally initiating a communicative behavior, and so the adult watches the child for any behavior that does spontaneously occur. This could be a random hand or foot movement, a fortuitous vocalization, or even a hiccup or other involuntary behavior. The adult generally chooses the highest or most logical behavior occurring at that moment to treat as a communication.

*Social* - at Level I, the child is not capable of intentionally controlling the behavior of people, and so the adult behaves as if the random communication was intended to signal the adult to do something interesting. The adult responds to the behavior as if the child were controlling the event.

*Cognitive* - at Level I, the child is not capable of understanding the world beyond his direct sensori-motor system. Therefore the consequence that the adult gives the child is multisensory and directly on the child's body.

Examples

Adult says "Now what?" and:

*Child* randomly moves hand

Adult responds by saying "You want the doggie to bite your hand", and causes a colorful, fuzzy stuffed animal to chew on the child's hand while chattering (visual, auditory, tactile consequence that is produced on the child's body)

or

*Child* accidentally touches own leg

Adult responds by saying "You want the car to drive on your leg" and causes a colorful, plastic car to run up and down the child's leg while making engine noises (visual, auditory, tactile consequence that is produced on the child's body)
LEVEL II. This level reflects a change in awareness compared to Level I. The child may quiet, stop and hesitate, as if he/she noticed that something interesting just happened. Or the child might become animated and increase activity, as if anticipating that something may happen again. The child doesn’t do anything to actively cause it to happen, but it is apparent that the child noticed the event. The adult invites a communication ("Now what?") and pauses.

**Communication** - at Level II, the child changes his/her state of activity, either decreasing or increasing actions, vocalizations, or attending. The adult reacts to one of these behaviors, and reacts to the behavior as if it was a request to repeat the interesting consequence.

**Social** - at Level II the child has not figured out how to get the interesting behavior to occur. The child is only reacting to it. The adult must behave as if the interest is an attempt to control the adult’s behavior.

**Cognitive** - at Level II, the child still requires sensori-motor consequences that occur directly on the child’s body.

**Examples**

*Adult* had just caused puppet to chew on child’s fingers and chatter

*Child* stops and looks in direction of puppet

Adult responds by saying "You want the doggie to bite your hand again?" and causes puppet to chew on child’s fingers and chatter.

or

Adult had just caused car to drive on child’s leg

*Child* shakes hands excitedly and vocalizes

Adult responds by causing car to drive on child’s leg while making engine noises
LEVEL III. This level reflects the first attempt to control the event. The child produces an action, as an experiment or trial, to see if the interesting action will occur again. The child lacks an understanding that the action is a signal to others. The child doesn't know if or why the event will occur again, but is exploring to see what happens when the child acts.

Communication - at Level III, the child begins to repeat actions that caused interesting events. The behaviors are more organized than random movements, but are not yet true points of reaches. They include extending a hand or foot, moving a finger, or vocalizing while looking.

Social - at Level III, the child is trying to maintain the interesting activity rather than specifically to communicate with others. The adult must interpret the attempt to maintain the event as a request for the adult to repeat the action.

Cognitive - an important advance occurs at Level III, as the child begins to reach out toward objects. The child is attempting to affect the object rather than waiting for the object to affect the child.

Examples

Adult says "Now what?" and:

Child extends hand in direction of puppet

Adult responds by saying "You want him to bite you again?" and causes puppet to chew on child's fingers and chatter.

or

Child kicks toward adult

Adult responds by saying "You want the car to go fast on your leg!" and causes the car to drive on the child's foot and leg.
LEVEL IV. This level reflects an emerging notion of causality. The child begins to understand that one thing can be used as a means to cause another thing to happen. The means can be social or physical.

Communication - at Level IV, sounds or gestures are used as a means to cause an event to occur again. The child looks at the object and vocalizes (for older children, this may even be a recognizable word). Gestures are true points and reaches to indicate what the child wants.

Social - the child is interested in people and will use communications to cause the adult to play social games, such as tickling or peek-a-boo. But the child still does not understand how communications can be used to cause the adult to do interesting things with objects.

Cognitive - at Level IV, one object can be used as a means to cause another object to respond. The child may hold and reach with one object in order to recreate an interesting event, or use one object to create an interesting event.

Examples

Adult says "Now what?" and:

Child reaches for and holds a cup

Adult causes puppet to begin to drink from the cup, making slurping sounds (the effect is between objects, and no longer directly occurs on child's own body).

or

Child looks at car and says "Fast"

Adult causes the car to drive fast on the child's leg.


LEVEL V. This level is characterized by true intentionality. The child understands that a request can be directed at an adult that will cause an interesting event to occur. The child begins to understand the functional relationship between objects.

**Communication** - at Level V the child looks at the adult and vocalizes (including meaningful words) or gestures (including conventional points and reaches) in order to cause the adult to make an event happen again. The child is purposefully communicating, rather than only trying to cause an event to recur.

**Social** - the child understands the play as the joint interaction between the child, the adult, and the object. The child makes requests, commands, demands and protests to direct the play.

**Cognitive** - the child uses objects appropriately to do single actions, especially familiar actions such as eating or combing hair.

Examples

*Adult* says "Now what?" and:

*Child* looks at adult and says "apple"

*Adult* gives apple to the child, who feeds it to the puppet or

*Child* points to car and:

*Adult* asks if the child wants the car to go fast or slow

*Child* chooses by telling adult

*Adult* causes car to drive fast across the table and crash
APPENDIX D

SAMPLE INTERACTIONS FROM
ADULT-INITIATED AND CHILD INITIATED FORMATS
(From Norris & Hoffman, 1990a)

Example interchange of adult and child within adult-initiated interaction:

Adult: (Presents a red ring)
   "Lets put this one on."
   (points)
   "Tell me 'on'."
Child: (Looks at adult and reaches for ring).
Adult: "Tell me 'on'."
Child: (Produces vocalization and taps toy)
Adult: "OK, you put it on"
   (assists child in putting ring on peg)
   "Yea, you put it on"
   (claps)
Adult: (presents a green ring)
   "Lets put this one on. Tell me 'on'."
Child: (Produces a vocalization and looks at adult).
Adult: Attempts to shape a closer approximation by modeling the target word.
Child: Produces an approximation of the target vowel.
Adult: "Oh! Good girl, you put it on" and assists child in stacking the ring. Claps at child's success.

Example interchange of adult and child within child-initiated interaction:

Child: (Repositions body away from some stacking rings that are placed on the floor.)
Adult: (Interprets the body turn as if it were meaningful and communicative by making a toy bird turn one of the rings)
   "Oh, you want the birdie to turn it."
Child: Looks at the adult, then at the rings, and touches the rings.
Adult: (Interprets the touch as a request to repeat the action, and again makes the bird turn the rings)
   "Oh, you want him to turn the ring again"  
   "Turn-turn" (spoken in bird voice)
Child: Smiles, looks at bird and turns the rings herself.
Adult: (Interprets the child's action as a request for a turn)
   "You want to turn another ring?"
   "makes the bird assist the child in adding and turning a new ring."
Child: (Lean back and touches her hair fortuitously while vocalizing, and looks at the adult.)
Adult: Interprets the new behavior as if it were meaningful and communicative by saying "Oh, you want the bird to kiss you," and makes the bird kiss the child at the point of the touch.

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APPENDIX E
INFANT SCALE OF NONVERBAL BEHAVIOR
(From Norris & Hoffman, 1990a)

<table>
<thead>
<tr>
<th>Levels of Interactive Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I (1-3 Month Ratings) These behaviors occur in response to general stimulation, and are usually in reaction to the daily actions or the general environment.</td>
</tr>
<tr>
<td>Level II (4-6 Month Ratings) These behaviors occur in response to play between people, generally reflecting turn taking but not specific control over others.</td>
</tr>
<tr>
<td>Level III (7 to 9 Month Ratings) These behaviors occur when the infant imitates control in the interaction, by imitating actions and reacting to participants share interaction with objects.</td>
</tr>
<tr>
<td>Level IV (10 to 15 Month Ratings) These behaviors include imitations of usual functional actions and conventional gestures or vocalizations; their meaning is usually clear in context.</td>
</tr>
<tr>
<td>Level V (12 to 18 Months Rating) These behaviors are directed at getting the adult to share objects, or to control the game as the other person playing.</td>
</tr>
</tbody>
</table>

Vocalizations
1. Undifferentiated Vocalizations done to general environment, rather than a specific stimulus |
2. Standardized sounds or rumbles of pleasure or frustration |
3. Coos and other vowel vocalizations produced to general stimuli |
4. Responds to others' vocalization with a vocalization in vocal play, not play with objects |

Vocal Actions
1. Random body movements showing excitement |
2. Startle response |
3. Attract attention with body movements |
4. Anticipatory activity (excitement when object seen) |

Facial and Body Postures
1. Maintains eye contact when interacted with |
2. Smiles or widens eyes when talked to |
3. Looks at people, not in response to play with objects |
4. Visually follows people and objects |

II. 4-6 Month Rating
Vocalizations
1. Vocalizations, including vocalizing when action done to infant, squeals when talked to, cries if disrupted, laughs in interaction. |
2. Vocalizations characterized by imitation changes in cooing, babbling consonants, and/ or produced, repetition of CV syllables, consonant /b/ or /d/ /n/ or /m/ |
3. Imitates pitch and loudness changes |
4. Vocalizes directly to another person |
5. Vocalizes while playing with toy |
6. Turn taking in vocalizations |

Vocal Actions
1. Social rituals, including pulling away, shaking head |
2. Responses to social stimuli with cries and Browns |
3. Wiggles limbs when adult assumes a familiar gesture |
4. Child reaches toward another person or close object |

Facial and Body Postures
1. Shows variations, including reaching arms to be picked up, moving close to another, clinging when held |
2. Smiles or Brown's at other people, but not because of play with objects |
3. Moves to see what is being shown or looked at |
4. Joint focus to something presented by adult |

III. 7-9 Month Rating
Vocalizations
1. Attempts to imitate speech sounds (may or may not be same sounds and CV syllables) |
2. Vocalizations show changes in pitch, quality, intensity, rate, and duration |
3. Vocalizes to have toy retrieved or adult do action |
4. Vocalizes at objects, then looks to adult and indicates the need for help with a pull, grab, etc. |
5. Imitates nonspeech sounds (ruffs, moaning, animal, etc.) |
6. Imitates words without attaching meaning |
7. Babble phrases with 1 or more different syllables, including sounds such as /i/ /i/ /i/ and /d/ |

Level Actions
1. Initiates movements like turning over, putting hand on toy |
2. Pushes away unwelcome food, object, person |
3. Moves limbs to indicate recognition or recurrence |
4. Grabs adult's hands, pulls hand, etc. to indicate recurrence |
5. Draw action for familiar game like pat-a-cake |

Facial and Body Postures
1. Smiles and laughs when needed or entertained |
2. Pulls back or moves to reject something |
3. Uses eye contact to indicate recurrence or help |
4. Allows by leaning over or moving forward, etc. to follow the actions of adults and objects |

IV. 10-12 Month Ratings
Vocalizations
1. Repeats vocalization if it is responded to |
2. Fusses, cries, moans, when desired object removed |
3. Expresses negative reaction through vocalization |
4. Uses single word to label |
5. Emitates a term of sounds said by adult |
6. Uses jargon to toys and people as if talking |

Vocal Actions
1. Points to noticed objects |
2. Points to parts of objects upon imitation |
3. Emitates a term of sounds said by adult |
4. Uses jargon to toys and people as if talking |

Facial and Body Postures
1. Wiggles body to continue a movement like bouncing |
2. Leaps body to represent an action (rocks to represent a rocking toy) |

V. 12-18 Month Rating
Vocalizations
1. Uses five words |
2. Uses one word for many meanings |
3. Imitates variety of words |
4. Uses jargon mixed with real words |

Vocal Actions
1. Gives objects to adult to get toy to interact with |
2. Family, reaches, grabs objects or toys to indicate wanting them |
3. Repeat actions that produce laughter or attention |
4. Uses gestures in combination to indicate wants |

Facial and Body Postures
1. Emotes facial movement or expression |
2. Leaps adult by hand to desired object |

VI. 18-24 Month Rating
Vocalizations
1. Vocabulary of 10-50 words |
2. Imitates 2-3 word combinations |
3. Attempts to describe experiences using jargon mixed with real words |
4. Uses a variety of word classes (actions, agents, attributes) |

Vocal Actions
1. Hands book to object to be read or shared |
2. Does a series of relational actions |

Facial and Body Postures
1. Does own action if other person will not respond |

IV. Reliability
1. Scores are assigned, and they reach a level of 90% accuracy in coding the behaviors.
APPENDIX F

DIAGNOSTIC CRITERIA FOR AUTISM DISORDER


A. A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):

(1) qualitative impairment in social interaction, as manifested by at least two of the following:
   a. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
   b. failure to develop peer relationships appropriate to developmental level
   c. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
   d. lack of social or emotional reciprocity

(2) qualitative impairments in communication as manifested by at least one of the following:
   a. delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
   b. in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
   c. stereotyped and repetitive use of language or idiosyncratic language
   d. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

(3) restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
   a. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
   b. apparently inflexible adherence to specific, nonfunctional routines or rituals
   c. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
   d. persistent preoccupation with parts of objects

B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.
APPENDIX G

PARENT CONSENT FORM

A Comparison of Traditional vs. Developmentally-Based Intervention for Young Nonverbal Children

Dear Parents:

Your child is invited to participate in a research project to help us learn more about how to best help speech-language pathologists and others work with young nonverbal students to improve their cognitive, social, and communication development. Your child has been selected on the basis of his pattern of development in these skills.

THE PURPOSE OF THE STUDY

Speech-language pathologists and others who work with nonverbal children are challenged to provide intervention which is effective to improve the development of the child's cognitive, social and communication skills. This study compares two different kinds of intervention proposed for nonverbal children to determine which format works best to elicit interactive behavior from the child.

EXPLANATION OF PROCEDURES

We are seeking permission for your child to participate in a research study. Your child will participate in their regular speech/language therapy sessions. During 10 speech/language therapy sessions with your child, two different formats of intervention will be utilized. Your child's response to each intervention format will be examined to determine which is more effective for your child.

POTENTIAL RISKS AND BENEFITS

This study does not involve any risk to your child. Your child will receive his usual amount of speech therapy in the usual setting. By participating, your child will benefit from more intensive examination of his response to two different kinds of therapy, in order to determine the format to which he best responds.
ASSURANCE OF CONFIDENTIALITY

The information that we collect from this study will be treated confidentially. Your child will never be referred to by name for educational or research purposes. Your child's name will not appear in written research reports.

WITHDRAWAL FROM THE STUDY

Participation in the study is completely voluntary. Your decision whether or not to allow your child to participate will not affect any educational services he is now receiving. If you decide to participate, you may withdraw your consent and discontinue your child's participation at any time.

OFFER TO ANSWER QUESTIONS

If you have any additional questions, please feel free to contact the researcher listed below. If you are willing to allow your child to participate, please sign and return this form to your child's teacher.

YOU ARE MAKING A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE READ THE INFORMATION PROVIDED ABOVE AND HAVE DECIDED TO PERMIT YOUR CHILD TO PARTICIPATE. YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP.

______________________________  ________________________________
Signature of Parent               Relationship to Child

______________________________
Date

Thank you for your interest in this project!

______________________________
Kelly Higgins, M.S., CCC-SLP
Speech-Language Pathologist
Department of Special Education: (318) 783-3171
Permission to Videotape

I authorize that my child ______________________ may be videotaped during speech therapy for educational and/or research purposes.

______________________________
Parent Signature

______________________________
Relationship to child

______________________________
Date
Significant nonverbal and verbal interactions of the adults and children were transcribed.

Significant nonverbal actions of the adults included those specifically related to or influencing the interaction with the child. This included gestures, such as holding out a hand, touching the child to gain attention or give direction, presenting toys in front of the child, etc. Significant nonverbal actions of the children included bodily orientation, significant body movements that were recognized by the adult in interaction, natural gestures such as reaching for objects or retracting a hand, actions with toys or on objects, smiling, and eye gaze.

All verbal interactions addressed to the child by the adult were transcribed. Occasionally, adults would talk to other adults within the intervention sessions. These utterances were separated by brackets within the interaction with a notation indicating to whom the adult was speaking. The vocalizations of the child that were characterized as jargon and were not distinctively tied to events or objects were generally noted but not phonologically transcribed. Changes in the child's vocalization that were recognizable as words tied to the context of interaction, or were considered to be imitations, were phonetically transcribed. Vocalizations were considered to be imitations if: a) the utterance was constructed of at least a consonant and verb (CV) or vowel reduplication (/o/ /o/), and b) the child's utterance was appropriate within the context of interaction. Laughing and crying were noted when they occurred. Repetitions of a word within the same utterance were not counted as additional words.

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Transcriptions utilized a vertically divided page format with one half of the page reflecting the utterances and gestures of the interventionist, and the other half those of the child. Utterances and gestures of the interventionist and the child were recorded to reflect chronological format, with successive events presented on successive lines on the page. Events that co-occurred were recorded on the same line.

The positions of the adult and child (sitting side-by side at table, child sitting on adult's lap with back to adult) were noted within brackets at the beginning of each segment unless no changes in positioning had occurred. The general context of the immediate interaction at the onset of a segment was also noted within brackets at the beginning of a segment. Occasionally, notations were made regarding intersegmental sections that were not transcribed.
## APPENDIX I

### OBSERVATION RATING SCALE

<table>
<thead>
<tr>
<th>Enjoyment Level</th>
<th>Negative range 1 - 2</th>
<th>Neutral range 3 - 4</th>
<th>Positive range 5 - 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative facial expression, may frown, grimace, or protest, seems unhappy.</td>
<td>Child appears passive, may have a blank expression, stare, or seem distant.</td>
<td>Happy facial expression, may laugh or smile, or seems happy.</td>
</tr>
<tr>
<td>Session 1:</td>
<td>1  2</td>
<td>3  4</td>
<td>5  6</td>
</tr>
<tr>
<td>Session 2:</td>
<td>1  2</td>
<td>3  4</td>
<td>5  6</td>
</tr>
<tr>
<td>Session 3:</td>
<td>1  2</td>
<td>3  4</td>
<td>5  6</td>
</tr>
<tr>
<td>Session 4:</td>
<td>1  2</td>
<td>3  4</td>
<td>5  6</td>
</tr>
<tr>
<td>Session 5:</td>
<td>1  2</td>
<td>3  4</td>
<td>5  6</td>
</tr>
<tr>
<td>Session 6:</td>
<td>1  2</td>
<td>3  4</td>
<td>5  6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interaction with the Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative range 1 - 2</td>
</tr>
<tr>
<td>Child disengages or avoids interaction with adult, may turn away eyes, or body, or try to leave the interaction.</td>
</tr>
<tr>
<td>Session 1: 1  2</td>
</tr>
<tr>
<td>Session 2: 1  2</td>
</tr>
<tr>
<td>Session 3: 1  2</td>
</tr>
<tr>
<td>Session 4: 1  2</td>
</tr>
<tr>
<td>Session 5: 1  ?</td>
</tr>
<tr>
<td>Session 6: 1  2</td>
</tr>
</tbody>
</table>
VITA

Kelly Higgins received her bachelor of science degree from the University of Oklahoma in 1982 and her master of science degree from the University of Southwestern Louisiana in 1987. She is currently a candidate for the degree of Doctor of Philosophy from the Louisiana State University and Agricultural and Mechanical College. She holds the Certificate of Clinical Competence in speech-language pathology by the American Speech-Language-Hearing Association, and is licensed by the Louisiana State Board of Examiners for Speech-Language Pathology.

During her professional career, Ms. Higgins has worked in a variety of settings including public and private school systems, private clinics and university settings. She has taught both graduate and undergraduate courses in communication disorders as well as supervising students and other professionals in clinical practicums and other professional settings. Ms. Higgins has pursued special interests in the areas of autism and learning disability, and she has presented papers on these topics locally as well as at the Annual Convention of the American Speech-Language-Hearing Association.
Candidate: Kelly C. Higgins

Major Field: Communication Disorders

Title of Dissertation: A Comparative Study of Communication Intervention for Nonverbal Children with Autism

Approved:

Janet Norris
Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:

23 October 1998